Knee pain and knee pain related disability in adults of the Western Development Region of Nepal

By

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Student Declaration

I declare that while registered as a candidate for the research degree, I have not been a registered candidate or enrolled student for another award of the University or other academic or professional institution.

I declare that no material contained in the thesis has been used in any other submission for an academic award and is solely my own work

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Type of Award Doctor of Philosophy (PhD)

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Abstract

Background

Knee pain and related disability are important public health problems worldwide. In a systematic review, the prevalence of knee pain varied between 2.4% to 49.2% worldwide and disabilities were greater in those with knee pain compared to those without. The prevalence of knee pain may be higher in mountainous regions. The research student is from Nepal. He has a clinical interest in musculoskeletal disorders and had found at the time of the thesis that there had been no study undertaken across Nepal. Such a study would inform Nepalese health policy.

Objectives

To estimate the prevalence of knee pain and knee related disability, overall and in different ecological zones, of one region of Nepal.

Methods

A cross-sectional multistage cluster survey was undertaken using a questionnaire in Nepali delivered face to face to adults aged over 18 years in seven sites across the three ecological zones (plain, hilly and mountainous) of the Western Development Region of Nepal. Crude weighted and age standardised period and point prevalence rates of knee pain were estimated. The prevalence of disability was compared between those who had knee pain and those who did not have knee pain. Binary logistic regression was used to investigate potential independent risk factors for the prevalence of knee pain and knee pain related disability.

Results

In total 694 participants were recruited; 52.6% were women, the mean age was 41 years and 14.1% lived in the mountainous zone. The period prevalence of knee pain was 22.3% (95% CI 19.2% - 25.5%) and of chronic knee pain was 12.1% (95% CI 9.5 – 14.7%). The point prevalence was 7.6% (95% CI 5.7%-9.6%). Knee pain was higher in the mountainous zone compared to the plain zone. Overall 25.6% of the 694 participants had disability, as measured by the WHO DAS 2.0, and this was significantly higher in those with knee pain compared to those without (81.2% vs. 9.5%). Disability was highest among those with knee pain in the mountainous zone, with all having disability. Despite this only 54.8% of those with knee pain sought advice for their condition, those in the mountainous zone were less likely to seek advice, access hospital treatment or take oral medications.

Conclusion

Knee pain is highly prevalent in Nepal. Just under half who suffer do not access services for pain management, even though knee pain is associated with high levels of disability. Rates of knee pain are highest in the mountainous areas where access to services is lowest. This demonstration of unmet need, particularly in the poorest and most remote areas of the country, is of importance to policymakers who should focus on raising awareness and improving access to services.

Acronyms

AMED: Allied and Complementary Medicine
DI: Disability Index
EMBASE: Excerpta Medica database
HAQ: Health Assessment Questionnaire
HRL : Hilly rural site
HUA : Hilly urban affluent
HUD : Hilly urban deprived
KOOS: Knee Injury and Osteoarthritis Outcome Score
KP: Knee pain
KPD; Knee pain related disabilities
MEDLINE: Medical Literature Analysis and Retrieval
MRL : Mountain rural site
MZ : Mountainous zone
PRL : Plain rural site
PSU: Primary sampling unit
PUA: Plain urban affluent site
PUD : Plain urban deprived site
PZ : Plain zone
SF; Short Form Questionnaire
SSU: Secondary sampling unit
WDR: Western Development Region
WHODAS 2.0: World Health Organization Disability Assessment Schedule 2.0
WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

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Chapter 1: Introduction

This chapter contains the background for this thesis: a study of knee pain and knee pain related disabilities in Nepal. It outlines the rationale of the thesis and contains a brief eco-geographical and sociodemographic description of Nepal, introduction to the Western Development Region, brief information about health seeking behaviour in Nepal and the aims and objectives of the thesis with an outline of chapters of the thesis, which follow this one.

1.1 Background of study

Musculoskeletal conditions are one of the major global public health problems, as they are the second leading cause of years lived with disability worldwide and, thereby, contribute to economic burden globally through loss of productivity and need for health and social care services (World Health Organization, 2006; Palazzo et al., 2014; Storheim and Zwart, 2014). Most people experience at least one episode of a musculoskeletal disorder during their lifetime (Bihari et al., 2011).

Of the different kinds of joint problems, knee pain is one of the most common musculoskeletal conditions, particularly in older adults (Dawson et al. 2004; Jordan et al., 2010), and consequently, it is one of the commonest causes of disability (Neogi, 2013; Litwic et al., 2013).

1.1.1 Why is knee pain important?

The knee is the largest weight-bearing joint in the body and is important in all activities involving the lower limb. Due to overuse or overload, the structures of the knee joint are particularly prone to injury causing pain and limiting lower limb function. Longer term, damage to the knee structures can lead to a chronic pain condition, knee osteoarthritis (Murase et al., 2015; Bhandarkar et al., 2016). The chronic pain and functional impairment associated with knee osteoarthritis has been shown to lead to disability, social isolation and reduced quality of life (Jhun et al., 2013; Miu and Chan, 2014).

Osteoarthritis of the knee is a highly prevalent disease, and is more common than osteoarthritis of the hip (Woolf and Pfledger, 2003). Although it is suggested that rates may be higher in Europe and the United States compared to developing countries (Woolf and Pfledger, 2003), recent studies suggest rates of knee pain and knee osteoarthritis are also high in Asian countries (Fransen et al., 2011). Recent estimates suggest that worldwide knee osteoarthritis affects around 200 million people and accounts for 11 million years lived with disability (Global Burden of Disease Study, 2015), with an increase of a third over the last 10 years. The increase in knee osteoarthritis is thought to be mainly due to the increase in the ageing population in developed and developing countries (Fransen et al., 2011; Suzman and Beard, 2011; He et al., 2016), as age is the major risk factor for osteoarthritis (Lui et al., 2015; Noormohammadpour et al., 2017; Park et al., 2017). Globally, the estimated number of people aged 65 years and over is likely to double from

8% in 2008 to 16.2% by 2040 (Suzman and Beard, 2011; He et al., 2016). The probable reason why the prevalence of knee osteoarthritis increases with age is cumulative exposure to other risk factors along with biological changes due to ageing. With age, there is progressive thinning of cartilage, weakening of muscle strength, poor proprioception and oxidative damage of the knee joint, and it becomes less able to resist other adverse factors (Zhang and Jordan, 2010).

The main other risk factors for knee osteoarthritis include gender, overweight and obesity, knee injury and occupational factors (Zhang and Jordan, 2010; Litwick et al., 2013). Women are consistently shown to have a higher rate of symptomatic knee osteoarthritis then men and are more likely to undergo knee replacement (Kim et al., 2008; Turkiewicz et al., 2015; National Joint Registry 2016; Park et al., 2017). The link between female gender and knee osteoarthritis suggests a possible link with sex hormones (Srikanth et al., 2005), which may alter the experience of pain (Pool et al., 2007; Vincent and Tracey, 2008). A recent systematic review has suggested that obesity increases the risk of knee osteoarthritis 4.5 times and overweight doubles the risk of knee osteoarthritis (Zheng and Chen, 2015). The possible reason for such a relationship is likely to be because obesity leads to excessive load on the knee joint during routine activities over time resulting in mechanical injury to and breakdown of cartilage in the knee (Chan and Chan 2011; Heidari 2011; Buckwalter et al., 2013). The prevalence of obesity has been increasing globally, and this may also be playing a part in the increasing prevalence of knee osteoarthritis, and, given the prevalence of obesity is rising in younger people as well, will result in a continuing increase in knee osteoarthritis rates (Ng et al., 2014).

Previous knee injury is a recognised risk factor for knee osteoarthritis because of direct damage to the knee joint (Felson et al, 1987; Fernandes et al., 2017). The increased risk of knee osteoarthritis following a previous injury has ranged between 2 and 7 times that of someone without injury in different studies (Wilder et al., 2002; Zhang et al., 2010). Similar damage may be caused by the repetitive and excessive joint loading related to occupations associated with heavy lifting or prolonged squatting and kneeling, which have also been shown to increase the risk of knee osteoarthritis, and may be of particular concern with the increasing need to continue to be productive into old age (Muraki, et al., 2009 Palmer, 2012; Hoy et al, 2011).

1.1.2 Measuring knee pain in populations

As can be seen from the above discussion, much of the global population data on knee pain relates to osteoarthritis, as do the studies of risk factors. In part, this is because it causes considerable disability (Global Burden of Disease Study, 2015) and, at least in developed countries, concerns about complications of hip and knee replacements as well as the cost of these surgeries have led to the development of population based registries allowing population study (National Joint Registry, 2016). In contrast, the measurement of the burden of knee pain in populations has mainly been through ad hoc population-based surveys (Fransen et al., 2011). These have been based on self-report questions, for example McAlindon et al., (1993).

The burden of knee pain in populations is measured by the prevalence of knee pain, which is how many cases occur in a defined population. Prevalence rate is the proportion of a given population with the condition of interest, in this case, knee pain. There are two different measures of prevalence (Webb et al., 2011).

Point prevalence: the number in a given population affected by the condition of interest at a specified point in time.

Period prevalence: the number in a given population affected by the condition of interest during a specified time interval, this includes new cases occurring in that time interval and existing cases at the beginning of the time interval.

The prevalence rate is estimated by dividing the prevalence by the population of interest and is expressed as a percentage.

As well as knee pain, the prevalence of knee disability can also be measured. Disability is usually measured by using validated questionnaires, which may be generic or knee specific. Generic questionnaires have usually been designed to measure levels of disability or quality of life in the general population or across a range of different conditions and the questions are not necessarily directly related to knee problems. They may include domains such as limitations in activities of daily living, mental and emotional wellbeing, cognition, social support et cetera. An example of these types of questionnaires is the World Health Organisation Disability Assessment Schedule (Ustun et al., 2010). Knee specific questionnaires are ones that have been designed to measure symptoms, functional limitations and quality of life domains known to be directly related to the knee e.g., pain on kneeling, and include such questionnaires as the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Knee Injury and Osteoarthritis Outcomes Score (KOOS) (KOOS User's Guide, 2012).

The following subsection provides an overview of knee pain prevalence studies.

1.1.3 Knee pain and knee pain related disability in developed countries

There have been numerous studies of knee pain in developed countries. In Europe and South America; these suggest that the prevalence of knee pain ranges from 18.2% to 54.1% (Cecchi et al., 2008; Soni et al., 2012; Thiem et al., 2013; Herquelot et al., 2014; Turkiewicz et al., 2015;Granados et al., 2016; Kiadaliri et al., 2016).

In developed countries, knee pain has also been shown to lead to impaired mobility and disability (Murray and Lopez, 1996), absenteeism from work and early claims for disability pension (Tellnes and Bjerkedal, 1989).

1.1.4 Knee pain and knee pain related disability in developing countries

Unlike in developed countries, there have been few studies of the prevalence of knee pain in developing countries. Most of these studies have been undertaken in Asia. Some studies have been conducted in Tamil Nadu, Bangalore and Maharashtra in India (Anantharaman and Muthunarayanan, 2016; Chia et al., 2016; Pal et al., 2016),in Korea (Park et al., 2017), in Karachi, Pakistan (Gibson et al. 1996), in Tibet province of China (Hoy et al. 2010), and South Korea (Kim et al. 2011).

These studies suggest that prevalence of knee pain ranges from 2.4% (Gibson et al. 1996) to 49.2% (Chokhanchichai et al. 2010). This suggests the problem of knee pain and knee pain related disabilities may be high in some south Asian countries. In the study by Chandrasakaran et al. (2003) conducted in Malaysia, knee pain was a commonly found musculoskeletal problem among female assembly workers.

A study conducted in the Tibet province of China identified some common contributing factors to knee pain with associated disabilities (Hoy et al. 2010): bending of the knees, sustained squatting (such as in toileting, clothes washing, socialising), lifting and carrying heavy loads (rocks, crops and children) over long distances in rugged hilly topography, and the wearing of poor quality footwear with little cushioning or arch support. Although, because of the abundance of sunlight, some disease conditions associated with knee pain like rickets and osteomalacia are less problematic in Asian countries, there is some evidence that they are becoming more of a problem in urban areas in India (Ravinder et al., 2000). In addition, some factors associated with knee pain and osteoarthritis in developed countries are also observed in Asian populations. Gibson et al. (1996) found that excessive body mass index was associated with knee pain in the Pakistani population. In all, knowledge about the possible impact of knee pain on adults in developing countries is scarce and further information is required to identify the occupational and environmental determinants of knee pain.

1.1.5 Knee pain in Nepal

There is little research undertaken on knee pain in the Nepalese population. The available information is merely limited to overall physical disabilities rather than being specifically about knee pain (New Era, 1999). A prevalence study revealed a general disability rate of 3% (United Nations, 1993), whereas a similar study showed 1.6% general disability in the population (Japan International Co-operation Agency, 2002). The Central Bureau Statistics, (2011) estimated that any type of disability affected 1.9% of the population and the prevalence of physical disability was 0.7%. A study conducted in a hilly rural community of Nepal revealed that males were found to be more disabled than females (Sauvey et al., 2005). The presence of osteoarthritis of the knee, hand or hip was observed in 10.4% of treated haematological patients in a tertiary care hospital in Pokhara, Nepal (Das and Paudel, 2006). Knee pain was one of the commonest reasons for consultation in a mobile health camp organized in the remote village of Tukuche, Mustang district of Nepal (Karrey, 2011).

Nepal has a diverse mixture of ecological zones: mountains, rolling hills, ridges, valleys and plain land. More than 83% of the land mass consists of peaks, hills and mountains. Almost half of the population live in these areas (Central Bureau of Statistics, 2011). They have to walk in rugged undulating topography, uphill and downhill and have to lift and carry heavy objects in routine indoor and outdoor tasks. The majority of the population of Nepal reside in villages and have to perform routine physical labour such as lifting and carrying heavy weights across rugged surfaces (Central Bureau of Statistics, 2011). Squatting is a common posture during washing clothes, toileting and undertaking agricultural tasks.

Traditionally Hindu, Buddhist, and Muslim people are culturally bound to flex their knees during prayer and meditation. The majority of the population are not able to afford furniture (chairs and tables) at home so have to sit on the floor with a cross legged (flexed knee) posture, because extension of the knee showing the soles of the feet while sitting on the floor is considered as uncivilized, impolite behaviour.

All of the above conditions are potentially predisposing factors for knee problems in the Nepalese population. Previous studies conducted in different parts of the world have shown associations between knee pain and rugged hilly topography, lifting and carrying heavy loads for long distances, climbing up and down steep and mountainous terrain, heavy domestic duties and climbing stairs (Zeng et. al., 2006; Clare et al., 2007; Cozzensa et al., 2007; Murakai et al., 2009; Hoy et al. 2010).

1.1.6 Rationale for the study

The Nepalese population have a number of predisposing risk factors, as discussed above, which might play a significant role in increasing the prevalence of knee pain and knee related disabilities. Because the initial literature review revealed a lack of studies about knee pain and knee pain related disabilities in the Nepalese population, it appeared that a population based prevalence study was warranted. This study would be helpful in identifying the extent of problems of knee pain and disabilities among adults in Nepal. The findings of such a study would be helpful in designing effective health care plans for the benefit and welfare of the people suffering from this condition in Nepal. Early detection and better management would be helpful to prevent morbidity and reduce the burden of disability associated with knee pain, improve quality of life and the financial consequences of reduced productivity.

Considering the resource constraints, for security reasons and because of easy accessibility, it was proposed to conduct the study in one of the five regions of the Western Development Region of Nepal. The geographical structure of this region is similar to other regions. Health facilities are distributed throughout this region.

1.1.7 Element of originality

To the best of the research student's knowledge at the time of undertaking the study, there were no other similar studies undertaken, or proposed to be undertaken, on knee pain and knee pain related disabilities in adults in Nepal.

Since identifying the literature review for this thesis, the reports of two studies undertaken in Nepal have been found. One peer reviewed article was published in 2015 (Baidya et al., 2015) and one study was reported in a local journal before this thesis was started (Bhattrai et al., 2007). These studies were undertaken in a limited area of one ecological zone. Neither of these studies fully address the objectives of this thesis and are discussed in more detail in the discussion section of the thesis.

1.2 Brief introduction to the study country and region

1.2.1 Nepal

Nepal is a small Southeast Asian country located in the lap of the Himalayas between India to the east, west and south and China to the north. It occupies a total area of 147,181 square kilometres (Central Bureau of Statistics, 2011) (2011)). The capital of the county is Kathmandu, which is located in the foothills of the Himalayas in a valley at an elevation of 1400 metres above sea level surrounded by hills. There are monuments, old buildings with a full range of historic and artistic cultural heritage (UNESCO, Kathmandu).

There is enormous altitudinal variation within the country starting from 70 metres above sea level in the plain zone of the Eastern Development Region to the highest peak, Mount Everest (8848 m), in the Central Development Region. The flat plain zone (Terai) is located in the south, small hills and mountains with valleys are in middle part known as the hilly zone and high mountains are in the north, known as the mountainous zone (World Health Organization, 2007).

Source: Local Government and Community, Government of Nepal, Ministry of Federal Affairs and Local Development

Figure 1. 1 Ecological map of Nepal

The plain zone comprises 23% of land surface with 50.7% of the population and 56% of the cultivated land (Figure 1.1). It consists of dense forest areas, national parks, wildlife reserves with fertile lands. The hilly zone contains mountains, high peaks, hills, valleys and lakes and accounts for about 42% of the land area with 37% of the cultivated land and 42.3% of the total population. The mountainous zone has eight peaks over 8000 metres in height including the highest peak in the world, Mount Everest. This zone occupies about 35.0% of land mass with 7.5% of cultivated land and only 7% of population reside in this zone (Central Bureau of Statistics, 2011); Ecological Zone Map, Nepal, 2000; Land Reform Map, 1986) (Table 1.1).

Table 1. 1 Ecological zones with level of elevation

Ecological zone	Elevation (Metres)	Population (%)
Plain zone	50 - 1,000	50.7
Hilly zone	1,001 - 3,000	42.3
Mountainous zone	3,001 and above	7.0

Source: Land Reform Map (1986) and Central Bureau of Statistics, (2011)

1.2.2 Administrative divisions

Administratively, Nepal is divided into five development regions: the Eastern Development Region, the Central Development Region, the Western Development Region, the Mid-Western Development Region and the Far-Western Development Region

Each development region is further divided into districts and districts are sub divided into electoral constituencies, municipalities and Village Development Committees (Table 1.2 and Figure 1.2).

Table 1. 2 Development Regions of Nepal

Development region	District (n)	Municipality (n)	VDC* (n)
Eastern Development Region	16	47	752
Central Development Region	19	68	939
Western Development Region	16	36	747
Mid-Western Development Region	15	19	510
Far-Western Development Region	9	21	328
Total	75	191	3576

*Source: Nepal: Ecological Zone Map (as of 2000), * VDC = Village Development Committee*

1.2.3 Western Development Region

Although there are a total of five regions in Nepal, here only the Western Development Region is described, because the study was conducted in this region. During the time the survey was conducted this was the most accessible and safe region in Nepal. The Western Development Region is located in the western central part of the country bounded by the Central Development Region in the east, the Mid-western Developmental Region in the west, India in the south and China on the northern side. It is the second largest development region in Nepal with an area of 29,398 square kilometres, 20% of the total land mass of Nepal, and a total population of 9,656,985 (34% of the national population) (Central Bureau of Statistics, 2011).

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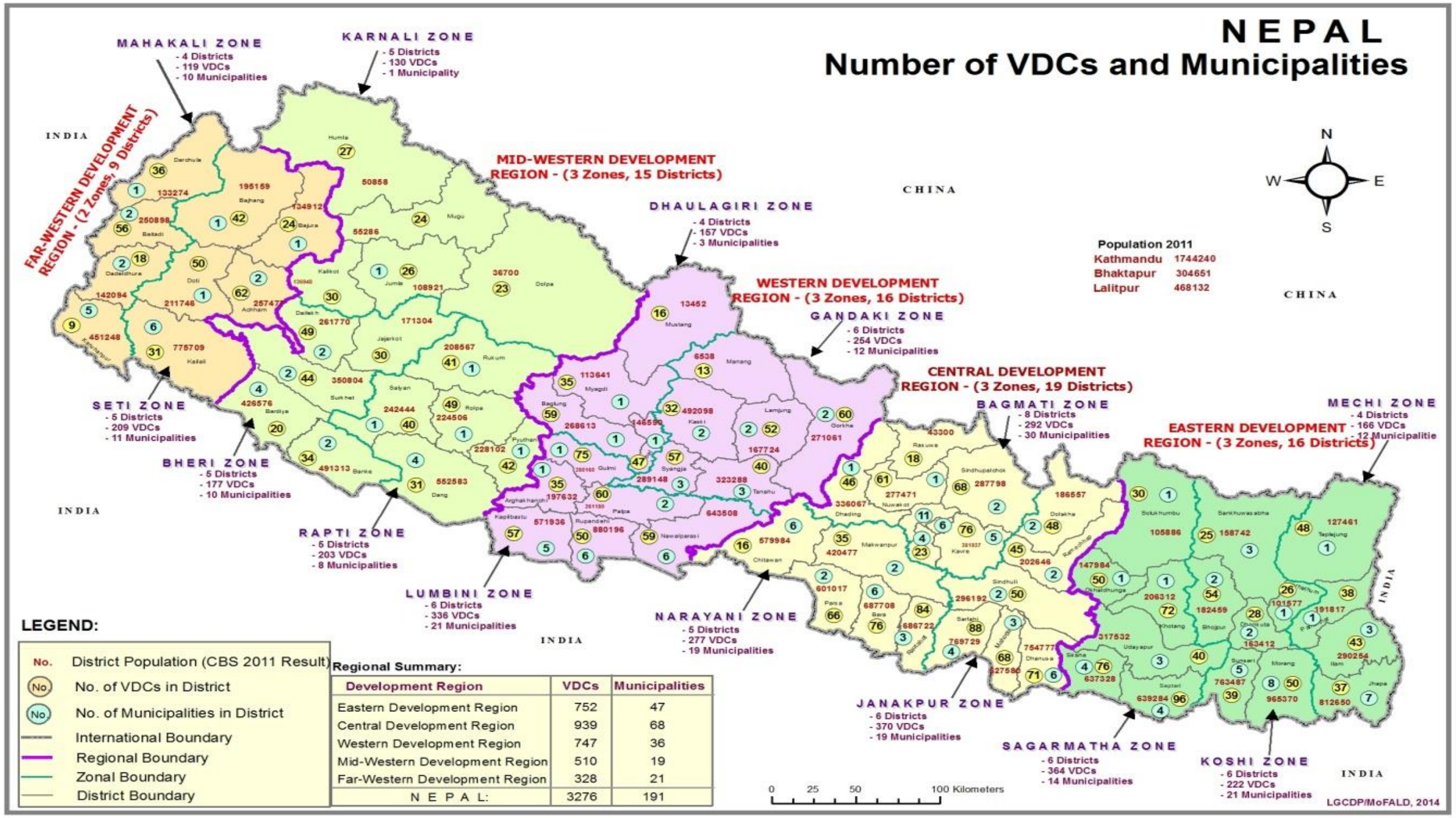

Source: Local government and community government of Nepal, Ministry of Federal affairs and Local Development

Figure 1. 2 Administrative divisions of Nepal

Three of the highest mountains of the world are located in this region, namely Dhaulagiri (8,167m), Manaslu (8,156 m) and Annapurna (8,091m). There are some famous tourist locations in this region; the birth-place of Lord Buddha at Lumbini in the plain zone, Pokhara Valley (a tourist hub) in the hilly zone and Muktinath Temple and Annapurna Trek in the mountainous zone. All districts are linked with all-year road transport. However, the mountainous and some hilly districts have rough roads (United Nations, Nepal, 2011).

Administratively, this region has been divided into 16 districts, 36 municipalities and 747 Village Development Committees across plain, hilly and mountainous land. (United Nations Nepal, 2009) (Table 1.2 and Figure 1.2).

1.2.4 Study sites

There were seven study sites selected for this survey of which four (affluent and deprived) sites were in urban areas and three sites were in rural areas. Those sites are shown in Figure 1.3 and are described in the survey methods section (Chapter 4).

Source: An Overview of the Western Development Region of Nepal (United Nations, Nepal) http://un.org.np/reports/overview-western-development-region-nepa [Cited on 08 July 2016]

Figure 1. 3 Administrative map of the Western Development Region with study sites

1.3 Help seeking behaviour

Help seeking behaviour has been defined as 'problem focused, planned behaviour, involving interpersonal interaction with a selected health care professional' (Cornally and McCarthy 2011).

In the UK, a study by Jordan et al., (2010) estimated that 324 per 10,000 patients registered with a general practitioner consulted about a knee problem each year. In a study in Denmark, 38% of patients with knee osteoarthritis had consulted their general practitioner in the previous three months, 18% had seen an allied health professional and 29% were using analgesics (Hoogeboom et al., 2012).

Studies suggest that some patients may delay seeking help for their knee condition or do not seek help (Thorstensson et al, 2009; Mendhe et al., 2016). Delay may lead to worse outcomes and it has been suggested that reasons for delay include lack of knowledge and a belief that knee pain is expected with age (Prasanna et al., 2013).

The level of help seeking behaviour for knee pain in the Nepalese population is unknown but may be affected by lack of access to health care facilities and expense of treatment, as well as, lay beliefs and cultural attitudes (Lam et al., 2013; Adhikari and Rijal 2014; Hees et al., 2014). An understanding of help seeking behaviour is important for policy makers to help develop prevention and health care strategies.

1.4 Thesis aims and objectives

1.4.1 Aims and objectives of the thesis

The aim of this thesis is to explore the prevalence and impact of knee pain and knee pain related disability within the adult population of the Western Development Region of Nepal.

The objectives of the thesis were:

- to systematically review the literature in order to identify the prevalence of knee pain and knee pain related disability in different populations
- to develop a questionnaire to measure the prevalence of knee pain and knee pain related disability in the Nepalese population
- to estimate the prevalence of knee pain and knee pain related disability in the Western Development Region of Nepal
- to estimate and compare the prevalence of knee pain and knee pain related disability in ecological zones (mountainous, hilly, and plain zone) of the Western Development Region of Nepal
- to estimate and compare the prevalence of knee pain and knee pain related disability across different socio-demographic (age, gender), occupational (agriculture and others), residency (urban, rural) and socio-economic subgroups.
- to ascertain the health seeking behaviour of those with knee pain and explore how this varies with ecological zone.

The objectives of the thesis were achieved through undertaking a survey of the adult Nepalese population in all ecological zones in the Western Development Region.

1.4.2 Outline of the thesis

Chapter 2 contains a review of studies of the prevalence of knee pain and knee related disability in adults. This chapter includes the aims and objectives of the review followed by methodology, results and discussion.

Chapter 3 contains the procedures applied during the development of the survey instrument to measure knee pain and knee pain related disability, including selection of demographic related questions, knee pain related questions, disability questions and questions about health seeking behaviours. It also outlines the process for translating the questionnaire from English to Nepali.

Chapter 4 This section includes the methods of the survey, process for obtaining ethical approval, data management and statistical methods. In addition to these, it also contains the rationale for the selection of the research setting, that is, the study sites in the Western Development Region of Nepal.

Chapter 5 contains the findings of the cross-sectional survey of knee pain in adults of the Western Development Region of Nepal. It includes information on the altitudes of the survey sites, the survey response and survey findings on the prevalence of knee pain.

Chapter 6 contains the findings on knee pain related disability and health seeking behaviours of participants with knee pain.

Chapter 7 is the discussion section of the thesis. It includes the summarised findings of the survey, interpretation of the findings of the survey in the context of the literature, the strengths and limitations of the survey and the implications of the thesis.

Chapter 8 is the conclusion.

1.5 Summary

This chapter provided a rationale for a survey of knee pain and knee related disability in one region of Nepal. Before proceeding to undertake the survey, it was necessary to check if any similar study had been undertaken in the Nepalese population. This was done by undertaking a review, using systematic methods. The review was also undertaken to help inform the design of the survey. The next chapter will contain the methods and findings of this literature review.

Chapter 2: A review of studies of the prevalence of knee pain and knee pain related disability

In the previous chapter, the aims and objectives of the thesis were outlined. This chapter reports on a literature review, using systematic methods, to identify population based studies on the prevalence of knee pain and knee pain related disability in adults. It uses systematic methods but is not a systematic review because there was only one researcher who reviewed all the abstracts and extracted the data. This approach was necessary due to the lack of resources available to the research student to include a second reviewer. However apart from this, the review followed Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines (Moher et al., 2009). A literature review using systematic methods was considered important because:

- there was a need to know if previous studies had been done in the Nepalese population
- there was no evidence of a systematic review looking at factors which might be important to knee pain in the Nepalese population, such as, terrain and rurality
- such a review would help inform the design of a future study in the Nepalese population.

2.1 Objectives

These were;

- to identify the prevalence of knee pain and knee-related disability in different populations
- to explore how the prevalence of knee pain varies with specific population characteristics, for example age, gender, occupation, place of residence (for example continent, country, rurality and terrain) and social class
- to identify the level and types of disability related to knee pain.

2.2 Methods

2.2.1 Selection criteria

Inclusion criteria

All cross-sectional studies measuring the prevalence of knee pain and/or knee pain related disabilities using self-report measures conducted within the community in any country or region of the world in adults aged 18 years or over were included. Only cross-sectional studies were included because these measure prevalence. The studies were restricted to those published in English or Nepali, in peer reviewed journals. Studies published in the Nepali language were included because the survey was to be conducted in Nepal. When researchers had included those aged 16 to 18 years and these did not represent more than 25% of the study population, these studies were included. The criteria for eligibility are outlined in Appendix 1.

Exclusion criteria

Studies, which reported the estimation of prevalence in other settings (for example hospitals), were excluded as were studies conducted solely in occupational groups and/or when the focus was a specific clinical condition. Those in which the presence of knee conditions was measured solely radiologically or clinically were also excluded. Studies submitted for a PhD thesis or as conference abstracts or in non-peer reviewed journals were not included.

2.2.2 Search strategy

Three databases were used to search for relevant studies (MEDLINE, EMBASE and AMED) from inception to September 2012. These databases were used because they would be most likely to have the relevant literature. Only three were searched because of resource and time constraints. The following subject headings and keywords were used to identify relevant studies:

Knee conditions: ‘’osteoarthritis’’, ‘’knee, patellofemoral pain syndrome’’, ’’ ligaments’’, ‘’articular, knee injuries’’; ‘’knee osteoarthritis’’, ‘’knee injury’’, ‘’knee pain’’, ‘’knee joint’’, and ‘’arthralgia’’.

Study design: ‘’cross-sectional studies’’, ‘’health surveys’’, ‘’population surveillance and prevalence’’.

All knee condition terms were put together using the Boolean operator ‘OR’ as were all study design terms. The knee condition terms and the study design terms were then joined using the Boolean operator ‘AND’. The search strategy was applied in MEDLINE as in Table 2.1. The other search strategies for EMBASE and AMED databases are in Appendix 2.

The comprehensiveness of the search strategy was crosschecked by seeing whether eight previously identified articles reporting on the prevalence of knee pain and knee related disability in populations had also been identified by the search of MEDLINE, EMBASE and/or AMED databases (Appendix 3). It was found that all of the eight articles were among the abstracts identified by the search of the three databases suggesting the adequacy of the selected subject headings and keywords (Appendix 3).

The titles and abstracts identified by the search were initially reviewed by the research student. Following the initial review, the titles and abstracts considered potentially eligible by the research student were then fully reviewed independently by the research student and the Director of Studies and a final list of abstracts agreed. Where they disagreed, they discussed together why the abstract was or was not eligible. If there was no resolution, a third reviewer (another supervisor) was available to look at the abstract. The full papers of the abstracts on which they agreed were then retrieved by the research student, and then both the research student and Director of Studies looked at these independently to decide if the study should be included. Again, there was a third reviewer available if needed. Mendeley Reference Manager, Elsevier Inc. version (2017) was used to manage the references.

In addition to the electronic search strategy, all reference lists of eligible manuscripts and identified systematic reviews were checked for other studies not identified by the search.

Table 2. 1 Example of one search strategy (MEDLINE)

S. No.	Search terms
1	exp Osteoarthritis, Knee/
2	exp Patellofemoral Pain Syndrome/
3	exp Ligaments, Articular/
4	exp Knee Injuries/
5	knee osteoarthritis.ti,ab.
6	knee injur$.ti.ab.
7	knee pain.ti.ab.
8	patellofemoral pain.ti.ab.
9	exp Knee Joint/
10	exp Arthralgia/
11	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12	exp Cross-Sectional Studies/
13	exp Health Surveys/
14	exp Population Surveillance/
15	prevalence.ti.ab.
16	12 or 13 or 14 or 15
17	11 and 16

Note: S No. = Serial number

2.2.3 Outcomes and outcome measures

Prevalence could be measured in two ways: point prevalence and period prevalence. Point prevalence was the number of cases present at a specified time. Period prevalence was the number of cases present during a specified interval. There were no criteria placed on the length of the time interval.

Knee pain needed to be measured quantitatively using a self-reported pain question or questionnaire. Disability needed to be measured quantitatively by either a generic quality of life or disability validated measure, a validated knee specific questionnaire on functional limitation, activity restriction and/or quality of life or any non-validated questions on any of the above.

2.2.4 Assessment of risk of bias in included studies

Risk of bias was assessed by the research student for each of the included studies using the scale developed by Hoy et al. (2012) (Appendix 4) which was specifically designed for the assessment of risk of bias in prevalence studies. This tool was developed from examining other checklists of risk of bias in prevalence studies and consensus exercises using international expert groups including musculoskeletal epidemiologists (Hoy et al., 2012). It has been tested for interrater agreement for the overall tool and for each item. It has demonstrated high interrater agreement with a Kappa statistic for the tool of 0.82 and ranging between 0.43 to 1.00 for individual items. This tool has been used in a number of systematic reviews (for example Hahnel et al., 2015;

Horton et al., 2016; Nglazi et al., 2016; Théroux et al., 2017; Tonouhewa et al., 2017; Yon et al., 2017).

This scale contains a list of ten criteria, of which four criteria are concerned with external validity and six criteria are concerned with internal validity. The questions concerned with external validity try to assess whether the target population represents the national population and the sampling frame is a true or close representation of the target population. Internal validity assessment criteria include whether data were directly collected from the subjects rather than proxy respondents and about the use of an acceptable case definition. Furthermore, it also assesses whether instruments were valid and appropriate and that, during data collection, a uniform common method was applied to all participants.

For each question, the study scored one if it met the criteria (low risk) and two if it did not (high risk). For each study, the number of questions, which scored two, was calculated and this was then used to categorise the study into whether overall the study had a low risk, moderate risk or high risk of bias. In this evaluation and in line with Hoy et al. (2012), any study obtaining no or one high risk criteria was considered low risk, those with two or three high risk criteria were considered moderate risk and those with more than three high risk criteria were considered high risk.

2.2.5 Data extraction

Relevant information was extracted by the research student only from each identified study into a bespoke data extraction form developed by the research student specifically for this thesis (Appendix 5). Information was extracted for each study on the following: title of article, journal name, publication date, volume; study population (for example country, continent, area); sampling method, data administration, sample size, response rate; sociodemographic and socioeconomic characteristics, occupation and residency (for example urban, rural, mountainous terrain). Information on the prevalence of knee pain and knee pain related disability, along with its distribution across different participant characteristics, and the applied definition and/or measurement instrument of knee pain and knee pain related disability was also extracted.

2.2.6 Approach to analysis of the studies

In the synthesis of data from a systematic review, there is not always a possibility or need to perform meta-analysis, statistical pooling, because of the diversity of the population characteristics and condition definition in selected studies. Under such conditions, a narrative approach to synthesis can be applied through charting the data (Arai et al., 2007). In this review, the implemented method for the synthesis of findings was narrative. This was appropriate in this thesis because the review was undertaken to inform the need for a survey in Nepal and to inform the design of that survey.

2.3 Results

The findings of this review are presented in three sections: findings of the search strategy, prevalence of knee pain and prevalence of knee pain related disabilities. Within each of the last two sections, there are subsections on characteristics of the eligible studies, study risk of bias and prevalence.

2.3.1 Findings of the search strategy

The searches of the three databases were run between 12 September and 11 October 2012. A total of 9339 abstracts were identified (Figure 2.1). On the first screen by the student, 95 titles and abstracts were considered potentially eligible, but on full review of these abstracts by the Director of Studies and the research student, 33 abstracts were considered eligible and their papers retrieved (Figure 2.1). A third reviewer was not needed to resolve any conflict between reviewers.

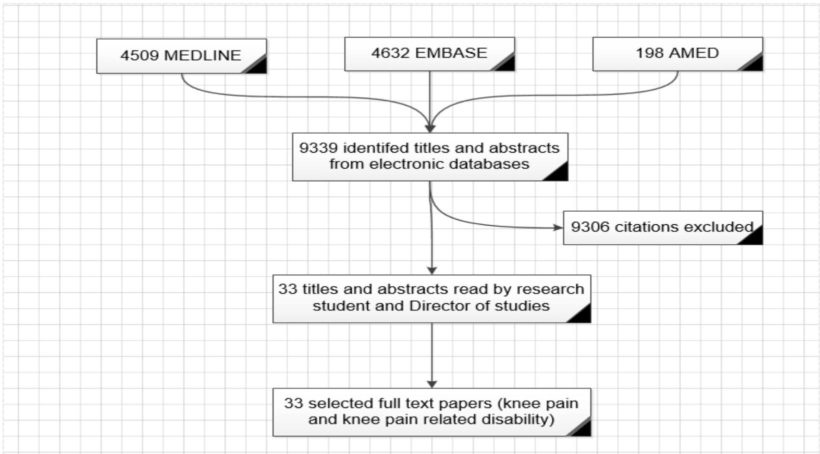

Figure 2. 1 Flow chart of selection of full text of knee pain and knee pain related papers

Of these 33 papers, all included information about prevalence of knee pain. Furthermore, two systematic reviews were identified from the search and these identified two new papers on prevalence of knee pain, giving 35 papers in total. On independent review by the student and Director of Studies of these papers, three were excluded because they did not meet the eligibility criteria outlined in Appendix 1 (Fig 2.2). The reasons for excluding the studies is shown in (Table 2.2). The remaining 32 papers related to 21 studies (Appendix 6).

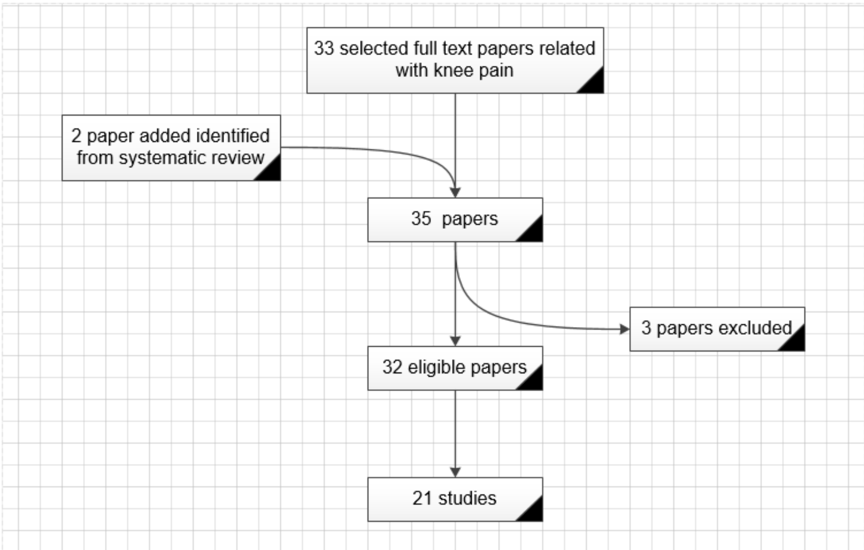

Figure 2. 2 Flow chart of selection of knee pain studies

Of the 33 papers, only 19 also reported on knee pain related disability (Figure 2.3). The two systematic reviews yielded one more potentially eligible study. After review, by both the Director of Studies and the student, of these 20 papers, four were excluded (Table 2.2). Therefore leaving 16 papers, which related to 10 studies on knee pain related disability (Appendix 6). The third reviewer was not needed throughout this process.

Table 2. 2 Reasons for exclusion of studies after screening of full text

Reason for exclusion	Number
Knee pain studies (n = 3)	
Radiological definition of knee pain	1
Not population based study	1
Not reporting on knee pain	1
Knee pain related disabilities (n = 4)	
Osteoarthritis study population	2
Not population based study	1
No extractable information on prevalence of knee pain related disability	1

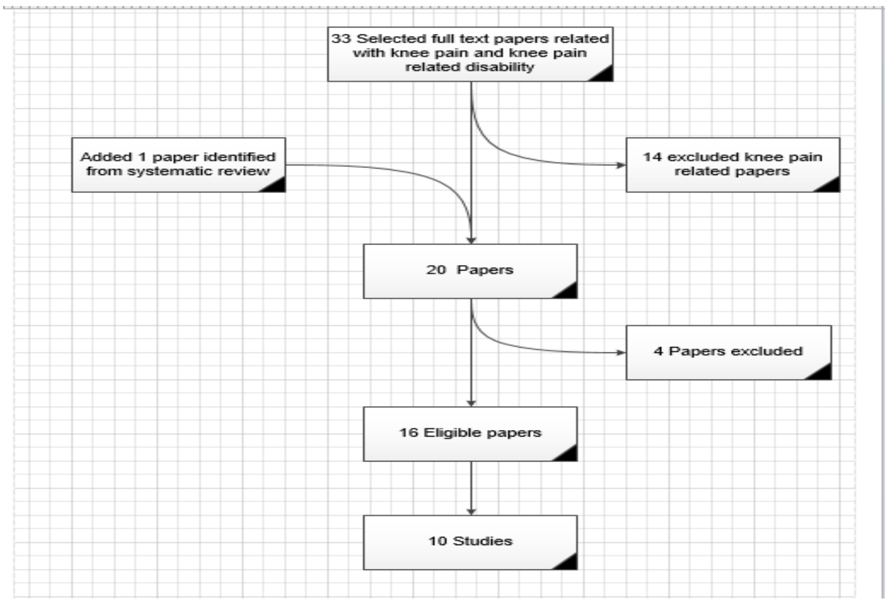

Figure 2. 3 Flow chart of selection knee pain related disability papers

2.3.2 Findings of the prevalence of knee pain

This section describes the characteristics and findings of the studies on knee pain prevalence.

2.3.2.1 Characteristics of the eligible studies

There were 21 cross-sectional studies reporting the prevalence of knee pain. These papers were published between 1989 and 2011 and the language of publication of all articles was English. Data was collected through application of face-to-face interview in twelve studies (Gibson et al., 1996; Jordan et al., 1996; Andersen et al., 1999; Bergenudd et al., 1989; Zeng et al., 2004; Adamson et al., 2005; Cecchi et al., 2008; Muraki et al., 2009; Chokhanchichai et al., 2010; Hoy et al., 2010; Ling et al., 2010; Sa et al., 2011;), postal administration (with self-completion) in six studies (Badley and Tennant, 1992; McAlindon et al., 1992; O'Reilly et al.,1998; Urwin et al., 1998; Dawson et al., 2004; Jinks et al., 2004), and questionnaire given to the participants and self-completed in three studies (Sakakibara et al., 1996; Zhai et al., 2006; Kim et al., 2011). In all studies, both male and female participants were included. The studies varied in the age range of the participants (Table 2.4). The sample size of the studies varied from a minimum of 303 participants (Chokhanchichai et al., 2010) to a maximum of 10,246 participants (Badley and Tennant, 1992). The number of male participants in the studies ranged between 71 to 2988 and the number of female participants ranged from 132 to 3804 (Table 2.3).

Table 2.3 Characteristics of reviewed studies

Study reference	Sampling method	Data administration	Sample size (n)	Response rate (%)	Age (years)	Male (n)	Female (n)
Badley and Tennant. (1992)	Random	Postal	10,246	87	16 +	NR	NR
Jinks et al. (2004)	Random	Postal	6792	77	50 - 75	2988	3804
Andersen et al. (1999)	Random	Face to face	6596	NR	60 to 90	NR	NR
Urwin et al. (1998)	Random	Postal	5752	78.5	16 to 75	2841	2911
Gibson et al. (1996)	Convenience	Face to face	4232	97	15 +	2156	2076
O'Reilly et al. (1998)	Random	Postal	4057	81.9	40 to 80	1961	2096
Dawson et al. (2004)	Random	Postal	3341	66.3	60 +	1557	1784
Sa et al. (2011)	Random	Face to face	2297	83.2	20 +	1024	1273
Muraki et al. (2009)	Random	Face to face	2282	57.3	60 +	817	1465
Zeng et al. (2004)	NR	Face to face	2040	81.3	16 +	985	1055
McAlindon et al. (1993)	NR	Postal	1694	80.4	55 +	677	1017

Continued table 2.3

Study reference	Sampling method	Data administration	Sample size (n)	Response rate (%)	Age (years)	Male (n)	Female (n)
Sakakibara et al.(1996)	NR	Self- completed	1466	74	30 +	696	770
Jordan et al. (1996)	NR	Face to face	1272	NR	45 +	413	859
Ling et al. (2010)	Random	Face to face	1026	91	50 +	503	523
Cecchi et al. (2009)	Multi stage	Face to face	1006	80	65 +	442	564
Adamson et al. (2006)	Cluster	Face to face	1006	NR	58 and 62	401	457
Kim et al. (2011)	Random	Self- completed	502	71	50 +	230	272
Zhai et al. (2006)	Random	Self- completed	500	NR	60 to 75	248	252
Hoy et al. (2010)	Cluster	Face to face	499	100	15 +	192	307
Chokhanchichai et al. (2010)	Convenience	Face to face	303	NR	50 +	71	232
Bergenudd et al. (1989)	NR	Face to face	574	NR	All 55	319	255

NR = Not reported

2.3.2.2 Settings of eligible studies for review

The distribution of the 21 studies by continent showed nine studies were conducted in Europe, of which seven studies were conducted in the United Kingdom (Badley and Tennant, 1992; McAlindon et al., 1992; O'Reilly et al., 1998; Urwin et al., 1998; Dawson et al., 2004; Jinks et al., 2004; Adamson et al., 2005). The other studies by Cecchi et al. (2009) and Bergenudd et al. (1989) were conducted in Italy and Sweden respectively.

Eight studies were conducted in the Asian continent, of which three studies were conducted in China (Zeng et al., 2004; Hoy et al., 2010; Ling et al., 2011, two in Japan (Sakakibara et al., 1996 and Muraki et al., 2009), one each in Pakistan (Gibson et al., 1996), Thailand (Chokhanchichai et al., 2010) and South Korea (Kim et al., 2011). Of the other four studies, two were conducted in the United States (Jordan et al., 1996; Andersen et al.,1999), one in Brazil, South America (Sa et al., 2011) and one was undertaken in Tasmania in Australia (Zhai et al., 2006) (Table 2.4).

2.3.2.3 Risk of bias assessment

Following the application of the ten assessment criteria for risk of bias (Hoy et al., 2012); just three (14.3%) studies were free from any risk of bias (Badley and Tennant, 1992; Andersen et al., 1999; Zhai et al., 2006) (Table 2.5).

Table 2. 4 Continent and country settings of studies

Continent	Area/Country
Europe - 9 studies	
Adamson et al. (2006)	Scotland, UK
Badley and Tennant. (1992)	West Yorkshire, UK
Bergenudd et al. (1989)	Sweden
Cecchi et al. (2009)	Chianti, Italy
Dawson et al. (2004)	Oxfordshire, UK
Jinks et al. (2004)	Northern Staffordshire, UK
McAlindon et al. (1993)	Bristol, UK
O'Reilly et al. (1998)	Nottingham, UK
Urwin et al. (1998)	Tameside, Manchester, UK
Asia - 8 studies	
Chokhanchichai et al. (2010)	Thailand
Gibson et al. (1996)	Karachi, Pakistan
Hoy et al. (2010)	Shigatse, Tibet, China
Kim et al. (2011)	Chunacheon, South Korea
Ling et al. (2010)	Wuchan, China
Muraki et al. (2009)	Japan
Sakakibara et al. (1996)	Matusukuwa, Japan
Zeng et al. (2004)	Shantou, Southeast China
Americas – 3 studies	
Jordan et al. (1996)	North Carolina, United States
Andersen et al. (1999)	United States
Sa et al. (2011)	Salvador, Brazil
Australasia - 1 study	
Zhai et al. (2006)	Tasmania, Australia

Note: UK = United Kingdom

Table 2. 5 Summary of risk of bias assessment of the studies on prevalence of knee pain

Study reference	Risk of bias assessment question (Criterion number)										High	Low	Risk
	1	2	3	4	5	6	7	8	9	10	risk	risk	grading
Zhai et al. (2007)	1	1	1	1	1	1	1	1	1	1	0	10	**No risk**
Andersen et al. (1999)	1	1	1	1	1	1	1	1	1	1	0	10	**No risk**
Badley et al. (1992)	1	1	1	1	1	1	1	1	1	1	0	10	**No risk**
Sa et al. (2011)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Kim et al. (2011)	1	1	1	2	1	1	1	1	1	1	1	9	**Low risk**
Ling et al. (2010)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Hoy et al. (2010)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Muraki et al. (2009)	1	1	1	2	1	1	1	1	1	1	1	9	**Low risk**
Cecchi et al. (2009)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Jinks et al. (2004)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Dawson et al. (2004)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**

Note: 1 *= Yes (Low risk),* 2 *= No (High risk), Mod. = Moderate.*

Continued Table 2.5

Citation	Risk of bias assessment questions (Criterion number)										High risk	Low risk	Risk grading
	1	2	3	4	5	6	7	8	9	10			
O'Reilly et al. (2000)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Urwin et al. (1998)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
McAlindon et al. (1993)	2	1	1	1	1	1	1	1	1	1	1	9	**Low risk**
Sakakibara et al. (1996)	2	1	2	1	1	1	1	1	1	1	2	8	**Mod. Risk**
Chokhanchichai et al. (2010)	2	1	2	2	1	1	1	1	1	1	3	7	**Mod. Risk**
Adamson et al. (2006)	2	1	1	2	1	1	1	1	2	1	3	7	**Mod. Risk**
Zeng et al. (2004)	2	1	1	1	1	2	1	1	2	1	3	7	**Mod. Risk**
Jordan et al. (1996)	2	1	2	2	1	2	1	1	1	1	4	6	**High risk**
Bergenudd et al. (1989)	2	2	2	2	1	1	2	1	1	1	5	5	**High risk**
Gibson et al. (1996)	2	2	2	1	1	2	2	1	1	1	5	5	**High risk**

Note: 1 *= Yes (Low risk),* 2 *= No (High risk), Mod. = Moderate.*

Eleven other studies failed to fulfil one criteria and were considered as having a low risk of bias (McAlindon et al., 1992; O'Reilly et al., 1998; Urwin et al., 1998; Dawson et al., 2004; Jinks et al., 2004; Cecchi et al., 2008; Muraki et al., 2009; Hoy et al., 2010; Ling et al., 2010; Kim et al., 2011: Sa et al., 2011). Four studies (19.1%) did not fulfil two or three criteria and were considered as having a moderate risk of bias (Sakakibara et al., 1996; Zeng et al., 2004; Adamson et al., 2005; Chokhanchichai et al., 2010). The other two studies (14.3%) failed to meet four or five criteria, so were considered as having high risk of bias (Jordan et al., 1996; Gibson et al., 1996) (Table 2.5).

A list of the criteria for the risk of bias tool is found in Appendix 4. The most common criterion which was not met was the first criterion *'was the study target population a close representation of the national population in relation to relevant variables?'*; this was not met by 16 studies (McAlindon et al., 1992; Jordan et al., 1996; Sakakibara et al., 1996; O'Reilly et al.,1998; Urwin et al., 1998; Gibson et al., 1996; Dawson et al., 2004; Jinks et al., 2004; Zeng et al., 2004; Adamson et al., 2005; Cecchi et al., 2008; Chokhanchichai et al., 2010; Hoy et al., 2010; Ling et al., 2010; Sa et al., 2011).

Non-fulfilment of the fourth criterion '*was the likelihood of non-response bias minimal?* occurred in six studies (Bergenudd et al., 1989; Adamson et al., 2005; Muraki et al., 2009; Chokhanchichai et al., 2010; Kim et al., 2011). Similarly, there was a failure to meet the third criterion *'was some form of random sample selection used to select the sample?'* in five studies (Sakakibara et al., 1996: Jordan et al., 1996 and Gibson et al., 1996;

Bergenudd et al., 1989; Chokhanchichai et al., 2010). The criterion '*was acceptable case definition in the study*?' was considered not to be met by three studies (Jordan et al., 1996; Gibson et al., 1996; Zeng et al., 2004). Two studies failed to meet the second criterion '*was the sampling frame not a true or close representation of the target population*?' (Gibson et al., 1996; Bergenudd et al., 1989). Two other studies failed to meet the ninth criterion *'was the length of the shortest prevalence period for the parameter of interest appropriate*?' (Zeng et al., 2004; Adamson et al., 2005). Furthermore, the criterion *'was the study instrument that measured the parameter of interest shown to have reliability and validity?'* was also not met by one study (Bergenudd et al., 1999) (Table 2.5).

2.3.2.4 Point prevalence of knee pain

The point prevalence of knee pain was reported in just three studies: two studies from the United Kingdom and one study from China (McAlindon et al., et al., 1992; Jinks et al., 2004; Hoy et al., 2010). Those studies used different questions to estimate point prevalence of knee pain in their studies. Whether any leg pain was present during the interview was administered by Hoy et al. (2011). Whereas, 'Have you had pain in the last year in your in or around the knee? If so, how many days have you had knee pain?' were used in the studies by McAlindon et al. (1992) and Jinks et al. (2004).

The point prevalence of knee pain for each study is reported in the table below (Table 2.6). The rates were not too dissimilar.

Table 2. 6 Point prevalence rate of knee pain

Study	Rate (%)
McAlindon et al. (1993)	24.6
Jinks et al. (2004)	20.5
Hoy et al. (2010)	24.5

The study by Hoy et al. (2010) was undertaken at an altitude of 3800 metres from sea level in a municipality with more than 70% rural area in the Tibet province of China. In the study by McAlindon et al. (1993), the point prevalence of knee pain increased with age. In those aged 85 and over, it was 1.7 times higher than the prevalence rate of the age group of 55 – 69 years (Table 2.7).

Table 2. 7 Point prevalence of knee pain by age group

Age group	n	Rate (%)
55 - 59 years	226	46 (20.4)
60 -64 years	297	68 (22.9)
65 - 69 years	237	75 (31.6)
70 - 74 years	229	68 (29.7)
75 -79 years	299	63 (21.1)
80 - 84 years	203	48 (23.6)
85 + years	143	49 (34.3)
Total	1634	417 (25.5)

Source: McAlindon et al. (1993)

2.3.2.5 Commonly used questions to assess period prevalence of knee pain

The period was 12 months in all studies. There were different questions used to define knee pain. The most common definition was pain lasting for more than one month in the past year. This was reported in 11 studies **(**McAlindon et al., 1992; Gibson et al., 1996; Sakakibara et al., 1996; Urwin et al., 1998; O'Reilly et al, 2000; Dawson et al., 2004; Cecchi et al., 2008; Muraki et al., 2009; Chokhanchichai et al., 2010; Ling et al., 2010; Kim et al., 2011) (Table 2.8). The other questions are shown in Table 2.8 and Appendix 7.

Table 2. 8 Administered questions in the assessment of knee pain with duration of knee pain

Knee pain lasting for four weeks or at least a month - 11 studies
Patient who has had pain in or around a knee most days for at least a month. Have you had knee pain, aching, or stiffness lasting at least a month? Have you ever had pain in or around the knee on most days for at least a month? Have you experienced any knee pain in the past months lasting for more than a month?
Knee pain lasting for six weeks or more - 1 study
Have you ever had pain in or around the knee on most days for at least six weeks?
Knee pain lasting for unspecified period - 9 studies
Have you had any leg pain between last harvest and now? Did you have regularly suffered from any swelling, pain or stiffness in or around knee joint? Have you had knee pain? Have you had pain in the last year in or around the knee? Felt knee pain between the distal 1/3rd of thigh and proximal 1/3rd of leg

2.3.2.6 Period prevalence of knee pain by study

The overall period prevalence rate of knee pain in different studies is shown in Table 2.9. The highest prevalence rate of 49.2% of knee pain was reported in the study undertaken in Pratuchi and Lumphee in Thailand by Chokhanchichai et al. (2010) and the lowest rate of 2.4% was reported in the study undertaken in Karachi Pakistan by Gibson et al. (1996).

Table 2. 9 Period prevalence rate of knee pain by study

Study	Period prevalence (%)
Chokhanchichai et al. (2010)	49.2
Jordan et al. (1996)	48.2
Zhai et al. (2006)	47.8
Jinks et al. (2003)	46.8
Kim et al. (2011)	46.2
Adamson et al. (2006)	32.1
Muraki et al. (2009)	32.8
Dawson et al. (2004)	31.2
Hoy et al. (2010)	29.5
O'Reilly et al. (2000)	28.5
McAlindon et al. (1993)	24.6
Cecchi et al. (2009)	22.3
Andersen et al. (1999)	21.2
Ling et al. (2010)	21.1
Sakakibara et al. (1996)	19.1
Zeng et. al. (2004)	17.2
Urwin et al. (1998)	13.8
Sa et al. (2011)	11.2
Bergenudd et al. (1989)	10.0
Badley and Tennant. (1992)	10.0
Gibson et al. (1996)	2.4

2.3.2.7 Period prevalence of knee pain by continent

The prevalence rate of knee pain was grouped based on continent (Table 2.10). The highest prevalence rate of knee pain observed in Asian, European and American studies was very similar being 49.1% in the study by Chokhanchichai et al. (2010), 46.8% in the study by Jinks et al. (2004) and 48.2% in the study by Jordan et al. (1996) conducted in Thailand, the United Kingdom and the United States of America respectively. Similarly, although there was a wide range of knee pain prevalence within each of the continents, this range was similar across the continents.

Within countries, there was also a difference in reported prevalence between studies. There was a 10% difference in the prevalence rate of knee pain between the studies conducted within China (Zeng et al., 2004 and Hoy et al., 2010). A similar difference was also seen between the two studies conducted in Japan with a period prevalence rate of 19.5% and 30.8% in the studies by Sakakibara et al. (1996) and Muraki et al. (2009) respectively. However, there was a much greater variation in the seven studies undertaken in the United Kingdom from 10.1% to 46.8%. Furthermore, there was also a wide difference in the prevalence rate between the two studies conducted in the United States (21.2% vs. 48.2%) (Andersen et al., 1999; Jordan, et al.1996) (Table 2.10).

Table 2. 10 Period prevalence rate of knee pain by continent and country

Study	Study sites	Rate (%)
Europe – 9 studies		
Jinks et al. (2004)	North Staffordshire UK	46.8
Dawson et al. (2004)	Oxfordshire, England, UK	32.6
Adamson et al. (2005)	Scotland, UK	32.1
O'Reilly et al. (2000)	Nottingham, UK	28.5
McAlindon et al. (1993)	Bristol, UK	24.6
Cecchi et al. (2009)	Chianti, Italy	22.3
Urwin et al. (1998)	Manchester, UK	13.8
Badley and Tennant (1992)	West Yorkshire, UK	10.1
Bergenudd et al. (1989)	Malmo, Sweden	10.0
Asia – 8 studies		
Chokhanchichai et al. (2010)	Pratuchi and Lumphee, Thailand	49.2
Kim et al. (2011)	Chunacheon, South Korea	46.2
Muraki et al. (2009)	Nationwide, Japan	32.8
Hoy et al. (2010)	Shigatse, Tibet, China	29.0
Ling et al. (2010)	Wuchan, China	21.1
Sakakibara et al. (1996)	Matusukuwa, Japan	19.1
Zeng et. al. (2004)	Shantou, Southeast China	17.2
Gibson et al. (1996)	Karachi, Pakistan	2.4
America – 3 studies		
Jordan et al. (1996)	North Carolina, United States	48.2
Andersen et al. (1999)	NHANES, United States	21.2
Sa et al. (1999)	Salvador, Brazil	11.2
Australia -1 study		
Zhai et al. (2006)	Tasmania, Australia	47.8

*Note: UK = United Kingdom, *NHANES = National Health and Nutrition Examination Survey*

2.3.2.8 Period prevalence of knee pain by gender

Knee pain was higher prevalent in female participants compared to male participants. Of the fifteen studies which report on the prevalence of knee pain by gender, females had a higher rate of knee pain in 12 (75%) studies (Table 2.11). However, in the study by Sa et al. (2011) males had a rate which was 2.1 times higher than the rate in females.

Table 2. 11 Period prevalence of knee pain by gender and by residency

Study	Male (%)	Female (%)	Total (%)
Urban - 6 studies			
Sakakibara et al. (1996)	15.1	23.2	19.1
Bergenudd et al. (1989)	8.0	12.0	10.0
Zeng et al. (2004)	11.9	22.6	17.2
Cecchi et al. (2009)	NR	NR	22.3
Sa et al. (2011)	18.1	5.1	11.2
Kim et al. (2011)	34.2	58.0	46.2
Rural - 2 studies			
Jordan et.al. (1996)	NR	NR	48.2
Ling et al. (2010)	NR	NR	21.1
Mixed (urban and rural) – 4 studies			
Gibson et al. (1996)	1.1	3.8	2.4
O'Reilly et al. (2000)	28.0	29.0	28.5
Muraki et al. (2009)	24.1	37.6	32.8
Hoy et al. (2010)	28.0	30.0	29.0
Residency not reported – 9 studies			
McAlindon et al. (1993)	20.1	27.6	24.6
Andersen et al. (1999)	18.3	23.3	20.8
Badley & Tennant (1992)	NR	NR	10.0
Urwin et al. (1998)	14.1	13.7	13.8
Jinks et al. (2004)	49.2	43.6	46.8
Dawson et al. (2004)	27.7	34.7	31.2
Adamson et al. (2006)	30.4	33.7	32.1
Zhai et al. (2007)	NR	NR	47.8
Chokhanchichai et al. (2010)	NR	NR	49.2

Note: NR = Not reported

2.3.2.9 Period prevalence of knee pain by age

The period prevalence of knee pain by age was reported in seven studies (Badley and Tennant, 1992; Gibson et al., 1996; Sakakibara et al., 1996; Urwin et al., 1998; Andersen et al., 1999; Dawson et al., 2004; Jinks et al., 2004). In all the studies, which reported on period prevalence by age group, period prevalence increased with increasing age (Badley and Tennant, 1992; Gibson et al., 1996; Sakakibara et al., 1996; Urwin et al., 1998; Andersen et al., 1999; Dawson et al., 2004; Jinks et al., 2004). Because the studies varied in the lower and upper limit of age and in how they grouped age, it was not possible to synthesise the data further by age group.

2.3.2.10 Prevalence knee pain by residency

The site of study, whether it was conducted in urban or rural areas, was reported in 12 studies, of which six studies were conducted in urban areas (Sakakibara et al.,1996; Bergenudd et al., 1989; Zeng et al., 2004: Cecchi et al., 2008; Sa et al., 2011; Kim et al., 2011), four studies in mixed (urban plus rural) areas (Gibson et al., 1996; O'Reilly et al., 2000; Muraki et al., 2009; Hoy et al., 2010) and two studies in rural areas (Jordan et al.,1996; Ling et al., 2010). There was a wide range of prevalence rates reported in each type of area but, in general, the rates seemed higher in studies containing rural sites.

2.3.2.11 Prevalence of knee pain in mountainous zone

Three studies were conducted in a mountainous zone: two in Japan (Sakaibara et al., 1996; Muraki et al., 2009) and one in China (Hoy et al., 2010). Of the Japanese studies, the study by Sakaibara et al. (1996) was conducted in mountain areas that compared urban and coastal areas whereas the other study by Muraki et al. (2009) was conducted in a mountainside town of Japan. The third study by Hoy et al. (2010) was conducted in a remote mountainous municipality located at an altitude of 3800 meters above sea level in the Tibet province of China. Period prevalence of knee pain in mountainous areas is shown in Table 2.12. The prevalence of knee pain was 32.7% in mountainous area and 22.7% in coastal areas in the study by Muraki et al. (2009).

Table 2. 12 Prevalence of knee pain in mountainous setting

Study reference	Setting	Total (%)
Muraki et al. (2009)	Japan	32.7
Sakakibara et al. (1996)	Japan	19.5
Hoy et al. (2010)	China	29.5

2.3.2.12 Prevalence of knee pain by social class

Three studies reported variation in the prevalence rate of knee pain by socioeconomic factors (Bergenudd et al., 1989; Gibson et al., 1996; Sa et al., 2011). The study by Sa et al. (2011) conducted in Brazil showed little difference in the period prevalence rate of knee pain between the lower social class (11.2%), middle social class (11.8%) and higher social class (10.8%). In the study by Bergenudd et al. (1999), knee pain prevalence was lower in the lower income group. Likewise, in the study by Gibson et al. (1996), conducted in Pakistan, the prevalence of knee pain in the urban affluent area (3.1%) was found to be higher than that in the rural deprived area (1.8%).

2.3.2.13 Period prevalence of knee pain by occupation

The study by O'Reilly et al. (1977) revealed differences in the prevalence rate of knee pain between different occupations showing 60% in carpenters, 45% in miners, 23.8% in police/security officers and 20.8% in teachers. Likewise, the study by Bergenudd et al. (1989) reported that the prevalence rate of knee pain was higher among men and women with a moderately heavy workload compared to those undertaking light work.

2.3.3 Findings of knee pain related disability

2.3.3.1 Characteristics of eligible studies

There were ten eligible studies reporting on knee pain related disability (Table 2.13). Information for the studies was collected by face-to-face administration of the questionnaire in five studies (Jordan et al., 1997; Andersen et al., 1999; Cecchi et al., 2009; Ling et al., 2010; Kim et al., 2011). The questionnaires were sent by post in four studies for self-completion (McAlindon et al., 1992; O'Reilly et al., 1998; Webb et al., 2004; Jinks et al, 2007). In one study, questionnaires were given to participants and filled in by the participants themselves (Sakakibara et al., 1996). All publications were published in English from 1996 to 2011. The minimum age of participants was 16 years (Webb et al., 2004) (Table 2.13).

The sample size of the studies varied from 502 participants (Kim et al., 2011) to 5784 participants (Jinks et al., 2007). Six studies presented data by gender with more female participants than male participants in all these studies (McAlindon et al., 1992; Sakakibara et al., 1996; Jordan et al., 1997; Ling et al., 2010; Cecchi et al., 2009; Kim et al., 2011) (Table 2.13).

Table 2. 13 Summary of studies on the prevalence of knee pain related disabilities

Study reference	Sampling method	Questionnaire administration	Sample size (n)	Response rate (%)	Age (years)	Male (n)	Female (n)
Jinks et al. (2007)	Random	Postal	5784	77	50 +	NR	NR
Andersen et al. (1999)	Random	Face to face	6596	NR	60 to 90	NR	NR
Webb et al. (2004)	Random	Postal	4515	78.5	16 +	NR	NR
O'Reilly et al. (1998)	Random	Postal	3323	81.9	40 to 79	NR	NR
McAlindon et al. (1992)	NR	Postal	1694	80.4	55 +	677	1017
Sakakibara et al. (1996)	NR	Self-administered	1466	74	30 +	696	770
Jordan et al. (1997)	NR	Face to face	1192	66	45 +	395	797
Ling et al. (2010)	Random	Face to face	1026	91	50 +	503	523
Cecchi et al. (2008)	Random	Self-administered	1006	79.2	65 +	442	564
Kim et al. (2011)	Random	Self-administered	502	71.8	50 +	230	272

Key: NR = Not reported

2.3.3.2 Setting of the studies

Of the identified ten studies, five were undertaken in Europe of which four studies were undertaken in the United Kingdom (McAlindon et al., 1992; O'Reilly et al.,1998; Webb et al., 2004; Jinks et al., 2007) and one study was undertaken in Chianti, Italy (Cecchi et al., 2009). Three studies were undertaken on the Asian continent, one each in Japan, South Korea and China (Sakakibara et al., 1996; Ling et al., 2010; Kim et al., 2011) respectively. The other two studies were undertaken in the United States (Andersen et al., 1999; Jordan et al., 1997) (Table 2.14).

Table 2. 14 Setting of selected studies

Study reference	Area/country
Europe - 5 studies	
Jinks et al. (2007)	North Staffordshire, United Kingdom
Webb et al. (2004)	Tameside, United Kingdom
O'Reilly et al. (1998)	Nottingham, United Kingdom
McAlindon et al. (1992)	Bristol, United Kingdom
Cecchi et al. (2008)	Chianti, Italy
Asian countries – 3 studies	
Sakakibara et al. (1996)	Matusukuwa, Japan
Kim et al. (2011)	Chunacheon, S Korea
Ling et al. (2010)	Wuchan, China
United States – 2 studies	
Andersen et al. (1999)	United States
Jordan et al. (1997)	North Carolina, United States

2.3.3.3 Risk of bias assessment

The risk of bias assessment of the identified studies showed just one study met all ten criteria (Andersen et al., 1999) (Table 2.15). Eight studies failed to meet the first criterion: 'was the study's target population a close representation of the national population in relation to relevant variables?' (McAlindon et al., 1992; Sakakibara et al., 1996; Jordan et al., 1997; O'Reilly et al., 1998; Webb et al., 2004; Cecchi et al., 2008; Ling et al., 2010). Another study also failed to meet the first criterion as above and the third criterion 'was some form of random selection used to select the sample, or was a census undertaken?' (Sakakibara et al., 1996).Three criteria were not met by the study by Jordan et al. (1997) the first and third criteria as above and additional the fourth criterion; 'was the likelihood of non-response bias minimal?' Overall, most studies (80.0%) were categorised as having a low risk of bias and two studies (20.0%) as having a moderate risk of bias. The risk of bias assessment questions (criteria) are given in Appendix 4.

Table 2. 15 Summary of risk of bias assessment of the studies on the prevalence of knee pain related disability

Citation	Risk of bias assessment criteria										High risk	Low risk	Risk grading
	1	2	3	4	5	6	7	8	9	10			
Andersen et al. (1999)	1	1	1	1	1	1	1	1	1	1	0	1	No risk
Kim et al. (2011)	1	1	1	2	1	1	1	1	1	1	1	9	Low risk
Ling et al. (2010)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
Cecchi et al. (2008)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
Jinks et al. (2007)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
Webb et al. (2004)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
O'Reilly et al. (1998)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
McAlindon et al. (1993)	2	1	1	1	1	1	1	1	1	1	1	9	Low risk
Sakakibara et al. (1996)	2	1	2	1	1	1	1	1	1	1	2	8	Moderate risk
Jordan et al. (1997)	2	1	2	2	1	1	1	1	1	1	3	7	Moderate risk

Note: 1 = Yes (Low risk), 2 = No (High risk), Mod. = Moderate.

2.3.3.4 Knee pain related disability

Of the ten studies, there were seven studies, which compared disability between those with knee pain and those without knee pain (McAlindon et al., 1992; O'Reilly et al., 1996; Jordan et al., 1997: Andersen et al., 1999; Jinks et al., 2007; Ling et al., 2010; Kim et al., 2011) (Table 2.16).

The measures used were the Health Assessment Questionnaire (HAQ) (McAlindon et al., 1992; Jordan et al., 1997), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) physical functioning subscale (Kim et al., 2011), the Short Form (SF 36) (O'Reilly et al., 1996; Jinks et al., 2007), the SF 12 (Ling et al., 2010) and a non-specified measure (Andersen et al., 1999) (Table 2.16).

All seven studies showed disability was worse among those who had knee pain compared to those who did not have knee pain. There was also evidence that disability was worse with increased age (Webb et al., 2004; Jinks et al., 2007). Disability was greater in women with knee pain compared to men with knee pain in two studies (Jinks et al., 2007; Kim et al., 2011).

Table 2.16 Knee pain related disability study findings

Study reference	Sample size (n)	Disability measures	Findings
McAlindon et al. (1993)	1694	Health assessment questionnaire (HAQ)	Disability was greater in those with knee pain compared to those who did not have knee pain in all age groups: data only available in a figure.
Sakakibara et al. (1996)	1466	Specific activities	Disability observed with specific activities in those with knee pain; the odds ratio of having knee pain when frequently lifting or handling heavy objects was 3.03 (95% CI 1.24 to 7.41) in women and 5.75 (95% CI 2.43 to 13.61) in men.
Jordan et al. (1997)	1272	Health Assessment Questionnaire (HAQ)	Disability was greater in those with knee pain compared to those without knee pain Mean HAQ scores were 0.146 in those with no knee pain, 0.335 in those with mild, 0.620 in those with moderate and 0.810 in those with severe pain.
O'Reilly et al. (1998)	4057	Short form 36 – physical function	Disability (Physical Function score <= 85) was present in 54.9% of knee pain participants compared to 27.5% in no knee pain participants. The median score was 66.7 (IQ 35 to 85) in those with knee pain and 90 (95% CI 75 to 100) in those without knee pain. This was statistically significant ($p<0.001$).

Continued table 2.16

Andersen et al. (1999)	6596	Nonspecific measure of disability	Knee pain prevalence increased as participants reported more difficulty undertaking lower limb physical tasks: compared to those who expressed no difficulty with task who had prevalence of knee pain less that 14%, those who reported much difficulty walking one mile had prevalence of 43.5% and those who reported difficulty walking up 10 steps or more had a prevalence of 44.4%.
Webb et al. (2004)	4515	Modified health assessment questions (HAQ)	The prevalence of knee pain with disability (modified HAQ >=0.5) was 6.0, which was a third of all those who reported knee pain.
Jinks et al. (2007)	6792	SF36	Disability was higher in those with continuing knee pain compared to those without knee pain. The difference in the mean SF36 physical functioning score was 25 (95% CI 23 to 27), for Body Pain was 27 (95% CI 25 to 29) and for Role Limitations was 28 (95% CI 25 to 31).
Cecchi et al. (2009)	1006	WOMAC Pain Score	The mean WOMAC Pain score was 5.4 +/-10.4. Climbing/descending stairs and walking were the activities with the highest pain scores (mean scores ranged between 1.2 and 2.3 across different age and genders).

Continued Table 2. 16

Ling et al. (2010)	1026	Short form 12 (SF12)	The SF 12 mental health component mean score was worse in those with knee pain (53.4) compared with those without knee pain (52.3). Self-reported physical disability undertaking certain activities was also greater: odds ratio 1.9 (95% CI 1.4 to 2.7) for walking; 4.0 (95% CI 3.0 to 5.5) for climbing up 10 steps; 4.2 (95% CI 3.1 to 5.8) for stooping, crouching, kneeling; 1.8 (1.1 to 2.8) for household chores and 2.2 (95% CI 1.3 to 4.0) for making meals.
Kim et al. (2011)	502	WOMAC	Subjects with knee pain had worse WOMAC scores compared to those without knee pain: odds ratios were 6.61 (95% CI 3.95-11.07) for pain, 5.29 (95% CI 3.25-8.63) for stiffness and 5.24 (95% CI 3.13-8.77) for function. Women with knee pain had higher scores than men with knee pain.

Four studies reported on knee pain related to specific activities (Table 2.17). Prevalence of knee pain when sitting on a mat (Tatami) on the floor was three times higher than sitting on a normal chair (24.8% vs. 8.4%) (Sakaibara et al., 1996) reflecting that activities associated with flexion of the knee are more likely to cause knee pain.

In two studies, about a quarter and one fifth of the participants with knee pain reported pain in the knee joint while kneeling (bending knees) (Sakakibara et al., 1996 and Jinks et al., 2007). Knee pain was experienced by more people when walking outdoors than indoors (13.5% vs. 4.4%) (Ling et al., 2010). Prevalence of reported knee pain was high when walking 400 metres or a quarter of mile (Andersen et al., 1996). More participants had problems when going downstairs than upstairs and indoor mobility (Ling et al., 2010). One in five participants reported knee pain while performing heavy household chores and this was three times higher than for light household chores (Ling et al., 2010).

Table 2. 17 Self-reported disability in daily living activities among participants with knee pain

Activities	Jinks et al. (2007) (%)	Sakakibara et al. (1996) (%)	Andersen et al. (1999) (%)	Ling et al. (2010) (%)
Standing	12	15		
Sitting on Tatami (mat)		25		
Habitual sitting on chair		8	2	
Walking		18	11	
Walking 400 metres or quarter mile			44	37
Indoor mobility				4
Outdoor mobility				13
Going upstairs	19			
Descending stairs	25			
Taking a bath				10
Getting in and out of bathroom	24			21

Continued table 2.17

Activities	Jinks et al. (2007) (%)	Sakakibara et al. (1996) (%)	Andersen et al. (1999) (%)	Ling et al. (2010) (%)
Using Western style toilet		21		
Using Japanese style toilet		41		
Bending knee (Kneeling)	28			26
Stooping, crouching, kneeling				70
Living on steep slopes		26		
Living on level ground		19		
Light household chores				8
Heavy household chores				21
Heavy domestic duties	30	17		27
Cleaning chores				14
House cleaning or chores				14
Laundry washing				12

2.4 Discussion of review

This review systematically examined the prevalence of knee pain and knee pain related disabilities in adults. This review found that the problem of knee pain and knee pain related disabilities is prevalent all over the world. The review did not identify any studies undertaken in the Nepalese population, which confirmed the need for the proposed survey of knee pain and knee related disability in the Western Development Region. The findings of this review provides prevalence rates, which can be compared with the results of the survey when completed.

There was a considerable difference in the period prevalence of knee pain across different studies, even those undertaken in the same continent and country. In part, this may be because of the sample characteristics. The results of the review suggested that prevalence is higher in older adults and studies differed in the age distribution of the sample. The review also suggested that knee pain was higher in women than in men, although this was not consistent across all studies.

Prevalence rates may also differ because of the applied definition of knee pain. There were three studies reporting on point prevalence; the rates in these studies varied between 20.5% and 24.5% and the definitions were similar in these studies. For period prevalence, there was a variety of definitions, which related mainly to the time for which people had pain. There were 12 studies that used a similar definition of 4 weeks. However, even using a similar definition, the rates for these studies varied. The frequency with which these definitions were used in the knee pain surveys helped the research student choose appropriate definitions for the survey in the Western Region of Nepal (see section 3.1.2).

There was limited information on the variation of prevalence of knee pain with other factors. Variation across studies was similar in Europe and Asia. Studies suggested that prevalence might be higher in rural areas and in areas that are, more affluent but there was conflicting evidence. Heavier work was related to a higher level of knee pain. Rates were high in mountainous areas. This suggests that these factors are worth further investigation.

There was good evidence that there is more disability in those with knee pain compared to those without knee pain. Pain was higher when undertaking specific activities that involved prolonged knee flexion or overload of the knee. This will be discussed in more detail in the discussion chapter of the thesis. Varieties of measures were used to measure disability including the Short Form (SF), the Health Assessment Questionnaire (HAQ) and the Western Ontario and McMaster Universities Index of Osteoarthritis (WOMAC).

2.5 Strengths and limitations of review

An intensive effort was made to discover all published research relevant to the topic of the prevalence of knee pain and knee pain related disabilities through searching three databases: MEDLINE, EMBASE and AMED. These databases contain peer reviewed international journals in the required subjects related to this review such as orthopaedic medicine and rheumatology, public health, allied health and health services research. However, other published articles, which were not included in those databases, might have been missed.

There was a language barrier in the selection of articles since articles published only in English and Nepali were included. There may have been relevant articles published in other languages, which would not have been included. This was necessary because of a lack of resources to translate manuscripts.

Generally, in systematic reviews, the selection of abstracts, two independent reviewers carry out eligibility screening and extraction of data, in order to get consensus. The Director of Studies reviewed the abstracts and papers that the research student considered eligible and the research student checked the abstracts twice with several weeks in between to try to reduce any bias. Nevertheless, studies may have been missed. Extraction of data and assessment of risk of bias is also usually performed by two independent reviewers and a comparison of the interrater scores made to ensure better outcomes. Due to the resource constraints as this was part of a PhD, it was not possible to recruit and manage another reviewer. This might be another possible weakness in this review.

2.6 Implications of the findings of the review

The systematic review has shown that knee pain is common, not just in developed countries but also in less developed countries. Knee pain is associated with considerable disability. Therefore, knowing about the prevalence of knee pain in a country and its distribution will give policymakers important information when planning services and preventive activities, thereby helping reduce current and future disability, need for long-term care and reducing economic burden on individuals and society.

The systematic review suggests that knee pain may be more common in mountainous areas, rural areas and in those undertaking heavier work. Nepal has mountainous areas, considerable amount of rural areas and many people are employed in agriculture (Central Bureau of Statistics, 2011). Therefore, a survey in Nepal should consider these factors to understand where policymakers and clinicians should target efforts.

Other implications from the systematic review will help the design of a survey in Nepal. This includes the definition used for knee pain prevalence in studies, the tools used to measure disability and questionnaire administration methods. The prevalence rates from the different studies in the review will allow some comparison with those from a study in Nepal. This will help understand whether there is more or less of a problem in the population.

2.7 Summary

This review suggests that a survey of knee pain and knee pain related disability in the Nepalese population is warranted and provides some comparative data for the findings of the proposed survey. It has provided information on appropriate definitions for the survey and factors that should be included in the survey. The development of the questionnaire for the survey in the Western Development Region of Nepal is described in the next chapter.

Chapter 3: Prevalence Study Questionnaire Development

This chapter contains a description of the processes undertaken to develop the questionnaire to collect information on the prevalence study of knee pain and knee pain related disability in the adult population of the Western Development Region of Nepal. The questionnaire was designed to be administered face to face. Initially the questionnaire was prepared in English and was later translated into the Nepali language. The translation of the questionnaire was done to ensure that the questions were asked in a standardised and appropriate format for the target audience and to fulfil the requirements of the Nepalese Health Research Council.

3.1. Aims and objectives

Aims: To design a questionnaire to meet the following main objectives of the thesis:

- to estimate the prevalence of knee pain and knee pain related disability in the Western Development Region of Nepal
- to estimate and compare the prevalence of knee pain and knee pain related disability in ecological zones (mountainous, hilly, and plain zone) of the Western Development Region of Nepal.

- to estimate and compare the prevalence of knee pain and knee pain related disability across different socio-demographic (age, gender), occupational (agriculture and others), residency (urban, rural) and socio-economic subgroups.
- to ascertain the health seeking behaviour of those with knee pain and explore how this varies with ecological zone.

Objectives

- To identify questions to capture socio-demographic data in the survey.
- To identify self report questions and questionnaires used in other studies to assess the period prevalence of knee pain, period prevalence of chronic knee pain and point prevalence of knee pain.
- To identify validated measures of disability relevant to the Nepalese population.
- To consider appropriate questions to determine the health seeking behaviour of the Nepalese population with regard to knee pain.
- To undertake cross-cultural validation of the questionnaire into Nepali.

3.2 Overview of questionnaire design

The questionnaire was designed to collect information to meet the main objectives of the study; that is the prevalence of knee pain and knee pain related disability in the Western Development Region of Nepal and the differences in these measures across different ecological zones: plain, hilly or mountainous zones. It was also designed to collect information on relationships between knee pain and knee pain related disability and other factors including socio-demographic, socioeconomic, residential (urban, rural) and occupational (agriculture related or other occupations) factors. In addition to these, it also contained questions to assess health seeking behaviour among those participants with knee pain.

The questionnaire was divided into four parts. The first part of the questionnaire was about socio-demographic, socioeconomic and occupational factors. The second part was related to the presence of knee pain, the third part was about health seeking behaviour in those with knee pain whereas the fourth part of the questionnaire was about disability.

3.2.1 General questions

The first few questions were general and were filled in by the research student. They included information on the locality so that the regional environment could be identified, that is ecological zone (plain land, hilly land and mountainous) and whether the locality was a rural, urban deprived or urban affluent area. These had been defined prior to selection of the study sites and had been defined using National Census definitions (Central Bureau of Statistics, 2011). . A unique code number was also given for the identification of the participant and household. This data helped to identify the site (cluster) in which the respondent lived. The research student also completed the gender of the participant.

Others questions were filled in by the research student upon asking the participants. This included questions on how long they had been in the area in order to exclude those who had been in the area for less than six months, information on the age of the participant and their marital, employment and educational status. Questions on employment, marital and educational characteristics were directly derived from either the National Census of Canada and of Nepal (Census of Canada, 2011; Central Bureau of Statistics, 2011). The question about residence in the area for less than six months was included because it was felt that this was not sufficient time to experience any musculoskeletal impact of the terrain.

3.2.2 Knee pain questions

The papers on the prevalence of knee pain identified by the literature review, reported in chapter two, were used to identify questions, which have been used to measure the prevalence of knee pain. Twenty-one studies included at least one question to estimate prevalence of knee pain but they varied in terms of the definition of knee pain and whether point and period prevalence was, being measured (Appendix 7). These questions were grouped as follows:

- **Point prevalence of knee pain**

  Knee pain at the moment on most days for more than a week or for seven days, or less than four weeks - three studies

- **Period prevalence of knee pain**

  Knee pain lasting for four weeks or at least a month –eleven studies

  Knee pain lasting for unspecified period – nine studies

  Knee pain lasting for six weeks or more – one study

Some studies had used both types of questions together for the measurement of both point prevalence of knee pain and period prevalence of knee pain. Extracted questions found in the review are outlined in (Table 3.1).

After reviewing of the questions, the following questions were used in the questionnaire for the estimation of the period and point prevalence study of knee pain in adults of the Western Development Region of Nepal, because they reflected the ones used in the most studies.

1. During the last 12 months, have you had any pain in or around either of your knee joints on most days for at least one month?
2. If the answer of the above question was yes, ‘Do you have any knee pain at the moment’?

Table 3. 1 Administered questions in the assessment of knee pain

1. For the estimation of period prevalence of knee pain

Knee pain lasting for 4 weeks or at least a month (n = 11)

Patient who has had pain in or around a knee most days for at least a month.

Have you had knee pain, aching, or stiffness lasting at least a month?

Have you ever had pain in or around the knee on most days for at least a month?

Have you experienced any knee pain in the past months lasting for more than a month?

Knee pain lasting for unspecified period (n = 9)

Do you have leg pain now?

Have you had any leg pain between last harvest and now?

Did you have regularly suffered from any swelling, pain or stiffness in or around knee joint? Have you had knee pain?

Have you had pain in the last year in or around the knee? Felt knee pain between the distal 1/3rd of thigh and proximal 1/3rd of leg

Knee pain lasting for six weeks or more (n=1)

Have you ever had pain in or around the knee on most days for at least six weeks?

2. For the estimation of point prevalence of knee pain

Knee pain at the moment, most days, more than a week (n = 3)

Do you have leg pain now?

The first question measured the period prevalence of knee pain and the second one, point prevalence of the knee pain. It was also felt to be important to assess whether subjects had chronic knee pain. This was not identified in the review. Therefore, to measure this, the classification applied by Jinks et al. (2004) in their study of a brief screening tool for assessment of pain was used: any pain persisting for more than three months within a year was categorised as chronic pain. Therefore, the second part of the first question on knee pain also had the following sub question:

If so, have you had the knee pain for three months or more?

3.2.3 Knee pain related disability questions

There were two ways the student wanted to investigate looking at knee pain related disability. Firstly, to measure disability related to different activities in those with knee pain and then, secondly, to measure the difference in disability between those with knee pain and those without knee pain. Initially the review on knee related disability was used to identify tools and questions that had been used to assess knee disability (Table 3.2).

These questionnaires were assessed as to whether permission was needed to use the tool, whether a licence was needed and whether there was a cost associated. Of these instruments, only the HAQ was available free of charge.

Table 3. 2 List of tools used in assessing knee pain related disability

Tools	Copyright	Cost	Licence	Permission requirement
Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)	Yes	Yes	Yes	Yes
Health Assessment Questionnaire (HAQ)	Yes	No	No	Yes
Short Form questionnaires (SF)	Yes	Yes	Yes	Yes
Non-specific questions	NA	NA	NA	NA

Note: NA = Not applicable

To measure disability related to different activities in those with knee pain, the HAQ was not appropriate because it included questions like getting in and out of the car, which were not appropriate to Nepal. WOMAC and SF has a cost and the resources were not available to the student. The Knee Injury and Osteoarthritis Outcome Score (KOOS) (KOOS User's Guide, 2012), a self-report questionnaire, was chosen to measure this problem as it is an instrument which was developed to assess the opinion of patients on knee pain and associated problems. It contains questions on pain with specific activity. It evaluates acute (short term) and chronic (long-term) knee complaints or knee injuries (KOOS User's Guide, 2012). It was developed in English and Swedish languages concurrently and later on, it was translated into 31 languages and is still undergoing translation into 14 languages (KOOS

User's Guide, 2012). At the time of constructing the questionnaire, this instrument had not been translated into the Nepali language.

The research student approached the KOOS developers about this and they were happy for it to be translated into the desired language (Appendix 8). The questionnaire can be administered by a face to face interview or telephone interview and completed within ten minutes. There is no need for a licence to use this instrument and it was available free of cost (Roos and Lohmander, 2003). All of these reasons helped the research student to decide to select the KOOS as an appropriate instrument to measure the effect of knee pain on daily activity. Fifteen items from the KOOS questionnaire were selected relating to pain on specific activities (Appendix 8), as these fitted with the survey objectives and the issues highlighted by the review**.**

After discussion with the supervisory team, the research student modified two questions and added two new questions into this section of the questionnaire to make it more appropriate for the social, cultural and ecological diversity of the study areas (Appendix 8). The modified questions were: **sitting** was changed to **sitting on a mat / flat surface** and **sitting on a chair / bench** (Q. No.16.3 and 16.4) and **heavy domestic duties** was converted to **carrying heavy weight** (Q. No. 16.12). Furthermore, **going up hill** and **coming down hill** (Q. No. 16.5 and 16.6) were added.

To compare disability between those who have knee pain and those who do not needs generic instruments, not instruments that are specific to knee pain so the WOMAC and KOOS were not appropriate. Generic instruments help to measure the mental, emotional and physical health condition. There were two generic tools identified by the review as being used by previous studies, the HAQ and SF questionnaire but the SF requires a licence and has a substantial cost. There is no cost to using the HAQ, although permission to use is required. However, as mentioned before, the HAQ contained questions such as getting into a car, which were not pertinent to the Nepalese population. Apart from this, generally HAQ does not capture disability associated with sensory organ dysfunction or psychiatric dysfunction nor directly measures patient satisfaction or social networking (Bruce and Fries, 2003)

So, to identify a generic instruments applicable to the Nepalese population, the research student reviewed further studies on disability in Nepal and this revealed that a study on disability was undertaken in Nepal (Thapa et al., 2003) using the World Health Organization Disability Assessment Schedule – 2.0 (Ustun et al., 2010). This could assess disability in both clinical and general population settings and was able to capture all types of limitations on activity and restrictions in participation experienced by an individual (Ustun et al., 2010). It could be used to detect any type of physical or mental disability in any heterogeneous cultural group. It was short, simple and easy to administer (about 20 minutes). It could capture the level of functioning in six domains: cognition, mobility, self-care, getting alone, life activities and participation (Ustun et al., 2010). It was available free of cost and only required prior permission to use. After requesting permission from the World Health

Organisation, Geneva, Switzerland to use this instrument, the research student gained permission (Appendix 9).

Thapa et al. (2003) had used a version of the WHODAS 2.0, which they had translated into the Nepali language and cross culturally validated in Nepalese communities. After personal communication with the author, they agreed to get a copy to the research student from the relevant organisations. Consequently, two copies were received of a Nepali WHODAS 2.0; one was received from the Centre for Victims of Torture, Nepal (CVICT) and one from the Transcultural Psychological Organization Nepal (TPO). Then, the research student assessed and compared the content of both the translated questionnaires, which were found to be the same, and compared the translated questionnaire with the English version and it was found to be consistent. The translated version was then included in the questionnaire, and because it had already been translated and cross-culturally validated, it was not included when the student undertook the forward and backward translation of his own questionnaire.

3.2.4 Questions related with health seeking behaviour for knee pain

This section of the questionnaire was prepared based on the existing health delivery system of the Government of Nepal and was derived from information on treatments and availability of public and private health services contained in the annual report of the Western Development Region of Nepal (Department of Health Services, 2013). This section consisted of questions related to participants’ habits of seeking consultation for knee pain followed by place of treatment at government (public) and private health facilities, modalities of treatment for knee pain and any reason for not seeking treatment for knee pain (Appendix 11, questions 17 to 20). The reasons for not seeking treatment within the Nepalese population included in these questions were generated from the research student’s own knowledge from working in the area as a clinician and from publications about health seeking behaviour (Prasanna et al., 2013; Lam et al., 2013).

3.2.5 Invitation letter to the participants in English

An invitation letter, to take part in the study, was initially prepared in English to inform the subject about the study and to invite them to participate in the survey (Appendix 10). Later on, the research student translated it into Nepali. The invitation letter was prepared using simple terms. It was placed on the first page of the questionnaire so that verbal consent could be taken before asking questions. Verbal consent to take part in the study with participants was recorded at the beginning of the questionnaire, so that each participant would be asked for their consent before administering further questions.

3.2.6 Finalization of the questionnaire in English

In the process of questionnaire design, every attempt was made to construct simple, clear and easily understandable questions that respondents could respond to easily. Drafts of the questionnaire were presented to the supervisor and the supervisory team. These were discussed, reviewed and revised several times during supervisory meetings prior to the finalization of the questionnaire (Appendix 11).

3.3 Translation of the questionnaire into Nepali

The purpose of the translation of the questionnaire was to achieve similar meaning of both the English and Nepali versions of the questionnaires with conceptual and somatic equivalence. Since only a minority of educated Nepali people could understand English, the questions needed to be delivered in Nepali, the official language of Nepal. Even though it was being delivered face to face, it was still felt necessary to translate the English language questionnaire into the Nepali language, so it could be delivered face to face in a consistent manner using appropriate language that participants would understand.

3.3.1 Overview of translation process

In the literature, there are different methods for translating a questionnaire from the original language to the target language. Brislin's model was applied during the translation of the questionnaire (Beaton et al,. 2000; Brislin, 1970). The following five steps steps were undertaken during the process of questionnaire translation (Beaton et al., 2000);

1. Determination of importance and relevance of translation.
2. Identification of forward and backward translators.
3. Examination of the forward and backward translated version.
4. Synthesis of translated version.
5. Reassessment and re-examining of the whole processes.

   (Beaton et al., 2000)

Review of the literature revealed that this model of translation was considered to be the best method for cross-cultural research by different organizations and authors (Beaton et al., 2002; Ozolins, 2009).

In line with this method, two bilingual people were recruited for forward translation (original to target language) and backward translation (target to original language). After receipt of the translated questionnaire, the research student reviewed and synthesised the contents of the forward and backward translations and identified inconsistencies between those translations and put these forward for discussion in an expert committee meeting consisting of the supervisors and a Nepali speaker.

Discrepancies in translation were discussed and necessary adjustments were made in the meeting to get uniform consensus. After the questionnaire format was given final approval by the expert committee and after gaining approval from the university ethics committee, the questionnaire was pre-tested in Preston, England and then, after verbal permission from the Nepal Medical Research Council, piloted in a semi urban area close to Kathmandu, Nepal.

After this, the supervisory team to administer during the survey approved a final copy of translated questionnaire. In this way, the questionnaire was translated from English to Nepali language. More details of the process are described in the following sections.

3.3.2 Identification of translators

According to Brislin's model, the translator should be a native speaker of the target language with the knowledge of both original and target language (Jones et al., 2001). The research student identified two native bilingual Nepalese (English and Nepali) for forward translation from original English to target Nepali language: one was a Public Health Graduate from the Tribhuvan University Nepal and at that time resided in London and the other was a graduate at the University of Central Lancashire who resided in Preston. For backward translation, one English native who was born in Nepal and who grew up and had been educated in England from primary school level to graduate level and another British native, who spoke and read Nepali, were identified. In each set, the purpose of both forward and backward translation of the questionnaire was discussed in detail with translators. A letter requesting their participation was sent to each translator before forwarding them a copy of the questionnaire for translation, and, in each case, the request was accepted and an acceptance letter was received.

3.3.3 Forward translation of questionnaire (English to Nepali)

A copy of the original English language questionnaire (Appendix 11) was sent to both translators. The translated copies from each translator were returned and are coded as T1 and T2 (Appendix 12 and 13).

3.3.4 Synthesis of translated Nepali questionnaire

After the completion of the translation of the English version (T1 and T2) questionnaire, responses were tabulated, for each question, from both translated versions to facilitate comparison. Then the responses were analysed to identify whether there were differences in the context and meaning of the questions. The majority of the questions were found to be consistent across the two translated versions. However, 19 words were found to differ between the two translations (Table 3.3). For nine of the nineteen words, the two versions were found to have similar meanings; for eight words, the two versions had different meanings; for two words, either the English word was used or the word had not been translated. After comparing and verifying the content and synthesizing the meaning, the research student developed a new Nepali version of the questionnaire (T3) from T1 and T2 (Appendix 14). The Nepali version of the questionnaire was then approved by the supervisory team and forwarded for backward translation.

Table 3. 3 Variations in forward translation (English to Nepali)

Variation/s	Question Numbers	Total
Use of different Nepali words with similar meanings	13, 13.1, 14.1, 15.11, 16, 16.1, 17, 19.4, 19.5	9
Use of different Nepali words with different meaning	14.1, 15.7, 15.12, 15.14, 15.15, 15.16, 19.1, 19.2	8
Use of English word	18.8	1
Missing word squatting	19	1
Total		19

3.3.5 Backward translation of questionnaire (Nepali to English)

The Nepali version of the questionnaire (T3) was forwarded to two translators for backward translation requesting translation from Nepali to English. After completion of the translation, English versions of the questionnaires (BT1 and BT2) were received from both translators (Appendix 15 and 16). The results were compiled and tabulated, reviewed and compared to analyse whether the backward translated questions were consistent or not. It was found that the majority of the translated questions were similar and consistent. However, ten translations were found to be inconsistent with the use of different words with partial loss of the intended meaning in eight questions and use of different words without losing the meaning in two questions (Table 3.4).

Table 3. 4 Inconsistencies in the backward translated questionnaires

Differences	Question No.	(n)
Uses of different words with partial loss of expected meaning	13, 16.4 , 16.7, 17, 17.5, 18, 18.1, 19.5	8
Uses of different words without losing expected meaning	16, 16.1	2
Total	10	10

Note: n = total number

3.3.6 Examination of the backward translated version questionnaire

The identified inconsistencies in translations were kept for discussion at a meeting of an expert committee. The expert committee comprised of the Director of Studies, two other supervisors, one bilingual Nepali expert (a final year PhD student) and the research student. The objective of the meeting was to identify any discrepancies between translated questionnaires and to finalize the questionnaire. In that meeting, members were divided into two groups. One forward translated Nepali version group was made up of the final year PhD student and research student and another backward translation review group was formed consisting the Director of Studies and two supervisors.

Before starting the meeting, a translated version of questions with an evaluation sheet asking the committee members opinions on the translated questionnaire was given to each member of the evaluation team (Appendix 17). They were requested to evaluate the contents of translated questions and comment on whether the meaning of translated questionnaire and original questions appeared similar or different.

The meeting started with a briefing of the objectives, the applied procedure of the selection of the translators, the applied method for translation of the questionnaire along with a list of inconsistent translations. The inconsistencies were discussed and each member carried out an assessment of the questionnaire individually. After completion of the assessment, the opinions were collected and compiled and disputed opinions were discussed to form a consensus. The findings of this meeting are in Appendix 18.

The forward translation assessment team found that the majority of translated questions (Appendix 11) were consistent except the omission of ***most of days*** and ***at least one month*** was missing (Q No. 13). Likewise, in the opinions of the backward translation section, a remarkable finding was the omission of ***most of days*** and at ***least one month*** was missed (Q No. 13), and of the use of the term ***full*** in extension of the knee joint (No. 16.1). The other identified minor differences in the use of words such as use of words: ***ground* vs. *flat surface***, **advice vs. consult and advice vs. treatment (**Q No. 16.2, 16.4, 17, 20.1). Likewise, the use of ***medical shop*** for **local pharmacy** and **homeopathy clinic** for **herbal clinic** in translations of BT2 (Q No 18.5 and 18.9) and cream (Q No. 19.7) was replaced *by* ***ointment or Vaseline*** (Appendix 19).

The expert committee concluded after correction of the identified errors of the respective questions that the translated questionnaire of the Nepali version would be suitable for pre-test and piloting purposes.

In the meantime, the research student had translated the invitation letter (Appendix 20) and the demographic section. The Nepali version of the WHODAS 2.0 and all other sections were compiled into a final set of the questionnaire in Nepali for pre-test (Appendix 21).

3.4 Pre-test of questionnaire

After gaining approval of the proposal from the University of Central Lancashire, Science, Technology, Engineering and Medicine (STEM) Ethics Committee, the Nepali version of the questionnaire was pre tested on five Nepalese adults who had been living in Preston for more than six months (Appendix 22). The age of the participants was between 20 to 45 years and three were male and two female. After explaining to them about the purpose of the testing, each was asked to read the questionnaire independently and to provide comments on the content of the invitation letter, their understanding of the questions, the flow of the questions and the layout. The participants were not asked to complete the questionnaire. The comments and suggestions received from the five participants were compiled.

The content of the invitation letter was found to be clearly understandable and acceptable (Appendix 23). The instructions for completing the questionnaire was easily understood as were the questions. The layout was acceptable and considered to be printed clearly. All of the participants felt it would be logical to have the question on academic attainment before the question related to employment status. They also pointed out that there was some duplication of the types of available health facilities for delivery of health services included in the relevant questions. All of the suggestions were accepted and necessary minor adjustments were made to the Nepali questionnaire and equivalent modifications were made to the English version. Given the minor modifications, the next version did not undergo any further pre-testing but was prepared for pilot testing (Appendix 24).

3.5 Piloting of questionnaire

After getting permission from the University of Central Lancashire, Stem Ethics Committee and submission of the proposal to the Nepal Health Research Council in Kathmandu, Nepal, for ethical approval, permission was gained from the Nepal Health Research Council to conduct a pilot of the questionnaire at Khokana village in the Saibu Village Development Committee of Lalitpur district, in the hilly zone of the Central Development Region of Nepal (Appendix 25).

After arriving at the specified location, the research student met the head of the community, local people and staff of a rural clinic (Saibu health post) and explained the aims and objectives of the study and the purpose of piloting of the questionnaire. Permission was obtained to conduct a pilot test of the questionnaire in that locality (Appendix 25). During the pilot, the letter of invitation was given to five participants and they were asked to read it through. Then permission was sought to administer the questionnaire. They were also asked to comment on any difficulties they had in understanding the meaning of the invitation letter and the questions. Of the five adults, two participants were male and three female and they were aged between 18 to 63 years. The research student did not encounter any difficulties while administering the questionnaire. Each participant was able to understand the questions and the responses were appropriate. The invitation letter and questionnaire were considered coherent and acceptable. The invitation letter was felt to outline the aims and objectives of the research clearly. The questionnaire was easily understandable by all respondents. In conclusion this pilot test of the questionnaire suggested that there were no modifications to the questionnaire required (Appendix 24).

3.6 Summary

This chapter described the development and translation of the questionnaire for survey data collection. The next chapter will describe the survey methods for the prevalence study in adults of the Western Development Region of Nepal.

Chapter 4: Prevalence - survey methods

The previous chapter described the questionnaire development for the prevalence survey of knee pain and knee pain related disability in the adult population of the Western Development Region of Nepal. This section will outline the survey protocol, and data collection and management processes, along with a section on statistical methods.

4.1 Objectives

The objectives were:

- to estimate the prevalence of knee pain and knee pain related disability in the Western Development Region of Nepal
- to estimate and compare the prevalence of knee pain and knee pain related disability in ecological zones (plain, hilly and mountainous zone) of the Western Development Region of Nepal
- to estimate and compare the prevalence of knee pain and knee pain disability across different socio-demographic (age, gender), occupational (agriculture and others), residency (urban, rural) and socio-economic subgroups
- to ascertain the health seeking behaviour of those with knee pain and explore how this varies within ecological zone.

4.2 Methods

4.2.1 Study design

The study design was a multistage cluster cross-sectional survey. A cross-sectional survey is appropriate to collect prevalence data, that is, the number of cases of the condition in the population.

Due to resource and time constraints and security concerns, it was not possible to undertake a random sample across the whole country; therefore, the Western Development Region, which was the most accessible and safest region, was selected. However, resource and time constraints as well as a lack of a sampling frame for the whole region meant a random sample could not be selected. Therefore, multistage, cluster sampling was chosen as an appropriate design.

In multistage clustering sampling, a random sample of primary administration units are first chosen from a target population within each of these, a random sample of lower layer administrative units are randomly selected. This continues hierarchically until the sampling unit for the survey is identified, that is, in this case, the household (Sedgwick, 2015).

Strengths of the multistage survey design

This method is useful because sampling is convenient, economical and efficient, since it does not require a complete list of participants in the target population. This reduces sample preparation cost and survey administration, since during survey; the enumerator does not need to travel across wide areas of the region. The list of potential survey members is required only for those clusters used at the final stage. The main disadvantages of multi-stage sampling are the same as for cluster sampling. There is greater potential for introducing bias compared with random sampling, as members of a cluster may be different in characteristics to others in the population, this may limit generalisability. Also there are statistical issues (see section 4.5.22) which require larger sample sizes and may require more complex statistical tests (Corsi et al 2012; Lee et al., 2014; Funaoka et al., 2006).

4.2.2 Study population

The study population was adults over 18 years of age living in households of the plain zone, hilly zone and mountainous zone of the Western Development Region of Nepal. The study was limited to adults because the musculoskeletal system is maturing in children and adolescents. Only adults over aged 18 years who had resided in that ecological zone (plain, hilly or mountainous) for at least six months were included. This was because otherwise it was felt that they may not have had sufficient exposure to the terrain for it to have an effect.

4.2.3 Sampling Strategy

For this survey, the Western Development Region was first divided into the three ecological zones (plain, hilly and mountainous) as one of the major objectives of the study was to identify the prevalence of knee pain in different types of terrain: plain zone, hilly zone and mountainous zone areas. Then a hierarchy of clusters were selected down to the sampling unit. In this study, the hierarchy within each ecological zone was district followed by Village Development Committee or municipality area followed by village or Tole followed by household (Figure 4.1). All adults within a household were invited to take part in the survey. This is discussed in more detail below.

4.2.3.1 Selection of study districts

The first stage cluster was the next administrative level down within each zone, which is the district; within each zone, one district was selected from all in that ecological zone. Given issues of accessibility and security concerns, it was decided not to randomly select a district in each zone but to obtain local knowledge of the most accessible and safest districts to collect data.

A meeting was organised with the senior officers of the Ministry of Health and Population and Ministry of Local Development in the Ministry of Health. In that meeting after a briefing of the aims, objectives and methodology of the survey, it was proposed to the conduct study in Mustang, Palpa and Rupandehi districts in the Western Development Region. Since Mustang was in the mountainous zone, Palpa in the hilly zone and Rupandehi in the plain zone.

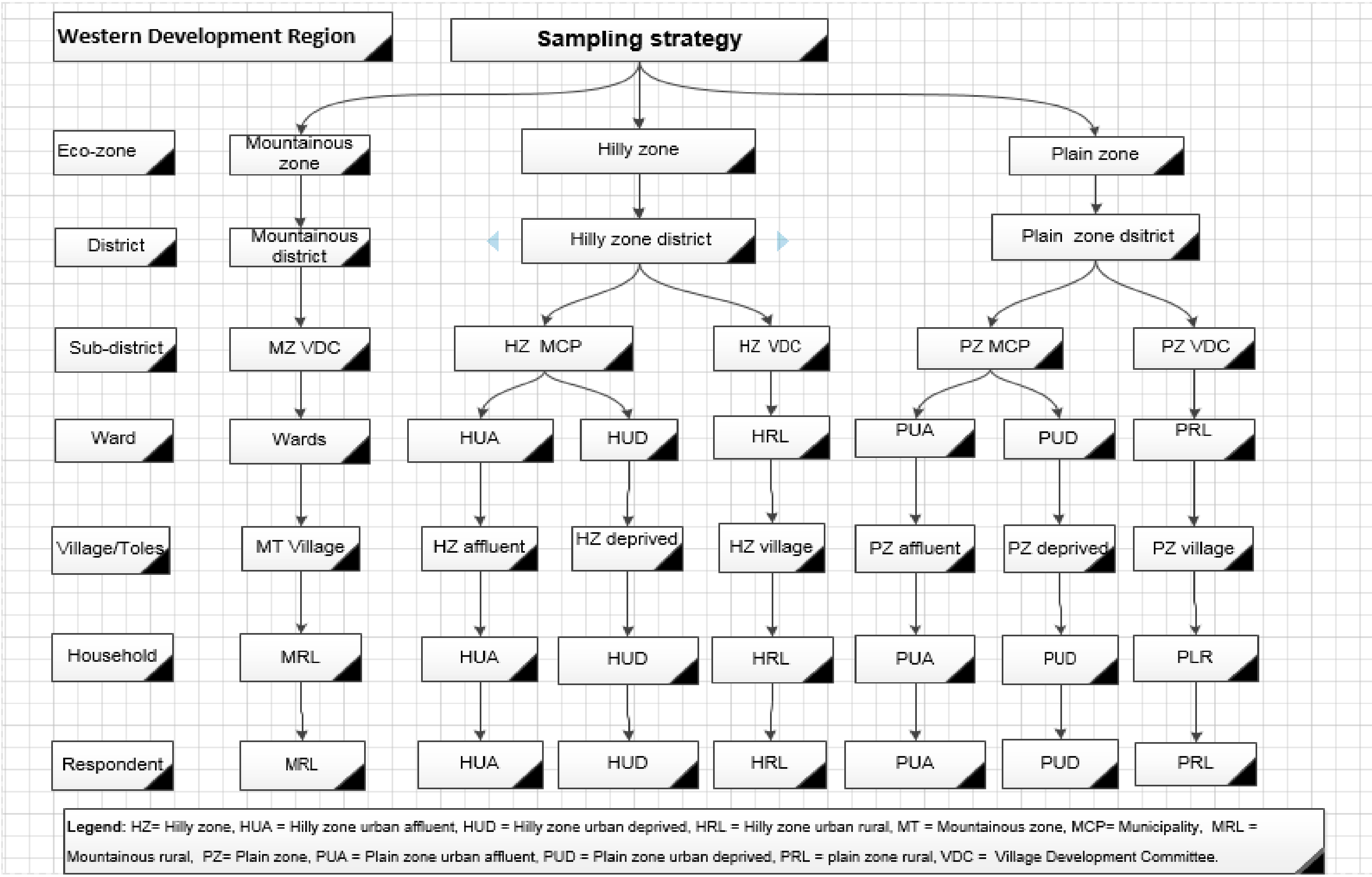

Figure 4. 1 Survey strategy

4.2.3.2 Selection of study sites within district

The second stage of cluster sampling was the next administrative level down within each district, which is either the municipality areas or the Village Development Committee. To try to ensure that the sample was as representative as possible of the population, it was decided that one site for data collection should be from the mountainous zone district and three each from the hilly and plain zone districts; giving seven sites in total. Within the hilly and plain zone district, one of the three was to be a rural area, one an urban affluent area and one an urban deprived area. The list of Village Development Committee/Municipality (VDC/MCP) areas was obtained from the selected district health office in each zone. Within the hilly and plain zone districts, the municipality areas and Village Development Committee were divided into those in urban areas and those in rural areas, and within the urban areas into those in urban affluent areas and those in urban deprived areas.

The selection of a Municipality area and Village Development Committee in each of the seven areas (mountainous district, hilly zone district rural, hilly zone district urban affluent, hilly zone district urban deprived, plain zone district rural, plain zone district urban affluent and plain zone district urban deprived) was performed by giving a unique number to each and putting these in an opaque envelope (one for each area). Then the researcher from each envelope randomly chose one number.

4.2.3.3 Selection of village or Tole

In the third and fourth stage of sampling, one ward and within the selected ward, one village or Tole (like a small village), was selected within each selected Municipality area / Village Development Committee chosen in the hilly and plain zones. The wards were identified first from the local municipality or Village Development Committee. After meeting with the officers and briefing them on the aims and objectives of the study, the research student received the names of the wards. For each area, the names of the wards (the number of which varied in each municipality area but were nine in each of the Village Development Committee areas) were put on separate pieces of paper and placed in an envelope; one envelope per area. The research student then chose blindly one piece of paper from each envelope, with the exception of the mountainous zone, thereby selecting three wards in the hilly zone, one that was affluent urban, one deprived urban and one rural, and in the plain zone similarly one that was affluent urban, one deprived urban and one rural. In the mountainous zone, the population is small and therefore three wards out of nine were randomly picked from the envelope.

Then for the selected wards, the same process was followed to select villages /Toles, the names of which were also obtained from officers of the ward offices in municipalities or from Village Development Committee offices, as appropriate. As before, for each ward, unique numbers were given to each village/Tole in that ward and these were placed in envelopes; a separate envelope for each selected ward in the hilly and plain zones and one envelope for the villages in the three wards in the mountainous zone.

For the hilly and plain land zones, the research student blindly picked one village from each envelope thereby picking one study site that was affluent urban, deprived urban and rural in the hilly zone and one study site that was affluent urban, deprived urban and rural in the plain zone. In the mountainous zone because of the small population in each village, two villages were randomly chosen from this envelope to form one rural site (there are no urban areas in the mountainous zone). In this way, the research student selected seven study sites for administration of the survey (Table 4.1).

Table 4. 1 Selection of study sites in different ecological zones

Ecological zone	District	Urban affluent site (HUA)	Urban deprived site (HUD)	Rural site (RRL)
Plain zone	Rupandehi	Plain zone urban affluent site (PUA)	Plain zone urban deprived site (PUD)	Plain zone rural site (PRL)
Hilly zone	Palpa	Hilly zone urban affluent site (HUA)	Hilly zone urban deprived site (HUD)	Hilly zone rural site (HRL)
Mountainous zone	Mustang	Not applicable	Not applicable	Mountainous rural site (MRL)

4.2.3.4 Selection of households

The fourth stage was selection of households within the sites. The aim was to recruit a hundred participants over 18 years of age in each study site. In six study sites other than the plain zone urban site, the first household was randomly chosen from the publically available electoral list of respective district electoral offices. The following method was applied to select the first household in all selected study sites. First of all the research student visited the respective electoral office copied household numbers on pieces of paper and kept these in an opaque paper bag. Then the research student withdrew a piece of paper blindly from the bag. This was the first household approached to undertake the study. Using a map of the respective areas, the subsequent households were chosen nearest to that first household in an interval of Nth households within the Tole and village in a randomly selected direction where *N* was the total number of households in the enumeration district of the selected area divided by 20 (the number of households it was estimated need to be approached to achieve the sample in each site). Then, the research student administered the questionnaire, applying a face-to-face interview, to each adult aged 18 years and over in that household, who agreed to take part, until the required number of participants were recruited in that site. When there was a fork in the road, a coin toss was used to select the direction to go in to select the next household.

The electoral list was not available in the plain zone urban affluent site. In that site the first house of the main entry road of that locality was selected to start the interview. Then subsequent houses were chosen applying the same procedure, as above until the required number of respondents were interviewed.

4.2.4 Data collection

Information on the following was collected using a questionnaire, which was administered face-to-face by the researcher. The questionnaire is shown in appendix 11 and its development is described in chapter 3.

In brief, the questionnaire was designed to collect information on:

- socio-demographic variables: age, gender, residency (urban/rural), employment status, occupation, marital status, educational level
- knee pain: presence of knee pain over the previous year; presence of knee pain at the time of the survey and presence of chronic knee pain (present for at least three months)
- knee pain on specific activity
- health seeking behaviour services, treatments and reasons for not accessing services
- disability measured using the WHODAS 2.0.

The research student visited each selected house during the daytime. In each household, the research student met with the head of the household and with their family members and explained to them about the aims and objectives of the study. Then the invitation letter was given to all eligible literate participants prior to conducting the interview and verbal permission taken to administer questionnaire before starting the interview. In the case of illiterate participants, the research student read the invitation letter loudly to the participant, explained the content of the invitation letter, and then took verbal permission. Then the research student administered the questionnaire preferably starting with the head of the household and continuing with other family members. It was conducted as a face to face interview with each member in turn in a separate place within the household from the other family members so that they could speak freely and confidentially. The research student asked each question, with their possible responses, one by one and marked the participant's responses in the questionnaire sheet on the spot.

After completion of each interview, the research student would review the filled questionnaire to check the completeness of the questionnaire and look for potential errors. Any missing responses were clarified with the participant and corrected as required. In every household, after completion of the questionnaires, a vote of thanks was given to respective respondents and family members for granting permission to conduct the interview, providing their valuable time and for answering questions without any hesitation. During administration of the questionnaire, the research student faced a problem with the question about going up and down hills in the plain zone. Topographically in the plain zone, there are no mountains and hills, so asking the question about going up hill and down hill was irrelevant. Therefore, the research student replaced these questions by asking about going upstairs for going up hill and getting downstairs for going downhill. The total duration taken for the fieldwork was 22 weeks.

4.2.5 Measures

The following was measured on knee pain using information provided by the questionnaire:

- point prevalence of knee pain
- twelve month prevalence of knee pain
- prevalence of chronic knee pain that is pain present for 3 months or more

For definitions, see section 4.5.1.1. The prevalence of knee pain was compared across the ecological zones (plain, hilly and mountainous zones) and across other factors including age, gender, residency, deprivation, occupation. There was further exploration to identify which factors were independent risk factors for knee pain.

The following was measured on knee pain related disability:

- In those with knee pain, the specific activities leading to knee pain and severity of knee pain with activity.
- The prevalence of disability in those with knee pain and those without knee pain measured using the WHODAS 2.0. Prevalence of disability was compared between those with knee pain and those without and an exploratory analysis was undertaken to assess if knee pain was an independent risk factor for disability. For definition of disability, see section 4.5.1.2.

In those with knee pain, the uptake of health care services and treatments were measured and uptake across ecological zones was compared. Reasons for not consulting about knee pain were explored.

4.2.6 Sample size

Given the sampling strategy, it was felt there were a number of unknowns about the clustering parameters that made it unfeasible to undertake a detailed formal sample size estimate. The supervisory team, including a senior medical statistician, discussed the sample size for the study in detail during early supervisory team meetings, as it was needed for the ethical approval from the Nepal Health Research Council.

The review of studies reporting the prevalence of knee pain in the published literature (fully reported in the previous chapter) suggested at the time of estimating the sample size that 30% was a good estimate of the period prevalence of knee pain in the population and that the rate might range from 6% to 49%. Therefore, sample size was estimated using this range, although subsequently studies with lower prevalence rates were identified.

It was recognised that there were clustering factors in the sampling strategy, which would lead to a reduction in the effective sample size (design effect). It was not possible to estimate the clustering parameters for this study à priori. Therefore, the effect on precision was investigated using a design effect due to clustering of 2; a large design effect to err on the side of caution. Given the time and resources available, the student felt that the number of participants that could be recruited in each site was around 100, which equals 300 in the plain and hilly zones.

The calculation of sample size was performed using nQuery + nTerim 2.0 software (released in 2012 by Statistical Solutions Ltd, 4500 Airport Business Park, Cork, Ireland), with the effective sample size adjusted by dividing the sample size (either 100 or 300) by the design effect of 2 prior to computing the confidence interval width for that sample size given 1- alpha (that is 0.95), a 2-sided interval and prevalence of 6% or 49%.

A sample size of 100 participants per study site would be sufficient to estimate with 95% confidence the prevalence of knee pain with a precision of within +/- 4.7% (+/- 6.6% with design effect of 2) for a low estimate of 6% and +/- 9.8% (+/- 13.9% with design effect of 2) for a high estimate of 49%. One hundred participants per study site would give a sample size of 300 participants in each of the ecological zones (hilly and plain) which would be sufficient to estimate with 95% confidence the prevalence of knee pain with a precision of within +/- 2.7% (+/- 3.8% with design effect of 2) for the lowest estimate and +/- 5.7% (+/- 8.0% with design effect of 2) for the highest. This degree of precision is generally satisfactory for a study of this nature, although the estimate for the mountainous zone would be rather imprecise if the design effect were close to (or above) 2. Therefore, a sample of 100 completed questionnaires was collected in each study site, to give a target of 700 questionnaires overall.

4.3 Ethical and other approvals

Ethical approval was obtained from the University of Central Lancashire, Ethics Committee, Science, Technology, Engineering and Medicine (STEM) and the Nepal Health Research Council (NHRC), Nepal, to conduct this survey (Appendixes 22 and 25).

4.3.1 Co-ordination with the Governmental organizations

The research student visited the Ministry of Health and Population (MoHP), the Ministry of Local Development (MoLD), the Nepal Health Research Council (NHRC) and met with responsible officials. The research student invited them to participate in that meeting which was held at the office of the Assistant Secretary of the Ministry of Health and Population in the second week of December 2013. The participants in that meeting were the Assistant Secretary of the Ministry of Health and Population, the Senior Officer of the Office of the Director General of the Department of Health Services (DoHS), the Chief of the Child Health Division and the Administrative Officer of the Ministry of Local Development. The objectives of that meeting were to familiarize them with the aims, objectives and methodology and to gain approval for the proposed survey and where it would take place, as well as to help to identify an appropriate site for pilot test of the questionnaire.

After a brief presentation of the aims, objectives and methodology of the study in English and Nepali, the research student also expressed concerns about the choice of the districts considering resource constraints, accessibility and security concerns. The members of the meeting appreciated the objectives of the study since an estimation of the prevalence of knee pain, knee pain related study had not been conducted before, and the study was well planned to cover the three ecological zones across rural and urban areas. It was also expressed that the findings of this survey could be useful during planning and implementation of health services in the future. Furthermore, they also suggested a place for piloting the questionnaire in a newly developed semi urban area of Khokana of Saibu VDC, Lalitpur in hilly zone of the Central Development Region. That was about seven kilometres from Kathmandu and was easily accessible. They also recommended the Western Development Region to do the survey with Mustang, Palpa and Rupandehi as the districts where it would be appropriate to conduct this survey as they were easily accessible and peaceful compared to other development regions and districts.

4.3.2 Co-ordination with local bodies in Nepal

During the survey in Nepal, coordination and cooperation from the public and private organizations along with community members was essential. In each district, the research student visited the District Health Office, the District Local Development Office in the district headquarters, the selected municipality, Village Development Committee, and the Primary Health Centre and the Heath Post of the selected study sites. In the study sites, the research student also contacted the Female Community Health Volunteers (FCHV), other local community leaders, schoolteachers and other formal and informal leaders as well. During the process of data collection, the research student received full support from these people particularly from FCHVs, since there was at least one FCHV in each ward. They are frontline local health resource people who are delivering community based health education and services in the community. They keep health records of each family member in their community. They also helped in the process of establishing a rapport with the community and family members. Likewise, staff of all health posts and Village Development Committees and municipalities also helped during the process of building rapport with local community people during the process of data collection.

4.3.3 Feedback to local community

After completion of the survey in each site, a vote of thanks was given to the community and local bodies in all study sites. Likewise, there was a debriefing visit to the offices of local bodies including Health Posts and District Health Offices, the Western Regional Health Directorate Office, Pokhara and the Department of Health Services, Kathmandu, Nepal. There, a vote of thanks was offered for granting permission to conduct the survey and providing their valuable time and support in every step from selection of the study sites to completion of survey. During the feedback meetings, the research student also reported the number of people reporting with knee pain to respective Health Post (rural health facility), District Health Office, Regional Health Directorate Office and Ministry of Health. They were eager to know the extent of the problem of knee pain in their community so that they could plan their program focusing on this problem for delivery of health services.

4.3.4 Confidentiality

All interviews were undertaken in private and not shared with others. The questionnaire had an anonymised identification number and could not be tracked back to the individual once the house was left. Only aggregated data was fed back to the communities and the respective health facilities, has been reported in the thesis, and will be reported in further dissemination. Furthermore, the names of the study sites are not and will not be used in any dissemination.

4.4 Data management

Data errors can creep in at any step of the process from initial data acquisition to archival storage (Hellerstain et al., 2008).

4.4.1 Errors in statistical data

It is important to identify and correct errors and minimize their impact on study results (Van den Borek et al., 2005). Data errors may profoundly influence statistical statements based on the data because they lead to inaccurate estimates (Jonge and Loo, 2013).

In epidemiological research, in spite of careful study design, conduct, and implementation of error-prevention strategies, errors can still occur. Data collected in a survey should be accurate and able to reflect the actual response, without any errors during collection, transcribing, coding or calculating variables (Van den Borek et al., 2005)**.** Systems to reduce data collection errors will improve efficiency and it is far cheaper and more efficient to prevent an error then to have to find it and correct it later.

There is a possibility of an occurrence of errors at the time of data entry (Dancey and Reidy, 2012). To reduce these errors, data cleaning is essential. Once the data has been entered and stored on a computer, there is a need to identify and eliminate obvious errors, which might have occurred during the course of data collection, coding and input stages (Bowlin, 2002; Campbell et al. 2007). In practice correcting errors in data and eliminating bad records is time consuming and tedious but should not be ignored (Jionge and Loo, 2003).

Validation is a process used to determine if data are inaccurate, incomplete, or unreasonable. The process may include format checks, completeness checks, reasonableness checks, limit checks, review of the data to identify outliers or other errors, and assessment of data by subject area experts (Redman, 1997). Data cleaning refers to the process of “fixing” errors in the data that have been identified during the validation process (Chapman and Speers, 1991).

4.4.2 Measures applied to reduce errors

A number of different precautionary measures were applied to reduce the possibility of errors from the conceptualization and formulation of the questionnaire until the administration of the questionnaire to the participants in the field.

4.4.2.1 Data collection

Care was taken during the process of typing up the questionnaire to ensure there were no mistakes. Before the final printing of the English questionnaire, the draft set was checked by the research student and the supervisors. Likewise, the translated version of the questionnaire was also checked and crosschecked by the research student and it was rechecked by the participants during the pre-test, as well. Furthermore, during piloting, it was further checked to find out if there were any mistakes or errors.

After completion of the administration of each questionnaire in each household, the questionnaire was re-checked by the research student to identify any error or missed information before leaving for another house. Any observed mistakes during checking were corrected, and missed information was asked about with participants on the spot. After returning to the university prior to starting data entry into the computer, all questionnaires were once more rechecked by the research student.

4.4.2.2 Data verification

Application of a data cleaning process is undertaken to identify errors and correct those errors or at least to minimize their impact on study results (Van den Broeck et al. 2005).

Initially data cleaning was started by selecting 70 (10.0%) of the total entered questionnaires. Those questionnaires were selected by using Excel generated random numbers. Then the entered data for each questionnaire was cross checked and verified with the information on the paper questionnaire. During checking, detected errors were recorded in a notebook. It was decided that an error rate less than 0.5% was allowable and 0.5%-1.0% being potentially allowable depending on the type of error (Van den Borek et al., 2005).

There were 32 questions with 91 items in each survey questionnaire. In total 70 questionnaires were checked in the first round. A total of 51 errors were detected in the first round of cross checking. This was 0.8% of the total items checked (6370) (Table 4.2). All errors were corrected. Eight (15.7%) errors were detected in the recoding of the occupation variable and six (11.8%) errors were identified in each of the following variables; educational level, experienced knee pain and reduction in usual activities. In addition to this, errors were detected in age and sex of the participant. The detected error rate was higher than expected error rate and errors were found in important demographic variables, that is age, gender, occupation and knee pain.

Table 4. 2 Identified errors in cross checking of questionnaires

Errors identified variables	1st round (n)	2nd round (n)	3rd round (n)
Employment and occupation other	8	12	0
Completed education level	6	7	0
Experienced knee pain	6	9	0
Reduction in usual activities	5	7	0
Identity number of respondent	4	0	0
Marital status	3	7	0
Household number	3	0	0
Difficulty in performing routine activities due to knee pain	4	10	0
Age	3	1	1
Gender	3	2	0
Sought consultation	3	0	0
Date of interview	2	0	0
Duration of residency in that locality	1	0	0
Site of treatment for knee pain	0	4	0
Employment status	0	9	0
Difficulty in walking long distance	0	6	0
Type of treatment for knee pain	0	7	0
Total number of errors	51	81	1
Total number of items checked	6370	56784	1092
% of errors detected in items checked	0.8%	0.1%	0.1%

Note: Each questionnaire has 91 fields.

Therefore, this was discussed with the supervisory team and a decision was made to recheck the remaining 624 questionnaires. With the application of similar procedures to the 624 questionnaires, a further 81(0.14% of the total items) errors were detected of which 12 (14.8%) were in occupation, 10 (12.3%) in having trouble in performing routine activities, nine (11.1%) in employment status and whether they experienced knee pain. Table 4.2 shows the detected error rate for the different variables. Detected errors were corrected.

Considering the types of errors and error rate in the second round of checking, a third round of checking was executed just in twelve randomly selected questionnaires. With application of the similar procedure of checking, only one error was found (0.09%) (Table 4.2).

4.4.2.3 Validation

In this process, descriptive statistics of the data were undertaken to identify errors, such as outliers, in the database.

Checking of errors in categorical variables

In this process, a frequency analysis for each categorical variable was undertaken. The obtained output provided a summary of each of the variables with a breakdown of the range of possible responses. The minimum and maximum values were checked to know whether these scores were within the range of given options or not. All of the output values were checked against those recorded in the database codebook. In a total of eight items (0.12%) of all items errors were noticed which were corrected. The research student also checked for any missing data.

Checking of errors in continuous variables

The procedure above was applied in the checking of the frequency of continuous data. Under this process, 3 (0.04% of all items) errors were detected. This practice of data verification and data validation built confidence in the quality of the data in the database.

4.5. Statistical analysis

4.5.1 Prevalence rates

4.5.1.1 Prevalence of knee pain

Prevalence estimates for knee pain and knee pain related disability were estimated. Period prevalence rate of knee pain was the number of people who reported they had knee pain for one month in the previous 12 months divided by the number of participants. Period prevalence rate of chronic knee pain was the number of people with knee pain as above who had the pain for at least three months divided by the number of participants. Point prevalence was the number of people who reported knee pain as above who had pain at the time of the survey divided by the number of participants. Prevalence rates were also estimated for gender, age group, ecological zones, urban and rural residency, and occupation. Prevalence estimates are presented with 95% confidence limits. Confidence limits were computed by application of the traditional method as described in Altman et al. (2005). Initially Chi squared tests were applied to explore the statistical significance of comparisons of categorical variables, for example between ecological zones (see logistic regression on section 4.5.5).

4.5.1.2 Prevalence of knee pain related disability

In this study, disability was measured using the WHODAS 2.0 questionnaire. For each of the 12 questions, there was a Likert scale, which was scored as follows: 0 – no disability, 1 – mild disability, 2 – moderate disability, 3 – extreme disability and 4 - cannot do. Computation of the WHODAS 2.0 was performed using the guidelines in the WHODAS 2.0 manual (Ustun et al. 2010; Andrews, et al, 2009). Overall disability was the sum of scores for the 12 questions and therefore was between (0 to 48). Then, 100 to convert it into percentages multiplied the sum of the 12 item score was divided by 48 and the product. In the next step, these percentage scores were grouped into 5 groups according to the severity of the disability. Those were none (0 – 4%), mild (5% - 24%), moderate (25% – 49%), severe (50 – 95%) and complete (95% to 100%) disability. However, in this study population, the number of participants with complete disability was very low, so the last two groups were combined. For most of the analyses, the disability percentage score was dichotomised into two groups, those with no disability and those with disability of any severity. A similar process was undertaken for each of the six domains of the WHODAS 2.0 for which there were two questions each:

- Cognition domain - understanding and communicating.
- Mobility domain – moving and getting around.
- Self-care domain – hygiene, dressing, eating and staying alone.
- Getting along domain – interacting with other people.
- Life activities domain – domestic responsibilities, leisure, work and school.
- Participation domain – joining in community activities.

4.5.2 Adjustment of prevalence rates due to study design

The study used a multistage cluster survey design. Therefore, it was necessary to investigate whether this design had an impact on the prevalence estimates and/or statistical tests.

4.5.2.1 Stratification due to multistage design

In a multistage design, there is a hierarchy of strata as previously described in section 4.2.3. To take this into account in estimating the prevalence, for each zone, the reciprocal of the proportion of selected areas at each level of the hierarchy was estimated, for example, the number of villages within all the villages in that zone. These were then multiplied all together with the sampling fraction, that is, the number of participants divided by the population to obtain a proportional weight, which is then applied to the survey rate in that zone and the rates for each zone summed.

4.5.2.2 Clustering

At the final stage of sampling in this study, all participants in a household present at the time of interview were selected. Therefore there is a potential clustering effect; that is within each household there could be a similar outcome in members the household because those in the household are more likely to behave or be like one another than those in different households, for example ethnicity, religion, type of work. If ignored at this level, the true population standard error would be underestimated. If there is a clustering effect, standard errors are larger if correctly estimated, than those that would have been obtained from a simple random sample of the same size (Fergusion and Corey, 1990).

The effect of clustering in the estimation of prevalence of knee pain and disability in different study sites was measured by the inflation factor. The inflation factor is the degree to which standard error has been inflated due to clustering at household level. The inflation factor is the estimate of the standard error (SE) divided by the estimate of the robust standard error (RSE). The robust standard error is the estimated standard deviation of cluster level prevalence estimates (in this study sites) after adjusting for clustering. An inflation factor less than one or equal to one was considered acceptable as it shows there is no effect of clustering (Kutner et al., 2004). The inflation factor was estimated for each site for each prevalence measure. The trend in inflation factors across the seven sites for each measure was reviewed and if several had an inflation factor much greater than one, or there was a trend in similar types of sites having an inflation factor greater than one, statistical tests, including confidence intervals and tests of statistical inference, adjusting for clustering would be used. If not, usual statistical tests not adjusted for clustering would be used.

4.5.3 Adjustment of prevalence rates to allow direct comparison between ecological zones and residences (urban and rural)

When undertaking a survey, the distribution of participants for factors like age and gender may differ between different populations. When these factors could influence the prevalence of the condition being measured, it is important to adjust the data to allow a comparison between the populations. In this study, knee pain estimates increased with age and there were differences in the distribution of age and gender factors between ecological zone populations. Therefore, prevalence rates were adjusted to consider this. There are two methods of standardization, direct and indirect (Curtin and Klein. 1995). In this study, the direct method of standardisation was applied, as the numbers were large. Standardisation took into account the age-sex distribution within each of the ecological zones when estimating rates for the whole population and age, for gender specific rates. This analysis used the Western Development Regional population as a reference. Directly standardised rates were estimated for period prevalence of knee pain, prevalence of chronic knee pain and point prevalence of knee pain. For each standardised rate, 95% confidence intervals were estimated using the method described in Finlayson et al. (2011).

4.5.4 Estimation of weighted prevalence rate

One of the purposes of the study was to estimate prevalence for the Western Development Region. However, when undertaking a survey, the distribution of participants for factors like age and gender may not reflect the distribution of these factors in the population. When these factors could influence the prevalence of the condition being measured and the aim is to estimate a rate to be generalised to the population, it is important to adjust the data so that the distribution is more similar to the population (Altman et al, 2005; Guo, 2011). This process is called weighting. In this study, knee pain estimates increased with age and differed across ecological zones and residency. There were some minor differences in the distribution of these factors between the survey and the regional populations and large differences between the distribution of the survey and regional populations by ecological zone. The latter was mainly because the mountainous zone was oversampled so that there were enough participants for estimation of rates in this ecological zone and comparisons between ecological zones. Therefore when estimating the overall regional rate, the mountainous area may be over represented.

Therefore, to get a more generalizable (to the Region) estimate, prevalence estimates were weighted for age, sex and ecological zone population within the hilly and plain land there was also weighting for urban and rural populations.

For this purpose, the Western Development Region population was aggregated into 10-year age bands within the mountainous, hilly urban, hilly rural, plain land urban and plain land rural areas within each gender using available population data, and the percentage of the population within each of these age bands estimated. For each of these 10 year age bands, the percentage of respondents falling into this 10 year age band was estimated. The weight to be applied to the knee pain prevalence within each of the 10 year age bands was estimated by dividing the population percentage by the sample percentage. A weight lower than one would be achieved if the population was oversampled, and above one, if it was under sampled. The weight was then applied to response data within each of the 10 year age bands and added across the study population to estimate an overall weighted rate. For each weighted prevalence, 95% confidence intervals were estimated using a method described by Guo, (2011).

The same process was also undertaken at ecological zone level and residency to estimate weighted prevalence rates for each ecological zone and urban and rural areas.

4.5.5 Logistic regression

Binary logistic regression was applied to investigate potential independent risk factors for the prevalence of knee pain and knee pain related disability. In these analyses of knee pain, the predicted variable was the relevant prevalence of the condition: present or not. Potential risk factors included in the analysis were those that had a statistical significance above 0.1 in univariate analysis or where there was evidence from the literature review that they might be important factors to consider (Kunter et al, 2004; Hair et al, 2010). All variables were categorical. For this analysis, the age of the participants was categorised into 18 - 34 years, 35 – 44 years, 45 – 54 years, 55 – 64 years and 65 years and over and ecological zone into plain, hilly and mountainous zone. Male gender, the 18 – 34 years age group, plain ecological zone, urban area and non-agricultural work were the selected reference groups because these had the lowest prevalence rates.

Computed odd ratios (OR) with 95% confidence limits and p values were used to compare and describe the association between potential risk factors and the prevalence of the condition in the univariate and multivariate analysis. A p value <0.05 was considered to demonstrate statistical significance.

The same method was also used to investigate association between the same risk factors and disability. The purpose of this analysis was to see if knee pain was an independent risk factor for disability and therefore this variable was added in with the reference being ‘no knee pain’. A similar logistic regression modelling approach was also applied to find out the association between knee pain and each of the six domains (cognition, mobility, self-care, getting along, life activities and participation) of disability.

Compared to the plain zone, in the hilly zone availability of health, services are less and people have to walk up and down hills. If people live in rural areas, they are more likely to work in agriculture and have to carry heavy loads. Therefore, the combination of living in a rural area and in a hilly zone might affect prevalence of knee pain more than the sum of the individual factors. That is, there may be an interaction. Therefore, in the logistic regression the effect of adding an interaction term (hilly zone with rural area) was investigated.

Chapter 5: Results - Prevalence of Knee Pain

5.1 Introduction

This and the following chapter contain the findings of the cross-sectional survey of knee pain and knee pain related disability in adults of the Western Development Region of Nepal. In this chapter, the altitudes of the survey sites, the survey responses and survey findings on the prevalence of knee pain are presented. In the following chapter, the findings about knee pain related disability and health seeking behaviour of participants with knee pain are presented.

5.1.1 Variation in altitudes of study area

Participants in three ecological zones were surveyed: plain zone, hilly zone and mountainous zone. The altitude was measured in each of the sites surveyed in each of these ecological zones using an altitude meter (Figure 5.1). The altitude of the study areas varied between 110 metres above sea level in the plain zone to 3710 metres in the mountainous zone. There was a minimal difference in the altitude between study sites in each zone. There was only a one metre difference in the altitude between study sites in the plain zone, 61 metres difference between the study sites in the hilly zone and 191 metres in the two villages, which made up the study site of the mountainous zone.

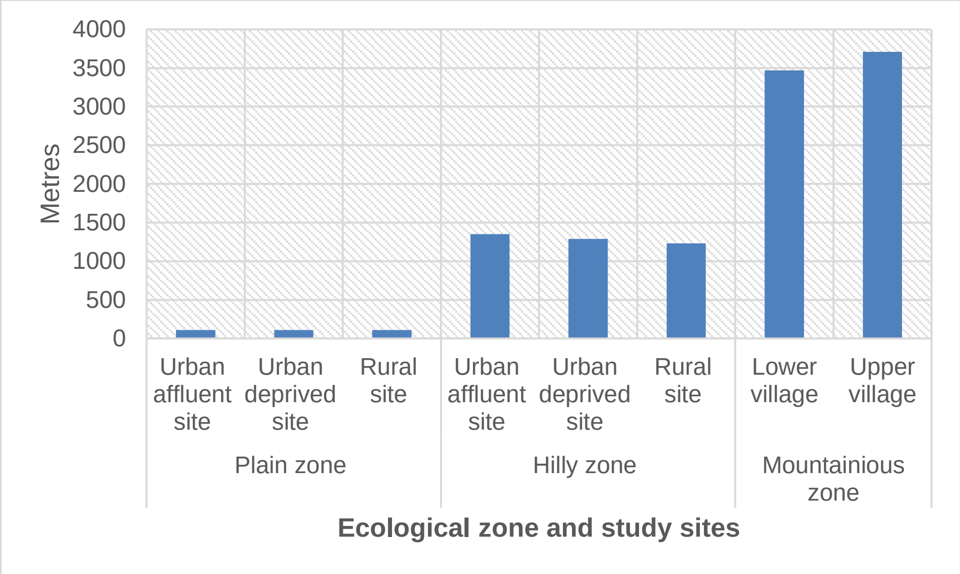

Figure 5. 1 Altitude in meters of the ecological zones and study sites

5.1.2 Population data for ecological zones and study sites

Most of the population figures used in the following analyses are derived from the Central Bureau of Statistics, 20112011 of Nepal (Central Bureau of Statistics, 2011). In addition, some population data were also gathered from local government offices. All the information was in single year age bands and was aggregated by the research student into appropriate age bands for analysis. In addition, data had to be aggregated from lower levels (Tole and village) to provide population data for urban and rural areas. Data were not available in sufficient detail to be able to aggregate data at an appropriate level to identify affluent and deprived population data in urban study sites. The population data is available in Appendix 26.

5.2 Survey response

5.2.1 Surveyed households in each study site

Of the total number of 3954 households in the identified sites of the three ecological zones, 211 (5.3%) households were visited for data collection. Table 5.3 shows the distribution of surveyed households by ecological zones and study sites. They were distributed as follows: 86 (2.7%) of the households in the plain zone were surveyed, 96 (13.5%) of hilly zone households and 29 (42.1%) of mountainous zone households (Table 5.1).

Table 5. 1 Distribution of surveyed household by ecological zones and study sites

	Households in selected sites (n)	Surveyed households n (%)
All sites	**3954**	**211 (5.3)**
Plain zone	**3174**	**86 (2.7)**
Plain zone urban affluent site	1736	29 (1.7)
Plain zone urban deprived site	1375	33 (2.4)
Plain zone rural site	63	24 (38.1)
Hilly zone	**711**	**96 (13.5)**
Hilly zone urban affluent site	342	27 (7.8)
Hilly zone urban deprived site	265	35 (12.2)
Hilly zone rural site	104	34 (32.7)
Mountainous zone	**69**	**29 (42.1)**
Mountainous zone rural site	69	29 (42.1)

5.2.2 Surveyed participants in each of the study sites

This survey was conducted in the seven sites of three ecological zones of the Western Development Region of Nepal as previously described in chapter 4. A total of 700 adults were asked to complete the survey (Table 5.2). A total number of 694 eligible participants completed the survey questionnaire.

No-one refused to complete the questionnaire, but six participants asked were subsequently found be ineligible because they had not resided in those areas for more than six months, which was one of the eligibility criteria (Appendix 5.2 thesis protocol). Of those who were eligible, 300 (43.2%) participants resided in the hilly zone, 296 (42.6%) in the plain zone and 98 (14.1%) in the mountainous zone. As intended, the number of participants recruited by study sites was similar and ranged between 98 to 100 adults (Table 5.2). The number of participants was higher in urban areas compared with rural areas (497 (57.2%) versus 297 (42.8%)).

Table 5. 2 Distribution of participant by study sites and ecological zones

Study areas	Sample size (n)	Participant number (n)	Response rate (%)
Plain zone	**300**	**296**	**98.6**
Plain zone urban affluent site	100	99	99.0
Plain zone urban deprived site	100	98	98.0
Plain zone rural site	100	99	99.0
Hilly zone	**300**	**300**	**100.0**
Hilly zone urban affluent site	100	100	100.0
Hilly zone urban deprived site	100	100	100.0
Hilly zone rural site	100	100	100.0
Mountainous zone	**100**	**98**	**98.0**
Mountainous zone rural site	100	98	98.0
Urban and rural areas			
Urban areas	400	397	99.5
Rural areas	300	297	99.0
Urban affluent and deprived areas			
Urban affluent areas	200	199	99.5
Urban deprived areas	200	198	99.0
Overall response	700	694	99.1

Of the population aged 18 years old and above in each of the ecological zones, 0.018% of the population from the plain zone were recruited, 0.025% from the hilly zone and 0.675% from the mountainous zone (Table 5.3).

Table 5. 3 Comparison of population aged 18 years old and above in ecological zones and number of people recruited

Study zones	Population size (n)	Participants (n)	Percentage of population (%)
Plain zone	1677271	296	0.018%
Hilly zone	1212580	300	0.025%
Mountain zone	14515	98	0.675%

5.2.3 Adult population by age and gender

The population of Nepal is 26,494,504 people of whom 4,926,765 (18.6%) live in the Western Development Region (Central Bureau of Statistics, 2011) (Table 5.4 and appendix 26). In the Western Development Region, the number of people aged 18 years and over (adult population) is 2,898,366 (58.8%) of whom 1,627,554 (56.2%) are female and 1,270,812 (43.8%) are male. In the survey, of the total number of 694 participants, 365 (52.6%) were female and 329 (47.4%) male. By age group, the highest number were in the age group of 18 – 34 years (n = 297, 42.8%) and the lowest number in the age group of 65 + years (n = 65, 9.5%). There was a smaller proportion of survey participants aged 18 to 34 years of age compared to the Western Development Region but a higher proportion of those 35 to 44 years of age.

Table 5. 4 Adult population and survey population of the Western Development Region by age group and gender

Age group	Western Development Region			Survey		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
18 - 34 Yrs.	541844 (42.6)	771562 (47.4)	1,313,406(45.3)	141 (42.8)	156 (42.7)	297 (42.8)
35 - 44 Yrs.	221776 (17.5)	303861 (18.7)	525637 (18.2)	65 (19.8)	89 (24.4)	154 (22.2)
45 - 54 Yrs.	194397 (15.3)	225132 (13.8)	419529 (14.5)	54 (16.4)	46 (12.6)	100 (14.4)
55 - 64 Yrs.	155483 (12.2)	169597 (10.4)	325080 (11.2)	39 (11.8)	39 (10.7)	78 (11.2)
65 + Yrs.	157312 (12.4)	157402 (9.7)	314714 (10.8)	30 (9.1)	35 (9.6)	65 (9.4)
Total	1,270,812 (43.8)	1627554 (56.2)	2,898,366 (100.0)	329 (47.4)	365 (52.6)	694 (100.0)

Source: Central Bureau of Statistics, 2011

5.3 Demographic characteristics of the participants

The previous section described the age and gender distribution of the participants. This section presents other demographic characteristics (marital status, employment status, occupation (agriculture related or not) and educational level) and further information on the distribution of age and gender by ecological zone and/or residency. Full results are given in table 5.5.

5.3.1 Gender

Of the 694 participants, there were more women than men (365 (52.6%) vs. 329 (47.4%)) but the distribution of gender by ecological zone and urban and rural residency were similar.

5.3.2 Age

The mean age of the participants was 41 years (SD 16.2). Participants were divided into five age groups to facilitate further analysis (18 - 34, 35 – 45, 45 – 54, 55 – 64 and over 65). The distribution of participants by age group has been already discussed in section 5.2.3. There were more participants in the age group of 18 – 34 years in the plain zone compared to the hilly zone and more in the hilly zone compared to the mountainous zone (48.0% vs. 40.7% vs. 33.3%). The proportion of participants over 55 years of age was greater in the hilly zone compared to the mountainous and the plain zones (24.4% vs. 18.3% vs. 17.5%).

5.3.3 Marital status

One fifth of the participants (20.9%) had never married. Three quarters of the (75.6%), participants were married. A small fraction (3.4%) were widows/widowers. More adults in the mountainous zone (28.6%) had never married compared to the two other zones. The reason for the high rate of unmarried adults in the mountainous zone is likely to be the presence of nuns in that area; 14 participants in the mountainous zone were nuns at a Buddhist monastery.

5.3.4 Employment status

Overall 80.3% of participants were employed, 16.5% participants were unemployed and 3.1% participants were unable to perform any work due to old age. Of those employed participants, 81.5% either were self-employed in their own business or in agriculture related work. The proportion of self-employed participants was greater in the plain zone compared to the hilly zone and the mountainous zone (74.0% vs. 57.3% vs. 64.3%). The proportion of the unemployed participants was greater in the mountainous zone compared to the hilly zone and the plain zone (28.6% vs. 16.7% vs. 12.5%).

5.3.5 Occupation

Agriculture related work (farming, fishery, livestock and poultry) employed 43.6% of participants. The proportion of participants working in agriculture was higher in rural areas compared to urban area (60.3% vs. 31.0%).

Table 5. 5 Demographic characteristics of the participants in the survey

Variables	Ecological zone			Urban vs. rural		Total
	Plain zone n (%)	Hilly zone n (%)	Mountainous zone n (%)	Urban n (%)	Rural n (%)	n (%)
Gender						
Male	142 (48.0)	141 (47.0)	46 (46.9)	187 (47.1)	142 (47.8)	329 (47.4)
Female	154 (52.0)	159 (53.0)	52 (53.1)	210 (52.9)	155 (52.2)	365 (52.6)
Age group						
18 - 34 Yrs.	142 (48.0)	122 (40.7)	33 (33.3)	172 (43.3)	125 (42.1)	297 (42.7)
35 - 44 Yrs.	59 (19.9)	62 (20.7)	33 (33.3)	83 (20.9)	71 (23.9)	154 (22.3)
45 - 54 Yrs.	43 (14.5)	43 (14.3)	14 (14.3)	61 (15.4)	39 (13.1)	100 (14.4)
55 - 64 Yrs.	27 (9.1)	39 (13.0)	12 (12.2)	46 (11.6)	32 (10.8)	78 (11.2)
65 + Yrs.	25 (8.4)	34 (11.4)	6 (6.1)	35 (8.8)	30 (10.1)	65 (9.4)
Marital status						
Never married	59 (19.9)	57 (19.0)	28 (28.6)	80 (20.2)	64 (21.5)	144 (20.7)
Married	227 (76.4)	234 (78.0)	65 (66.3)	306 (77.1)	220 (74.1)	526 (75.8)
Widow / widower	10 (3.5)	9 (3.0)	5 (5.1)	11 (2.8)	13 (4.4)	24 (3.5)
Occupation						
Not agriculture*	157 (53.0)	183 (61.0)	52 (53.1)	274 (69.0)	118 (39.7)	392 (56.5)
Agriculture	139 (46.7)	117 (39.0)	46 (46.9)	123 (31.0)	179 (60.3)	302 (43.5)

*Note; * includes unemployed and unable to work*

Cont. Table 5.5

Study areas	Ecological zone			Urban vs. rural sites		Total n (%)
	Plain zone n (%)	Hilly zone n (%)	Mountainous zone n (%)	Urban n (%)	Rural n (%)	
Employment status						
Employed elsewhere	34 (11.5)	65 (21.7)	4 (4.1)	69 (17.4)	34 (11.4)	103 (14.8)
Self employed	219 (74.0)	172 (57.3)	63 (64.3)	252 (63.5)	202 (68.0)	454(65.4)
Unemployed	37 (12.5)	50 (16.7)	28 (28.6)	63 (15.9)	52 (17.5)	115 (16.6)
Unable to work	6 (2.0)	13 (4.3)	3 (3.1)	13 (3.3)	9 (3.0)	22 (3.2)
Academic achievement						
Not been school	40 (13.5)	17 (5.7)	35 (35.7)	36 (9.1)	56 (18.8)	92 (13.3)
1 - 5 yr. school	107 (36.1)	80 (26.7)	41 (41.8)	98 (24.7)	130(43.8)	228 (32.9)
6 - 10 yr. school	118 (39.9)	130 (43.3)	18 (18.4)	180(45.3)	86 (29.6)	266 (38.3)
> 10 yr. school	31 (10.5)	73 (24.3)	4 (4.1)	83 (20.9)	25 (8.4)	108 (15.5)

*Note; * includes unemployed and unable to work*

5.3.6 Academic attainment

Overall, ninety-two (13.3%) participants had never attended any type of schooling. This was highest in the mountainous zone (35.7%) compared with other ecological zones. Only 108 (15.6%) participants had attended more than ten years schooling of which 4 (4.1%) participants were from the mountainous zone (Table 5.5).

5.4 Period prevalence of knee pain

The number of participants with knee pain in the previous twelve months was estimated by asking the question: 'During the last 12 months, have you had any pain in or around either of your knee joints on most days for at least one month?' (Q. No. 13 on survey questionnaire appendix 11). The period prevalence of knee pain was then estimated by dividing the number of participants who said they had knee pain by the total number of participants, expressed as a percentage.

5.4.1 Investigating clustering effect in the survey

The data for this measure was first analysed to investigate whether there were any clustering effects, which would need to be accounted for when estimating confidence intervals and tests of hypotheses. The result of this analysis is given in Appendix 27.

In this analysis, the inflation factor was less than one in all selected study sites, which suggests there is no clustering effect from collecting data from all adults in the household rather than randomly selecting adults. As there is no evidence of clustering (by household) for the estimates of period prevalence of knee pain, confidence intervals and other statistical tests have not been adjusted for clustering.

5.4.2 Survey prevalence rate

Of the 694 participants, 155 (22.3%, 95% CI 19.2% - 25.5%) had knee pain. Table 5.6 shows the survey period prevalence rate of knee pain in the different groups. The prevalence of knee pain was significantly different between the age groups ($p < 0.001$). Across ecological zones, knee pain prevalence was lowest in participants from the plain zone (n = 52, 17.3%) and highest in participants from the mountainous zone (n = 31, 31.6%). The difference between the three ecological zones was statistically significant ($p< 0.001$). The period prevalence of knee pain was statistically significantly higher in those who were engaged in agricultural occupations (n = 87, 28.8%) compared to non-agricultural occupations (n = 68, 17.3%) ($p< 0.001$).

The survey period prevalence of knee pain was similar in male and female participants (21.6% vs. 23.1% respectively, $p = 0.65$). Knee pain prevalence was similar in urban and in rural areas (21.4% vs. 23.6%, $p = 0.49$), and in urban areas between affluent and deprived sites (22.7% vs. 20.1%, $p = 0.67$).

Table 5. 6 Period prevalence of knee pain

Variables	n (%)	Chi Square Test Statistics
Overall	155 (22.3)	
Gender		0.21, df 1, p = 0.65
Male	71 (21.6)	
Female	84 (23.1)	
Age groups		**114.1, df 4, p < 0.001**
18 – 34 Yrs.	28 (9.4)	
35 – 44 Yrs.	25 (16.2)	
45 – 54 Yrs.	26 (26.0)	
55 – 64 Yrs.	37 (47.4)	
65+ Yrs.	39 (60.0)	
Ecological zones		**9.2, df 2, p < 0.001**
Plain zone	52 (17.3)	
Hilly zone	72 (24.0)	
Mountainious zone	31 (31.6)	
Residency		**0.46, df 1 p = 0.49**
Urban areas	85 (21.4)	
Rural areas	70 (23.6)	
Urban affluent vs. deprived		0.78, df 1, p = 0. 67
Urban affluent	45 (22.7)	
Urban deprived	40 (20.1)	
Occupation		**12.9, df 1, p < 0.001**
Non agriculture	68 (17.3)	
Agriculture	87 (28.8)	

Note: Statistically significant values are highlighted in bold

5.4.3 Adjusted prevalence rates

The study used a multistage, cluster design (see section 4.2). Analysis showed that clustering did not need to be taken into account in estimating confidence intervals for the prevalence of knee pain. However, it is usual to account for the stratification in the multistage design when estimating the prevalence and confidence intervals. This was undertaken using the method described in the statistical methods section (4.5). For each zone, the reciprocal of the proportion of selected areas of all areas at each level of the hierarchy was estimated, for example the number of villages within all the villages in that zone. These were then multiplied all together with the sampling fraction, that is, the number of participants divided by the population to obtain a proportional weight, which is then applied to the survey rate in that zone and the rates for each zone summed. After this was done, an overall rate of 17.8% for the prevalence was estimated, which is much lower than the prevalence observed in the survey. This appeared to be because of the overweighting of the plain zone urban site, which had the lowest rates, and, compared to other sites, the households were under sampled, as there were more households per head of population (Table 5.3). This was not known at the time of developing the survey. This would have led to a non-representative sample and, given this concern, further adjustment for the stratification introduced by the multistage aspect of the study design has not been further considered in analyses.

5.4.4 Weighted rates

The reason for undertaking this survey was to obtain findings, which can be generalised, to the Western Development Region. In the survey sample there was a higher proportion of females compared to the proportion of males in the Western Development Region and there was a smaller proportion of survey participants aged 18 to 34 years of age compared to the Western Development Region but a higher proportion of 35 to 44 years of age (see table 5.4).

Gender differences are unlikely to affect the generalisation of the survey findings to the regional population because the difference between male and female was small. However, the difference between age groups was larger. In addition, there was a higher proportion of the sample from the mountainous zone compared to the proportion in the region (Table 5.2). Therefore, in order to provide an estimate for the prevalence of knee pain in the Western Development Region, a weighted prevalence and 95% CI was estimated (Table 5.7). The method for weighting is described in the statistical methods (Chapter 4). The rate was weighted to account for differences between the survey sample and the population in the distribution of gender, age group and ecological zone. The weighted rate was 21.5% (95% CI 18.3% - 23.9%) and was similar to the survey rate (Table 5.7).

Weighted prevalence of knee pain were also estimated for each ecological zone; these rates were weighted for gender and age within each ecological zone. When weighting was undertaken for each ecological zone, there were differences between the survey and weighted prevalence rates for the plain and hilly zones (Table 5.7); the weighted rates were lower than the survey rate. Hence, when weighted prevalence rates were estimated for urban and rural areas, the difference between the weighted prevalence of knee pain between urban and rural areas was larger than the difference between the urban and rural survey rates.

Table 5. 7 Prevalence of knee pain: survey rate, weighted rate and age-sex adjusted rate

Study areas	Survey rate % (95% CI)	Weighted rate % (95% CI)	Age-sex standardised rate* % (95 % CI)
WDR	22.3 (19.2 - 25.5)	21.5 (18.3 - 23.9)	
Ecological zone			
Plain zone	17.6 (13.2 - 21.9)	15.0 (11.6– 18.6)	19.5 (16.6 - 23.1)
Hilly zone	24.0 (19.2 - 28.8)	18.8 (14.9 – 22.8)	22.9 (18.4 - 27.3)
Mountainous zone	31.6 (22.8 - 40.8)	32.8 (27.8 – 38.1)	32.1 (27.4 - 36.9)
Residency			
Urban areas	21.4 (17.4 - 25.4)	18.3 (14.9 – 22.1)	22.3 (16.4 – 28.4)
Rural areas	23.6 (18.7 - 28.4)	27.2 (22.5 – 32.1)	24.1 (19.4 - 29.1)

** Using the Western Development Regional (WDR) population as the reference population;*

CI= Confidence interval

5.4.5 Age standardised rates

In both comparisons of survey and weighted rates, the prevalence of knee pain is higher in the mountainous zone compared to the hilly zone and in the hilly zone compared to the plain zone. Nevertheless, the age distribution is different in the three zones (Table 5.4) and age is related to the prevalence of knee pain. Therefore, to be able to compare the zonal rates, age-sex standardised rates were estimated using the Western Development Region as the reference population. The mountainous zone still had the highest rate and the plain zone the lowest. The mountainous zone prevalence was higher than in the hilly and plain zone. The prevalence of knee pain is highest in the mountainous zone in both males and females. The sex specific, age-standardised prevalence of knee pain is higher in females than males in the mountainous zone but similar in the two other zones (Table 5.8).

Table 5. 8 Comparison of survey, weighted and age standardised rate by gender

Ecological zone	Survey rate (%)		Weighted rate (%)		Age standardised rate (%)	
	Male	Female	Male	Female	Male	Female
Plain zone	16.9	18.1	17.2	18.7	18.5	17.4
Hilly zone	23.4	24.5	22.3	23.8	24.2	23.5
Mountainous zone	30.4	32.6	27.4	31.6	28.4	37.3

Note: Weighted and standardised to the Western Development Regional population

5.4.6 Prevalence of knee pain between agriculture related occupation and non-agriculture related occupation: ecological zones and residency

A comparison of the prevalence of knee pain by occupation between ecological zones showed that knee pain prevalence was higher in all zones for those in agricultural occupations but the difference was only significant for the hilly zone (36.8% vs. 15.8%, Chi squared 17.1, df1, p <0.001) (Table 5.9). The prevalence of knee pain between the urban and the rural area shows a statistically significantly higher rate in the urban areas in those working in agriculture- related occupations compared to those not (32.4% vs. 16.4%, Chi squared 13.07, df1, p <0.001) but differences were not statistically significant in the rural areas (26.3% vs. 19.5%, Chi squared 1.81, df1, p =0.18) (Table 5.10).

Table 5. 9 Survey period prevalence of knee pain between those working in agriculture or not in ecological zones and urban and rural areas

Study areas	Agricultural occupation n (%)	Non - agricultural occupation n (%)	Total n (%)
Ecological zone			
Plain zone	26 (18.7)	26 (16.6)	52 (17.6)
Hilly zone	43 (36.8)	29 (15.8)	72 (24.0)
Mountainous zone	18 (39.1)	13 (25.0)	31 (31.6)
Residency			
Urban areas	40 (32.4)	45 (16.4)	85 (21.4)
Rural areas	47 (26.3)	23 (19.5)	70 (23.6)

5.4.7 Association between prevalence of knee pain and some demographic variables

Univariate and multivariate analysis was performed using logistic regression to assess which factors were associated with knee pain. In this logistic regression analysis, male gender, age group of 18 – 34 years, plain zone, urban area and non-agricultural occupation were used as the reference categories for the respective variables, as these had the lowest rates within the respective variables.

The univariate analysis confirmed the findings of table 5.10. Age group, ecological zone and agricultural occupations were each significantly associated with an increased risk of knee pain ($p<0.001$) but urban vs. rural residency and gender were not. Significantly higher odds ratios were observed for older age groups, mountainous zone compared to plain zone and agriculture occupation. When comparing knee pain in different age groups using 18 – 34 years as reference, the age group over 65 years had 14.41 times the odds of knee pain (95% CI 7.67 - 27.08). Participants residing in the mountainous zone had an odds ratio of 2.8 for knee pain using the plain zone as reference (95% CI, 1.29 – 3.65, $p <0.001$). Compared to the plain zone, hilly zone residents had a higher odds of knee pain but the lower confidence limit was just less than one (OR 1.48, 95% CI 0.99 - 2.21).

Gender and residency were kept in the multivariate analysis because gender had been linked to knee pain in the studies in the systematic review and because weighted rates suggested that the influence of rurality might be underestimated by survey rates because of the survey age-sex distribution. In the multivariate analysis, independent risk factors for knee pain were age, ecological zone and type of occupation. The comparison of prevalence of knee pain by age group also shows an odds ratio of 13.8 in the 65+ age groups using those aged 18 – 34 years as reference. The effect of age group on knee pain was highly statistically significant ($p < 0.001$). Participants working in agriculture had an odds ratio for knee pain of 1.7, which was slightly lower than in the univariate analysis although still significant ($p = 0.02$), suggesting some of the relationship could be explained by other factors. In the multivariate analysis, the odds of knee pain in those living in the mountainous zone was 3.0 times that of the odds of knee pain in those living in the plain zone (Table 5.10).

The possibility of an interaction between ecological zone and residency (urban or rural) was investigated but this interaction was not statistically significant ($p = 0.4$) and did not change the interpretation of the multivariate analysis so has not been included in the regression model (Appendix 28).

Table 5. 10 Association between knee pain and demographic variables: univariate and multivariate logistic regression

Variables	Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value
Gender		0.67		0.36
Male	1		1	
Female	1.1 (0.8 - 1.6)		1.1 (0.8 - 1.7)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	1.9 (1.0 - 3.3)		1.5 (0.9 - 2.8)	
45 - 54 Yrs.	3.4 (1.9 - 6.1)		2.8 (1.5 - 5.2)	
55 - 64 Yrs.	8.7 (4.8 - 15.7)		7.4 (4.0 – 13.6)	
65 + Yrs.	14.4 (7.7 - 7.1)		13.8 (7.2 - 26.2)	
Ecological zone		**<0.001**		**<0.001**
Plain zone	1		1	
Hilly zone	1.5 (1.0 - 2.2)		1.3 (0.8 - 2.1)	
Mountainous zone	2.8 (1.3 - 3.7)		3.0 (1.6 - 5.9)	
Residency		0.49		0.57
Urban areas	1		1	
Rural areas	1.1 (0.8 – 2.8)		1.3 (0.5 – 3.1)	
Occupation		**<0.001**		**0.02**
Non agriculture	1		1	
Agriculture	1.9 (1.3 - 2.8)		1.7 (1.1 - 2.6)	

Note: Statistically significant values are highlighted in bold. CI = *Confidence interval*

In the multivariate analysis, gender, age groups, ecological zone, residency and occupation were included. Male gender, 18 – 34 years, plain zone, urban residence, non-agricultural occupation were reference categories.

5.5 Prevalence of chronic knee pain

The number of participants with chronic knee pain was estimated by asking participants who had knee pain in the last 12 months, ‘If so, have you had the knee pain for three months or more?’ (Q No. 14 on survey appendix 11). Those who said yes were categorised as having chronic knee pain. The prevalence of chronic knee pain was the number of participants with chronic knee pain divided by the number of participants in the survey, expressed as a percentage.

5.5.1 Investigating clustering effects

The data for this measure was first analysed to investigate whether there were any clustering effects, which would need to be accounted for when estimating confidence intervals and tests of hypotheses. The result of this analysis is given in the table 5.12. In this analysis, the inflation factor was more than one in only two sites (Appendix 27).

As the number of sites with an inflation factor >1 was limited, the sites with an inflation factor >1 were quite different in terms of ecological zone and residency and the inflation factor estimates were close to one, it suggests in general, there is no substantial clustering (by households) for the estimates of prevalence of chronic knee pain, and so all statistical inference tests (that is confidence interval and statistical tests) do not need to be adjusted for clustering.

5.5.2 Overall survey rates

Of the 694 participants, chronic knee pain was found in 84 participants. The survey period prevalence of chronic knee pain was 12.1% (95% CI 9.5% - 14.7%); this was a little over half that of general knee pain (that is knee pain for at least a month present in the last 12 months). Similar trends were observed in geographical and socio-demographic groups as seen for general knee pain, with higher rates with increasing age, agricultural occupation and mountainous ecological zone (Table 5.11). However there was a significantly increased rate in rural participants compared to urban participants which was not observed with general knee pain ($p < 0.001$) (Table 5.11).

Table 5. 11 Survey prevalence rate of chronic knee pain

Variables	Survey rate n (%)	Chi Square Test Statistic
Overall	84 (12.1)	
Gender		0.79, df1, p = 0.37
Male	36 (10.9)	
Female	48 (13.2)	
Age group		**142.18, df 4, p < 0.001**
18 – 34 Yrs.	12 (3.5)	
35 – 44 Yrs.	9 (7.7)	
45 – 54 Yrs.	9 (7.4)	
55 – 64 Yrs.	19 (23.1)	
65+ Yrs.	35 (43.3)	
Ecological zone		**29.7, df 2, p < 0.001**
Plain zone	18 (6.1)	
Hilly zone	40 (13.3)	
Mountainous zone	26 (26.5)	
Residency		**10.9, df 1, p < 0.001**
Urban areas	34 (8.6)	
Rural areas	50 (16.8)	
Urban affluent and deprived area		**0.79, df 1, p = 0.04**
Urban affluent	18 (9.1)	
Urban deprived	16 (8.1)	
Occupation		**8.5, df 1, p < 0.001**
Non agriculture	35 (8.9)	
Agriculture	49 (16.2)	

Note: Statistically significant values in variables are highlighted in bold.

5.5.3 Weighted and standardised rates

The weighted rate for the Western Development Region was 10.9% (95% CI 7.3% to 12.4%); similar to the overall survey rate of 12.1% for chronic knee pain as were the weighted ecological zone rates compared to the ecological zone survey rates (Table 5.12). The age-sex standardised rates suggest that the mountainous zone (26.9%, 95% CI 23.7% to 30.3%) has a greater problem with chronic knee pain than the plain zone (7.2%, 95% CI 4.6% to 9.9 %). In the plain zone, the age sex standardised rate for chronic knee pain is 41% of that for general knee pain whereas in the mountainous zone it is 85% (more than double that for the plain zone) (see Tables 5.7 and 5.12).

Table 5. 12 Prevalence of chronic knee pain: survey rate (weighted rate, age sex standardised rate

Study areas	Survey rate % (95% CI)	Weighted rate % (95% CI)	Age-sex standardised rate* % (95 % CI)
WDR	12.1 (9.7 - 14.5)	10.9 (7.3 - 14.4)	
Ecological zone			
Plain zone	6.1 (3.4 - 8.8)	5.2 (3.1 – 7.3)	7.2 (4.6 – 9.9)
Hilly zone	13.3 (9.7 - 17.4)	10.4 (7.5 – 13.4)	12.4 (9.5 – 15.3)
Mountainous zone	26.5 (19.8 - 33.3)	24.2 (18.3 – 30.1)	26.9 (23.7 – 30.3)
Residency			
Urban areas	8.6 (5.8 - 11.3)	9.2 (6.7– 11.7)	8.6 (5.8 – 11.5)
Rural areas	16.8 (12.6 - 21.2)	11.7 (7.4 – 15.9)	16.8 (14.4 – 19.2)

**Standardised to regional population WDR (Western Development Region)*

5.5.4 Association between chronic knee pain and demographic variables

Univariate and multivariate analysis was performed using logistic regression to assess which factors were associated with chronic knee pain. The univariate analysis indicated that age, ecological zone, agriculture related occupation and residency were significantly associated with an increase in chronic knee pain but gender was not *(*Table 5.13)*.*

In the multivariate analysis, independent risk factors for chronic knee pain were age and ecological zone. Residency and occupation were not independent risk factors in the multivariate analysis. The comparison of the prevalence of chronic knee pain by age group shows the odds was 33.3 times higher in those aged 65 + years than the odds of those aged 18 – 34 years. The change in the odds of chronic knee pain in respect to age was statistically significant ($p < 0.001$). So, with the age group 18 – 34 years as reference, the odds ratio for chronic knee pain for the age group of 65 + was nearly 2.5 times higher than the general knee pain odds ratio (Tables 5.10 and 5.13). Participants living in the mountainous zone had odds of chronic knee pain, which were 8.8 times greater than the odds of chronic knee pain in the plain zone (Table 5.13). So, with the plain zone as reference, the odds ratio for chronic knee pain for the mountainous zone was nearly three times that for general knee pain (Tables 5.10 and 5.13).

Table 5. 13 Association between chronic knee pain and demographic variables: univariate and multivariate logistic regression

Variables	Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value
Gender		0.37		0.19
Male	1		1	
Female	1.2 (0.8 – 1.9)		1.4 (0.8 - 2.2)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	1.4 (0.6 - 3.6)		1.0 (0.4 – 2.6)	
45 - 54 Yrs.	2.4 (1.0 - 5.8)		1.9 (0.7 - 5.1)	
55 - 64 Yrs.	7.7 (3.5- 16.6)		6.8 (2.9 – 15.9)	
65 + Yrs.	27.7 (13.0 - 59.0)		33.3 (14.7 – 75.4)	
Ecological zone		**<0.001**		**<0.001**
Plain zone	1		1	
Hilly zone	2.4 (1.3 – 4.2)		2.4 (1.2 – 4.7)	
Mountainous zone	5.5 (2.9 – 10.7)		8.8 (3.6 – 21.2)	
Residency		**<0.001**		0.48
Urban areas	1		1	
Rural areas	2.2 (1.4 – 3.4)		1.7 (0.6 – 2.5)	
Occupation		**<0.001**		0.17
Non agriculture	1		1	
Agriculture	1.5 (1.2 - 3.1)		1.5 (0.8 – 2.7)	

Note: Statistically significant values are highlighted in bold. CI = *Confidence interval*

In the multivariate analysis gender, age groups, ecological zone, residency and occupation were included. Male gender, 18 – 34 years, plain zone, urban residence, non-agricultural occupation were reference categories.

5.6 Point prevalence of knee pain

The number of participants with knee pain at the time of survey was estimated by asking participants who had knee pain in the last 12 months, ‘Do you have any knee pain at the moment?’ (Q No. 15 on survey appendix 11). The point prevalence of knee pain was the number of participants who said yes to that question divided by the number of participants in the survey, expressed as a percentage.

5.6.1 Investigating clustering effects

The data for this measure was first analysed to investigate whether there were any clustering effects. The result of this analysis is given in (Appendix 27). In this analysis the inflation factor was more than one in only one site. This suggests there is no substantial clustering (by households) for the estimates of point prevalence of knee pain, and that, any statistical test of inference does not need to be adjusted for clustering.

5.6.2 Findings

The survey point prevalence rate was 7.6% (n=53, 95% confidence interval 5.7% - 9.6 %). Point prevalence significantly changed with age ($p < 0.001$), and was significantly different across ecological zones ($p < 0.001$) and residency ($p = 0.01$) (Table 5.14).

Table 5. 14 Survey point prevalence rate for knee pain

Variables	Survey rate n (%)	Chi Square Test Statistic
Overall	53 (7.6)	
Gender		2.2, df 1, p = 0.14
Male	20 (6.1)	
Female	33 (9.1)	
Age groups		**165.4, df 4, p < 0.001**
18 – 34 Yrs.	4 (1.3)	
35 – 44 Yrs.	4 (2.6)	
45 – 54 Yrs.	4 (4.0)	
55 – 64 Yrs.	11 (14.1)	
Ecological zones		**18.5, df 2, p < 0.001**
Plain zone	12(4.1)	
Hilly zone	24 (8.0)	
Mountainous zone	17 (17.3)	
Residency		**7.2, df 1, p = 0.01**
Urban areas	21 (5.2)	
Rural areas	32 (10.8)	
Urban affluent and deprived area		0.45, df 1, P = 0.83
Urban affluent	11 (5.5)	
Urban deprived	10 (5.1)	
Occupation		4.0, df 1, p = 0.04
Non agriculture	23 (5.9)	
Agriculture	30 (9.9)	

Note: Statistically significant values are highlighted in bold.

The weighted rate was 5.8% (95% CI, 3.9% - 7.7%) (Table 5. 15). Age-sex standardised rates confirmed that point prevalence rates were higher in the mountainous zone than in the plain zone and hilly zone. In the plain zone, the age-sex standardised rate for point prevalence of knee pain is 25% of that for general knee pain whereas in the mountainous zone it is 55% (again more than double that for the plain zone) - see sub-section (5.5.3). Table 5.15 also shows that urban-rural differences are reversed in weighted and age-standardised analyses.

Table 5. 15 Survey rates, weighted rate and age-sex standardised rate for point prevalence rate for knee pain

Study areas	Survey rate (%) (95% CI)	Weighted rate % (95% CI)	Age-sex standardised rate % (95 % CI)
WDR	7.6 (5.7 - 9.6)	5.8 (3.9 - 7.7)	
Eco. zone			
Plain zone	4.1 (1.8 - 6.3)	3.3 (2.4 – 4.3)	4.9 (3.6 – 6.3)
Hilly zone	8.0 (4.9 - 11.1)	6.2 (3.8 – 8.6)	7.6 (5.6 – 9.7)
Mt. zone	17.3 (10.9 -3.8)	14.3 (10.118.3)	17.9 (14.9 – 20.8)
Residency			
Urban areas	5.3 (3.1–7.5)	5.3 (3.4 – 7.3)	6.1 (3.6 – 8.5)
Rural areas	10.8 (7.2- 14.3)	8.2 (5.3 – 11.2	4.4 (3.2 – 5.7)

Note: Eco. Zone = Ecological zone, Mt. zone = Mountainous zone, WDR = Western Development Region.

5.6.3 Association between point prevalence of knee pain and demographic variables

Univariate and multivariate analysis was performed using logistic regression to assess which factors were associated with point prevalence of knee pain (Table 5.16). The univariate analysis suggested that age, ecological zone, agriculture related occupation and residency were significantly associated with an increase in odds of knee pain at the time of the survey but gender was not (Table 5.16).

Table 5. 16 Association between point prevalence of knee pain and demographic variables: univariate and multivariate logistic regression

Variables	Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value
Gender		0.14		0.67
Male	1		1	
Female	1.5 (0.9 - 2.7)		1.9 (0.9 – 3.4)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	1.9 (0.5 - 7.9)		1.3 (0.3 - 5.5)	
45 - 54 Yrs.	3.1 (0.8 - 12.4)		2.8 (0.6 - 12.2)	
55 - 64 Yrs.	12.0 (3.7 - 38.9)		11.9 (3.4 – 41.6)	
65 + Yrs.	62.8 (20.9 - 188.7)		91.5 (27.5– 304.6)	
Ecological zone		**<0.001**		**<0.001**
Plain zone	1		1	
Hilly zone	2.1 (1.0 - 4.2)		2.0 (0.9 – 4.5)	
Mountainous zone	5.0 (2.3 - 10.8)		10.4 (3.4 – 31.9)	
Residency		**<0.001**		0.56
Urban areas	1		1	
Rural areas	2.2 (1.2 – 3.8)		1.3 (0.5 – 3.1)	
Occupation		**0.04**		0.67
Non agriculture	1		1	
Agriculture	1.8 (1.1 - 3.1)		1.2 (0.6 – 2.5)	

Note: Statistically significant values are highlighted in bold. CI = *Confidence interval*

In this multivariate analysis gender, age groups, ecological zone, residency and occupation were included. Male gender, 18 – 34 years, plain zone, urban residence, non-agricultural occupation were reference categories.

In the multivariate analysis, independent risk factors for point prevalence of knee pain were age and ecological zone (Table 5.16). The comparison of the point prevalence of knee pain by age group shows the odds were 91.5 times greater in those aged 65 + than the odds of those aged 18 – 34 years. So, with the age group 18 – 34 years as reference, the odds ratio for point prevalence of knee pain for the age group of 65 + was over 6.5 times higher than the general knee pain odds ratio (Table 5.10 and 5.16). Participants living in the mountainous zone had odds of point prevalence of knee pain that were over 10 times greater than the odds of general knee pain in the plain zone (Table 5.16). Therefore, with the plain zone as reference, the odds ratio for point prevalence of knee pain for the mountainous zone was nearly 3.5 times that for general knee pain (Table 5.10 and 5.16).

Chapter 6: Results- Knee pain related disabilities and health seeking behaviour

In the previous section, results of the survey on knee pain prevalence were presented. This chapter contains the findings on knee pain related disabilities and the health seeking behaviour of the participants with knee pain.

6.1. Knee pain related disabilities

6. 1.1 Prevalence of disability

During the survey, disability was assessed in all survey participants by asking a set of 12 questions adapted from the 'Measuring health and disability manual for World Health Organization disability assessment schedule' (WHODAS 2.0) (Utsun et al., 2010), which was previously validated in the Nepalese population (see chapter 3 and appendix 3.4). All 694 participants completed the WHODAS 2.0 and the mean score was 4.2 (SD 8.9). Initially disability was categorised into four categories based on thresholds according to the WHODAS manual: none, mild, moderate and severe disability. These thresholds are discussed in the statistical methods section but in summary the classification was **no disability** - 0 to 4%, **Mild** - 5% to 24%, **Moderate** - 25% to 49%, **Severe -** 50% to 100%. A total of 178 (25.6 %, 95% CI 22.4 – 28.9) participants reported disability, of whom 73 (10.5%) had mild disability, 57 (8.2%) had moderate disability and 48 (6.9%) had severe disability. To facilitate further analysis, disability has been dichotomised into 'no disability' and 'disability', which includes mild, moderate, and severe disability (Table 6.1).

Table 6. 1 Prevalence of disability with degree of severity

Gender	No disability n (%)	Disability			Total disability n (%)
		Mild n (%)	Moderate n (%)	Severe n (%)	
Male	244 (74.2)	37 (11.4)	25 (7.6)	23 (6.9)	85 (25.8)
Female	272 (74.5)	36 (9.9)	32 (9.7)	25 (6.8)	93 (25.4)
Total	516 (74.3)	73 (10.5)	57 (8.2)	48 (6.9)	178 (25.6)

6.1.2 Investigating clustering effect in disability data

The data for disability versus no disability was investigated to assess whether there were any clustering effects. In this analysis, the inflation factor for six sites was less than one and was just over 1 in one site, the hilly urban deprived site (Appendix 27). Therefore, it was assumed there was no clustering effect and no adjustment was necessary when estimating confidence intervals and performing statistical tests.

6.1.3 Prevalence of disability by characteristics of the participant

Table 6.2 shows disability rates by participant characteristics. Analysis of disability showed that the distribution in male and female participants was similar with 93 (25.4%) female participants and 85 (25.8%) male participants ($p = 0.9$). The prevalence of disability varied with age with higher rates in older age groups, and this was statistically significant ($p < 0.001$); 13 (4.4%) participants in the age group 18 – 34 years had disability compared to 58 (89.2%) in the age group of 65 years and over. The distribution of disability by ecological zone showed that 56 (18.9%) participants in the plain zone had disability, 76 (25.3%) participants in the hilly zone had disability and 46 (46.9%) participants in the mountainous zone had disability; this was statistically significant ($p <0.001$).

Significantly more participants had disability in rural areas compared to urban areas (30.3% vs. 22.2%, $p = 0.01$) and in agriculture related occupation compared to non-agriculture occupation respectively (33.1% vs. 19.9%, $p <0.001$).

Table 6. 2 Prevalence of disability

Variables	No disability n (%)	Disability n (%)	Chi Squared test Statistic
Gender			0.012, df 1, **p** = 0.9
Male	244 (74.2)	85 (25.8)	
Female	272 (74.5)	93 (25.4)	
Age group			**275.1, df 4, p < 0.001**
18 - 34 Yrs.	284 (95.6)	13 (4.4)	
35 - 44 Yrs.	127 (82.5)	27 (17.5)	
45 - 54 Yrs.	70 (70.0)	30 (30.0)	
55 - 64 Yrs.	28 (35.9)	50 (64.1)	
65 + Yrs.	7 (10.8)	58 (89.2)	
Eco zone			**30.3, df 2, p <0.001**
Plain zone	240 (81.1)	56 (18.9)	
Hilly zone	224 (74.5)	76 (25.3)	
Mountain zone	52 (53.1)	46 (46.9)	
Residency (Urban vs. rural)			**5.9, df 1, p = 0.01**
Urban	309 (77.8)	88 (22.2)	
Rural	207 (69.7)	90 (30.3)	
Occupation (Agriculture vs. non agriculture)			**15.6, df 1, p <0.001**
Not agriculture	314 (80.1)	78 (19.9)	
Agriculture	202 (66.9)	100 (33.1)	

Note: Statistically significant values are highlighted in bold.

6.1.4 Prevalence of disability between those participants who had knee pain and those who did not have knee pain

Table 6.3 shows the prevalence of disability in those participants who had different types of knee pain in this survey (knee pain in last 12 months, chronic knee pain and knee pain at the time of the survey). One hundred and twenty seven (81.2%) of the 155 participants with knee pain over the previous 12 months had disability, 81 (96.4%) of 84 participants with chronic knee pain had disability and all 53 participants with pain at the time of the survey had disability. The prevalence was much higher in those who had knee pain in the last 12 months compared to those who did not (81.2% vs. 9.5%); this pattern was also seen for chronic knee pain (96.4% vs. 15.9%) and knee pain at the time of the survey (100.0% vs. 19.5%). These differences were statistically significant (Table 6.3).

All other analyses in this section are by whether the participants had had knee pain in the last 12 months or not. There were much higher rates of disability in those who had knee pain compared to those who did not across all participant characteristics (Table 6.4). Even in older participants, those with knee pain had higher rates of disability. Just considering those with knee pain, all of the participants in the mountainous zone reported disability whereas over three quarters of those with knee pain in the hilly zone and the plain zone reported disability but disability was also highest in those without knee pain in the mountainous zone (Table 6.4). The prevalence of disability was also higher in rural participants compared with urban participants (88.5% vs. 76.4%).

Table 6. 3 Comparison of disability rate by type of knee pain

Types of knee pain	Knee pain participants (n)	Knee pain		No knee pain		Statistical significance test
		No disability n (%)	Disability n (%)	No disability n (%)	Disability n (%)	
Felt knee pain in last 12 months	155	28 (18.2)	127 (81.2)	488 (90.5)	51 (9.5)	Chi Squared test 331.6, df 1, **$p < 0.001$**
Chronic knee pain	84	3 (3.6)	81 (96.4)	513 (84.1)	97 (15.9)	Chi Squared test 251.1, df1, **$p < 0.001$**
Knee pain at time of the survey	53	0	53 (100.0)	516 (80.5)	125 (19.5)	Fisher Exact test **$p <0.001$**

Note: Statistically significant values are highlighted in bold.

Table 6. 4 Prevalence of disability between participants who had period prevalence of knee pain and those who did not have period prevalence of knee pain

Variables	Knee pain N = 155 (%)	No Knee pain N = 539 (%)
Gender		
Male	57 (80.8)	28 (10.9)
Female	70 (83.3)	23 (8.2)
Age group		
18 - 34 Yrs.	12 (42.9)	1 (0.4)
35 - 44 Yrs.	19 (76.0)	8 (6.2)
45 - 54 Yrs.	23 (88.5)	7 (9.5)
55 - 64 Yrs.	34 (91.8)	16 (39.0)
65 + Yrs.	39 (100.0)	19 (73.1)
Ecological zone		
Plain zone	40 (76.9)	16 (6.5)
Hilly zone	56 (77.7)	20 (8.7)
Mountainous zone	31 (100.0)	19 (28.3)
Residency (Urban vs. rural)		
Urban	65 (76.4)	23 (7.4)
Rural	62 (88.5)	28 (12.3)
Occupation (Agriculture vs. non agriculture)		
Not agriculture	54 (79.4)	24 (7.4)
Agriculture	73 (83.9)	27 (12.6)

6.1.5 Disability by six domains of functioning between those participants with and without knee pain

Scores obtained by asking the 12 different questions on the WHODAS 2.0 about experiences during the previous 30 days were compiled into six domains of functioning, following the guidelines from the WHODAS manual (Ustun et al., 2010; Andrew et al., 2009). The six grouped domains were Cognition – understanding and communication; Mobility – moving and getting ground; Self care - hygiene, dressing, eating and staying alone; Getting along – interacting with other people's; life activities – domestic responsibilities, leisure, work and school, and Participation – joining in community activities. Analysis of the prevalence of disability in those participants who had knee pain and those who did not have knee pain showed a higher prevalence among those who had knee pain compared to those who did not in all domains (Table 6.5). In those with knee pain, disability prevalence was highest in the mobility domain (81.9%) followed by life activities (78.7%) in (Table 6.5).

Table 6. 5 Prevalence of disability by domains

Disability domain	Knee pain (n=155) n (%)	No knee pain (n=539) n (%)
Cognition	111 (71.6)	29 (5.5)
Mobility	127 (81.9)	53 (9.8)
Self-care	108 (69.7)	28 (5.2)
Getting along	108 (69.7)	25 (4.6)
Life activities	122 (78.7)	34 (6.3)
Participation	110 (71.1)	28 (5.2)

6.1.6 Association between prevalence of disability and knee pain

Univariate and multivariate analysis was performed using logistic regression to assess which factors were associated with disability and to explore if knee pain was an independent risk factor for disability. In this logistic regression analysis, no knee pain was used as the reference category (Table 6. 6).

The univariate analysis confirmed the findings of table 6.5. Age group, ecological zone, agriculture-related occupation, residency and knee pain were each significantly associated with an increased risk of disability but gender was not. Significantly, higher odds ratios were observed for older age groups, mountainous zone compared to plain zone and agriculture related occupation compared to non-agricultural occupation. The odds of knee pain were 43 times that of those without knee pain ($p < 0.001$) (Table 6. 6).

In the multivariate analysis, independent risk factors for disability were age, ecological zone and knee pain. Participants with knee pain had an odds ratio for knee pain related disability of 80.1 ($p < 0.001$).which was almost double than that observed in the univariate analysis (Table 6. 6).

Table 6. 6 Association between disability and demographic variables and knee pain: univariate and multivariate logistic regression

Variables	Univariate analysis		Multivariate analysis	
	Odd ratio (95% CI)	p value	Odd ratio (95% CI)	p value
Gender		0.86		0.79
Male	1		1	
Female	1.0 (0.7 - 1.4)		0.9 (0.5 - 1.7)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.				
35 - 44 Yrs.	4.6 (2.3 - 9.3)		5.9 (2.1 – 15.3)	
45 - 54 Yrs.	9.4 (4.6 - 18.9)		14.3 (5.0 - 41.6)	
55 - 64 Yrs.	39.0 (18.9 - 80.4)		89.5 (28.7 – 279.3)	
65 + Yrs.	181.0 (69.2 - 473.3)		590.3 (151.6 – 2298.7)	
Ecological zone		**< 0.001**		**<0.001**
Plain zones	1		1	
Hilly zone	1. 5 (1.0 - 2.1)		0.9 (0.4 - 1.8)	
Mountain zone	3.8 (2.3 - 6.2)		12.2 (4.2 – 35.6)	
Residency		**0.02**		0.13
Urban areas	1		1	
Rural areas	1.5 (1.1 - 2.2)		0.5 (0.2 – 1.2)	
Occupation		**<0.001**		0.82
Non - agriculture	1		1	
Agriculture	2.0 (1.4 - 2.8)		1.1 (0.5 - 2.3)	
Knee pain		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	43.4 (26.3 - 71.6)		80.1 (35.7 – 179.8)	

Note: Statistically significant values are highlighted in bold, C I = *Confidence interval*

In this multivariate analysis, gender, age groups, ecological zone, residency and occupation were included. Male gender, 18 – 34 years, plain zone, urban residence, non-agricultural occupation were reference categories.

6.1.7 Logistic regression of disability by six domains of functioning

Knee pain as an independent risk factor for disability was also investigated for each of the six domains of functioning in the WHODAS 2.0 scale (Appendix 29). Gender, age, ecological zone, residence, occupation and knee pain were included in these analyses, as before. Knee pain was an independent risk factor for each of the domains. The highest odds ratios for knee pain were observed for life activities (OR 108.3, p <0.001) followed by getting along (OR 101.6, p <0.001). Other domains odd ratios were as follows: self-care (OR 69.3, p <0.001), cognition (OR 68.5, p<0.001) and mobility (OR 66.7, p <0.001).

6.2 Knee pain while performing selected physical activities

Knee pain on performance of different physical activities was investigated among those participants who had knee pain by using some questions from the KOOS as previously described. These questions were asked of those participants who had reported knee pain lasting for more than one month in the previous 12 months (Table 6.7). There were four activities that were not performed by most of the participants; these were going up and down hills and going up and down stairs. Of the remaining activities, more than half of the participants in all activities, except two, experienced knee pain while performing these physical activities (Table 6.7).

The number of participants experiencing pain was highest for kneeling on meditation activity (65.1%) and was over 60% for using squatting posture at work and on the toilet. Less than half the participants had pain on rising from sitting or walking on flat surfaces (Table 6.7). Knee pain while performing physical activities was statistically significantly higher for participants with knee pain living in the mountainous zone compared to the hilly zone and plain zone for all the activities except for walking on a flat surface ($p = 0.19$) (Table 6.7).

Figure 6.1 shows the severity of knee pain experienced by the participants while undertaking these activities. Kneeling on meditation, squatting on the toilet, carrying heavy weights, getting on and off the toilet, sitting on a mat and straightening the knee fully were the activities that had the greatest proportion of participants reporting at least moderate knee pain.

Table 6. 7 Experiencing knee pain in performing physical activities by ecological zone

Physical activities	Plain zone (N = 52) n (%)	Hilly zone (N = 72) n (%)	Mountainous zone (N = 31) n (%)	Total (N = 155) n (%)	Chi Square test for comparison between zones
Straightening knee fully	18 (34.6)	39 (46.4)	25 (80.6)	82 (52.9)	16.6, df 2, **p < 0.001**
Sitting on flat surface	22 (42.3)	43 (51.2)	25 (80.6)	90 (58.1)	11.8,df 2, **p < 0.001**
Sitting on the chair / bench	20 (38.5)	39 (46.4)	25 (80.6)	90 (58.1)	13.9,df 2, **p < 0.001**
Walking on flat surface	14 (26.9)	28 (33.3)	14 (45.2)	56 (36.1)	3.2, df 2, p = 0.19
Rising from sitting	15 (28.8)	30 (35.7)	24 (77.4)	69 (44.5)	18.9, df 2, **p < 0.001**
Standing upright	18 (34.6)	37 (44.0)	24 (77.4)	79 (51.0)	14.2, df 2, **p < 0.001**
Getting on / off toilet	19 (36.5)	37 (44.0)	23 (74.2)	79 (51.0)	11.1, df 2, **p < 0.001**
Carrying heavy weight	23 (44.2)	43 (51.2)	25 (80.6)	79 (51.0)	10.7, df 2, **p < 0.001**
Squatting at work	26 (50.0)	49 (58.3)	24 (77.4)	99 (63.9)	7.3, df 2, **p** = **0.02**
Squatting on toilet	26 (48.0)	46 (63.8)	25 (80.6)	97 (62.4)	7.8, df 2, **p** = **0.02**
Kneeling on meditation	28 (51.9)	48 (57.1)	25 (80.6)	101 (65.1)	6.2, df 2, **p** = **0.04**

Note: Statistically significant values are highlighted in bold.

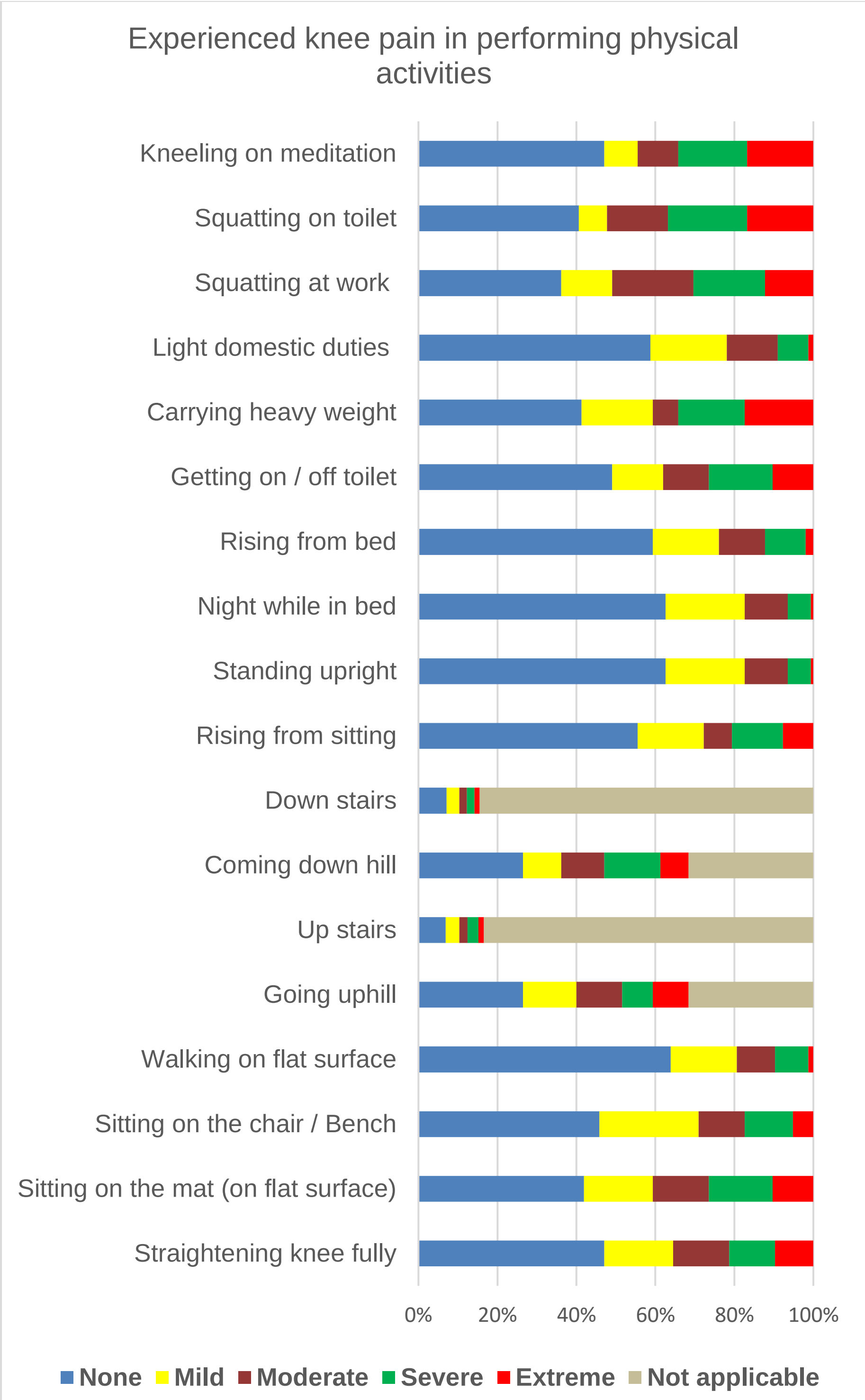

Figure 6. 1 Number of participants experiencing knee pain while performing selected physical activities

6.3 Health seeking behaviour

This section describes the health seeking behaviour of the survey participants with knee pain in the last 12 months. For a description of the types of health, services available in the Western Development Region see Chapter 1 Section 1.3). To help in the interpretation of this section, further detail on the health services in each of the selected districts and sites is outlined here.

Public hospitals were available in each zone whereas private hospitals were in plain and hilly zones (Table 6.8). In the mountainous zone, the distance between the study site and district hospital was 38 kilometres. It takes three to four hours to travel from study site to that hospital using public transport along mountainous rough roads. In the hilly zone study district, there was one public and two private hospitals in the district headquarters. The hilly zone rural site was 26 kilometres from these hospitals and it takes one and half hours to travel from that rural site to those hospitals using public transport. Nevertheless, the urban sites were within proximity of these hospitals. In the plain zone, there was one district level public hospital and another zonal hospital in an adjoining town (one hour drive) hospital. The plain zone rural study site was five kilometres from those hospital sites. It takes about half an hour to travel between study site and hospital. Urban sites were in the same place where these hospitals were located (Table 6.8).

Some selected district hospitals have been delivering physiotherapy services. In survey districts, none of the hospitals were delivering these services and participants have to take these services from private health service providers. This was known through asking local people. Physiotherapy services were not available at all in the mountainous zone (Table 6.8).

Table 6. 8 Health facilities in study districts

Study districts	Public hospital	Private hospital	Primary health centre	District health Office
Plain zone district	2	2	5	1
Hilly zone district	2	2	2	1
Mountainous zone district	1	0	0	1
Total	5	4	7	3

Source: District Health Offices: Rupandehi, Palpa and Mustang district of Nepal

6.3.1 Advice seeking for knee pain

Of the 155 participants who had knee pain during the previous 12 months, 85 (54.8%) had sought advice for the management for their knee pain. Of the 84 participants with chronic knee pain, 48 (57.1%) had sought advice and of the 53 who had pain at the time of the survey, 32 (60.0%) had sought advice (Table 6.9).

The rest of this section is on the 155 participants with knee pain during the previous 12 months. Only 13 out of the 31 (41.9%) participants with knee pain in the mountainous zone sought advice for knee pain compared to 44 out of 72 (61.1%) participants in the hilly zone and 28 out of 52 (53.8%) participants in the plain zone, though the difference was not statistically significant (p = 0.20) (Table 6.9).

In urban areas, 52 out of 85 participants (61.1%) compared to 33 out of 70 (47.2%) participants in rural areas consulted with knee pain, but this difference was not significant (p = 0.08). There were slightly higher, but not statistically significant, observed consultation rates in urban affluent areas, 29 out of 45 (64.5%), compared with urban deprived areas, 23 out of 40 (57.5 %) (p = 0.30) (Table 6.9).

Table 6. 9 Proportion of participants who sought advice for knee pain in different areas

Study sites	Advice n (%)	No advice n (%)	Chi Square test
Overall	85 (54.8)	70 (45.2)	
Ecological zone			3.2,df 1, p = 0.20
Plain zone	28 (53.8)	24 (46.1)	
Hilly zone	44 (61.1)	28 (38.9)	
Mountainous zone	13 (41.9)	18 (58.1)	
Urban vs. rural sites			3.1, df 1, p = .081
Urban area	52 (61.1)	33 (38.9)	
Rural areas	33 (47.2)	37 (52.8)	
Urban affluent vs. deprived area			3.4, df 1, p = 0.30
Urban affluent	29 (64.4)	16 (35.6)	
Urban deprived	23 (57.5)	17 (42.5)	

6.3.2 Where did survey participants go for treatment?

Table 6.10 shows the number of visits made by participants to health institutions (public and private) for treatment across the different ecological zones. They had visited both public and private health facilities. Of the 155 participants with knee pain, 82 (52.9%) visited a public health facility and 106 (68.4%) visited a private health facility for advice and treatment. Hospital was the most commonly chosen health facility for the treatment of knee pain; 67

(43.2%) participants visited a hospital, of which 42 (27.1%) of participants went to public hospitals and 25 (16.1%) participants visited private hospitals. Utilization of the public hospital was highest in the plain zone (n=18, 34.6%) and of private hospitals was highest in the hilly zone (n=20, 27.7%). However, there was only one participant in the mountainous zone who took treatment in hospital (Table 6.10).

Use of pharmacies was highest in the plain zone (n=16, 30.8%) and again only one participant from the mountainous zone used a pharmacy. Only 12 (11.5%) participants in both the hilly and plain zone received physiotherapy service for their treatment, with equal numbers in each. No one in the mountainous zone received physiotherapy. Table 6.10 shows that seeking treatment in public and private health facilities were statistically significantly different across ecological zones ($p < 0.001$) other than in acupuncture clinic and physiotherapy ($p = 0.21$), neither of which were available in the mountainous zone (Table 6.10).Those with knee pain in the mountainous zone predominantly used public health services.

Table 6. 10 Place of treatment for knee pain by ecological zone

Health institutions	Plain zone n (%)	Hilly zone n (%)	Mountainous zone n (%)	Fisher's Exact test p value
Knee pain participants	52 (17.3)	72 (24.0)	31 (31.6)	
Public health facilities				
Rural health clinic	11 (21.2)	3 (4.1)	12 (38.7)	**p < 0.001**
Primary health centre	2 (3.8)	12 (16.7)	0	**p < 0.001**
Hospital	18 (34.6)	23 (31.9)	1 (3.2)	**p < 0.001**
Private health facilities				
Hospital	5 (9.6)	20 (27.7)	0	**p < 0.001**
Pharmacy	16 (30.8)	9 (12.5)	1(3.2)	**p < 0.001**
Acupuncture clinic	4 (7.7)	2 (2.7)	NA	p = 0.21
Physiotherapy clinic	6 (11.5)	6 (8.3)	NA	p = 0.23
Ayurvedic	10 (19.2)	9 (12.3)	0	**p < 0.001**
Herbal clinic	10 (19.2)	8 (12.5)	1 (3.2)	**p < 0.001**

Note: Statistically significant values are highlighted in bold. NA = Not available

6.3.3 Uptake of knee pain treatments

Of the different available treatments for knee pain, oral painkillers were most commonly used (n=85, 54.8%) followed by massage (n=70, 45.2%), creams (n=68, 43.8%) and hot compress (n=52, 33.5%) participants. Physiotherapy was not often used (n=13, 8.4%). Those in the mountainous zone tended to have less of these treatments than those who lived in the other zones with the exception of walking aids, which were used, three times more often in the mountainous zone compared with the other zones. Traditional methods of treatment for knee pain were less commonly used (Table 6.11).

6.3.4 Reasons for not seeking treatment

Of all available services, almost half the participants with knee pain (n=70, 45.2%) did not utilize any services. Exploration of the reasons for not taking up these services showed that 66 (42.4%) of these participants applied home remedies, 49 (31.6%) felt knee pain was a feature of old age requiring no treatment and 31 (20.0%) said that treatments were too expensive. These concerns were more common among participants in the mountainous zone but none of these differences was statistically significantly different across ecological zones. Less than ten participants reported that they had no faith in existing services, felt that health institutions were too far away or that they could not visit alone (Table 6.12).

Table 6. 11 Applied remedies for knee pain by ecological zone

Type of treatment	Plain zone n (%)	Hilly zone n (%)	Mountainous zone n (%)	Total n (%)	Statistical tests
Oral pain killer	28 (53.8)	44 (61.1)	13 (41.9)	85 (54.8)	Chi Squared test = 1.6, df. 2, p = 0.47
Massage	23 (44.2)	35 (48.6)	12 (38.7)	70 (45.2)	Chi Squared test = 1.1, df 2, p = 0.57
Cream / Vaseline	21 (46.3)	35 (48.6)	12 (38.7)	68 (43.8)	Chi Squared test = 1.7, df 2 , p = 0.43
Hot compress	18 (34.6)	27 (37.5)	7 (22.5)	52 (33.5)	Chi Squared test = 0.4, df 2, p = 0.81
Walking stick	15 (28.1)	18 (25.0)	7(22.5)	40 (25.8)	Chi Squared test = 1.4, df 2, p = 0.50
Bandage	7 (13.5)	18 (25.0)	5 (16.1)	30 (19.3)	Chi Squared test = 1.9, df 2, p = 0.37
Herbal medicine	12 (23.1)	12 (16.7)	6 (19.3)	30 (19.3)	Chi Squared test = 2.6, df 2, p = 0.27
Ayurvedic medicine	11 (21.1)	9 (12.5)	0	20 (12.9)	Fisher Exact test **p = <0.001**
Physiotherapy	5 (9.6)	8 (11.1)	NA*	13 (8.4)	Fisher Exact test p = 0.31

NA = not available*

Table 6. 12 Reasons for not seeking treatment by ecological zone

Reasons	Plain zone n (%)	Hilly zone n (%)	Mountainous zone n (%)	Total n (%)	Statistical tests
Application of home remedies	23 (34.8)	28 (42.4)	15 (22.7)	66 (42.5)	Chi-Squared 5.8, df 2, p = 0.055
Aging leads to such problems	13 (26.5)	22 (44.5)	14 (28.5)	49 (31.6)	Chi-Squared 4.4, df 2, p = 0.113
Expensive treatment	9 (31.0)	11 (29.0)	11(29.0)	31 (20.0)	Chi-Squared 2.8, df 2, p = 0.247

Chapter 7: Discussion

7.1 Introduction

In this thesis, the prevalence of knee pain and knee pain related disability in the adult population of the Western Development Region of Nepal was explored using a survey instrument developed for the study. The survey also explored the health seeking behaviour of participants with knee pain in this population. In this chapter, the findings of the thesis, its strengths and weaknesses and the implications for public policy in Nepal, for clinicians and for further research are discussed. The findings of the survey are discussed with reference to the findings of the review on the prevalence of knee pain and knee pain related disability (Chapter 2), which was undertaken prior to the survey. Therefore, a summary of the findings of this review is outlined below before proceeding to a discussion of the thesis survey findings.

7.2 Summary of the review on the prevalence of knee pain and knee pain related disability

7.2.1 Prevalence of knee pain

Twenty-one studies (Table 2.4) reporting the prevalence of knee pain were identified by the review. All the studies reported on period prevalence of knee pain, and three studies had also reported on point prevalence of knee pain.

The period prevalence of knee pain reported by the studies ranged from 2.4% in a study conducted in Pakistan (Gibson et al., 1996) to 49.2% in a study conducted in Thailand (Chokhanchichai et al., 2010). This range was the same for the 12 (57.1%) of the 21 studies which used a similar question on period prevalence to the thesis survey in Nepal (McAlindon et.al., 1992: Gibson et al., 1996; Sakakibara et.al., 1996: Urwin et al., 1998: Bergenudd et al., 1989: O'Reilly et al., 2000: Cecchi et al., 2008: Muraki et al., 2009: Chokhanchichai et al., 2010; Ling et al., 2010; Kim et al., 2011). Point prevalence of knee pain was between 20.5% and 24.6% in the 3 studies, which reported on this (McAlindon et al., 1992; Jinks, et al., 2004; Hoy et al., 2011). These studies used a similar question to the thesis survey.

The review studies showed that the prevalence of knee pain increased with age and was higher in females. Although there were only a few studies, there was also a suggestion of higher rates in mountainous areas compared to coastal areas (Muraki et al., 2009) and in rural compared to urban areas (Gibson et al., 1996 and Muraki et al., 2009). The evidence about social class and knee pain was conflicting.

There were eight studies conducted in Asia in the review but none of the studies identified were from Nepal. However, since the review was completed, two studies have been found. One study was published in 2015 outside of the period of the review reported in this thesis (Baidya et al., 2015). This study was undertaken in three Village Development Committees in the hilly zone of the Central Development Region of Nepal. It reports on the period prevalence of knee pain. Another study was only published in a local journal but was published within the time limits of the review (Bhattarai et al., 2007). It was not identified by the electronic search, which illustrates one of the limitations of the review because only peer reviewed articles were included and sources of non-peer reviewed reports were not searched. The study was undertaken in a rural community living in the plain zone of the Eastern Region of Nepal. It included 1730 individuals of age 15 – 64 years and investigated the point prevalence of pain in different joints including the knee. The findings of these two Nepalese studies cannot be generalised to regions of Nepal as they were each undertaken within one ecological zone; for this reason, they cannot fulfil some of the objectives of this thesis to examine differences across different ecological zones or urban and rural residency. Their findings are discussed in more detail during the further discussion of the findings of the thesis.

7.2.2 Prevalence of knee pain related disability

Ten studies were identified that reported on knee pain related disability; none of these studies was undertaken in Nepal. Different disability measures were used including the Health Assessment Questionnaire, Short Form 12 and 36, the Western Ontario McMaster University Osteoarthritis Index and other non-specific scales. The findings of the review showed that disability was higher in those with knee pain compared with those without and this was seen in all age groups. Knee pain disability was higher in females than males and in older age groups. It was not possible to use the measures of disability from the review studies in the thesis survey either because they cost too much or because they included questions not relevant to the Nepalese population. Further review of the literature revealed an appropriate instrument, the WHODAS 2.0 (Ustun et al., 2010), which had been used in a survey about disability in Nepalese participants (Thapa et al., 2003). Some questions from the Knee Injury and Osteoarthritis Outcome Score (KOOS) were also used in the thesis survey to explore symptoms related to different activities with some adaptation to make it more relevant to the Nepalese population.

7. 3. Knee pain in the Western Development Region

7.3.1 The prevalence of knee pain

The overall prevalence rate of knee pain in this survey was 22.3%, with a weighted rate of 21.5%. This rate is similar to the studies by Ling et al., (2010) and Sakakibara et al. (1996), which used a similar definition of knee pain and were undertaken in Asian countries. However, it was lower than the prevalence recorded by two other Asian studies, that which did Hoy et al. (2010) conduct in Tibet and Muraki et al. (1996) who undertook their study in mountainous and coastal areas of Japan. These studies did not weight their survey rates, which might explain some of the differences; also, Tibet is mountainous and in this survey, rates of knee pain in participants from the mountainous site (31.6%) were similar to the rates seen in the Tibetan study. Some of the studies in the review were restricted to older participants over 65 years of age, whereas in the thesis survey participants were aged over 18 years. Older participants have higher rates of knee pain. In participants in the thesis survey over 65 years of age, the prevalence of knee pain was 60%, which is almost 3 times higher than the review studies limited to this age group (Andersen et al., 1999; Cecchi et al., 2008). Another possible reason for the high rate of knee pain in the thesis survey could be that the Nepalese population do not have as good access to treatment services for their problem in its early stage. In this survey, 42.5% of participants relied on application of home remedies for their knee pain and 45.2 % did not seek advice on their knee pain. Of those who did not consult about their knee pain, 31.6% believed that it was a consequence of aging and 20.0% felt that treatment was too expensive. Other studies in Nepal have also shown that poor access and cost factors affect consultation.

A study, conducted in a Village Development Committee of a hilly zone district of the Eastern Region of Nepal, reported that modern health services were costly and that local people preferred traditional health services (Bhattrai et al., 2015). Though modern health services in Nepal have been available for some time, the majority of the Nepalese people cannot afford more than the minimum basic health services due to poverty (Panthi and Chalishe. 2013). Only 62% of Nepalese households have access to a health facility within 30 minutes of travel and this is lower in rural areas (59%) compared to urban areas (86%) (Central Bureau of Statistics, 2011). To address this gap, the Government of Nepal initiated a community health insurance programme in 2015 to try to increase access to poor and marginalized people. This scheme was piloted in three districts of Nepal and the Government is planning to extend it throughout the country within three years (Department of Health Services, 2013). The health system of Nepal faces other multiple challenges such as unequal distribution of health care services, poor infrastructure, and inadequate supply of essential drugs, poorly regulated private providers, inadequate budget allocation for health sectors and poor retention of health staff in rural areas (Mishra et al., 2015).

A study by Jinks et al. (2004) using a similar definition for chronic knee pain as the thesis study, had a prevalence of 25% in a UK population, twice that of the thesis survey. However, the age of participants in that study was 50 years of age and over. Chronic knee pain in the thesis study was 12.1% in all participants but increased with age and was 43.3% in those over 65 years. The study by Jinks et al. (2004) reported that the general practice consultation rate was 2.5 times higher in those with chronic knee pain compared to those with no knee pain (46% vs. 18%) suggesting that these patients need more input from health care services. In Nepal, the higher rate may be because of lack of early treatment and access to health facilities, and the emphasis for policymakers should be on focusing on ways of reducing knee pain and on improving access to treatment earlier.

Chronic knee pain is a major health problem and has become more common in ageing populations. It is a common reason for mobility restriction (Brooks, 2006). Chronic knee pain can lead to severe difficulties in performing domestic duties, bending, bathing, climbing and descending stairs (Jinks et al., 2007) and can lead to long term absence from work (Woolf and Pfleger., 2003). In the absence of national health services, patients have to pay the cost of consultation, medication, therapies and assistive devices (Murray and Lopez, 1996: Badely et al., 1995). In addition to this, it may require informal care with additional expenditure or loss of earnings for the family (Vandenberg et al., 2004). Therefore, there is an economic burden on the person, their family, and to society (Lapsley et al., 2001).

In this survey, the estimated overall point prevalence rate for knee pain was 7.6% with a weighted rate of 5.9%. This was three times lower than the reported 24.5% prevalence rate in the study by Hoy et al. (2010) undertaken in Tibet; as discussed above this is possibly due to the study being conducted in an area of high altitude; however, the rate observed in the Tibetan study is still higher than that observed in the mountainous zones in the thesis survey (17.3%). As highlighted above, since undertaking the review, there has been one study found which reports on the point prevalence of knee pain in a Nepalese population (Bhattarai et al., 2007). This was undertaken in three Village Development Committees of the plain zone of the Eastern Development Region of Nepal. The point prevalence in this study was 3.5%. This prevalence rate is similar to the point prevalence rate of knee pain observed in the plain zone in the thesis survey (weighted rate 3.3%).

As well as reporting the survey prevalence rates, weighted prevalence rates were estimated. It was impractical to recruit participants from the whole of the Western Development Region due to resource constraints, so data were collected from seven sites of that region. The selected sample was a small part of the population from which it was drawn. Despite best efforts, there were small differences in population structure (age and sex) between the survey study sites, and the regional and the mountainous zone was over sampled to allow, enough participants from this zone for comparison with the other two zones. So to get a representation of the problem of knee pain within the Western Development Region, the thesis survey rates were weighted for age, sex and zone (Guo, 2011).

To be able to compare prevalence rates between ecological zones, age-sex standardisation was undertaken to adjust for these factors, using the population of the Western Development Region as reference. This showed that the prevalence of knee pain was highest in the mountainous zone for period prevalence, period prevalence of chronic knee pain and point prevalence. In addition, in logistic regression analysis of period prevalence, period prevalence of chronic pain and point prevalence, older age and mountainous ecological zone were independently associated with knee pain in all measures. Agricultural related occupation was only found to be an independent risk factor for the period prevalence of knee pain. For all these measures of knee pain prevalence, female gender was not shown to be an independent risk factor, despite most studies reporting on gender in the review suggesting that rates were higher in females compared to males. The risk factors are discussed in more detail in the next sections.

7.3.2 Knee pain and gender

The period prevalence of knee pain in this study was 23.1% in female and 21.6% in male participants; gender was not an independent risk factor for any of the types of knee pain investigated in this study. Studies conducted in neighbouring countries to Nepal also report similar prevalence rates of knee pain between females and males, for example in the study by Hoy et al. (2010) in Tibet, a mountainous area, the rate was 28% in females and 29% in males. However, most of the other studies reporting on gender in the review suggested a higher rate in females (McAlindon et al., 1992; Gibson et al., 1996; Sakakibara et al., 1996: Andersen et al., 1998: Dawson et al., 2004: Jinks et al., 2007 and Muraki et al., 2009). Even the recently published study in the hilly zone of Nepal observed a prevalence rate twice as high in females than in males (Baidya et al., 2015). Knee osteoarthritis is reported to have a higher prevalence in women than men (Leveillea et al., 2005; Barteley and Fillingrim, 2013). The higher rate of knee problems in women in these studies might be explained by biological factors (Flingrim and Maxiner, 1995). There is considerable evidence, which suggests that female hormones contribute to many clinical pain conditions (Lipton et al., 2001).

Epidemiologic and clinical findings have demonstrated that women are at increased risk for chronic pain (Fillingrim et al., 2009). There is some evidence that gender is a factor in modulating the experience of pain (Hassan et al., 2014). Research suggests that males and females experience pain and respond differently to analgesic medications (Paller et al., 2009). There is some suggestion that differences in pain are due to sex steroid hormones, both the absolute levels and the occurrence of cyclical fluctuations in women, but the relationship between sex hormones and pain is complex (Vincent and Tracy, 2008). For both sexes, the probability of experiencing a painful condition increases with pubertal development and sex differences in the prevalence of painful conditions appear after puberty (Vincent and Tracey, 2008).

From puberty onwards, men have significantly higher levels of testosterone and its metabolites than women and this may have an analgesic effect protecting against the development of painful conditions, such as, temporomandibular joint pain (Fischer et al., 2007). Previous research has indicated that men typically tolerate more pain in experimental settings than women do (Pool et al., 2007). Women generally have an increased sensitivity to experimental pain when compared to men (Riley, et al., 1998). In women, variation in symptom severity across the menstrual cycle occurs in a number of clinical pain conditions (Vincent and Tracey, 2008). Many clinical pain conditions improve during pregnancy including arthritis, migraine and pelvic pain, and there is an associated reduction in pain sensitivity, a phenomenon known as pregnancy-induced analgesia (Hassan et al., 2014). After the menopause, when levels of oestrogen and progesterone are very low in women, the sex difference in pain is much less marked (LeResche et al., 2005).

It has been considered that joint laxity may be why more women experience joint pain and that this is related to female hormone levels. In a study conducted in Iran to identify the relationship between gender hormone and anterior knee laxity fluctuation in sex hormones was shown to play a role in differences in knee laxity across the menstrual cycle period (Shultz et al., 2004). A relationship between joint laxity and maternal hormones in pregnancy was found by Marnach et al. (2003). However, a recent study conducted at an orthopaedic clinic on forty female athletes reported that there was no significant difference in anterior cruciate ligament laxity in female athletes during the three phases of the menstrual cycle (Shafiei et al., 2016).

There is little research undertaken on pain in the Nepalese population to explain why the prevalence rates of knee pain in this study are similar in men and women. So studies in neighbouring countries have been used to support explanations for similar rates in males and females. The customs, culture, and geography of Nepalese are similar to those of India and China since it is bordered by these countries. Therefore, factors in these countries playing a part in knee pain could also play a part in knee pain in the Nepalese population. Kneeling is a common activity, which is often considered as increasing knee pain (Knee Injury and Osteoarthritis Outcome Score User's Guide, 2012). In Muslim communities, kneeling at prayer is a common and regular activity and may be performed by both men and women up to five times a day (Gibson et al., 1996; Ariff et al., 2015). In Buddhist and Hindu cultures, meditation is a common activity undertaken cross-legged by both men and women. Support for these prayer rituals being a reason for knee pain is from a study by Ariff et al. (2015) who found that it required a greater range of motion at the knee than at the hip, and that the range of motion decreased with age and higher body mass index, risk factors for knee pain and osteoarthritis. Sitting cross-legged may be worse than kneeling as Chokhanchichai et al. (2010) found that among 303 Thai adults, 49.2% reported knee pain and this was significantly worse among Buddhists compared to Muslims.

Squatting is a daily occurrence for many in China and has been shown to be a strong risk factor for knee osteoarthritis (Zhang et al., 2004: Kim et al., 2010). A study of the association between posture and the prevalence of knee osteoarthritis in Beijing supported the role of squatting in knee pain. They found that ’prolonged squatting for more than an hour a day is a strong risk factor for knee osteoarthritis among elderly Chinese’ (Kim et al., 2008). Another reason why there may be similar rates in men and women is that both undertake strenuous daily activities, which increase loads on the knee. Asian women, particularly in rural areas, spend considerable time squatting during housework, childcare and cooking as well as home-based farming duties such as rice planting and harvesting (Kim et al., 2010). Sakaibara et al. (1996) suggested that chronic exposure to farming might contribute to the development of mechanical injury to the knee joint leading to knee pain. As males are more likely to undertake more strenuous agricultural roles, this might help explain why rates for males are similar to rates for females in Nepal. Furthermore, a large proportion of men and women living with hip or knee pain do not consult health care professionals (Thorstensson et al., 2009), and this was observed in the thesis survey. This might lead to ongoing knee problems.

7.3.3 Knee pain and age

The prevalence of knee pain was higher in older age groups in the survey population. This observation is in line with all the other studies in the review, which report on age (section 2.4.2.9, Chapter 2). However, many of these studies are limited to older age groups, whereas this study also included younger participants and showed that knee pain was increased in those aged 35 years and above compared to younger participants.

In multivariate analysis, the odds ratios for those aged 65 years and over compared to the reference age group (18 – 34) years were 13.8 (95% CI 7.2 – 22.3) for the period prevalence of knee pain, 33.3 (95% CI 14.7 – 65.4) for prevalence of chronic knee pain and 91.5 (95% CI 27, 5 – 162.3) for point prevalence. Therefore, age was more strongly associated with chronic knee pain and most strongly associated with current pain. The odds ratio for knee pain incrementally increased with increasing age.

Osteoarthritis is a degenerative joint disease in older populations where the surface of the knee joint is damaged and the surrounding bone gets thicker and inflamed and the knee is the most commonly affected large joint (Felson et al., 1987: Loeser, 2010: Heijink et al., 2012). Excessive loading across the knee joint is an important risk factor in the pathogenesis of knee osteoarthritis (Andriachi and Mundermann, 2006). The Nepalese custom culture is to sit cross-legged on a flat surface. In Nepal more than 81% of the population are Hindu, 9% Buddhist and 3% Muslim (Statistical Yearbook of Nepal, 2013). During meditation and worship, it is normal practice to sit cross-legged on a flat surface or kneel, which in studies in China and Thailand have been considered potential risk factors for knee osteoarthritis (Gibson et al., 1996; Zeng et al., 2004; Chokhanchichai et al., 2010: Hoy et al., 2010). Further, as discussed above squatting during occupational and domestic chores and toileting is common. Frequent occupational squatting, kneeling, heavy weight lifting for prolonged periods, climbing and descending hills and stairs, and excessive walking for long periods have been reported as leading to a greater likelihood of worse cartilage morphology scores leading to damage to knee cartilages resulting in knee pain (Zhang et al., 2004: Amin et al., 2008: Jensen et al., 2008). People living in multi-storey buildings without an elevator and having to go up and down stairs report a higher prevalence of knee pain (Zeng et al., 2006). Squatting, lifting and carrying heavy weights have been associated with knee pain (Veerapenet al., 2007) and squatting and sitting on the floor were found to be associated with osteoarthritis in a community based survey conducted in Iran (Dahaghain et al., 2009). In the thesis survey, activities such as kneeling for meditation, squatting on the toilet, carrying heavy weights, getting on and off the toilet and sitting on a mat, were associated with pain in those with knee pain.

7.3.4 Knee pain and agriculture related occupations

In this study the overall prevalence of knee pain was about 1.5 times higher in those participants who worked in agriculture related occupations than those working in non-agricultural occupations for all types of prevalence but only statistically significant in the multivariate analysis for period prevalence of knee pain ($p < 0.001$).

Studies conducted in India, Sweden and in the United States have also revealed that the prevalence of knee pain was higher in those who were working in agriculture related occupations than those working in other types of occupations (Holmberg et al., 2003; Gomez et al., 2003; Davis and Kotowski, 2007; Gupta and Tarique, 2013; Chandra and Parvez, 2016). Chronic musculoskeletal pain, especially involving the back, knee and hip was common among farm workers (Xiao et al., 2013). It is a common Nepalese custom and practice to squat for agricultural tasks during rice plantation and harvesting (Joshi, 2002), putting further strain on the knee joint.

7.3.5 Knee pain across different ecological zones

The period prevalence of knee pain and chronic knee pain and the point prevalence of knee pain varied across ecological zones. Prevalence were higher in the mountainous zone compared to hilly and plain zones even when the differences in age-sex distribution were taken into account.

The prevalence rate of knee pain in the mountainous zone observed in this study was consistent with the reported 29% period prevalence of knee pain in a study by Hoy et al. (2010) conducted in a sample of 499 people residing in 19 rural and semi urban areas located at an altitude of 3800 meters above the sea level in the Tibetan province of China. This altitude is similar to the altitude observed in the mountainous zone study site of the thesis survey. The thesis survey mountainous site was located on the southern side of the Himalayas whereas the study site in the study by Hoy et al. (2010) was located on the northern side of the Himalayas. The sociocultural practices in the mountainous zone of Nepal are similar those in to Tibet. The majority of the participants in both studies were living in mountainous areas with a subsistence way of life and were generally in poor health.

There are also studies of knee pain undertaken in plain zones. In a study in a rural plain area of Tamil Nadu in India, the period prevalence of knee pain was 18.6% (Muthunarayanan et al., 2015) this rate is almost equal to the period prevalence rate in the plain zone of the thesis survey. The study undertaken by Bhattarai et al. (2007) was in a rural community of the plain zone of the Eastern Region of Nepal. As previously discussed, the point prevalence of knee pain was 3.5%, similar to the rate reported in the thesis survey (Bhattarai et al., 2007).

The other study undertaken in Nepal, which was published after the review (Baidya et al., 2015), was undertaken in the hilly zone of the Central Development Region. This study reports on the period prevalence of knee pain. In this study, the period prevalence was 15.6%. This is lower than the reported period prevalence of knee pain in the hilly zone reported in the thesis survey (24.0%). The reason it is likely to be lower is that the study by Baidya was undertaken in flat land within a valley similar to topography the plain zone. The plain zone rate in the thesis was 17.3 %.

The discussion above supports the thesis observation that rates of knee pain are higher in areas that are more mountainous. The overloading of the knee in activities such as walking on rugged, steeply elevated surfaces and climbing up and down hills and mountains, was shown to be associated with knee pain in other studies (Hoy et al., 2010) and may explain why rates are highest in mountainous zones (Hoy et al., 2010; Chokkhanchitchai et al., 2010). Possible other reasons for the higher rate in the mountainous zone in this thesis could be high poverty levels and consequent lack of health services. There were lower rates of people taking oral medication among the mountainous zone participants and only one person with knee pain went to a hospital about their condition.

Another possible factor could be a deficiency of vitamin D in Nepalese people that could affect the growth and development of bone, leading to deformity resulting in bone pain. Shrestha et al. (2012) have shown that insufficiency of vitamin D can be found in 78.2% of individuals aged 18 to 80 attending a home care centre in Lalitpur, Nepal. The mountainous zone tends to be cloudier, with less sunlight, and nutrition is worse, in particular Vitamin D (Development, 2016). Different findings have been reported on the role of vitamin D (25 hydroxyvitamin-D) in knee pain, function. Some studies suggest low levels of Vitamin D in those with knee osteoarthritis and that after supplementation of vitamin D, symptoms of knee pain are relieved and strength of quadriceps muscles improve (Sanghi et al., 2013; Barker et al., 2014; Heidari et al., 2015). However, other studies report no difference in the outcomes (reduction of knee pain, stiffness or function) between those with vitamin D supplementation and placebo groups (McAlindon et al., 2013; Arden et al., 2016). Therefore, further research is needed to elucidate the role of vitamin D in the development and progression of knee pain as well as to assess the efficacy of vitamin D supplementation to reduce knee pain (Mabey et al., 2015).

7.3.6 Weather and knee pain

As well as the terrain, the weather in the mountainous areas of Nepal is different from the other areas. It is colder and has severe winters. In the spring and winter, temperatures can go from around 15 to 20 degrees in the day but can be less than 0 degree in nighttime. Pateberg et al. (1985) reported that patients diagnosed with arthritis have frequently reported pain exacerbated by meteorological changes and they often state that pain is worse under certain weather conditions that is at low temperatures and high humidity. Among 557 patients in four cities in the United States with chronic pain, in a study by Jamison. (1995), 52.6% of patients with joint pain noticed that their pain was affected before and 62.3% during weather change. In a population-based study conducted in North West England, musculoskeletal pain was highest in winter and lowest in summer (Macfarlane et al., 2010). In a study conducted in a sample of 6000 adults aged over 20 years in Japan, 50% of respondents with pain reported that their pain was more intense in cold weather and less intense in warm weather (Inoue et al., 2015).

Moss et al. (2016) have shown that subjects with knee osteoarthritis have significantly increased sensitivity to cold stimuli compared to those without knee osteoarthritis. In a study on mice, Fernandes et al. (2017) showed that cold exposure significantly increased blood flow into the arthritic knee joint more than the unaffected knee joint and increased thermal hyperalgesia. However, there is some conflicting evidence. Smedslund et al. (2011) in a systematic review to examine the association between weather and rheumatoid arthritis pain to date, studies have not shown any consistent effect of weather conditions on pain in people with rheumatoid arthritis. However, this condition is less relevant to this survey as the most common cause of knee pain in this population is likely to be degenerative rather than inflammatory.

7.4 Knee pain related disability

Disability in the thesis survey was investigated by using the WHODAS 2.0 adapted for and validated in the Nepalese population (Ustun et al., 2010). Knee pain was associated with a higher level of disability. The overall prevalence rate of disability was 25.6% in those with knee pain: 25.8% in male and 25.4% in female participants. The rate of disability was 80.1 times higher in those with knee pain than in participants without knee pain. In other studies, disabilities were more frequently reported in subjects with knee pain than those without knee pain (see section 2.3.3).

Studies conducted in India in participants aged over 70 using the WHODAS 2.0 questionnaire have reported disability rates of over 70.0% (Joshi et al., 2003; Sinalkar et al., 2015). One of the likely reasons for the higher rate in those studies is the age of the participants, since all of the participants were over 75 years of age. In the thesis survey, the prevalence of disability increased with age and the prevalence of overall disability among those aged over 65 was 89.2%, which is consistent with the reported disability rate of the Indian studies.

In the thesis survey, among the six domains of disability in the WHODAS 2.0, the mobility domain (81.9%) was the most highly affected domain among knee pain participants and the least affected domain was the self-care domain (69.7%). In other studies of these domains were also the most and least affected domains (Ortega et al., 2011; Sinalkar et al., 2015).

Logistic regression analysis showed that knee pain was an independent risk factor for disability overall and for each domain of disability, even accounting for age and ecological zone, which were also independent risk factors. This finding is supported by the studies by Ortega et al. (2011) and Sinalkar et al. (2015). However, not all disability will be related solely to knee pain in these participants as other musculoskeletal problems, such as back pain, are common in the Nepalese population and these often commonly occur with other joint pain (Bhattarai et al., 2007; Baidya et al., 2015). The thesis survey did not collect information on other musculoskeletal disorders or other co-morbidities.

The highest rate of disability in those with knee pain was seen in the mobility domain, but knee pain was most strongly associated with life activities. This is supported by the high levels of pain on performance of daily activities seen in the thesis survey. Others have noted that daily activities are linked with knee pain such as washing clothes and washing dishes and other heavy household chores; using a pit latrine, performing agriculture related chores in a squatting posture; sitting on a mat (Tatami), and on the floor (Andersen et al., 1996; Sakakibara et al., 1996; Ling et al., 2010; Sinalkar et al., 2015). Symptoms linked to activities were worse among those with knee pain living in mountainous areas. This may be because of the reasons discussed in the previous section about why knee pain might be more common in the mountainous areas

7.5 Health seeking behaviours

Overall, 54.8% percent of participants with knee pain had sought advice over the previous year. Regarding variation in utilization of services, studies have revealed, that in general, a higher level of pain and disability is associated with higher health care usage (Waxman et al., 1998; Elliott et al., 2004). Chronic pain participants were more likely to have multiple consultations than those with acute pain (Bedson et al., 2007). However, among knee patients there has been no association demonstrated between the severity of the knee pain and an increased consultation rate (Jordan et al., 2010).

Austin, (1998) has suggested that disability is a greater determinant factor in seeking consultation or help than severity of pain and co-morbidities. Thorstensson et al. (2009) revealed that the strongest determinants of seeking advice for pain were reduced mobility, urban residency, and severity of pain, while the presence of co-morbidities and socio-demographic characteristics were less important. Similarly, another study by Blyth et al. (2001) has reported that disabling chronic pain was associated with seeking health care rather than pain.

The survey tried to find out the possible reasons for not consulting. It found that 42.5% of participants with knee pain had applied home remedies for knee pain and that 31.6% believed that ageing leads to such problems. For 20.0%, though, the concern was about expensive treatments. Others have shown that poverty, lack of funds for health expenses, lack of family support and lack of transportation is associated with lower consultation rates (Hees et al., 2014; Morrison et al., 2017). Oral medicines are relatively cheap. However, oral tablets available in Nepalese public health facilities are only mild analgesics as the Government of Nepal has been supplying only limited types of essential drugs to health facilities, and there is usually a shortage (Hees et al., 2014 : Morrison et al., 2017). Many cannot afford to pay. The majority of Nepalese are poor and underprivileged. The population living below the poverty line was 25.2% in 2010 and per capita income was US dollars 2400 (Economic survey

Nepal, 2015). This may improve with the health care insurance programme that has just started (Mishra et al., 2015).

In the Western Development Region of Nepal, there was also unequal uptake of clinical services and this appeared to be dependent on accessibility. For the delivery of health services for the population in the three study districts, there were only 10 hospitals and 128 urban and rural clinics delivering primary health care services. This was unequal across the ecological zones, leading to further inequality in access. There were five hospitals (3 district level public hospital and 2 private hospitals) in the plain zone. In the hilly zone, there were 16 (11 district level public and five private) hospitals but there was only one public hospital in the mountainous zone. Although not stated by many in the thesis survey as a barrier, there was a greater time to travel to hospital services from the mountainous zone site, compared to the plain and hilly sites, which might also help explain to some extent why those living in the mountainous zone did not take up this type of service in.

Participants with knee pain had been applying traditional and modern methods of medical services together. Therefore, many participants had consulted at more than one health facility for treatment and advice for their knee pain and sometimes at both public and private health services (Furber, 2002). Studies have found that people use different modalities of health services with various expectations of better treatment and quicker recovery (Nahin et al., 2007).

Access to physiotherapy in the UK and other developed countries is important for the management of knee pain. In Nepal, district level public hospitals and health clinics do not provide a physiotherapy service. However, zonal and regional level public hospitals and private hospitals deliver this service in hilly and plain zones. Therefore, as this service was available mainly at the tertiary level and people were not able to pay its cost, its uptake was low and it was not at all available to people in mountainous zone areas. Therefore, one in four participants with knee pain relied on the use of a walking stick.

Possibly, because of the lack of access to therapy services, the use of walking sticks was highest in the mountainous zone with more than half of participants with knee pain using a walking stick. Sticks are simple devices and are popular because of manoeuvrability and ease of use and they are socially acceptable (Hagen, 2012). Walking sticks or canes are recommended in the management of knee osteoarthritis (Hagen, 2012), because they can reduce pain in patients with hip and knee pain. Wooden canes are lightweight devices but the most benefit is gained by them being fitted by health professionals, as required (Hoeing, 2004: Lam, 2007*).* Unfortunately, in Nepal, they are most often used without professional advice (Hoeing, 2004), because that service is not accessible. The walking sticks used tend to be fashioned by local people out of wooden sticks found in the forest. The lack of access to health services, medications and therapists, might also help to explain the increased reliance on home remedies in the mountainous areas as observed in the survey.

7.6 Strengths of the study

As far as the research student is aware, this is the first large-scale study of knee pain and knee pain related disability across different zones of one region in the Nepalese population. It was not possible to survey across the whole of Nepal because of time and resources, so the study was limited to one region. Study sites were distributed across all ecological zones and the study design ensured that urban and rural areas and affluent and deprived areas were surveyed. There are five development regions in the country and all have plain, hilly and mountainous ecological zones. Socioculturally, they are also similar to each other. Therefore, it is likely that the prevalence rates observed in this study likely reflect those of the whole country.

Random selection of study sites was undertaken to reduce selection bias. However, the study districts were not randomly chosen, due to accessibility and security concerns. It would also have been better to randomly select individuals within households to reduce the risk of a clustering effect, which would have reduced the effective sample size, but this was not applied in this survey because it would have needed a longer time and more sites to gain the same number of participants. However, analysis suggests that clustering at household level did not need to be taken into account in the analysis.

Prior to the development of the survey instrument, a literature review was conducted. The findings of the literature review were used to confirm the design of the survey ensuring that the questions used to estimate the period prevalence of knee pain and the point prevalence of knee pain were robust and would allow comparison with studies conducted in other countries. For measuring disability, the WHODAS 2.0 was used. The WHODAS 2.0 is a well validated instrument and the version in Nepalese had been validated in the Nepalese population by the Centre for Victims of Torture, Nepal (CVICT, Nepal) and the Transcultural Psychological Organization, Nepal (TPO, Nepal). The KOOS was used to assess the severity of symptoms by activity in those with knee pain. This is a well validated tool but has not been validated in the Nepalese population (Roos and Lomander, 2003). Some questions, which were relevant for a survey in the Nepalese population, were extracted from this list of questions or were modified to be appropriate for the Nepalese population. However, while administrating the questionnaire, it became clear that questions on walking up and down hills was not relevant to participants in the plain zone and those on using stairs were not relevant to large parts of the population, particularly in rural and deprived areas and in the mountainous zone. Those in the plain zone do not encounter hills and the majority of rural and urban deprived participants live in huts, which do not have stairs.

The questionnaire used in the thesis survey was translated into the Nepali following standard procedures and was piloted before the study to ensure that it was easily understood and that the questions the survey was asking were what was intended and the question stems were broad enough to capture common answers. The questionnaire was delivered face to face in Nepali because of the high level of illiteracy in the country and the number of written languages used. The review suggested that face to face administration would not affect prevalence rates significantly.

The response rate was very high. This is in the main due to the courteousness of the Nepalese people. None of the participants was offered any sort of remuneration or benefit, and data was collected voluntarily after obtaining verbal permission from the participants. Prior to the administration of the survey questionnaire in every site, the research student contacted local formal and informal leaders in the community including teachers, health volunteers, local health authorities and local bodies to establish a relationship with them. After introducing and explaining the aims and objectives of the study, the student sought approval from them to conduct the survey in their communities. In addition to this, prior to becoming a student, the research student had worked for the Ministry of Health in Nepal for more than two decades and was a well-known physician familiar with the different sociocultural backgrounds of the study areas. Application of these procedures and mobilization of local community leaders led to the research student gaining full cooperation and support from the local community, which contributed to the very high response rate.

Processes were undertaken to ensure the quality of the data. Questionnaires were checked after completion of their administration and before leaving the household; any missing information or errors spotted were corrected at the time. Data from the questionnaires was entered onto a computer on return to the university, and before entering the data into the computer, it was rechecked. Once all data was entered, the research student checked it all and any observed errors were corrected prior to the analysis of data.

7.7 Limitations of the study

Reliance on self-reported data concerning knee pain, knee pain related disability and health seeking means that there is a possibility of recall bias. The questions required participants to consider the frequency, timing and severity of symptoms of their knee pain and to think about what treatments they received or took and from whom they sought advice. Recalling might be more difficult for some participants than for others, for example older participants, which could result in differential bias in the prevalence across these groups (Patten, 2003). However, the prevalence rates were similar to some other studies.

This study applied a multistage sampling to select study sites, household and participants. However, while selecting participants from households, only adults who were present at the time of the interview in the households were included. So there is a possibility of selection bias since those who were at work were not included in this study, because data was collected during the day time from 10 am to 5 pm, to ensure the safety of the research student. Those at home may have had more health conditions, preventing them from working.

Because of time and resource constraints, data had to be collected within a limited time within each study site. About six weeks was spent in each study area and all of the data collection was completed in five months. It was collected during the winter season starting in the plain zone, then the hilly zone and lastly the mountainous zone. In Nepal, the winter season is the coldest season. As there is some evidence that weather might account for some of the differences in knee pain, this is a potential source of bias, which might have increased the rates of knee pain observed.

This study was looking at the estimate of the prevalence of knee pain and knee pain related disability and economic impact has not been measured in this study. Since musculoskeletal conditions are a major burden on individuals and their families, the health system and the social care system, with direct and indirect costs, (Woolf and Pfleger 2003), this needs to be considered in future research.

7. 8 Implications of the findings

7.8.1 Implications of the findings for policy-makers and clinical services

Knee pain is a primary symptom in osteoarthritis of the knee and the course of pain starts with intermittent weight bearing mild pain leading to more persistent chronic knee pain and then to disability (Neogi, 2011). The pain contributes to functional limitations, reduced quality of life, and increased use of health services (Halder, 1992; McAlindon et al., 1993; Dominick et al., 2004;

Ayis and Dieppe, 2009). Pain negatively affects mood, and people begin to dislike participating in social and recreational activities, thereby becoming an increasing burden on family and society (Maly and Cott, 2009). To try and prevent these consequences, attention should be given to the delivery of appropriate health services to those affected in the community. There are networks of public and private health institutions throughout the study sites for the delivery of health services. However, reported utilization of those services showed that only 55% of participants have taken advice from those facilities. Of those who did not utilize these services; one in three participants applied home remedies, one in four did not utilize those facilities thinking ageing leads to such problems and one in five refused to use these services due to cost. Further strengthening of existing services is needed with particular attention on those who cannot afford to access current services.

Delivery of physiotherapy services in public facilities was not available in rural areas. However, it was available in private sectors in the plain zone and hilly zone. Upon inquiring about physiotherapy in the management of knee pain in these areas, it was found that there was little knowledge about physiotherapy. Physiotherapy education in Nepal is at its initial phase, and it needs a strong governing policy and leadership to facilitate a rightful place in the health team (Acharya et al., 2015). Physiotherapists are available in 55.8% of private hospitals and 25% of public hospitals (Baidya et al., 2016). Physiotherapy services are only available at some district level and zonal hospitals. However, in the mountainous zone, there is no service and the nearest hospital is the regional hospital in Pokhara valley, which is 20 minutes flight or almost two days' drive by public transport. Considering this reality, there is a need to provide a service within the community, which requires training of the health professionals who are working in primary care health facilities. Therefore, the public health services planner should give attention as how to include delivery of physiotherapy in the care and support of people suffering from knee pain and knee pain related disability in all communities.

Knee pain and knee pain related disability hampers the ability to work and reduces productivity affecting the economy of the person, family, community and nation as well. In a study by Bhattarai et al. (2007), man days lost due to pain were 1.37 days/person/month and the cost per person was US$ 1,370. The costs are related to loss of productivity due to the inability to work and the cost of the management of the problems. There remains a need for an in-depth study of knee pain. This could provide a better insight into the service need to allow providers and policymakers to plan an appropriate, affordable, easily available and sustained program to reduce the gap between ecological zones as well as improving services for all.

The survey has also shown that almost half of the participants were not utilizing any available health services. For a substantial proportion, this was because they thought that there was no need for treatment because it was part of the ageing process or because they were applying home remedies. Therefore, there needs to be an emphasis on increasing the awareness and education of the public and their family members about the potential benefits of treatment and utilization of available services for knee pain. Some of these treatments are relatively low cost for example painkillers and assistive devices. However, alongside raising awareness, there needs to be greater access to services to provide these treatments. It is noticeable that for people in the mountainous areas these services are not available.

In addition to this, as earlier mentioned, knee pain might progress to chronic knee pain with persistent pain and disability, which might lead to emotional stress on the patients and their family. During the exploration of methods of treatment utilized for the management of knee pain, none of the options provided were associated with reducing emotional distress. However, in a systematic review by Phyomaung et al. (2014) there was a strong evidence for a relationship between depression and knee pain. Therefore, attention should be paid to how to tackle these factors during management of knee pain to prevent further disability.

7.8.2 Implication of the findings for researchers

After identifying the lack of knowledge of the importance of physiotherapy in the management of knee pain in Nepal, further work is needed on how best to provide these services particularly in rural and isolated communities such as the mountainous zone. Since the objectives of this thesis were to identify the prevalence of knee pain and associated knee pain disability in the community, the thesis has not explored the economic impacts of these problems on the patient, family, community, region and nation. As this will help planners of health services, further research should focus on the identification of economic impacts along with designing of novel cost-effective models for the management of identified problems of knee pain and knee pain related disability, suitable for the different ecological zones.

Further research is needed into the impact of localised weather and knee pain in the Nepalese population to identify potential preventative strategies. In addition to this, further research is required to identify other reasons for increased risks in mountainous areas. Environmental changes like the use of machinery in farming and the provision of a drinking water supply, which would reduce the physical needs to carry heavy water pots, may be helpful. Furthermore, there should be some research into how to raise awareness about the impact of kneeling, sitting cross legged and squatting, and how to promote behavioural and sociocultural changes.

The KOOS questionnaire did not include relevant questions to investigate knee related problems in a Nepalese or similar population, for example use of stairs, squatting, sitting cross-legged or going up and down hills. A similar questionnaire should be developed and validated for developing countries including Nepal.

7.9 Dissemination of findings

During the meeting with senior and local staff of the Ministry of Health, Nepal at the time of data collection, they were keen to know the results of the survey. The research student is planning to submit the main findings of the study to the Nepal Health Research Council along with the Ministry of Health and local health bodies and will publish the findings in a journal in the local language, since international journals are not available and the public cannot read publications published in English.

The findings of the research will be also disseminated in English language peer reviewed journals. The research will be targeted at journals such as the Journal of Epidemiology and Community Health, Osteoarthritis and Cartilage and Physiotherapy.

Chapter 8: Conclusion

Musculoskeletal conditions are one of the major global public health problems and one of the most common causes of physical disability (Murray and Lopez, 1997; Lohmander, 2000). Knee pain is one of the most common musculoskeletal conditions and one of the commonest causes of disability in older adults (Jordan et al 2010; Dawson et al., 2004).

A literature review, using systematic methods, was undertaken to identify population-based studies on the prevalence of knee pain and knee pain related disability in adults. All cross-sectional studies measuring the prevalence of knee pain and/or knee pain related disability using self-report measures conducted within the community in any country or region of the world in adults aged 18 years or over were included. Twenty-one studies reporting on the prevalence of knee pain were identified by the review. All the studies reported on period prevalence of knee pain, and three studies had reported on point prevalence of knee pain. The period prevalence of knee pain reported by the studies ranged from 2.4% in a study conducted in Pakistan (Gibson et al., 1996) to 49.2% in a study conducted in Thailand (Chokhanchichai et al., 2010). Point prevalence of knee pain was between 20.5% and 24.6% in the three studies, which reported on this (Jinks et al., 2004; McAlindon et al., 1992; Hoy et al., 2010). The review showed that the prevalence of knee pain increased with age and was higher in females. Although there were only a few studies, there was also a suggestion of higher rates in mountainous areas compared to coastal areas (Muraki et al., 2009) and in rural compared to urban areas (Gibson et al., 1996 and Muraki et al., 2009). Ten studies were identified that reported on knee pain related disability. The findings of the review showed that disability was higher in those with knee pain compared with those without and this was seen in all age groups. Knee pain disability was higher in females than males and in older age groups. At the time of the review, there had been no study undertaken across Nepal.

As the review identified that there were no studies undertaken in Nepal, a large-scale multistage cluster survey to measure the prevalence of knee pain and related disability in adults was undertaken in seven sites across three ecological zones of the Western Development Region of Nepal. In total 694 participants were recruited. The period prevalence of knee pain was 22.3% (95% CI 19.2% - 25.5%) and of chronic knee pain was 12.1% (95% CI 9.5 % – 14.7%). The point prevalence was 7.6% (95% CI 5.7%-9.6%). Knee pain was higher in the mountainous zone compared to the plain zone. The distribution of prevalence of knee pain was similar to that reported in other, Asian studies (Sakaibara et al., 1996; Muraki et al., 2009; Ling et al., 2010). Overall 25.6% of the 694 participants had disability, as measured by the WHO DAS 2.0, and this was significantly higher in those with knee pain compared to those without (81.2% vs. 9.5%). Disability was highest among those with knee pain in the mountainous zone, with all having disability. Despite this only 54.8% of those with knee pain sought advice for their condition. Of the different available treatments for knee pain, oral painkillers remained the most commonly used remedy (n=85, 54.8%) but less than 10% had used physiotherapy (n=13, 8.4%). Use of walking stick was common in the mountainous region. Of those not seeking advice, 49 (31.6%) felt knee pain was a feature of old age requiring no treatment and 31 (20.0%) said that treatments were too expensive. Those in the mountainous zone were less likely to seek advice, access hospital treatment or take oral medications.

This is the first large scale study of knee pain in Nepal across different ecological zones. Although it is from one region of Nepal, the findings are likely to be generalizable across the regions. The main finding of this study was that knee pain is highly prevalent in Nepal with over one in five of the population suffering from knee pain and one in ten from chronic knee pain. Pain negatively affects mood, and people begin to dislike participating in social and recreational activities, thereby becoming an increasing burden on family and society (Maly and Cott, 2009). To try and prevent these consequences, attention should be given to the delivery of appropriate health services to those affected in the community, but access and expense were important factors particularly in the mountainous area. The Government of Nepal has been supplying only limited types of essential drugs to health facilities, and there is usually a shortage (Hees et al., 2014: Morrison et al., 2015) many cannot afford to pay. There is a reliance on the use of walking sticks but these are homemade and there are no physiotherapy services to support their fitting. Physiotherapy services are only available at some district and zonal hospitals. However, in the mountainous zone, there is no service and the nearest hospital is the regional hospital in Pokhara valley, which is 20 minutes flight or almost two days drive by public transport. Therefore, there needs to be more attention on providing services and medications to those who cannot afford them currently and strengthening community services including pharmacies and physiotherapy services, particularly in mountainous regions. Lack of knowledge among participants about the benefits of treatment was also found, and there needs to be an emphasis on increasing the awareness and education of the public and their family members about the potential benefits of treatment and utilization of available services for knee pain. The findings of this study are important for Nepalese policymakers as they illustrate an unmet need, particularly in the poorest and most remote areas of the country.

The thesis has not explored the economic impacts of these problems on the patient, family, community, region and nation. As this will help to the planners of health services. Fuurther research should focus on the identification of economic impacts along with designing of novel cost-effective models for the management of identified problems of knee pain and knee pain related disability, suitable for the different ecological zones.

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Appendices

Appendix 1: Eligibility criteria for selection of studies

Basis	Inclusion criteria	Exclusion criteria
Type of studies	Cross-sectional, community-based, population studies and surveys	Clinical trials, cohort studies, case control studies; unless they report as the prevalence in the community. Studies conducted solely in: clinical occupational groups, sports
Population	Men and women	
Age	Over 18 years except those studies where researchers have included those aged 16 to 18 years and these did not represent more than 25% of the study population	Under 18 years of age
Setting	Any country	None
Language of publication	English or Nepali	Other than Nepali or English languages.
Studies published as	Peer reviewed manuscripts	Conference abstracts, PhD Thesis

Continued appendix 1

Duplicate publications	Latest issue of publication in English or Nepalese will be included	
In case of publication of more than one publication of the same study population / outcome with different in size of the study populations	Study with the largest population will be included	
Outcome measures:	Prevalence of knee pain. Prevalence of knee related disabilities Systematic reviews of prevalence of knee pain and knee related disabilities to review the reference lists.	Prevalence of solely symptomatic or radiographic osteoarthritis or pain syndrome

Appendix 2: Searched strategies in databases

MEDLINE Databases

S. No.	Search terms	Results
1	exp Osteoarthritis, Knee/	8798
2	exp Patellofemoral Pain Syndrome/	381
3	exp Ligaments, Articular/	22996
4	exp Knee Injuries/	14707
5	knee osteoarthritis.ti,ab.	3664
6	knee injur$.ti,ab.	2006
7	knee pain.ti,ab.	3448
8	patellofemoral pain.ti,ab.	769
9	exp Knee Joint/	39844
10	exp Arthralgia/	6533
11	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10	75279
12	exp Cross-Sectional Studies/	148163
13	exp Health Surveys/	369226
14	exp Population Surveillance/	45703
15	prevalence.ti,ab.	320290
16	12 or 13 or 14 or 15	754762
17	11 and 16	4509

Note: S No. = Serial number

EMBASE databases

S. No.	Search terms	Results
1.	exp Osteoarthritis, Knee/	14412
2.	exp Patellofemoral Pain Syndrome/	560
3.	exp Ligaments, Articular/	35982
4.	exp Knee Injuries/	20783
5.	knee osteoarthritis.ti,ab.	4993
6.	knee injur$.ti,ab.	2439
7.	knee pain.ti,ab.	4436
8.	patellofemoral pain.ti,ab.	897
9.	exp knee Joint/	38189
10	exp Arthralgia/	30775
11.	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10	126919
12.	exp Cross-Sectional Studies/	81717
13.	exp Population Surveillance/	140839
14.	Prevalence.ti,ab.	517294
15.	12 or 13 or 14	633935
16.	11 and 15	4632

Continued appendix 2

AMED databases

S. No.	Search terms	Results
S15	(S10 or S11 or S12 or S13) AND (S9 and S14)	198
S14	S10 or S11 or S12 or S13	5816
S13	Prevalence	3026
S12	Population surveillance	14
S11	Health survey	1513
S10	Cross sectional studies	1678
S9	(S1 or S2 or S3 or S4 or S6 or S6 or S7or S8)	5458
S8	Arthralgia knee	96
S7	Arthralgia	138
S6	Knee joint	3264
S5	Knee pain	696
S4	Knee injuries	1392
S3	Ligaments, Articular	424
S2	Patellofemoral Pain Syndrome	223
S1.	Osteoarthritis, Knee	924

Appendix 3: Cross checking of selected articles with prior consulted articles

Author/s	Title of article
McAlindon et al. (1992)	Knee pain and disability in the community
Gibson et al. (1996)	Knee pain amongst the poor and affluent in Pakistan
O' Reilly et al. (2000)	Knee pain and disability in the Nottingham community: association with poor health status and psychological distress
Zeng et al. (2004)	Low prevalence of knee and back pain in southeast China; the Shantou COPCORD study
Dawson et al. (2004)	Epidemiology of hip and knee pain and its impact on overall health status in older adults
Adamson et al. (2006)	Prevalence and risk factors for joint pain among men and women in the West of Scotland Twenty-07 study
Hoy et al. (2010)	In rural Tibet, the prevalence of lower limb pain, especially knee pain, is high: an observational study
Kim et al. (2011)	Prevalence of Knee Pain and Its Influence on Quality of Life and Physical Function in the Korean Elderly Population: A Community Based Cross-Sectional Study

Appendix 4: Risk of bias assessment questions

Criterion No.	Assessment questions	Yes	No
External validity			
1	Was the study's target population a close representation of the national population in relation to relevant variables?		
2	Was the sampling frame a true or close representation of the target population?		
3	Was some form of random selection used to select the sample, or was a census undertaken?		
4	Was the likelihood of non-response bias minimal?		
Internal validity			
5	Were data collected directly from the subjects (as opposed to a proxy)?		
6	Was an acceptable case definition used in the study?		
7	Was the study instrument that measured the parameter of interest shown to have validity and reliability?		
8	Was the same mode of data collection used for all subjects?		
9	Was the length of the shortest prevalence period for the parameter of interest appropriate?		
10	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?		
11	Summary item on the overall risk of study bias		
	Overall agreement for the 11 items		

Souirce: Hoy. et al (2011)

Appendix 5: Data extraction sheet

1 Identification features of the article:

Unique code:

Date of data extraction:

Name of author/s:

Article title:

Type of publication: e. g journal

Language of publication:

Name of Journal:

Year of publication:

Volume:

Page number:

2 Study period:

2.1 Study design: Cross sectional study, Population based,

Method of data collection: Postal, face-to-face, self-administration

2.2 Study population:

Target population:

Target Sample size:

Sampling method and sampling frame:

Response rate:

2.4 Setting (country):

3 Participant's characteristics;

Population Characteristic : Age, sex, residency, occupation, educational attainment

4 **Given definitions of outcomes in studies**: Knee pain, acute knee pain, chronic knee pain, chronic knee pain related disabilities

5. **Outcomes measures:** Knee pain, acute knee pain, chronic knee pain, chronic knee pain related disabilities

Method of data administration (for example questionnaires, instruments, tools)

6 **Type of prevalence measure** (point / period prevalence)

Duration of condition:

Prevalence rate:

Confounders:

Adjusted rates:

7 Assessing risk of bias in prevalence studies of knee pain and knee related disabilities, Damian, et al (2012)

External validity

1 Was the study's target population a close representation of the national population in relation to relevant variables?

2 Was the sampling frame a true or close representation of the target population?

Continued appendix 5

3	Was some form of random selection used to select the sample, OR was a census undertaken?
4	Was the likelihood of non-response bias minimal?
	Internal validity
5	Were data collected directly from the subjects (as opposed to a proxy)?
6	Was an acceptable case definition used in the study?
7	Was the study instrument that measured the parameter of interest shown to have validity and reliability?
8	Was the same mode of data collection used for all subjects?
9	Was the length of the shortest prevalence period for the parameter of interest appropriate?
10	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?
11	Summary item on the overall risk of study bias
12	Overall agreement for the 11 items

Appendix 6: Titles of identified eligible articles for review

Knee pain related studies:

Name of author/s	Title of article
Elizabeth et al. (1992)	Changing profile of joint disorders with age: findings from a postal survey of the population of Calderdale, West Yorkshire, United Kingdom
McAlindon et al. (1993)	Knee Pain and Disability in the Community
Jordan et.al. (1996)	Self-reported functional status in osteoarthritis of the knee in a rural southern community: the role of socio-demographic factors, obesity, and knee pain.
Gibson et al., (1996)	Knee pain amongst poor and affluent in Pakistan
Sakakibara et al. (1996)	Knee pain and its associations with age, sex, obesity, occupation and living conditions in rural inhabitants of Japan
Urwin et al. (1998)	Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation

Continued appendix 6

Bergennadda et al (1999)	Knee pain in middle age and its relationship to occupational work load and psychosocial factors
Andersion et al. (1999)	Prevalence of significant knee pain among older Americans: results from the Third National Health and Nutrition Examination Survey
Reilly et al. (2000)	Occupation and knee pain: a community study
Jinks et al. (2003)	A brief screening tool for knee pain in primary care (KNEST). 2. Results from a survey in the general population aged 50 and over
Dawson et al. (2004)	Epidemiology of hip and knee pain and its impact on overall health status in older adults
Zeng et al. (2004)	Low prevalence of knee and back pain in southeast China; the Shantou COPCORD study
Adamson et al. (2006)	Prevalence and risk factors for joint pain among men and women in the West of Scotland Twenty-07 study
Zhai et al. (2007)	Correlates of Knee Pain in Older Adults: Tasmanian Older Adult Cohort Study

Continued appendix 6

Cecci et al.(2008)	Epidemiology of hip and knee pain in a community based sample of Italian persons aged 65 and older
Muraki et al. (2009)	Prevalence of radiographic knee osteoarthritis and its association with knee pain in the elderly of Japanese population-based cohorts: the ROAD study.
Hoy et al. (2010)	In rural Tibet, the prevalence of lower limb pain, especially knee pain, is high: an observational study
Chokhanchichai et al. (2010)	The effect of religious practice on the prevalence of knee osteoarthritis
Ling et al. (2010)	Marked disability and high use of non-steroidal anti-inflammatory drugs associated with knee osteoarthritis in rural China: a cross-sectional population-based survey
Sa et al. (2011)	Knee Pain Prevalence and Associated factors in a Brazilian Population Study
In et al. (2011)	Prevalence of knee pain and its influence on quality of life and physical function in the Korean elderly population: a community based cross-sectional study

Continued appendix 6

Knee pain related disabilities studies	
McAlindon et al.(1993)	Knee pain and disability in the community
Sakakibara et al. (1996)	Knee pain and its associations with age, sex, obesity, occupation and living conditions in rural inhabitants of Japan
Jordan et al. (1997)	Self-reported functional status in osteoarthritis of the knee in a rural southern community: the role of socio-demographic factors, obesity, and knee pain.
O'Reilly et al. (1998)	Screening for pain in knee osteoarthritis: Which question?
Andersen et al.(1999)	Prevalence of significant knee pain among older Americans: results from the Third National Health and Nutrition Examination Survey
Webb et al. (2004)	Opportunities for prevention of ‘clinically significant’ knee pain: results from a population-based cross sectional survey
Jinks et al. (2007)	Osteoarthritis as a public health problem: the impact of developing knee pain on physical function in adults living in the community: (KNEST 3)

Continued appendix 6

Cecchi et al. (2009)	Measures of physical performance capture the excess disability associated with hip pain or knee pain in older persons
Lin et al.(2010)	Marked disability and high use of non-steroidal antiinflammatory drugs associated with knee osteoarthritis in rural China: a cross-sectional population-based survey
Kim et al. (2011)	Prevalence of significant knee pain among older Americans: results from the Third National Health and Nutrition Examination Survey

Appendix 7: Administered questions with duration of knee pain

Knee pain lasting for 4 weeks or at least a month-11 studies

Study references	Applied question
McAlindon et al. (1992)	Have you ever had pain in or around the knee on most days for **at least a month**?
Gibson et al. (1996)	Adults who had experienced at least 4 weeks of joint pain or swelling at any time.
Urwin et al. (1998)	Subjects were asked whether they had experienced pain in any of the following area for more than one week in the **past month**.
O'Reilly et al. (2000)	Have ever had pain in or around the knee on most days for **at least a month**? If so have you experienced any pain during the last year?
Cecci et al. (2008)	Participants were asked in the **past 4 weeks** have you had knee pain.
Muraki et al. (2009)	Knee pain was defined that in and around the knee joint on most days during the **past month**.
Chokhanchichai et al. (2010)	Patient who has had pain in or around a knee most days for **at least a month.**
Ling et al. (2010)	Have you had pain, aching, or stiffness lasting **at least a month** in or around the knee in the past 12 months?

Continued appendix 7

Kim et al. (2011)	Have you had pain, aching, or stiffness lasting **at least a month** in your knee?'
Knee pain lasting for unspecified period - 9 studies	
Bergenudd et al. (1989)	The information on occurrence of pain in the knee joints if it occurred for **more than one month** in the year preceding the examination.
Badley et al. (1992)	Does anyone in your household suffer from any pain, swelling or stiffness in their joints including knee joint? No reference was made for time period.
Jordan et al.(1996)	Knee pain on most days was recorded as present or absent
Sakakibara et al. (1996)	Have you had pain in the knee joints which lasted for **more than one month** in the past year?
Jinks et al. (2004)	Have you had pain in the last year in or around the knee?
Dawson et al. (2004)	During the past 12 months, have you had pain in or around either of your knee joints on most days for **one month or longer?**
Zeng et al. (2004)	Do you have painful joint and/or soft tissue/musculoskeletal pain and/or swollen joints and/or stiff joints and/or stiff back and/or less movement in any joint and/or less movement of the back or neck in the PAST **(More than 7 days)?**

Continued appendix 7

Zhai et al. (2006)	Knee pain was assessed by applying WOMAC index to measure data on pain, stiffness, and physical functions.
Adamson et al. (2006)	'Do you regularly suffer from any swelling, pain or stiffness in or around knee joint?'
Hoy et al. (2010)	Have you had any leg pain between last harvest and now?
Sa. et al. (2011)	Knee pain was defined as pain between the distal 1/3 of the thigh and proximal 1/3 of leg.
Knee pain lasting for 6 weeks- 1 study	
Andersen et al. (2006)	Whether they had experienced significant knee pain on most days over the preceding **six weeks.**

Appendix 8: Knee injury and Osteoarthritis Outcome's Score (KOOS) Questionnire

Following **highlighted activites** were included in the questionire from the knee Injury and Osteoarthritis Outcome Score (KOOS)

S No.	**Pain (P)**
1	P1 How often is your knee painful. What degree of pain have you experienced the last week when…?
2	P2 Twisting/pivoting on your knee?
3	P3 Straightening knee fully
4	P4 Bending knee fully
5	P5 Walking on flat surface
6	P6 Going up or down stairs
7	P7 At night while in bed
8	P8 Sitting or lying
9	P9 Standing upright
	Other Symptoms (Sy)
1	Sy1 How severe is your knee stiffness after first wakening in the morning?
2	Sy2 How severe is your knee stiffness after sitting, lying, or resting later in the day?
3	Sy3 Do you have swelling in your knee?
4	Sy4 Do you feel grinding, hear clicking or any other type of noise when your knee moves?

Continued appendix 8	
5	Sy5 Does your knee catch or hang up when moving?
6	Sy6 Can you straighten your knee fully?
7	Sy7 Can you bend your knee fully?
	Activities of daily living (A)
	What difficulty have you experienced the last week…?
1	A1 Descending
2	A2 Ascending stairs
3	A3 Rising from sitting
4	A4 Standing
5	A5 Bending to floor/picking up an object
6	A6 Walking on flat surface
7	A7 Getting in/out of car
8	A8 Going shopping
9	A9 Putting on socks/stockings
10	A10 Rising from bed
11	A11 Taking off socks/stockings
12	A12 Lying in bed (turning over, maintaining knee position)
13	A13 Getting in/out of bath
14	A14 Sitting
15	A15 Getting on/off toilet
16	A16 Heavy domestic duties (shovelling, scrubbing floors, etc)
17	A17 Light domestic duties (cooking, dusting, etc)

Continued appendix 8

Sport and recreation function (Sp)	
	What difficulty have you experienced the last week…?
1	Sp1 Squatting
2	Sp2 Running
3	Sp3 Jumping
4	Sp4 Turning/twisting on your injured knee
5	Sp5 Kneeling
	Knee-related quality of life
1	Q1 How often are you aware of your knee problems?
2	Q2 Have you modified your lifestyle to avoid potentially damaging activities to your knee?
3	Q3 How troubled is you with lack of confidence in your knee?
4	Q4 In general, how much difficulty do you have with your knee?

Appendix 9: Permission from World Health Organization to use WHODAS 2.0 and related materials and copy of self-administered questionnaire.

a <fouste@who.int>
Fri 08/02/2013 12:45
Inbox

To: Dan Bahadur Baidwar-kshetri;
You forwarded this message on 17/04/2013 17:28.
Dear Mr Kshetri,

With thanks we acknowledge receipt of the WHODAS 2.0 user agreement. We are pleased to grant you herewith a non-exclusive, royalty free license to use the WHODAS 2.0 and related material for the purpose outlined in the user agreement.

Attached you will find the WHODAS 2.0 instrument versions and an order form for the WHODAS 2.0 manual which provides further background information on the population norms, scoring algorithm, development history, psychometric properties and applications.

Kind regards,
Ms Eva Foust
Assistant
Classifications, Terminologies and Standards (CTS)
World Health Organization | Avenue Appia 20 | 1211 Geneva | Switzerland
Email: fouste@who.int | Tel: +41 22 791 20 73 | Fax: +41 22 791 41 50
Web: http://www.who.int/classifications/en/

9.2 WHODAS 2.0 12 item version, self-administered questionnaire

WHODAS 2.0

WORLD HEALTH ORGANIZATION
DISABILITY ASSESSMENT SCHEDULE 2.0

12-item version, self-administered

This questionnaire asks about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs.

Think back over the past 30 days and answer these questions, thinking about how much difficulty you had doing the following activities. For each question, please circle only one response.

In the past 30 days, how much difficulty did you have in:						
S1	Standing for long periods such as 30 minutes?	None	Mild	Moderate	Severe	Extreme or cannot do
S2	Taking care of your household responsibilities?	None	Mild	Moderate	Severe	Extreme or cannot do
S3	Learning a new task, for example, learning how to get to a new place?	None	Mild	Moderate	Severe	Extreme or cannot do
S4	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	None	Mild	Moderate	Severe	Extreme or cannot do
S5	How much have you been emotionally affected by your health problems?	None	Mild	Moderate	Severe	Extreme or cannot do

Please continue to next page...

WHODAS 2.0

WORLD HEALTH ORGANIZATION
DISABILITY ASSESSMENT SCHEDULE 2.0

12
Self

In the past 30 days, how much difficulty did you have in:						
S6	Concentrating on doing something for ten minutes?	None	Mild	Moderate	Severe	Extreme or cannot do
S7	Walking a long distance such as a kilometre [or equivalent]?	None	Mild	Moderate	Severe	Extreme or cannot do
S8	Washing your whole body?	None	Mild	Moderate	Severe	Extreme or cannot do
S9	Getting dressed?	None	Mild	Moderate	Severe	Extreme or cannot do
S10	Dealing with people you do not know?	None	Mild	Moderate	Severe	Extreme or cannot do
S11	Maintaining a friendship?	None	Mild	Moderate	Severe	Extreme or cannot do
S12	Your day-to-day work?	None	Mild	Moderate	Severe	Extreme or cannot do

H1	Overall, in the past 30 days, how many days were these difficulties present?	***Record number of days*** ____
H2	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	***Record number of days*** ____
H3	In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	***Record number of days*** ____

This completes the questionnaire. Thank you.

Appendix 10: Invitation letter to the participant in English

Dear respondent

Regards (Namaste)

I am Dan Bahadur Baidwar Kshetri, a PhD student at the University of Central Lancashire, Preston, and Lancashire, England. At moment I am in your community to conduct a survey. I am collecting information about the number of adults with the problem of knee pain in the community. I would like to ask you some questions, if you could spend some time answering my questions. It will take 20 to 30 minutes to complete this survey. I will start asking with you some general questions about your age, gender, current marital status and occupation. Then, I will ask you questions about knee pain and ability to perform your usual activities within last year. Even if you are healthy and have no difficulties with your knees, I would still like to ask.

Your participation is voluntary. During the survey, if you change your mind and are not interested in completing the survey, you can withdraw. You are also free to refuse to reply to any question that is asked in the questionnaire. Once you have completed the questionnaire and I have left your house it will not be possible to withdraw as I will not be able to identify which questionnaire is yours. By completing the questionnaire, you have agreed to take part in the survey. The information you provide in this survey is confidential. However, the overall findings will be used for research purposes, presentations, reports, and articles.

If you have any questions about this survey, you can ask me immediately on the spot or at any time. My contact address in Nepal is GPO – 10301, Kathmandu, Nepal until end of Feb 2014. After then you can contact me at my address of England: Dan Bahadur Baidwar Kshetri University of Central Lancashire, School of Postgraduate Dental and Medical Education, Greenbank Building - 321, Preston, England. PR1 2HE, email: *dbbaidwar-kshetri@uclan.ac.uk.* If you want further information about this study and have any concerns you can contact with my supervisor Maria Paola Dey, Professor of Public Health Epidemiology, University of Central Lancashire, Greenbank Building – 313, PR1 2HE, Preston, England, email *MPDey@Uclan.ac.uk.*

Appendix 11: Survey questionnaire in English

Survey questionnaire for the prevalence survey of knee pain and knee pain related disabilities in adults of the Western Development Region of Nepal

I agree to take part in to this study voluntarily.

Yes [ ] No [ ]

PART 1 - DEMOGRAPHIC INFORMATION

This portion will be completed by interviewer by observing the study site:

1. Study area code: ……………..
2. Unique house No.: ……………
3. Individual No.: ……………
4. Interview date: (Day/Month/Year): …. /…. /……..
5. Ecological zone: (*Please put a cross within brackets*)
   (1) Mountain [ ] (2) Hill [ ] (3) Terai (low land) [ ]
6. Administrative division: *(Please print in the space provided)*
   (1) District ………… (2) VDC/Municipality ……………
   (3) Ward No ………… (4). Village / Tole ……………
7. What is the gender of an interviewee? (*Please put a cross within brackets)*
   (1) Male [ ] (2) Female [ ]

This portion will be completed by interviewer asking with interviewee.

8. Have you been living in this locality for more than six months? *Please put a cross within brackets)*
   Yes [ ] No [ ]
9. What is your age?
   …….. Years
10. What is your current marital status?: (*Please put a cross within brackets*)
    (1) Never married [ ] (2) Married [ ]
    (3) Divorced [ ] (4) Separated [ ]
    (5) Widowed [ ] (6) would rather not say [ ]

11. What is your current employment status? (Please put one or more crosses within brackets)
    (1) Paid employment [ ]
    (2) Self-employed [ ]
    (3) Out of work and looking for work [ ]
    (4) Out of work but not currently looking for work [ ]
    (5) Voluntarily Retired [ ]
    (6) Unable to work [ ]
    (7) Homemaker [ ]
    (8) Other (please specify): ……………….
12. What is the highest degree or level of schooling completed?: (*Please put a cross within one or more brackets*)
    (1) Not been to school [ ]
    (2) (2) Informal education [ ]
    (3) Primary school (1 – 5 grade) [ ]
    (4) High school (6 – 10 grade) [ ]
    (5) Certificate level [ ]
    (6) Bachelor level or more [ ]

Part 2 - Questions related to knee pain

13. During the last 12 months, have you had any pain in or around either of your knee joints on most days for at least one month? (*Please mark a cross within one bracket*)

    Yes [ ] No [ ]
14. If so, have you had the knee pain for three months or more? (*Please mark a cross within brackets*)

    Yes [ ] No [ ]
15. Do you have any knee pain at the moment? (*Please mark a cross within brackets*)

    Yes [ ] No [ ]

Note: *If there is no knee pain in the above asked question number 13 moves directly to part 3, otherwise continue.*

Continued appendix 11

16. What amount of knee pain have you experienced the last week during the following activities because of your knee pain? (*Please mark a cross within one or more squares in following table)*

S No.	Activities	None (0)	Mild (1)	Moderate (2)	Severe (3)	Extreme (4)
16.1	Straightening knee fully	[ ]	[ ]	[ ]	[ ]	[ ]
16.2	Sitting on the mat (on flat surface)	[ ]	[ ]	[ ]	[ ]	[ ]
16.3	Sitting on the chair / Bench	[ ]	[ ]	[ ]	[ ]	[ ]
16. 4	Walking on flat surface	[ ]	[ ]	[ ]	[ ]	[ ]
16.5	Going uphill	[ ]	[ ]	[ ]	[ ]	[ ]
16.6	Coming down hill	[ ]	[ ]	[ ]	[ ]	[ ]
16.7	Rising from sitting	[ ]	[ ]	[ ]	[ ]	[ ]
16. 8	Standing upright	[ ]	[ ]	[ ]	[ ]	[ ]
16.9	At night while in bed	[ ]	[ ]	[ ]	[ ]	[ ]
16.1	Rising from bed	[ ]	[ ]	[ ]	[ ]	[ ]
16.11	Getting on / off toilet	[ ]	[ ]	[ ]	[ ]	[ ]
20.12	Carrying heavy weight	[ ]	[ ]	[ ]	[ ]	[ ]
16.13	Light domestic duties (cooking, dusting)	[ ]	[ ]	[ ]	[ ]	[ ]
16.14	Squatting at work for examplewashing dishes or clothes	[ ]	[ ]	[ ]	[ ]	[ ]
16.15	Squatting on toilet	[ ]	[ ]	[ ]	[ ]	[ ]
16.16	Kneeling on meditation	[ ]	[ ]	[ ]	[ ]	[ ]

17. Did you consult a health institution or a health professional in the last 12 month because of your knee pain? (*Please mark a cross within brackets)*

Yes [ ] No [ ]

18. If so, where did you consult for the treatment of your knee pain in the last 12 months? (*Please put a cross* or more *within brackets*)

Health facilities	**(Government services)**	**(Private services)**
18.1. Sub / health post	[ ]	[ ]
18.2. Primary health center	[ ]	[ ]
18.3. Local pharmacy	[ ]	[ ]
18.4 Acupuncture clinic	[ ]	[ ]
18.5 Physiotherapy clinic	[ ]	[ ]
18.6 Ayurvedic Clinic	[ ]	[ ]
18.7 Herbal Clinic	[ ]	[ ]
18.8 Others (please state): ………………………………		

19. Did you receive any of the following treatments for your knee pain? (*Please mark a cross* or more *within brackets*)

(19.1) Oral Pain killer	[ ]	(19.2) Injection	[ ]
(19.3) Physiotherapy	[ ]	(19.4) Application of heat	[ ]
(19.5) Application of heat cold	[ ]	(19.6) Bandage	[ ]
(19.7) Cream / Vaseline	[ ]	(19.8) Massage	[ ]
(19.9) Walking stick	[ ]	(19.10) Herbal medicine	[ ]
(19.11) Acupuncture	[ ]	(19.12) Ayurvedic medicine	[ ]

(19.13) others (please specify)……………………

20. If you did not seek treatment, why? (Please mark a cross in one or more spaces provided within brackets)

20.1 No faith in existing service [ ]

20.2 Aging leads such problems [ ]

20.3 Applied home remedies [ ]

20.4 Treatment is expensive [ ]

20.5 cannot go alone to health facilities [ ]

20.6 Health institutions are far from home [ ]

20.7 Others; please specify …………………………….

Part 3 - Questions related with knee pain related disabilities

Adapted from World Health Organization Disability Assessment Schedule (WHO DAS 2)

The interview is about difficulties people have because of health conditions.
Hand flashcard #1 to respondent
By health condition, I mean diseases or illnesses, or other health problems that may be short or long lasting; injuries; mental or emotional problems; and problems with alcohol or drugs.

I remind you to keep all of your health problems in mind as you answer the questions.

When I ask you about difficulties in doing an activity think about...
Point to flashcard #1

i. Increased effort
ii. Discomfort or pain
iii. Slowness
iv. Changes in the way you do the activity.

Point to flashcard #1
When answering, I'd like you to think back over the past 30 days.
I would also like you to answer these questions thinking about how much difficulty you have had, on average, over the past 30 days, while doing the activity as you usually do it.
Hand flashcard #2 *to respondent (*Use this scale when responding.)
Read scale aloud: None, mild, moderate, severe, extreme or cannot do.
Continued Appendix 11
Read scale aloud:
None, mild, moderate, severe, extreme or cannot do.

Continued appendix 11

Core questions

Q No.	In the past 30 days, how much difficulty did you have in:	None	Mild	Moderate	Severe	Extreme / cannot do
21 (S1)	Standing for long periods such as 30 minutes?	1	2	3	4	5
22 (S2)	Taking care of your household responsibilities?	1	2	3	4	5
23 (S3)	Learning a new task, for example, learning how to get to a new place?	1	2	3	4	5
24 (S4)	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	1	2	3	4	5
25 (S5)	How much have you been emotionally affected by your health problems?	1	2	3	4	5

Continued appendix 11

Continued core questions						
26 (S6)	Concentrating on doing something for ten minutes?	1	2	3	4	5
Q No.	In the past 30 days, how much difficulty did you have in:	None	Mild	Moderate	Severe	Extreme / cannot do
27 (S7)	Walking a long distance such as a kilometer [or equivalent]?	1	2	3	4	5
28 (S8)	Washing your whole body?	1	2	3	4	5
29 (S9)	Getting dressed?	1	2	3	4	5
30 (S10)	Dealing with people you do not know?	1	2	3	4	5
31 (S11)	Maintaining a friendship?	1	2	3	4	5
32 (S12)	Your day-to-day work/school?	1	2	3	4	5

H1	Overall, in the past 30 days, how many days were these difficulties present?	Record No. of days ……
H2	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	Record No. of days …….
H3	In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	Record No. of days ………

Flashcard 1 Health conditions

Health conditions

Diseases, illnesses or other health problems

Injuries

Mental or emotional problems

Problems with alcohol

Problems with drugs

Having difficulty with an activity means:

Increased effort

Discomfort or pain

Slowness

Changes in the way you do the activity

Think about the past 30 days only

Flashcard 2

1	2	3	4	5
None	Mild	Moderate	Severe	Extreme / Cannot do

Appendix 12: Forward translated questionnaire from English to Nepali (T1)

Translation 1 (T1)

Q No		हो	होइन
13	गएको १२ महिनामा के तपाईंको घुंडा वा घुँडाको जोर्नी वोरीपरी झण्डै दिनभरी जस्तैः एक महिना सम्म दुखि रह्यो?	[ ]	[ ]
14	त्यसो हो भने, के तपाईंलाई तिन महिना वा सो भन्दा बढी घुडा दुखेको छ त ?	[ ]	[ ]
15	के तपाइलाई अहिले घुडा दुखि राखेको छ त ?	[ ]	[ ]

16. घुडाँ दुखाईको कारणले गर्दा तलको क्रियाकलापमा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ?

S NO.	क्रियाकलापहरू	(गार्हो हुँदै भएन)	(अलि कती भयो)	(ठीक ठिकै भयो)	(धेरै गार्हो भयो)	(सार्है गार्हो भयो)
1	घुडाँ पुरा तन्काउदा)	[ ]	[ ]	[ ]	[ ]	[ ]
2	गुन्द्रिमा वा सम्म सतहमा बस्दा	[ ]	[ ]	[ ]	[ ]	[ ]
3	कुर्सीमा वा बेन्चमा बस्दा	[ ]	[ ]	[ ]	[ ]	[ ]
4	सम्म सतहमा हिन्दा	[ ]	[ ]	[ ]	[ ]	[ ]
5	उकालो चढ्दा	[ ]	[ ]	[ ]	[ ]	[ ]
6	ओह्रालो झर्दा	[ ]	[ ]	[ ]	[ ]	[ ]
7	बसेको ठाउबाट उठ्दा	[ ]	[ ]	[ ]	[ ]	[ ]
8	ठाडो उभिदा	[ ]	[ ]	[ ]	[ ]	[ ]
9	रात्तीमा ओछ्यानमा हुदा	[ ]	[ ]	[ ]	[ ]	[ ]
10	ओछायाँबाट उठ्दा	[ ]	[ ]	[ ]	[ ]	[ ]
11	शौचालयमा बस्दा वा उठ्दा	[ ]	[ ]	[ ]	[ ]	[ ]
12	गह्रुंगो भारी बोक्दा वा उचाल्दा	[ ]	[ ]	[ ]	[ ]	[ ]
13	घरमा हलुका काम गर्दा, जस्तै – खाना पकाउँदा, कुच्चो लगाउँदा	[ ]	[ ]	[ ]	[ ]	[ ]
14	बसेर काम गर्दा जस्तै भाडा माझ्दा वा कपडा धुदा	[ ]	[ ]	[ ]	[ ]	[ ]
15	सौचालयमा बस्दा	[ ]	[ ]	[ ]	[ ]	[ ]
16	ध्यान गर्दा घुडा दोब्र्याएर बस्दा)	[ ]	[ ]	[ ]	[ ]	[ ]

17. तपाइको घुडाको दुखाईको कारणलेगर्दा गएको १२ महिनामा के तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भयो त?

Yes [सल्लाह लिएँ] No [लिईन]

18. यदि तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भएको थियो भने काहाबाट लिनु भयो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

SN	स्वास्थ्य संस्थाहरू	सरकारी	निजी
1	उप-स्वास्थ्य चौकी	[ ]	[ ]
2	प्राथमिक स्वास्थ्य केन्द्र	[ ]	[ ]
3	सरकारी अस्पताल	[ ]	[ ]
4	प्राइभेट अस्पताल	[ ]	[ ]
5	स्थानीय औषधि पसल	[ ]	[ ]
6	अकुपन्चर क्लीनीक	[ ]	[ ]
7	फिजियोथेरापी क्लिनिक	[ ]	[ ]
8	आयुर्वेदिक क्लिनिक	[ ]	[ ]
9	जडीबुटी क्लिनिक	[ ]	[ ]
10	अन्य (कृपया भन्नुहोस)	[ ]	[ ]

19. तपाईको घुंडा दुखाईको उपचारको सिलसिलामा तलका कुनै उपचार लिनु भएको छ? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

SN	ब्यबहारिक उपचार पद्दति	क्रस चिन्ह लगाउनुहोस्
1	दुखाई कम गर्ने खाने चक्की	[ ]
2	सूई	[ ]
3	फिसिओथेरापी	[ ]
4	तातोले सेकाउने	[ ]
6	चिसोले सेकाउने	[ ]
7	पट्टि बाध्ने	[ ]
8	मलम वा भ्यासिलिन लगाउने	[ ]
9	मालिस गर्ने	[ ]
10	लठ्ठी टेकेर हिड्ने	[ ]
11	जडिबुटी औषधि	[ ]
13	अकुपन्चर	[ ]
14	आयुर्वेदिक औषधि	[ ]
15	अरु भए , कृपया भन्नुहोस	[ ]

20. यदि तपाईले कुनै उपचार गर्नु भएको छैन भने किन नगर्नु भएको?

SN	उपचार नगर्नको कारणहरु	क्रस चिन्ह लगाउनुहोस्
1	उपलब्ध सेवामा विशवास नै नभएर	[ ]
2	उमेरको कारणले यस्तो समस्या आइहाल्छ	[ ]
3	घरेलु औषधि उपचार गरेकोले	[ ]
4	औषधि उपचार नै महँगो भएर	[ ]
5	स्वास्थ्य सुबिधा भए पनि एक्लै जान नसकेर	[ ]
6	स्वास्थ्य संस्था घरबाट टाढा भएर	[ ]
7	अरु भए, कृपया भन्नुहोस	[ ]

Appendix 13: Forward translated questionnaire from English into Nepali

<u>घुडा दुखाइ सम्बन्धी प्रश्नहरु (T2)</u>

गएको १२ महिनामा के तपाईंलाई कुनै पनि घुडा वा घुडाको जोर्नी वरिपरी कम्तिमा १ महिना सम्म धेरै जशो दुखी राखेको थियो ?

थियो / थिएन

यदी थियो भने ३ महिना वा त्यो भन्दा बढी सम्म तपाईंको घुडा दुख्ने गरेको थियो त?

यो / थिएन

के अहिले पनि घुडा दुखिराखेको छ्?

छ / छैन

घुडाँ दुखाईको कारणले तपसिल्का किर्याकलाप गर्दा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ?

दु:खाइको मात्रा /

गार्हो हुँदै भएन

अलि कती भयो

ठीक ठिकै भयो

धेरै गार्हो भयो

सार्हे गार्हो भयो

किर्याकलापहरु

घुडा सिधा गर्दा

गुन्द्रिमा या सम्मो ठाउमा बस्दा

कुर्ची या बेन्चमा बस्दा

सम्मो ठाउमा हिड्दा

उकालो उक्लदा

ओरालो झर्दा

बसिराखेर उठ्दा

ठिङ उभीदा

रातीमा ओछ्यानमा हुँदा

ओह्ह्यन्बाट उठ्दा

चर्पिमा बस्दा वा उठ्दा

गर्हौ भारी बोकदा

हलका घरआयसी काम गर्दा उदाहरण: पकाउने, बढार्ने

बसेर काम गर्दा उदाहरणको लागि भाडा माझ्दा, लुगा धुदा

टुक्रुक बसेर सौच गर्दा

घुडा टेकेर ध्यान गर्दा

के तपाईंले बिगत १२ महिनामा घुडा दुखेर स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसँग परामर्स लिनु भयो ?
भयो / भयन
यदी लिनु भएको भय बिगत १२ महिनामा घुडा दुखेको उपचारको लागि कहाँ बाट परामर्स लिनु भयो ?
(कृपया कोस्ट भित्रको एक वा त्यो भन्दा बढी स्थानमा क्रस चिन्ह लगाउनु होस्)
निजी
18.1 उप / स्वास्थ्य चौकी
18.2 प्राथमिक स्वास्थ्य केन्द्र
18.3 सरकारी अस्पताल
18.4 निजी अस्पताल
18.5 स्थानिय औषधी पसल
18.6 अक्कुपञ्चर क्लिनिक
18.7 फिजिओथेरापी क्लिनिक
18.8 आयुर्वेदिक क्लिनिक
18.9 जडिबुटी क्लिनिक
19.10 अरु कुनै (कृपया यहाँ लेख्नुहोस्)
के तपाईंले घुडा दुखेको लागि तल दिएका मध्ये कुनै उपचार लिनु भएको छ् ?
(कृपया कोस्ट भित्रको १ वा त्यो भन्दा बढी स्थानमा क्रस चिन्ह लगाउनु होस्)
प्रयोग गरिएका उपचार बिधिहरु
19.1 दुखाइ कमगर्ने खाने औषधीहरु
19.2 सुईहरु
19.3 फिजिओथेरापी
19.4 तातोले सेक्ने
19.5 चिसो लगाएर
19.6 पट्टी बाधेर
19.7 मल्हम वा भेसलिन लगाएर
19.8 मालिस गर्ने
19.9 टेकेर हिंड्ने लठ्ठी
19.10 जडिबुटी औषधी
19.11 अक्कुपञ्चर
19.12 आयुर्वेदिक औषधी
19.13 अरु कुनै (कृपया यहाँ लेख्नुहोस्)
Q. No. 20 यदी उपचार नखोज्नु भएको भए किन न खोज्नु भएको?
उपचार नलिनुका कारणहरु
20.1 उप्लब्ध सेवामा विश्वाश नभएर
20.2 उमेर बढेको कारणले यस्ता समस्याहरु हुन्छन्र
20.3 घरेलु उपचार बिधिहरु
20.4 उपचार महगो भ्एर
20.5 एक्लै स्वास्थ्य सुबिधा लीन स्वास्थ्य संस्थामा जान नसकेर
20.6 अरु कुनै (कृपया यहाँ लेख्नुहोस्)

Appendix 14: Synthesized Nepali version final questionnaire (T3)

Q No.	Synthesized translated questions in Nepali language
13.	गएको १२ महिनामा, के तपाईंको घुंडा वा घुँडाको जोर्नी वोरीपरी झण्डै दिनभरी जस्तैः एक महिना सम्म दुखि रह्यो? थियो / थिएन
14.	यदी थियो भने, ३ महिना वा त्यो भन्दा बढी सम्म तपाईंको घुडा दुख्ने गरेको थियो? थियो / थिएन
15.	के अहिले पनि घुडा दुखिराखेको छ्? छ् / छैन
16.	घुडाँ दुखाईको कारणले तपसिल्का किर्याकलाप गर्दा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ?
16.1	घुडाँ पुरा तन्काउदा
16.2	गुन्द्रिमा या सम्मो ठाउमा बस्दा
16.3	कुर्सीमा वा बेन्चमा बस्दा
16. 4	सम्मो ठाउमा हिड्दा
16.5	उकालो उक्लदा
16.6	ओरालो झर्दा
16.7	बसिराखेर अनी उठ्दा
16. 8	ठिङ उभीदा
16.9	रातीमा ओछ्यानमा हुँदा

16.10 ओछानयाँबाट उठ्दा

16.11 शौचलयमा बस्दा वा उठ्दा

20.12 गर्हौ भारी बोकदा

16.13 घरमा हलुका काम गर्दा, जस्तै – खाना पकाउँदा, कुच्चो लगाउँदा

16.14 टुक्रुक बसेर काम गर्दा जस्तै: भाडा माझ्दा वा कपडा धुदा

16.15 टुक्रुक बसेर सौच गर्दा

16.16 घुडा दोब्रायर ध्यान गर्दा

17. के तपाईंले बिगत १२ महिनामा घुडा दुखेर स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसँग परामर्स लिनु भयो ?

सल्लाह लिएँ / सल्लाह लिईन

18. यदि तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भएको थियो भने काहाबाट लिनु भयो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

स्वास्थ्य संस्थाहरू

सरकारी

18.1 उप / स्वास्थ्य चौकी

18.2 प्राथमिक स्वास्थ्य केन्द्र

18.3 सरकारी अस्पताल

18.4 निजी अस्पताल

18.5 स्थानिय औषधी पसल

18.6 अक्कुपञ्चर क्लिनिक

18.7 फिजिओथेरापी क्लिनिक

18.8 आयुर्वेदिक क्लिनिक

18.9 जडिबुटी क्लिनिक

18.10 अरु कुनै (कृपया यहाँ लेख्नुहोस्)

19. के तपाईंले घुडा दुखेको लागि तल दिएका मध्ये कुनै उपचार लिनु भएको थियो ? (कृपया कोस्ट भित्रको एक वा त्यो भन्दा बढी कोठाहहरुमा क्रस चिन्ह लगाउनु होस्)

प्रयोग गरिएका उपचार बिधिहरु

19.1 दुखाइ कमगर्ने खाने औषधीहरु

19.2 सुईहरु

19.3 फिजिओथेरापी

19.4 तातोले सेक्ने

19.5 चिसो लगाएर

19.6 पट्टी बाधेर

19.7 मल्हम वा भेसलिन लगाएर

19.8 मालिस गर्ने

19.9 टेकेर हिंड्ने लठ्ठी

19.10 जडिबुटी औषधी

19.11 अक्कुपञ्चर

19.12 आयुर्वेदिक औषधी

19.13 अरु कुनै (कृपया यहाँ लेख्नुहोस्)

20 यदी उपचार नखोज्नु भएको भए किन न खोज्नु भएको?

उपचार नलिनुका कारणहरु:

20.1 उप्लब्ध सेवामा विश्वाश नभएर

20.2 उमेर बढेको कारणले यस्ता समस्याहरु हुन्छन्न

20.3 घरेलु औषधि उपचार गरेकोले

20.4 उपचार महगो भ्एर

20.5 एक्लै स्वास्थ्य सुबिधा लीन स्वास्थ्य संस्थामा जान नसकेर

20.6 स्वास्थ्य संस्था घरबाट टाढा भएर

20.7 अरु कुनै (कृपया यहाँ लेख्नुहोस्)

Appendix 15: Backward translated questionnaire

Backward Translation (BT1)

Q No.	Backward translation (T3)
13	Did you feel persistence pain in or around either of knees lasting for one month or more during previous 12 months? Yes/No
14	If so , whether the pain was lasted for three months or more Yes/No
15	Are you feeling knee pain, at the moment? Yes/No
16	Because of knee pain how much knee pain did you feel during performance of the following activities?
16.1	Straightening the knee joint
16.2	Sitting on flat surface or mat
16.3	Sitting on chair or a bench
16. 4	Walking on flat surface
16.5	Climbing uphill
16.6	Getting downhill
16.7	Standing from sitting position
16. 8	Standing erectly
16.9	At night on bed
16.10	Getting off bed
16.11	Getting on / off toilet
20.12	Carrying heavy weight
16.13	Performing light work at home e. g. Cooking, dusting

Continued appendix 15.

16.14	Squatting at work for exampleWashing dishes, or washing clothes
16.15	Squatting on toilet
16.16	Kneeling on meditation
17	Did you seek consultation for knee pain at heath facilities or with heath workers in last 12 months? Yes/No
18.	If so, where did you seek for treatment? (please mark cross in one or more squares) Health facilities Governmental Private
18.1	Sub/health post
18.2	Primary health centre
18.3	Governmental hospital
18.4	Private hospital
18.5	Local pharmacy
18.6	Acupunctures clinics
18.7	Physiotherapy clinic
18.8	Ayurvedic clinic
18.9	Herbal clinic
18.10	Others (specify...)
19.	Did you receive any following methods of treatment for your knee pain? (please mark cross in one or more squares)

Continued appendix 15.

	Applied methods of treatment
19.1	Oral pain killers
19.2	Injections
19.3	Physiotherapy
19.4	Application of heat
19.5	Application of cold
19.6	Bandage application
19.7	Ointment or Vaseline
19.8	Massage
19.9	Walking stick
19.10	Herbal medicine
1911	Acupuncture
1912	Ayurvedic medicine
19.13	Others (specify...)
20.	If you did not seek treatment, why?
20.1	No faith on available services
20.2	Aging can develop such problems
20.3	Application of home remedies
20.4	Costly treatment
20.5	Inability to attend health facility alone
20.6	Health facilities are far from house
20.7	Others (specify...)

Appendix 16: Backward translated questionnaire (BT2)

Q No.	Backward translation (T4)
12	In the past 12 months, did you experience pain in or around the knee joint for the past one month?
	Yes / No
13	If yes, then did it persist for 3 or more months?
	Yes / No
14	Does is still hurt?
	Yes / No
15	How severe was the knee pain during performance of the following your daily activities?
	Activities
16	Because of knee pain how much knee pain did you feel during performance of the following activities?
16.1	straightening the knee joint
16.2	while sitting on a mat or sitting on the ground
16.3	sitting on a chair or a bench
16. 4	walking on a ground level
16.5	climbing uphill
16.6	walking downhill
16.7	getting up from sitting position
16. 8	Standing erect
16.9	at night on bed
16.10	while getting off the bed
16.11	Getting on / off toilet

Continued appendix 16.

20.12	while carrying heavy weight
16.13	while doing light work at home e.g., cooking or sweeping
16.14	squatting at work like washing dishes or clothes
16.15	squatting on toilet
16.16	kneeling on meditation
17	In the past 12 months, have you taken any advice for your knee pain from the health organisations or health professionals?
	took advice/ didn't take advice
18	If you took advice from the health organisations or health professionals then where from? (please tick one or more from below)
	Health organisation
	government
	private
18.1	sub/health post
18.2	primary health centre
18.3	government hospital
18.4	private hospital
18.5	medical shop
18.6	acupuncture clinic
18.7	physiotherapy clinic
18.8	Ayurvedic clinic
18.9	homeopathy clinic
18.10	Others (please mention)

Continued appendix 16.

19	Have you taken any of the following mentioned treatment for the knee pain? (please cross one or more of the following) therapy used)
	Applied modalities of treatment
19.1	oral medication for pain relief
19.2	inject able
19.3	physiotherapy
19.4	Application of heat
19.5	Application of cold
19.6	bandage
19.7	ointment or Vaseline
19.8	massage
19.9	walking stick
19.10	herbal medicine
19.11	Acupuncture
19.12	Ayurvedic medicine
19.13.	others (please mention)
20	If you did not seek medical advice then why not?
	reasons for not taking medical advice
20.1	did not believe on the service provided
20.2	because of the old age, such problems occur
20.3	using home medications
20.4	expensive treatment
20.5	cannot go alone to seek health advice at health facilities
20.6	medical centre being far from home

Appendix 17: Opinions of all team members on the assessment of backward translated Nepali version questionnaire

Q No.	Backward translated questions in English (BT1)	(BT2)	Identified difference	Opinions of team member RST	SVR1	SVR2	SVR 3	PhD *
13	Did you feel persistence pain in or around either of knees lasting for one month or more during previous 12 months?	In the past 12 months, did you experience pain in or around the knee joint for the past one month?	**RSR:** Orders of words are different with missing of continuous pain in translation of T4. **SVR1:** Not past one month and knee joint, and most of days not mentioned in BT1. **SVR2:** Inconsistence, not mentioned knee joint. **SVR3:** Missing of most days and at least one month period.	?	?	?	?	?

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD studentRST = research student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Continued appendix 17

16.1	Straightening the knee joint	Straightening the knee joint	**SVR1:** the word fully is missing in both.	OK	?	OK	OK	OK
16.2	Sitting on flat surface or mat.	While sitting on a mat or sitting on the ground	**SVR1:** Ground vs. flat surface. **SVR2:** Difference in sitting on ground in BT2	OK	OK /?	?	OK	OK
16.4	Walking on flat surface	Walking on a ground level	**RSR**: Different words for flat surface. **SVR1:** flat surface vs. ground. **SVR2:** flat surface vs. ground.	?	Ok /?	?	BT1	OK

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD studentRST = research student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Continued appendix 17

17	Did you seek consultation for knee pain at heath facilities or with heath workers in last 12 months?	In the past 12 months, have you taken any advice for your knee pain from the health organisations or health professionals?	**RSR:** Different words with same meaning. **SVR1:** Advice vs. consultation subtly different	?	?	OK	BT1	OK
18.5	Local pharmacy	Medical shop	**RSR:** Different words used for pharmacy with similar meaning in Nepali.	?	?	OK	BT1	OK
18.9	Herbal clinic	homeopathy clinic	**RSR**: Difference in BT1. **SVR1**: No BT1	? / BT1	BT1	OK	OK	OK
19.7	Ointment or Vaseline	Ointment or Vaseline	**SVR1:** Cream	OK	?	OK	OK	OK

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD studentRST = research student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Appendix 18: Compiled inconsistent opinions of the members of the team on backward translated Nepali version questionnaire

S No.	Q No.	Backward translated questions in English (BT1)	(BT2)	Identified differences	Opinions RST	SVR1	SVR2	SVR 3	PhD *
1	13	Did you feel persistence pain in or around either of knees lasting for one month or more during previous 12 months?	In the past 12 months, did you experience pain in or around the knee joint for the past one month?	**Dan:** Orders of words are different with missing of continuous pain in translation of T4. **Paola:** Not past one month and knee joint, and most of days not mentioned in BT1. **Chris:** Inconsistence, not mentioned knee joint. **James:** Missing of most days and at least one month period.	?	?	?	?	?

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD student, RST = Research Student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Contined appendix 18

2	16.1	Straightening the knee joint	Straightening the knee joint	**Paola:** the word fully is missing in both.	OK	?	OK	OK	OK
3	16.2	Sitting on flat surface or mat.	While sitting on a mat or sitting on the ground	**Paola:** Ground vs. flat surface. **Chris:** Difference in sitting on ground in BT2	OK	OK /?	?	OK	OK
4	16.4	Walking on flat surface	Walking on a ground level	**Dan**: Different words for flat surface. **Paola:** flat surface vs. ground **Chris:** flat surface vs. ground.	?	Ok /?	?	BT1	OK
5	17	Did you seek consultation for knee pain at heath facilities or with heath workers in last 12 months?	In the past 12 months, have you taken any advice for your knee pain from the health organisations or health professionals?	**Dan:** Different words with same meaning. **Paola:** Advice vs. consultation subtly different	?	XX /?	OK	BT1	OK

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD student, RST = Research Student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Contined appendix 18

6	18.5	Local pharmacy	medical shop	**Dan:** Different words used for pharmacy with similar earning in Nepali.	?	?	OK	BT1	OK
7	18.9	Herbal clinic	homeopathy clinic	**Dan**: Difference in BT1. **Paola**: No BT1	? / BT1	BT1	OK	OK	OK
8	19.7	Ointment or Vaseline	Ointment or Vaseline	**Paola:?** Cream	OK	?	OK	OK	OK

Note: BT = Backward translation, OK = agreed to apply, PHD = PhD student, RST = Research Student, SVR = supervisor, Sign of interrogation (?) = not agreed for application, S. No. = Serial number, Q NO. = Question number

Appendix 19: Final translated questionnaire of knee pain in Nepali version with back ward translations

Q No.	Final Nepali version questions	Backward translated questions into English Translator (BT1)	Translator (BT2)
13.	गएको १२ महिनामा, के तपाईंको घुंडा वा घुँडाको जोर्नी वोरीपरी झण्डै दिनभरी जस्तैः एक महिना सम्म दुखि रह्यो?	Did you feel persistence pain in or around either of knees lasting for one month or more during previous 12 months?	In the past 12 months, did you experience pain in or around the knee joint for the past one month?
	जोर्नी वोरीपरी झण्डै दिनभरी जस्तैः एक महिना सम्म दुखि रह्यो?	Yes / No	Yes / No
	थियो / थिएन	Yes / No	Yes / No
14.	यदी थियो भने, ३ महिना वा त्यो भन्दा बढी सम्म तपाईंको घुडा दुख्ने गरेको थियो?	If so , whether the pain was lasted for three months or more	If yes, then did it persist for 3 or more months?
15.	के अहिले पनि घुडा दुखिराखेको छ्?	Are you feeling knee pain, at the moment?	Does is still hurt?
	थियो / थिएन	Yes / No	Yes / No
16.	घुडाँ दुखाईको कारणले तपसिल्का किर्याकलाप गर्दा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ?	Because of knee pain, how much knee pain did you feel during performance of the following activities?	How severe was the knee pain during performance of the following your daily activities?

16.1	घुडाँ पुरा तन्काउदा	Straightening the knee joint	Straightening the knee joint
16.2	गुन्द्रिमा या सम्मो ठाउमा बस्दा	Sitting on flat surface or mat.	While sitting on a mat or sitting on the ground
16.3	कुर्सीमा वा बेन्चमा बस्दा	Sitting on chair or a bench	Sitting on a chair or a bench
16.4	सम्मो ठाउमा हिड्दा	Walking on flat surface	Walking on a ground level
16.5	उकालो उक्लदा	Climbing uphill	Climbing uphill
16.6	ओरालो झर्दा	Getting downhill	walking downhill
16.7	बसिराखेर अनी उठ्दा	Standing from sitting posture	Getting up from sitting posture
16.8	ठिङ उभीदा	Standing erectly	Standing erect
16.9	रातीमा ओछ्यानमा हुँदा	At night on bed	At night on bed
16.1	ओछानयाँबाट उठ्दा	Getting off bed	While getting off the bed
16.11	शौचलयमा बस्दा वा उठ्दा	Getting on/off toilet	Getting on/off toilet
16.12	गर्हौ भारी बोकदा	Carrying heavy weight	While carrying heavy weight
16.13	घरमा हलुका काम गर्दा, जस्तै – खाना पकाउँदा, कुच्चो लगाउँदा	Performing light work at home, e.g., cooking, dusting	While doing light work at home, e.g., cooking or sweeping
16.14	टुक्रुक बसेर काम गर्दा जस्तै: भाडा माझ्दा वा कपडा धुदा	Squatting at work for examplewashing dishes or washing clothes	Squatting at work like washing dishes or clothes
16.15	टुक्रुक बसेर सौच गर्दा	Squatting on toilet	Squatting on toilet
16.16	घुडा दोब्रायर ध्यान गर्दा	Kneeling on meditation	Kneeling on meditation

Continued appendix 19

17.	के तपाईंले बिगत १२ महिनामा घुडा दुखेर स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसँग परामर्स लिनु भयो ?	Did you seek consultation for knee pain at heath facilities or with heath workers in last 12 months?	In the past 12 months, have you taken any advice for your knee pain from the health organisations or health professionals?
	सल्लाह लिएँ / सल्लाह लिईन	Yes/No	Took advice/ didn't take advice
18.	यदि तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भएको थियो भने काहाबाट लिनु भयो?	If so, where did you seek for treatment?	If you took advice from the health organisations or health professionals then where from?
	स्वास्थ्य संस्थाहरू	Health facilities	Health organisation
	सरकारी	Governmental	Governmental
	निजी	Private	Private
18.1	उप / स्वास्थ्य चौकी	Sub/health post	Sub/health post
18.2	प्राथमिक स्वास्थ्य केन्द्र	Primary health centre	Primary health centre
18.3	सरकारी अस्पताल	Governmental hospital	Government hospital
18.4	निजी अस्पताल	Private hospital	Private hospital
18.5	स्थानिय औषधी पसल	Local pharmacy	Medical shop
18.6	अक्कुपञ्चर क्लिनिक	Acupuncture clinic	Acupuncture clinic
18.7	फिजिओथेरापी क्लिनिक	Physiotherapy clinic	Physiotherapy clinic
18.8	आयुर्वेदिक क्लिनिक	Ayurveda clinic	Ayurveda clinic
18.9	जडिबुटी क्लिनिक	Herbal clinic	Homeopathy clinic
18.10	अरु कुनै (कृपया यहाँ लेख्नुहोस्)	Others (specify...)	Others (please mention)

Continued appendix 19

19.	के तपाईंले घुडा दुखेको लागि तल दिएका मध्ये कुनै उपचार लिनु भएको थियो?	Did you receive any following methods of treatment for your knee pain?	Have you taken any of the following mentioned treatment for the knee pain?
19.1	दुखाइ कमगर्ने खाने औषधीहरु	Oral pain killers	Oral medication for pain relief
19.2	सुईहरु	Injections	Injections
19.3	फिजिओथेरापी	Physiotherapy	Physiotherapy
19.4	तातोले सेक्ने	Application of heat	Application of heat
19.5	चिसो लगाएर	Application of cold	Application of cold
19.6	पट्टी बाधेर	Bandage application	Bandage
19.7	मल्हम वा भेसलिन लगाएर	Ointment or Vaseline	Ointment or Vaseline
19.8	मालिस गर्ने	Massage	Massage
19.9	टेकेर हिंड्ने लठ्ठी	Walking stick	Walking stick
19.1	जडिबुटी औषधी	Herbal medicine	Herbal medicine
19.11	अक्कुपञ्चर	Acupuncture	Acupuncture
19.12	आयुर्वेदिक औषधी	Ayurveda medicine	Ayurveda medicine
19.13	अरु कुनै (यहाँ लेख्नुहोस्)	Others (specify...)	Others (please mention)

Continued appendix 19

20.	यदी उपचार नखोज्नु भएको भए किन न खोज्नु भएको?	If you did not seek treatment, why?	If you did not seek medical advice then why not?
	उपचार नलिनुका कारणहरु	Reasons for not taking treatment	Reasons for not taking medical advice
20.1	उप्लब्ध सेवामा विश्वाश नभएर	No faith on available services	Did not believe on the service provided
20.2	उमेर बढेको कारणले यस्ता समस्याहरु हुन्छन्न	Aging can develop such problems	Because of the old age, such problems occur
20.3	घरेलु औषधि उपचार गरेकोले	Application of home remedies	Using home medications
20.4	उपचार महगो भ्एर	Costly treatment	Expensive treatment
20.5	एक्लै स्वास्थ्य सुबिधा लीन स्वास्थ्य संस्थामा जान नसकेर	Inability to attend health facility alone	Cannot go alone to seek health advice at health facilities
20.6	स्वास्थ्य संस्था घरबाट टाढा भएर	Health facilities are far from house	Medical centre being far from home
20.7	अरु कुनै (यहाँ लेख्नुहोस्)	Others (specify...)	Others (please mention)

Appendix 20: invitation letter in Nepali

सहभागीहरु लाई अनुरोध पत्र

सहभागी महोदय

नमस्ते

मेरो नाम दान बहादुर बैदवार क्षेत्री हो र हाल म बेलायत स्थित ल्यान्केसायर केन्द्रिय विश्वविध्यालयमा विध्यावारीधी तहमा अध्यनरथ छु । हाल म नेपालका बयस्कहरुमा हुन सक्ने घुडा दुखाइ तथा असमर्थता सम्बन्धी समस्याहरुको सर्वेक्षेण गर्नको लागि यस ठाउँमा आएको छु। मैले यस समुदायमा बयस्कहरुमा भएका घुडा समन्धी समस्याहरु र त्यसबाट हुनसक्ने असमर्थता समबन्धी तथ्यान्क संकलन गर्दैछु।

यसको लागि यदि तपाइले केहि समय मैले सोधेंका प्रश्नहरुको जवाफ दिनको लागि बिताउन सक्नु हुन्छ भने तपाइँ संग केहि प्रश्नहरु सोध्न चाहन्छु। यसकोलागि २० देखि ३० मिनेट समय लाग्न सक्छ। सुरुमा, मैले तपाइ सँग तपाइको उमेर, बैबाहिक तथा पेशागत स्थिती जस्ता सामान्य प्रस्नहरु सोध्नेछु। यसपछि घुडा समन्धी समस्याहरु र त्यसबाट हुनसक्ने असमर्थता हरुले तपाइलाई गएको सालमा पुराएको अबरोध बारेमा सोध्नेछु। हाल तपाईंलाई घुडा सम्बन्धि समस्या नभय पनि मैले यो समुदायमा कतिजना लाइ यस्तो समस्या छ भन्ने तथ्य थाहा पाउनु पर्ने भएको हुदा तपाईलाई प्रस्नहरु सोध्नेछु।

Continued appendix 20

यदि तपाईलाई यस सर्वेक्षेण समन्धी कुनै जिज्ञासा भएमा सर्वेक्षेण पछी तुरुन्तै अन्तरबार्ता स्थानमा वा कुनै पनि बेला मसंग संपर्क राखीसोध्न सक्नु हुनेछ। संपर्कको लागी २०७० साल चैत्र मसान्त सम्म मेरो नेपालको ठेगाना: पत्र मन्जुसा नम्बर १०३०१ , सुन्धारा, काठमाडौँ, नेपाल हुनेछ। त्यसपछी जरुरी परेमा तपाईंले मलाइ मेरो बेलायतको तपसिलको ठेगानामा: दन्त तथा चिकित्सा बिभाग, लान्केसायर केन्द्रिय बिश्वबिद्यालय, ग्रिनबैंक भवन - ३२१, प्रेस्टन, बेलायत, पोस्ट कोड: PR1 2HE , वा मेरो इमेल dbbaidwar-kshetri@uclan.ac.uk ठेगानामा सम्पर्क गर्न सक्नु हुनेछ। यस अतिरिक्त, यदी तपाईंलाई यस् भन्दा बढी बुझ्ने चाहना भएमा तपाईंले मेरो सुपरभाईजर प्राध्यापक मारिया पाओला डे, जनस्वास्थ्य तथा रोग बिज्ञान बिभाग, लान्केसायर केन्द्रिय बिश्वबिद्यालय, ग्रिनबैंक भवन – 313, प्रेस्टन, बेलायत, पोस्ट कोड: PR1 2HE , वा इमेल MPDey@Uclan.ac.uk मा सम्पर्ग गर्न सक्नु हुनेछ।

मिती : ....

Appendix 21: Questionnaire for pre test and pilot test

पशिमान्चल बिकास क्षेत्रका, नेपालका बयस्कहरुमा हुन सक्ने घुडा दुखाइ तथा असमर्थता सम्बन्धी समस्याहरुको सर्वेक्षेण प्रश्नावली

म यस् अन्तर्वातामा सहभागी हुन स्वइच्छाले मन्जुर

छु [ ] **छैन** [ ]

भाग १: पारिवारिक विवरण सम्बन्धित प्रश्नावली (कृपया प्रश्न नम्बर १-देखी ६-सम्मका प्रश्नहरु को जवाफ सर्वेक्षेक आँफैले अबलोकन गरी भर्नु पर्नेछ:

(१) अध्ययन क्षेत्र संकेत नम्बर

(२) सहभागि नम्बर: ...

(३) घरको संकेत नम्बर: ...

(४) अन्तरबार्ता मिति (दिन/ महिना/ साल): .../ ...../ ...

(५) भौगोलिक क्षेत्र (कृपया उयुक्त कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) उच्च पहाड ( ) (२) पहाड ( )

(३) तराई ( )

(६) प्रशासनिक बिभाजन (कृपया खाली स्थानमा भर्नुहोस्) :

(१) जिल्ला: ... (२) गाउँ बिकास समिती / नगर पलिका

(३) वार्ड नम्बर: ...... (४) गाउँ वा टोलको नाम: ....

(७) सहभागीको लिङ (कृपया उयुक्त कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) पुरुष ( ) (२) महिला ( )

यस पछाडिका सबै प्रश्नहरुको जवाफ सर्वेक्षेकले सहभागी सँग सोधी भर्नु पर्नेछ

(८) के तपाईं यस् स्थानमा छ् महिना भन्दा अघी देखी बसोबास गर्दै आउनु भएको छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) छु ( ) (२) छैन ( )

(९) तपाईंको उमेर अहिले कती बर्ष भयो?

.... बर्ष

(१०) तपाईंको हालको बैबाहिक अवस्था के छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्):

(१) अविवाहित ( ) (२) विवाहित ( )
(३) सम्बन्ध बिक्छेद भएको ( ) (४) छुट्टी भिन्न भएको ( )
(५) बिधुवा / बिधुर ( ) (६) बताउन इच्छा नभएको ( )

११. तपाईंको हालको रोजगारी स्थिती के छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

(१) रोजगार ( )
(२) स्वरोजगार ( )
(३) बेरोजगार भए र रोजगारी खोज्दै छु ( )
(४) बेरोजगार भयतापनी हाल रोजगारी खोजेको छैन ( )
(५) सवेक्छिक अबकास भएको ( )
(६) कामगर्न असमर्थ ( )
(७) घरधन्दा ( )
(८) अन्य केही भएमा उल्लेख गर्नुहोस् ....

(१२) तपाईंले कुन स्तर सम्मको अध्ययन पुरा गर्नु भएको छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्):

(१) स्कूल गएको छैन ( )

(२) प्रोउढ शिक्षा ( )

(३) प्राथ्मिक स्कुल स्तर (१ देखी ५ कक्षा) ( )

(४) हाइस्कुल स्तर (छ् देखी १० कक्षा) ( )

(५) प्रमाणपत्र स्तर ( )

(६) स्नात्क स्तर वा सो भन्दा बढी ( )

भाग २: घुडा दुखाइ सँग सम्बन्धित प्रश्नावली

(१३) गएको १२ महिनामा, के तपाईंको घुंडा वा घुँडाको जोर्नी वोरीपरी प्राय जसो झण्डै दिनभरी जस्तै कम्तिमा पनि एक महिना सम्म दुखि रह्यो? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

थियो [ ] थिएन [ ]

(१४) यदी थियो भने ३ महिना वा त्यो भन्दा बढी सम्म तपाईंको घुडा दुख्ने गरेको थियो त? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

थियो [ ] थिएन [ ]

(१५) के तपाइलाई अहिले पनि घुडा दुखि राखेको छ? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

छ् [ ] छैन [ ]

द्रस्ट्ब्य: यदी माथि सोधिएकोप्रश्न नम्बर १२ प्रश्नमा घुडाको पिडा छैन भनी सिधै भाग ३ मा जानुहोस् ।

Continued appendix 21

(१६) घुडाँ दुखाईको कारणले तपसिल्का किर्याकलाप गर्दा गएको ७ दिनमा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ? (कृपया एक वा बढी तल दिएक कोठाहरुमा क्रस चिन्ह लगाउनुहोस्)

क्रम सन्खया	किर्याकलापहरु	दु:खाइको मात्रा				
		गार्हो हुँदै भएन	अलि कती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	सार्है गार्हो भयो
१६.१	घुडाँ पुरा तन्काउदा					
१६. २	गुन्द्रिमा या सम्मो ठाउमा बस्दा					
१६.३	कुर्सीमा वा बेन्चमा बस्दा					
१६. ४	सम्मो ठाउमा हिड्दा					
१६. ५	उकालो उक्लदा					
१६.६	ओरालो झर्दा					
१६. ७	बसिराखेर अनी उठ्दा					
१६.८	ठिङ उभीदा					
१६.९	रातीमा ओछ्यानमा हुँदा					
१६.१०	ओछानयाँबाट उठ्दा					
१६.११	शौचलयमा बस्दा वा उठ्दा					
१६.१२	गर्हौ भारी बोकदा					
१६.१३	घरमा हलुका काम गर्दा, जस्तै – खाना पकाउँदा, कुच्चो लगाउँदा					
१६.१४	टुक्रुक बसेर काम गर्दा जस्तै: भाडा माझ्दा वा कपडा धुदा					
१६.१५	टुक्रुक बसेर सौच गर्दा					
१६.१६	घुडा टेकेर ध्यान गर्दा					

(१७) के तपाईंले बिगत १२ महिना भित्रमा घुडा दुखेर स्वास्थ्य संस्था वा स्वास्थ्य कर्तासँग परामर्स वा सर-सल्लाह लिनु भयो? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

सल्लाह लिएँ [ ] सल्लाह लिईन [ ]

(१८) यदि तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भएको थियो भने काहाबाट लिनु भयो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

स्वास्थ्य संस्थाहरू	**सरकारी**	**निजी**
(१८.१) उप / स्वास्थ्य चौकी	[ ]	[ ]
(१८.२) प्राथमिक स्वास्थ्य केन्द्र /अस्पताल	[ ]	[ ]
(१८.३) स्थानिय औषधी पसल	[ ]	[ ]
(१८.४) अक्कुपञ्चर क्लिनिक	[ ]	[ ]
(१८.५) फिजिओथेरापी क्लिनिक	[ ]	[ ]
(१८. ६) आयुर्वेदिक क्लिनिक	[ ]	[ ]
(१८. ७) जडिबुटी क्लिनिक	[ ]	[ ]
(१८. ८) अरु कुनै (कृपया यहाँ लेख्नुहोस्)	[ ]	[ ]

(१९) के तपाईंले घुडा दुखेको लागि तल दिएका मध्ये कुनै उपचार लिनु भएको थियो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्).

प्रयोग गरिएका उपचार बिधिहरु

(१९.१) दुखाइ कमगर्ने खाने औषधीहरु [ ]
(१९.२) सुई [ ]
(१९.३) फिजिओथेरापी [ ]
(१९.४) तातोले सेक्ने [ ]
(१९.५) चिसो लगाएर [ ]
(१९.६) पट्टी बाधेर [ ]
(१९.७) क्रिम वा भेसलिन [ ]
(१९.८) मालिस गर्ने [ ]
(१९.९) टेकेर हिंड्ने लठ्ठी [ ]
(१९.१०) जडिबुटी औषधी [ ]
(१९.११) अक्कुपञ्चर [ ]
(१९.१२) आयुर्वेदिक औषधी [ ]
(१९.१३) अरु कुनै (कृपया यहाँ लेख्नुहोस्)…………………………

(२०) यदी उपचार नखोज्नु भएको भए किन न खोज्नु भएको? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

उपचार नलिनुका कारणहरु:

(२०.१) उप्लब्ध सेवामा विश्वाश नभएर [ ]
(२०.२) उमेर बढेको कारणले यस्ता समस्याहरु हुन्छन्न [ ]
(२०.३) घरेलु औषधि उपचार [ ]
(२०.४) उपचार महगो भ्एर [ ]
(२०.५) एक्लै स्वास्थ्य सुबिधा लीन स्वास्थ्य संस्थामा जान नसकेर[ ]
(२०.६) स्वास्थ्य संस्था घरबाट टाढा भएर [ ]
(२०.७) अरु कुनै (कृपया यहाँ लेख्नुहोस्): ………………………

भाग ३ : असमर्थताहरुको मुलायन्कन सम्बन्धि प्रश्नावली

यस् खन्ड अन्तर्गतका प्रश्नहरु **विश्व स्वास्थ्य संगठन को असमर्थ्ता** मुलायन्कन **सुची २.० (१२ बुदे अन्तर्वाता लिने बयक्यिले सोध्ने सस्करण) बाट लिएका हुन।**

जवाफ दिने बयक्तिलाई भन्नुहोस्:

यो कुराकानी र अन्तर्वाता स्वास्थ्यको कारणले गर्दा मानिसमा आइपर्नसक्ने कठिनाईको बारेमा हो।

हाते फ्लाशकार्ड नम्बर एक सभागीलाई दिनुहोस्।

यहाँ स्वास्थ्य सम्बान्धि समस्या भन्नाले लामो समय सम्म रहने अथवा थोरै समयमा ठीक हुने बिभिन्न रोगहरु, चोटपटकहरु, मानसिक (मनको) समस्याहरु र जाँड - रक्सी वा लागू पदार्थ सेवन जस्ता कुराहरु पर्दछन ।

यी प्रश्नहरुको जवाफ दिदा तपाईंको स्वास्थय सम्बन्धी समस्या लाई मनमा राख्न हुन अनुरोध गर्दछु। जब म तपाईंलाई काम गर्दा परेको अप्ठेरोबारेमा सोध्छु, त्यसबेला तपाईंले यी कुराहरुको बारेमा सोच्नुहोस्।

फ्लाशकार्ड नम्बर एक तर्फ दृष्टि दिनुहोस्

- धेरै परीश्रम (मेहनत) गर्न परेको
- असजिलो वा पिडाको अनुभव
- ढिला सुस्ती
- तपाईंले सधैं गर्ने भन्दा फरक तरिकाले गर्न परेको

जवाफ दिदा तपाईंले गएको एक महिनालाई सधैं जसो गर्ने कामकाज गर्दाखेरी तपाईंलाई कतिको अप्ठायरो परेको थियो, यसबारे सोचेर जवाफ दिनुहोस। गएको एक महिनमा सधै जशो गर्ने कामकाज गर्दाखेरी तपाईंलाई कत्तिको अप्ठायरो परेको थियो , यस्बारे सोचेर जवाफ दिनुहोस् ।

हाते फ्लाश कार्ड नम्बर दुई सभागीलाई दिनुहोस् (सहभागिले जवाफ दिदा जेल यो स्केल प्रयोग गरी राख्नुहोस)

स्केलमा लेखियको कुराहरु ठुलो स्वरमा पढ्नुहोस्:

गार्हो हुँदै भएन, अलिकती भयो, केहीबढी भयो, ठीक ठिकै भयो, धेरै गार्हो भयो

Continued appendix 21

फ्लाश कार्ड नम्बर 2 देखाउनु होस् र सोध्नुहोस् (कृपया कोठा भित्रको उपयुक्त अंकलाई बिर्तले घेर्नु होला)

क्र. स.	गएको एक महिनामा तपाईंको स्वास्थ्य कस्तो थियो?	गार्हो हुँदै भएन	अलिकती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	सार्है गार्हो भएर / गर्न सकिएन /
२१ (S1)	लामो समयसम्मा (जस्तै आधा घण्टासम्मा) उभिइरहन कतिको गार्हो भयो ?	१	२	३	४	५
२२ (S2)	घरको कामकाज गर्न कत्तिको गार्हो भयो	१	२	३	४	५
२३ (S3)	नयाँ काम वा सीप सिक्न जस्तै नयाँ खानेकुरा बनाउने, नयाँ ठाउमा जाने, जस्तो कुरामा कतिको गार्हो भयो?	१	२	३	४	५
२४ (S4)	गाउघरमा हुने काममा अरुले जस्तै सहभागी हुन (जस्तै भोज भतेर् जादा, धर्मिक कामहरुमा वा अन्य काममा) कतिको गार्हो भयो ?	१	२	३	४	५
२५ (S5)	तपाईंको स्वास्थ्य समन्धि समस्याले तपाईंको मनमा कतिको असर पार्यो?	१	२	३	४	५
२६ (S6)	कुनै कामगर्न दश मिनेटसम्म ध्यान दीइरहनु पर्दा कतिको गार्हो भयो ?	१	२	३	४	५
२७ (S7)	लगातर लामो समय (जस्तै एक किलोमिटर जति) सम्म हिंड्नु पर्दा कतिको गार्हो भयो ?	१	२	३	४	५
२८ (S8)	तपाइलाई जिउ नुहाउदा कतिको गार्हो भयो ?	१	२	३	४	५
२९ (S9)	कपडा लगाउन कतिको गार्हो भयो ?	१	२	३	४	५
३० (S10)	आफुले नचिनेको मान्छे सँग व्यबहार गर्नुपर्दा कतिको गार्हो भयो ?	१	२	३	४	५
३१ (S11)	साथीहरुसँग समन्ध कायम राख्न कतिको गार्हो भयो ?	१	२	३	४	५
३२ (S12)	दैनिक कामकाज गर्न कतिको गार्हो भयो ?	१	२	३	४	५

H1	समग्रमा भन्नुहोस्, गएको एक महिनामा यी समस्याहरुले तपाईंलाई कतिदिन अप्ठेरो पर्यो?	(दिन संखयामा उल्लेख गर्नुहोस्)
H2	गएको एक महिनामा स्वास्थ्यको कुनै कारणलेगर्दा कती दिन सम्म तपाईंले सधैं गर्ने काम ठ्यामै गर्न सक्नु भएन ?	(दिन संखयामा उल्लेख गर्नुहोस्)
H3	गएको एक महिनामा, माथि भन्नु भएको ठयाम्मै काम गर्न नसकेकेका दिनहरु बाहेक अरु कती दिन स्वास्थयका कारणले सधैं गर्ने कामकाज कम गर्न परेको थियो ?	(दिन संखयामा उल्लेख गर्नुहोस्)

फ्लाश कार्ड नम्बर – १ स्वास्थ्य अवस्थाहरु

स्वास्थ्य अवस्थाहरु

- **रोग लागेको** , **बिरामी परेको वा अरु** स्वास्थ्य समस्याहरु
- **चोट पटक हरु**
- **मनका** समस्याहरु
- **जाड रक्सी सम्बन्धी समस्याहरु**
- लागू पदार्थ सम्बन्धी समस्याहरु

कामकाज गर्न गार्हो भएमा भन्नाले निम्न लिखित कुराहरु जनाउदछन

- धेरै परीश्रम (मेहनत) गर्न परेको
- असजिलो वा पिडाको अनुभव
- ढिला सुस्ती
- तपाईंले सधैं गर्ने भन्दा फरक तरिकाले गर्न परेको

गएको एक महिनाको बारेमा मात्र सोच्नुहोस्

फ्लाश कार्ड नम्बर – २

1	2	3	4	5
गार्हो हुँदै भएन	अलिकती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	गर्न सकिएन / सारहै गार्हो भएर

Appendix 22: Approval of Proposal by STEM Ethics Committee, the University of Cental Lancashire

21 October 2013

University of Central Lancashire

Paola Dey / Dan Baidwar-kshetri

School of Postgraduate Medical and Dental Education

University of Central Lancashire

Dear Paola / Dan

Re: STEM Ethics Committee Application

Unique Reference Number: **STEM 061**

The STEM ethics committee has granted approval of your proposal application '**A Prevalence Survey of Knee Pain and Knee Pain Related Disabilities in Adults of Nepal**'.

Please note that approval is granted up to the end of project date or for 5 years, whichever is the longer. This is on the assumption that the project does not significantly change; in which case, you should check whether further ethical clearance is required.

We shall e-mail you a copy of the end-of-project report form to complete within a month of the anticipated date of project completion you specified on your application form. This should be completed, within 3 months, to complete the ethics governance procedures or, alternatively, an amended end-of-project date forwarded to roffice@uclan.ac.uk quoting your unique reference number.

Yours sincerely

Kevin Butt

Vice Chair

STEM Ethics Committee

Appendix 23: Findings of the pre test of the questionnaire

Findings of prestest

Page	Coomemts in Nepali langauge	Coomemts in English
1	**पारिवारिक तथा भौगोलिक विवरण**	Demographic questions
1	**प्रश्न** नम्बर १ देखी ७	Q. No 1 - 6
1	(५) (४) अध्ययन स्थलको उचाइ मिटरमा.........	Altitude of the study area was missed
	११. तपाईंले कुन स्तर सम्मको अध्ययन पुरा गर्नु भएको छ्? (कृपया कोस्टभित्र एक स्थानमा ऋश चिन्ह लगाउनुहोस्):	Order of question has been inter changed between question number 11 and 12.
	(१८.३) अस्पताल	There is duplication of private and governmental hospital as which has been categorised into private and governmental groups.

Appendix 24: Final questionnaire used in pilot test and data collection

पशिमान्चल बिकास क्षेत्रका, नेपालका बयस्कहरुमा हुन सक्ने घुडा दुखाइ तथा असमर्थता सम्बन्धी समस्याहरुको सर्वेक्षेण प्रश्नावली

म यस् अन्तर्वातामा सहभागी हुन स्वइच्छाले मन्जुर

छु [ ] **छैन** [ ]

भाग १: पारिवारिक विवरण सम्बन्धित प्रश्नावली (कृपया प्रश्न नम्बर १-देखी ६-सम्मका प्रश्नहरु को जवाफ सर्वेक्षेक आँफैले अबलोकन गरी भर्नु पर्नेछ:

(१) अध्ययन क्षेत्र संकेत नम्बर

(२) सहभागि नम्बर: ...

(३) घरको संकेत नम्बर: ...

(४) अन्तरबार्ता मिति (दिन/ महिना/ साल): ...../ .../...

(५) भौगोलिक क्षेत्र (कृपया उयुक्त कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) उच्च पहाड ( ) (२) पहाड ( )

(३) तराई ( )

(६) प्रशासनिक बिभाजन (कृपया खाली स्थानमा भर्नुहोस्) :

(१) जिल्ला: ... (२) गाउँ बिकास समिती / नगर पलिका

(३) वार्ड नम्बर: ... (४) गाउँ वा टोलको नाम: ...

(७) सहभागीको लिङ (कृपया उयुक्त कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) पुरुष ( ) (२) महिला ( )

यस पछाडिका सबै प्रश्नहरुको जवाफ सर्वेक्षेकले सहभागी सँग सोधी भर्नु पर्नेछ

(८) के तपाईं यस् स्थानमा छ् महिना भन्दा अघी देखी बसोबास गर्दै आउनु भएको छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्) :

(१) छु ( ) (२) छैन ( )

(९) तपाईंको उमेर अहिले कती बर्ष भयो?

... बर्ष

(१०) तपाईंको हालको बैबाहिक अवस्था के छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्):

(१) अविवाहित ( ) (२) विवाहित ( )

(३) सम्बन्ध बिक्छेद भएको ( ) (४) छुट्टी भिन्न भएको ( )

(५) बिधुवा / बिधुर ( ) (६) बताउन इच्छा नभएको ( )

११. तपाईंको हालको रोजगारी स्थिती के छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

(१) रोजगार ( )

(२) स्वरोजगार ( )

(३) बेरोजगार भए र रोजगारी खोज्दै छु ( )

(४) बेरोजगार भयतापनी हाल रोजगारी खोजेको छैन ( )

(५) सवेक्चिक अबकास भएको ( )

(६) कामगर्न असमर्थ ( )

(७) घरधन्दा ( )

(८) अन्य केही भएमा उल्लेख गर्नुहोस् ....

(१२) तपाईंले कुन स्तर सम्मको अध्ययन पुरा गर्नु भएको छ्? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्):

(१) स्कूल गएको छैन ( )

(२) प्रोउढ शिक्षा ( )

(३) प्राथ्मिक स्कुल स्तर (१ देखी ५ कक्षा) ( )

(४) हाइस्कुल स्तर (छ् देखी १० कक्षा) ( )

(५) प्रमाणपत्र स्तर ( )

(६) स्नात्क स्तर वा सो भन्दा बढी ( )

भाग २: घुडा दुखाइ सँग सम्बन्धित प्रश्नावली

(१३) गएको १२ महिनामा, के तपाईंको घुंडा वा घुँडाको जोर्नी वोरीपरी प्राय जसो झण्डै दिनभरी जस्तै कम्तिमा पनि एक महिना सम्म दुखि रह्यो? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

थियो [ ] थिएन [ ]

(१४) यदी थियो भने ३ महिना वा त्यो भन्दा बढी सम्म तपाईंको घुडा दुख्ने गरेको थियो त? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

थियो [ ] थिएन [ ]

(१५) के तपाइलाई अहिले पनि घुडा दुखि राखेको छ? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

छ् [ ] छैन [ ]

द्रस्ट्ब्य: यदी माथि सोधिएकोप्रश्न नम्बर १२ प्रश्नमा घुडाको पिडा छैन भनी सिधै भाग ३ मा जानुहोस् ।

Continued appendix 24

(१६) घुडाँ दुखाईको कारणले तपसिल्का किर्याकलाप गर्दा गएको ७ दिनमा तपाईले कत्तिको गहिरो दुखाईको अनुभव गर्नु भएको छ? (कृपया एक वा बढी तल दिएक कोठाहरुमा क्रस चिन्ह लगाउनुहोस्)

क्रम सन्खया	किर्याकलापहरु	दु:खाइको मात्रा				
		गार्हो हुँदै भएन	अलि कती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	सार्है गार्हो भयो
१६.१	घुडाँ पुरा तन्काउदा					
१६. २	गुन्द्रिमा या सम्मो ठाउमा बस्दा					
१६.३	कुर्सीमा वा बेन्चमा बस्दा					
१६. ४	सम्मो ठाउमा हिड्दा					
१६. ५	उकालो उक्लदा					
१६.६	ओरालो झर्दा					
१६. ७	बसिराखेर अनी उठ्दा					
१६.८	ठिङ उभीदा					
१६.९	रातीमा ओछ्यानमा हुँदा					
१६.१०	ओछानयाँबाट उठ्दा					
१६.११	शौचलयमा बस्दा वा उठ्दा					
१६.१२	गर्हौ भारी बोकदा					
१६.१३	घरमा हलुका काम गर्दा, जस्तै – खाना पकाउँदा, कुच्चो लगाउँदा					
१६.१४	टुक्रुक बसेर काम गर्दा जस्तै: भाडा माइदा वा कपडा धुदा					
१६.१५	टुक्रुक बसेर सौच गर्दा					
१६.१६	घुडा टेकेर ध्यान गर्दा					

Continued appendix 24

(१७) के तपाईंले बिगत १२ महिना भित्रमा घुडा दुखेर स्वास्थ्य संस्था वा स्वास्थ्य कर्तासँग परामर्स वा सर-सल्लाह लिनु भयो? (कृपया कोस्टभित्र एक स्थानमा क्रश चिन्ह लगाउनुहोस्)

सल्लाह लिएँ [ ] सल्लाह लिईन [ ]

(१८) यदि तपाइले स्वास्थ्य संस्था वा स्वास्थ्य कर्मीसंग सर-सल्लाह लिनु भएको थियो भने काहाबाट लिनु भयो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

स्वास्थ्य संस्थाहरू	**सरकारी**	**निजी**
(१८.१) उप / स्वास्थ्य चौकी	[ ]	[ ]
(१८.२) प्राथमिक स्वास्थ्य केन्द्र /अस्पताल	[ ]	[ ]
(१८.३) स्थानिय औषधी पसल	[ ]	[ ]
(१८. ४) अक्कुपञ्चर क्लिनिक	[ ]	[ ]
(१८.५) फिजिओथेरापी क्लिनिक	[ ]	[ ]
(१८. ६) आयुर्वेदिक क्लिनिक	[ ]	[ ]
(१८. ७) जडिबुटी क्लिनिक	[ ]	[ ]
(१८. ८) अरु कुनै (कृपया यहाँ लेख्नुहोस्)	[ ]	[ ]

(१९) के तपाईंले घुडा दुखेको लागि तल दिएका मध्ये कुनै उपचार लिनु भएको थियो? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्).

प्रयोग गरिएका उपचार बिधिहरु

(१९.१) दुखाइ कमगर्ने खाने औषधीहरु [ ]

(१९.२) सुई [ ]

(१९.३) फिजिओथेरापी [ ]

(१९.४) तातोले सेक्ने [ ]

(१९.५) चिसो लगाएर [ ]

(१९.६) पट्टी बाधेर [ ]

(१९.७) क्रिम वा भेसलिन [ ]

(१९.८) मालिस गर्ने [ ]

(१९.९) टेकेर हिंड्ने लठ्ठी [ ]

(१९.१०) जडिबुटी औषधी [ ]

(१९.११) अक्कुपञ्चर [ ]

(१९.१२) आयुर्वेदिक औषधी [ ]

(१९.१३) अरु कुनै (कृपया यहाँ लेख्नुहोस्)..............................

(२०) यदी उपचार नखोज्नु भएको भए किन न खोज्नु भएको? (कृपया एक वा बढी कोठाहहरुमा क्रस चिन्ह लगाउनुहोस्)

उपचार नलिनुका कारणहरु:

(२०.१) उप्लब्ध सेवामा विश्वाश नभएर [ ]

(२०.२) उमेर बढेको कारणले यस्ता समस्याहरु हुन्छन्न [ ]

(२०.३) घरेलु औषधि उपचार [ ]

(२०.४) उपचार महगो भ्एर [ ]

(२०.५) एक्लै स्वास्थ्य सुबिधा लीन स्वास्थ्य संस्थामा जान नसकेर [ ]

(२०.६) स्वास्थ्य संस्था घरबाट टाढा भएर [ ]

(२०.७) अरु कुनै (कृपया यहाँ लेख्नुहोस्): ....

भाग ३ : असमर्थताहरुको मुलायन्कन सम्बन्धि प्रश्नावली

यस् खन्ड अन्तर्गतका प्रश्नहरु **विश्व स्वास्थ्य संगठन को असमर्थ्ता** मुलायन्कन **सुची २.० (१२ बुदे अन्तर्वाता लिने बयक्यिले सोध्ने सस्करण) बाट लिएका हुन।**

जवाफ दिने बयक्तिलाई भन्नुहोस्:

यो कुराकानी र अन्तर्वाता स्वास्थ्यको कारणले गर्दा मानिसमा आइपर्नसक्ने कठिनाईको बारेमा हो।

हाते फ्लाशकार्ड नम्बर एक सभागीलाई दिनुहोस्।

यहाँ स्वास्थ्य सम्बान्धि समस्या भन्नाले लामो समय सम्म रहने अथवा थोरै समयमा ठीक हुने बिभिन्न रोगहरु, चोटपटकहरु, मानसिक (मनको) समस्याहरु र जाँड - रक्सी वा लागू पदार्थ सेवन जस्ता कुराहरु पर्दछन ।

यी प्रश्नहरुको जवाफ दिदा तपाईंको स्वास्थय सम्बन्धी समस्या लाई मनमा राख्न हुन अनुरोध गर्दछु। जब म तपाईंलाई काम गर्दा परेको अप्ठेरोबारेमा सोध्छु, त्यसबेला तपाईंले यी कुराहरुको बारेमा सोच्नुहोस्।

फ्लाशकार्ड नम्बर एक तर्फ दृष्टि दिनुहोस्

- धेरै परीश्रम (मेहनत) गर्न परेको
- असजिलो वा पिडाको अनुभव
- ढिला सुस्ती
- तपाईंले सधैं गर्ने भन्दा फरक तरिकाले गर्न परेको

जवाफ दिदा तपाईंले गएको एक महिनालाई सधैं जसो गर्ने कामकाज गर्दाखेरी तपाईंलाई कतिको अप्ठायरो परेको थियो, यसबारे सोचेर जवाफ दिनुहोस। गएको एक महिनमा **सधै जशो** गर्ने कामकाज गर्दाखेरी तपाईंलाई कत्तिको अप्ठायरो परेको थियो , यस्बारे सोचेर जवाफ दिनुहोस् ।

हाते फ्लाश कार्ड नम्बर दुई सभागीलाई दिनुहोस् (सहभागिले जवाफ दिदा जेल यो स्केल प्रयोग गरी राख्नुहोस)

स्केलमा लेखियको कुराहरु ठुलो स्वरमा पढ्नुहोस्:

गार्हो हुँदै भएन, अलिकती भयो, केहीबढी भयो, ठीक ठिकै भयो, धेरै गार्हो भयो

Continued appendix 24

फ्लाश कार्ड नम्बर 2 देखाउनु होस् र सोध्नुहोस् (कृपया कोठा भित्रको उपयुक्त अंकलाई बिर्तले घेर्नु होला)

क्र. स.	गएको एक महिनामा तपाईंको स्वास्थ्य कस्तो थियो?	गार्हो हुँदै भएन	अलिकती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	सार्है गार्हो भएर / गर्न सकिएन /
२१ (S1)	लामो समयसम्मा (जस्तै आधा घण्टासम्मा) उभिइरहन कतिको गार्हो भयो ?	१	२	३	४	५
२२ (S2)	घरको कामकाज गर्न कत्तिको गार्हो भयो	१	२	३	४	५
२३ (S3)	नयाँ काम वा सीप सिक्न जस्तै नयाँ खानेकुरा बनाउने, नयाँ ठाउमा जाने, जस्तो कुरामा कतिको गार्हो भयो?	१	२	३	४	५
२४ (S4)	गाउघरमा हुने काममा अरुले जस्तै सहभागी हुन (जस्तै भोज भतेर् जादा, धर्मिक कामहरुमा वा अन्य काममा) कतिको गार्हो भयो ?	१	२	३	४	५
२५ (S5)	तपाईंको स्वास्थ्य समन्धि समस्याले तपाईंको मनमा कतिको असर पार्यो?	१	२	३	४	५
२६ (S6)	कुनै कामगर्न दश मिनेटसम्म ध्यान दीइरहनु पर्दा कतिको गार्हो भयो ?	१	२	३	४	५
२७ (S7)	लगातर लामो समय (जस्तै एक किलोमिटर जति) सम्म हिंड्नु पर्दा कतिको गार्हो भयो ?	१	२	३	४	५
२८ (S8)	तपाइलाई जिउ नुहाउदा कतिको गार्हो भयो ?	१	२	३	४	५
२९ (S9)	कपडा लगाउन कतिको गार्हो भयो ?	१	२	३	४	५
३० (S10)	आफुले नचिनेको मान्छे सँग व्यबहार गर्नुपर्दा कतिको गार्हो भयो ?	१	२	३	४	५
३१ (S11)	साथीहरुसँग समन्ध कायम राख्न कतिको गार्हो भयो ?	१	२	३	४	५
३२ (S12)	दैनिक कामकाज गर्न कतिको गार्हो भयो ?	१	२	३	४	५

H1	समग्रमा भन्नुहोस्, गएको एक महिनामा यी समस्याहरुले तपाईंलाई कतिदिन अप्ठेरो पर्यो?	(दिन संखयामा उल्लेख गर्नुहोस्)
H2	गएको एक महिनामा स्वास्थ्यको कुनै कारणलेगर्दा कती दिन सम्म तपाईंले सधैं गर्ने काम ठ्यामै गर्न सक्नु भएन ?	(दिन संखयामा उल्लेख गर्नुहोस्)
H3	गएको एक महिनामा, माथि भन्नु भएको ठयाम्मै काम गर्न नसकेकेका दिनहरु बाहेक अरु कती दिन स्वास्थयका कारणले सधैं गर्ने कामकाज कम गर्न परेको थियो ?	(दिन संखयामा उल्लेख गर्नुहोस्)

फ्लाश कार्ड नम्बर – १: स्वास्थ्य अवस्थाहरु

स्वास्थ्य अवस्थाहरु

- **रोग लागेको** , **बिरामी परेको वा अरु** स्वास्थ्य समस्याहरु
- **चोट पटक हरु**
- **मनका** समस्याहरु
- **जाड रक्सी सम्बन्धी समस्याहरु**
- लागू पदार्थ सम्बन्धी समस्याहरु

कामकाज गर्न गार्हो भएमा भन्नाले निम्न लिखित कुराहरु जनाउदछन

- धेरै परीश्रम (मेहनत) गर्न परेको
- असजिलो वा पिडाको अनुभव
- ढिला सुस्ती
- तपाईंले सधैं गर्ने भन्दा फरक तरिकाले गर्न परेको

गएको एक महिनाको बारेमा मात्र सोच्नुहोस्

फ्लाश कार्ड नम्बर – २

1	2	3	4	5
गार्हो हुँदै भएन	अलिकती भयो	ठीक ठिकै भयो	धेरै गार्हो भयो	गर्न सकिएन / सारहै गार्हो भएर

Appendix 25: Nepal Health Research Council approval letter

Nepal Health Research Council
Estd. 1991

Ref. No.: 8881

29 January 2014

Mr. Dan Bahadur Baidwar Kshetri
Principal Investigator
University of Central Lancashire
UK

Ref: **Approval of Research Proposal** entitled **A prevalence survey of knee pain and knee pain related disabilities in adults of Western Development Region of Nepal**

Dear Mr. Kshetri ,

It is my pleasure to inform you that the above-mentioned proposal submitted on 24 November 2013(**Reg. no. 183/2013** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on 26 January 2014 (2070-10- 12).

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol.

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, the total research amount is US$ 2,329.01 and accordingly the processing fee amounts to US$ 100.00. It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the research section of NHRC.

Thanking you.

....
Dr. Guna Raj Lohani
Executive Chief

Appendix 26: Population distribution of Western Development Region (WDR)

Adult population distribution in Western Development Region (WDR)

Age group	Western Development Region		
	Male	Female	Total
18 - 34 Yrs.	541844	771562	1313406
35 - 44 Yrs.	221776	303861	525637
45 - 54 Yrs.	194397	225132	419529
55 - 64 Yrs.	155483	169597	325080
65 - 74 Yrs.	104702	103957	208659
75 + Yrs.	52610	53445	106055
Total	1270812	1627554	2898366

Continued appendix 26

Adult population distribution in Western Development Region (WDR)

Age group	WDR Urban			WDR Rural			WDR total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	106466	134783	241251	432979	637556	1070548	539445	772339	1311799
35 - 44 Yrs.	42505	48335	90840	179271	255525	434796	221776	303860	525636
45 - 54 Yrs.	29168	30415	59583	165229	194687	359916	194397	225102	419499
55 - 64 Yrs.	18698	19655	38353	135785	150942	286727	154483	170597	325080
65 - 74 Yrs.	10598	11964	22562	92620	90630	183250	103218	102594	205812
75 + Yrs.	4926	6028	10954	47684	47417	95101	52610	53445	106055
Total	212361	251180	463543	1053568	1376757	2430338	1265929	1627937	2893881

Continued appendix 26

Rural adult population distribution by ecological zone

Age group	Mountainous zone			Hilly zone			Plain zone		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	3572	2669	6241	276735	443666	720401	261537	325227	586764
35 - 44 Yrs.	1647	1271	2918	111910	179128	291038	108219	123462	231681
45 - 54 Yrs.	1249	967	2216	110568	141215	251783	82580	82950	165530
55 - 64 Yrs.	802	812	1614	93273	108216	201489	61408	60569	121977
65 - 74 Yrs.	541	553	1094	63275	66929	130204	40886	36475	77361
75 + Yrs.	196	236	432	37299	39057	76356	15115	14152	29267
Total	8007	6508	14515	693060	978211	1671271	569745	642835	1212580

Continued appendix 26

Urban adult population distribution in Western Development Region (WDR)

Age group	Hilly zone			Plain zone			WDR total urban		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	71181	93783	164965	35285	41000	76286	106466	134783	241251
35 - 44 Yrs.	27369	32989	60358	15136	15346	30482	42505	48335	90840
45 - 54 Yrs.	19035	20810	39845	10133	9605	19738	29168	30415	59583
55 - 64 Yrs.	12201	13538	25739	6497	6117	12614	18698	19655	38353
65 - 74 Yrs.	7200	8639	15839	3398	3325	6723	10598	11964	22562
75 + Yrs.	4480	5620	10100	446	408	854	4926	6028	10954
Total	141466	175379	316846	70895	75801	146697	212361	251180	463543

Continued appendix 26

Rural adult population distribution in Western Development Region (WDR)

Age group	Mountanious rural zone			Hilly rural zone			Plain rural zone		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	3572	2669	6,241	203,156	350,660	553,828	226252	284227	510,479
35 - 44 Yrs.	1647	1271	2,918	84,541	146,138	230,679	93083	108116	201,199
45 - 54 Yrs.	1249	967	2,216	91,533	120,375	211,908	72447	73345	145792
55 - 64 Yrs.	802	812	1614	80,072	95,678	175,750	54911	54452	109363
65 - 74 Yrs.	541	553	1094	56,078	58,287	114,365	37488	33150	70638
75 + Yrs.	196	236	432	32819	33437	66256	14669	13744	28413
Total	8007	6508	14,515	548,199	804,575	1,352,786	498,850	567,034	1,065,884

Continued appendix 26

Rural population distribution in Western Development Region (WDR)

Age group	WDR Rural		
	Male	Female	Total
18 - 34 Yrs.	432,980	637,556	1,070,548
35 - 44 Yrs.	179,271	255,525	434,796
45 - 54 Yrs.	165,229	194,687	359,916
55 - 64 Yrs.	135,785	150,942	286,727
65 - 74 Yrs.	94,107	91,990	186,097
75 + Yrs.	47,684	47,417	95,101
Total	1,055,056	1,378,117	2,433,185

Continued appendix 26

Urban and rural adult population distribution in hilly zone and plain zone

Plain zone

Age groups	Plain zone rural			Plain zone rural urban			Plain zone total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	226,252	284,227	510,479	35285	41000	76285	261,537	325,227	586,764
35 - 44 Yrs.	93,083	108,116	201,199	15136	15346	30482	108,219	123,462	231,681
45 - 54 Yrs.	72,447	73,345	145,792	10133	9605	19738	82,580	82,950	165,530
55 - 64 Yrs.	54,911	54,452	109,363	6497	6117	12614	61,408	60,569	121,977
65 - 74 Yrs.	37,488	33,150	70,638	3398	3325	6723	40,886	36,475	77,361
75 + Yrs.	14669	13744	28413	446	408	854	15,115	14,152	29,267
Total	498,850	567,034	1,065,884	70895	75801	146696	569,745	642,835	1,212,580

Continued appendix 26

Hilly zone

Age group	Hilly zone rural			Hilly zone urban			Hilly zone Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
18 - 34 Yrs.	205,554	349,883	555,437	71181	93783	164964	276,735	443,666	720,401
35 - 44 Yrs.	84,541	146,139	230,680	27369	32989	60358	111,910	179,128	291,038
45 - 54 Yrs.	91,533	120,405	211,938	19035	20810	39845	110,568	141,215	251,783
55 - 64 Yrs.	81,072	94,678	175,750	12201	13538	25739	93,273	108,216	201,489
65 - 74 Yrs.	56,075	58,290	114,365	7200	8639	15839	63,275	66,929	130,204
75 + Yrs.	32819	33437	66256	4480	5620	10100	37,299	39,057	76,356
Total	548,199	804,575	1,352,774	141466	175379	316845	693,060	978,211	1,671,271

Continued appendix 26

Mountainous zone

Age group	Mountainous zone		
	Male	Female	Total
18 - 34 Yrs.	3572	2669	6241
35 - 44 Yrs.	1647	1271	2918
45 - 54 Yrs.	1249	967	2216
55 - 64 Yrs.	802	812	1614
65 - 74 Yrs.	541	553	1094
75 + Yrs.	196	236	432
Total	8007	6508	14515

Appendix 27: Investigating clustering effects in the survey

Analysis of standard error, robust standard error and inflation factor for study sites for period prevalence of knee pain, chronic knee pain, point prevalence of knee pain and knee pain induce disability.

Period prevalence of knee pain

Analysis of standard error, robust standard error and inflation factor for period prevalence of knee pain

Study sites	Standard error (SE)	Robust standard error (RSE)	Inflation factor (RSE/SE)
Plain zone urban affluent site	0.040	0.030	0.75
Plain zone urban deprived site	0.038	0.030	0.79
Plain zone rural site	0.036	0.026	0.71
Hilly zone urban affluent site	0.043	0.040	0.91
Hilly zone urban deprived site	0.042	0.036	0.84
Hilly zone rural site	0.043	0.036	0.83
Mountainous rural site	0.047	0.036	0.77

Continued appendix 27

Chronic knee pain

Analysis of standard error, robust standard error and inflation factor for prevalence of chronic knee pain

Study sites	Standard error (SE)	Robust standard error (RSE)	Inflation factor (RSE/SE)
Plain zone urban affluent site	0.026	0.023	0.88
Plain zone urban deprived site	0.020	0.023	1.15
Plain zone rural site	0.028	0.024	0.86
Hilly zone urban affluent site	0.034	0.032	0.94
Hilly zone urban deprived site	0.036	0.032	0.89
Hilly zone rural site	0.026	0.032	1.23
Mountainous rural site	0.045	0.032	0.71

Point prevalence of knee pain

Analysis of standard error, robust standard error and inflation factor for point prevalence

Study sites	Standard error (SE)	Robust standard error (RSE)	Inflation factor (RSE/SE)
Mountainous rural site	0.038	0.029	0.76
Hilly zone urban affluent site	0.026	0.026	1.00
Hilly zone urban deprived site	0.026	0.029	1.12
Hilly zone rural site	0.034	0.028	0.82
Plain zone urban affluent site	0.021	0.019	0.95
Plain zone urban deprived site	0.017	0.016	0.94
Plain zone rural site	0.022	0.021	0.95

Continued appendix 27

Knee pain related disability

Standard error, robust standard error and inflation factor for knee pain related disability

Study sites	Standard error (SE)	Robust standard error (RSE)	Inflation factor (RSE/SE)
Plain urban affluent site	0.043	0.043	0.98
Plain urban deprived site	0.034	0.033	0.94
Plain rural site	0.040	0.030	0.78
Hilly urban affluent site	0.045	0.042	0.94
Hilly urban deprived site	0.042	0.048	1.14
Hilly rural site	0.044	0.034	0.77
Mountainous rural site	0.051	0.040	0.79

Appendix 28: Interaction with indicator variable for hilly and rural area for period prevalence of knee pain

Variables	95% confidence interval for odd ratio	Overall p value
Gender		
Male	1.0	
Female	1.2 (0.8 - 1.7)	0.5
Age group		<0.001
18 - 34 Yrs.	1.0	
35 - 44 Yrs.	1.6 (0.9 - 2.4)	
45 - 54 Yrs.	3.0 (1.6 – 4.7)	
55 - 64 Yrs.	7.9 (4.3 – 11.9)	
65+ yrs.	13.9 (7.3 - 20.5)	
Ecological zone		<0.001
Plain zone	1.0	
Hilly zone	1.2 (0.7 - 2.0)	
Mountain zone	2.5 (1.6 – 3.5)	
Residency (Urban vs. rural)		
Urban	1.0	
Rural site	0.9 (0.5 - 1.4)	0.8
Occupation		
Non agriculture		
Agriculture	1.5 (1.0 - 2.1)	0.12
Interaction variable indicator variable for hilly and rural area		
Hilly rural	1.4 (0.9 – 2.1)	0.4

Appendix 29: Logistic regression analysis of disability by six domains of functioning disability

1. Cognition

Variables	Univariate analysis		Multivariate analysis	
	Odd ratio (95% CI)	p value	Odd ratio (95% CI)	p value
Gender		0.65		0.64
Male	1		1	
Female	1.1 (0.8 - 1.6)		1.2(0.2 - 2.2)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	4.5 (2.1 - 6.9)		4.5 (1.6– 7.4)	
45 - 54 Yrs.	9.1(4.2 – 14.3)		12.1 (3.9 - 20.7)	
55 - 64 Yrs.	23.4 (10.8 - 36.7)		22.7 (7.4 – 37.9)	
65 + Yrs.	95.7 (40.7 - 150.9)		264.9 (69.4 – 459.4)	
Eco zone		**< 0.001**		**<0.001**
Plain zones	1		1	
Hilly zone	1. 3 (0.8 - 1.9)		0.7 (0.3 - 1.2)	
Mountain zone	4.6 (3.2 - 6.3)		15.4 (5.1 – 25.5)	
Residency urban vs. Rural		**< 0.001**		0.91
Urban area	1		1	
Rural area	1.8 91.2 - 2.6)		1.1 (0.4 - 1.9)	
Occupation		**<0.001**		0.76
Non - agriculture	1		1	
Agriculture	1.9 (1.3 - 2.5)		0.9 (0.1 - 1.8)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	44.4 (26.6 – 63.4)		68.5 (30.7 – 106.3)	

Note: Statistical significant values are highlighted in bold

Continued appendix 29

2. Mobility

Variables	Univariate analysis Odd ratio (95% CI)	p value	Multivariate analysis Odd ratio (95% CI)	p value
Gender		0.91		0.89
Male	1		1	
Female	1.0 (0.7 - 1.4)		1.0(0.5 - 1.8)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	5.1 (2.5 - 1.1)		6.4 (2.5– 10.7)	
45 - 54 Yrs.	9.4 (4.6 - 14.9)		13.1 (4.7 - 23.3)	
55 - 64 Yrs.	39.0 (18.9 - 58.4)		73.6 (24.9 – 128.4)	
65 + Yrs.	181.0 (69.2 -293.9)		477.4 (130.6 – 827.3)	
Ecozone		**<0.001**		**<0.001**
Plain zones	1		1	
Hilly zone	1. 4 (0.9 - 1.9)		0.8 (0.4 - 1.3)	
Mountain zone	3.6 (2.2 - 5.9)		8.9 (3.2 – 14.6)	
Residency urban vs. Rural		0.02		0.71
Urban area	1		1	
Rural area	1.5 (1.2 - 1.9)		0.9 (0.4 – 1.4)	
Occupation		**<0.001**		0.92
Non - agriculture	1		1	
Agriculture	2.0 (1.4 - 2.8)		1.0 (0.5 -1.8)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	41.6 (25.3 - 57.9)		66.7 (30.7 - 102.6)	

Note: Statistical significant values are highlighted in bold

Continued appendix 29

3. Self-care

Variables	Univariate analysis Odd ratio (95% CI)	p value	Multivariate analysis Odd ratio (95% CI)	p value
Gender		0.8		0.16
Male	1		1	
Female	1.2 (0.8 - 1.8)		1.6 (0.8 – 2.3)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	6.0 (2.6 - 9.7)		7.7 (4.5 – 11.4)	
45 - 54 Yrs.	10.2 (4.4 - 17.1)		14.9 (6.4 - 23.7)	
55 - 64 Yrs.	25.1 (10.9 - 35.3)		23.5 (7.2 - 40.8)	
65 + Yrs.	144.5 (57.1 - 227.3)			
Eco zone		**< .001**		**<0.001**
Plain zones	1		1	
Hilly zone	1.5 (0.9 - 2.3)		1.0 (0.5 - 1.7)	
Mountain zone	4.4 (2.6 - 6.3)		13.2 (6.3 – 20.9)	
Residency urban vs. Rural		**<0.001**		0.71
Urban area	1		1	
Rural area	1.7 (1.2 - 2.5)		1.2 (0.5 – 1.9)	
Occupation		**<0.001**		0.29
Non - agriculture	1		1	
Agriculture	1.8 (1.2 - 2.4)		0.7 (0.3 - 1.1)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	41.9 (25.1 - 59.7)		69.3 (30.4 – 112.4)	

Note: Statistical significant values are highlighted in bold

Continued appendix 29

4. Getting along

Variables	Univariate analysis Odd ratio (95% C I)	p value	Multivariate analysis Odd ratio (95% C I)	p value
Gender		0.84		0.97
Male	1		1	
Female	1.0 (0.6 - 1.5)		1.0 (0.5 - 1.9)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	5.3 (3.4 - 7.2)		6.9 (2.2 – 11.8)	
45 - 54 Yrs.	9.6 (4.2 - 16.3)		16.1 (10.7 - 21.7)	
55 - 64 Yrs.	21.1 (9.4 - 33.1)		20.8 (6.2 - 39.5)	
65 + Yrs.	90.4 (38.1 - 145.7)		379.0 (82.9 – 576.1)	
Eco zone		**< .0001**		**<0.001**
Plain zones	1		1	
Hilly zone	1.3 (0.8 - 1.7)		0.7 (0.3 - 1.2)	
Mountain zone	5.4 (3.2 - 8.1)		29.2 (18.6 – 39.8)	
Residency urban vs. Rural		**0< 001**		< 0.37
Urban area	1		1	
Rural area	1.8 (1.3 - 2.3)		0.9 (0.4 – 1.7)	
Occupation		**<0.001**		0.37
Non - agriculture	1		1	
Agriculture	1.8 (1.2 - 2.5)		0.7 (0.3 - 1.2)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	47.2 (27.9 - 67.3)		101.6 (39.9 - 167.5)	

Note: Statistical significant values are highlighted in bold

Continued appendix 29

5. Life activities

Variables	Univariate analysis Odd ratio (95% CI)	p value	Multivariate analysis Odd ratio (95% CI)	p value
Gender		0.86		0.99
Male	1		1	
Female	1.0 (0.7 - 1.4)		1.0 (0.5 - 1.9)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	5.5 (3.7 - 7.8)		8.1 (2.8 – 13.5)	
45 - 54 Yrs.	8.7 (6.1 - 11.4)		12.2 (6.9 - 17.5)	
55 - 64 Yrs.	26.0 (17.3 - 37.2)		32.9 (10.2 -49.3)	
65 + Yrs.	127.6 (52.7 - 209.2)		51.4 (129.6 – 73.2)	
Eco zone		**< 0.001**		**<0.001**
Plain zones	1		1	
Hilly zone	1.6 (1.1 - 2.4)		1.2 (0.6 - 1.9)	
Mountain zone	4.5 (2.7 - 6.3)		19.4 (6.0 – 33.4)	
Residency urban vs. Rural		**0.01**		0.77
Urban area	1		1	
Rural area	1.6 (1.1 - 2.3)		0.9 (0.4 – 1.6)	
Occupation		**<0.001**		0.63
Non - agriculture	1		1	
Agriculture	1.9 (1.3 - 2.7)		0.8 (0.4 - 1.5)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	54.9 (32.7 - 77.1)		108.3 (46.5 - 173.7)	

Note: Statistical significant values are highlighted in bold

Continued appendix 29

6. Participation

Variables	Univariate analysis Odd ratio (95% CI)	p value	Multivariate analysis Odd ratio (95% CI)	p value
Gender		0.51		0.41
Male	1		1	
Female	1.1 (0.8 - 1.6)		1.3 (0.7 - 2.2)	
Age group		**<0.001**		**<0.001**
18 - 34 Yrs.	1		1	
35 - 44 Yrs.	4.8 (2.1 - 7.5)		5.4 (2.7 – 8.3)	
45 - 54 Yrs.	9.0 (4.0 - 14.4)		13.4 (4.1 - 22.4)	
55 - 64 Yrs.	27.4 (12.3 - 43.2)		36.0 (10.8 - 63.9)	
65 + Yrs.	116.6 (47.9 - 192.3)		482.3 (112.2 – 873.7)	
Eco zone		**< 0.001**		**<0.001**
Plain zones	1		1	
Hilly zone	1.3 (0.8 - 2.0)		0.6 (0.3 - 0.9)	
Mountain zone	4.4 (2.6 - 6.7)		16.7 (5.2 – 29.4)	
Residency urban vs. Rural		**<0.001**		0.99
Urban area	1		1	
Rural area	1.7 (1.2 - 2.2)		1.0 (0.4 – 1.8)	
Occupation		**<0.001**		0.36
Non - agriculture	1		1	
Agriculture	1.8 (1.2 - 2.6)		0.7 (0.3 - 1.3)	
Knee pain prevalence		**<0.001**		**<0.001**
No knee pain	1		1	
Knee pain	44.6(26.7- 40.6)		82.1 (34.7 - 139.3)	

Note: Statistical significant values are highlighted in bold