Prevalence of Work-Related Musculoskeletal Disorders among Dental Workers in Enugu Metropolis, Nigeria

Running (short) title: **WRMSDs among Dental Workers**

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Abstract

Background: Work-related musculoskeletal disorders (WRMSD) are the main occupational health hazard among several clinicians, but its prevalence among dental workers in Nigeria has not been well-studied. Objective: This study evaluated the pattern and prevalence of WRMSDs among dental workers in the Enugu metropolis, Nigeria. **Materials and Methods:** Six hospitals with dental clinics participated in this cross-sectional survey in the Enugu metropolis. One-hundred and fifty standardized musculoskeletal symptom (Nordic) questionnaires were adopted and distributed, of which 141 were returned. The questionnaire elicited data on demographic characteristics and carrier profiles, ergonomics, and the body parts involved in the occupational activities. **Results:** The results indicated that 83% of the respondents sustained musculoskeletal injury more than once. Bending (66%) and performing repetitive tasks (58.2%) were the most performed risk activities. The lower back (66%) was the most affected body part, followed by the upper back (58.9%), neck (51%), shoulder (47.5%), and hip (46.1%). The most common preventive measures taken by individuals were resting (57%) and avoiding lifting (53.2%). **Conclusion:** There is a high prevalence of WRMSD among dental workers, with a consequent negative effect on their work habits, and reduced productivity.

Keywords: Dental workers, Enugu Nigeria, prevalence, work-related musculoskeletal disorders

Introduction

Musculoskeletal disorders affect nerves, tendons, muscles, and supporting structures such as intervertebral discs with symptoms ranging from mild periodic discomfort to several chronic and severe pain[1]. It majorly affects the neck, shoulder, back, wrist, and hand with common signs like a decreased range of motion, deformity decreased grip strength, and loss of muscle function. Symptoms include pain, numbness tingling, burning cramping, and stiffness[2].

The term Work-related musculoskeletal disorders (WRMSDs) was used in this study as signs and symptoms arising due to a series of micro-traumas to bones, joints, ligaments, muscle tendons, blood vessels, and nerves that accumulate and intensified by work[3]. Many occupations place

high physical and mental demands on employees, putting them at risk of developing a work-related musculoskeletal disorder (WRMSD). Workers' habits must be continually reassessed to ensure proper posture, body mechanics, equipment use, stretching techniques, frequent breaks, and overall healthy lifestyles[4]. A multi-center epidemiologic study has shown that over 65 percent of dental health care workers suffer from musculoskeletal disorders during their working careers, ceasing pain and discomfort, forcing them to take time off from the surgery, and in some cases leading to retirement.[2] The work of Leggat et al.[5] also, highlighted that WMSD among dental health workers might contribute considerably to sick leaves, reduced productivity, and the future possibility of leaving the profession at an early age. Similarly, the work of Hayes et al.[6] on the prevalence of work-related musculoskeletal disorders amongst dental healthcare workers showed that the prevalence of WRMSD had contributed as high as 64 to 93 percent of pain reported to the clinicians.

According to Yasobant and Rajkumar[7], the causes of WRMSD are multi-factorial, including workplace conditions and exposures and organizational, psychosocial, and socio-cultural variables among others. Daily exposure to physical risk factors and insufficient rest or recovery time are among the principal organizational factors that can lead to musculoskeletal disorders[8]. The intrinsic and extrinsic (physical) factors which include the work procedures, equipment, and environment lead to biomechanical stress on the muscle, tendons, spinal discs, and nerves[9,10]. Force, repetition, awkward or long-term static postures, vibration, and work in low temperatures are also considered the principal physical work-related risk factors concerning musculoskeletal disorders[11,12].

Thus, this makes it necessary that adequate knowledge, skills, and information on working methods and techniques, as well as on working movements, postures, and loads are provided to

help reduce the risk of musculoskeletal disorders[13]. It has been suggested that injuries caused by WRMSD or similar cumulative trauma disorders, can be reduced or prevented by applying ergonomics in dental equipment and instrument design[14]. Occupation ergonomics attempts to improve the fit between the workforce and the work environment through the optimized design of jobs and work systems. Ergonomics programs most often focus on physical job features, such as tool or workstation dimensions, heavy lifting, awkward postures, and repetitive tasks[2].

However, much of the focus regarding WRMSD has not been thoroughly addressed among dental workers in Nigeria. Dental workers due to the nature of their profession may be subjected to tasks, which can be very physically challenging and labour-intensive involving direct contact with patients. They include performing manual work, continuous bending, or transferring dependent patients, with few breaks to relieve the continuous load of static muscle contractions[15,16]. Previous studies have shown that dental workers are commonly involved in the process of repetitive work using the same muscles and tendons for a considerable part of the working day, which may be responsible for fatigue and injuries[16,17]. They also engage in awkward postures; with the hands above shoulder height or with the wrist noticeably bent, in which the joints are more susceptible to injuries and muscles have less capacity for exerting force[18]. Evidence is scarce on WRMSD prevalence and pattern of presentation among Dental workers in Nigeria. An assessment of the WRMSD amongst dental workers and the underlying factors associated with it is required to elucidate the nature of this important issue and to guide in drawing ergonomic programs targeted at improving their working practices. Thus, the present evaluated the pattern and prevalence of WRMSDs among dental workers in the Enugu metropolis.

Materials and methods

Design

This is a cross-sectional descriptive survey to investigate the work-related musculoskeletal disorders (WRMSD) prevalence among dental workers in the Enugu metropolis, which was randomly selected from six hospitals with dental clinics including the University of Nigeria Teaching Hospital, Ituku-Ozalla Enugu, Federal School of Dental Technology, and Therapy Enugu, the State Dental clinic; and three private dental clinics within Enugu metropolis.

Ethical considerations

The ethical approval for this study was obtained from the University of Nigeria Teaching Hospital Research Ethics Committee (NHREC/05/01/2008B-FWA00002458-1RB00002323). All participants gave their informed consent, and the study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Participants

This study utilized a convenience sampling technique to recruit participants from the selected hospitals in Enugu metropolitans. This study involved 141 dental workers between the age ranges of 21-70 years who are operating within Enugu Metropolis, registered with the selected hospitals, who are willing and available to participate in the study. Those who had a history of surgery to their lower back, ankle, and foot or any deformity of the spine, knee, foot ankle joints, and who had cognitive impairment affecting their ability to understand the context of the questionnaire were excluded from this study.

Procedure

Participants were contacted in person within the dental unit of the selected hospitals. The purpose, procedures, and relevance of the study were explained to the participants on which basis their written informed consent was requested and obtained.

The biodata of the participants (age, marital status, rank or occupation, and religion and tribe), job history and method of work, physical load, and musculoskeletal complaints were identified and defined by the presence or observed of pain in each specific body region using the standard and prophylactic method adopted concerning the musculoskeletal complaint.

Questionnaire

A standardized musculoskeletal symptom (Nordic) questionnaire was adopted and distributed to collect data for this study. The questionnaire comprised two sections: demographic characteristics and carrier profiles, Ergonomics, and the body parts involved in the occupational activities. The section elicited information on the general characteristics of the dental workers while the second section comprised four-part Nordic questionnaires which consisted of 20 items (WRMSDs based). Each eliciting information on job history and method of work, physical load, and musculoskeletal complaints were identified and defined by the presence or observed of pain in each specific body region using the standard and prophylactic method adopted concerning the musculoskeletal complaint. Also, their respective knowledge of musculoskeletal symptoms and their prevalence were evaluated.

Statistical Analyses

Before data collection, PASS and NCSS computer software version 2000 determined the sample size power (n=200). Further, D-Augustino normality test to confirm normal population sampling. The descriptive statistical analysis of frequency and percentages was used to analyse the data. All analyses were carried out with the SPSS computer statistical software version 20.

Results

Table 1 shows that most of the respondents were male (57.4%), within the age range of 21–30 years (36.2%) with a mean age of 37 years, most of them were married (64.5%), and the majority (91.5%) were Christians. The table also demonstrates that most of the respondents (85%) were Igbos and the proportion of the respondents who had worked for 5 years (38.3%) was more than those who had worked 4 (19.1%), 3 (14.2%), 1 (14.2%), and 2 (11.3%) years, in that order.

Table 2 shows that most respondents (96.4%) have sustained WRMSD, while five (3.6%) have not. The most affected part of the body includes lower back injuries (66.1%), upper back (58.9%), neck (51.1%), shoulder injuries (47.5%), and hip (46.1%), while the ankle/foot was the least (22.7%) affected.

Table 3 shows that most (58.2%) of the dental workers sustained injuries when applying modalities and performing a repetitive task. Most (66.0%) of them indicated that they were bending when the injury occurred, while 34.8% and 19.1% claimed that their injuries occurred when lifting heavy equipment/patients and when transferring patients, respectively.

As indicated in Table 4, the majority of the respondents (57.4%) used rest to treat WRMSD, followed by medical treatment (52.5%) and exercise (51.1%). In addition, 30.5% used postural adaptation while 26.2% used surgical treatment.

Finally, Table 5 showed that WRMSD affected the ability of the dental workers to lift objects (53.2%); in 35.5% of them, it led to the change of working positions frequently, while in 24.1%, there was a change in the work schedule. Also, 21.3% decreased the use of manual techniques, 17.7% of the dental workers encouraged patients' responsibility in carrying out treatment, and 49.6% increased their use of mechanical aids. In addition, there was a decrease in patients' care

time in 17.7% of the respondents; 42.6% claim that they increased their use of other personnel; while 30.5% and 50.4% stopped working when hurt and took rest, respectively. Only 14.3% of them applied an improved body mechanics.

Discussion

This study aimed to assess the pattern and prevalence of work-related musculoskeletal disorders (WRMSDs) among dental workers in the Enugu metropolis. The result of the study revealed that a high percentage of the respondents have sustained low back pain followed by an upper back injury. This is in line with the findings of Buckle et al.[19] which revealed that WRMSD majorly affects the lower back, neck, shoulder, elbows, forearms, wrist, and hands. This finding also corroborates the findings of Blyth et al.[20], which showed that musculoskeletal pain is the major and most common cause of chronic pain and physical disability that affects hundreds of workers across the world. As well, Adegoke et al.[21] reported similar findings on the prevalence of work-related musculoskeletal pain among physiotherapists, which revealed that the majority of the physiotherapists have sustained low back pain followed by wrist pain. This high prevalence could be due to the frequent bending and poor posture associated with their work[6,21].

The result showed that the subjects sustained WRMSD when they were utilizing modalities, performing repetitive tasks, bending, transferring dependent patients, and lifting heavy equipment. This confirmed the findings of Adegoke et al.[21], which showed that transferring dependent patients and performing repetitive tasks were the most frequent causes of WRMSD in their study among dental workers.

On the type of treatment commonly used by dental workers when they sustain WRMSD, the highest used treatment modality reported in this study was rest, followed by medical treatment and

exercise. Other treatments include postural adaptation and surgical treatment. These findings did not agree with the findings of Adegoke et al.[21], which stated that only a few (4.2%) of the injured physiotherapists in their study used rest to reduce pain but mostly modified their position and work environment to reduce their symptoms. This difference in their findings could be due to the difference in the professional population studied. Adegoke et al.[21] assessed physiotherapists, which is a reference profession on the concepts of ergonomics and best intervention for WRMSDs. This difference could signpost a path for improvement and is noteworthy in interventional programs designed to improve ergonomics practice among dental health workers.

On the contrary, the sustained injury affected their work habit in different patterns as most of the dental workers altered their work habits due to WRMSD while around two-fifths of them did not. It was also observed that the dental workers mostly avoided lifting heavy objects, as they also frequently changed their working positions, and working schedules, decreased manual techniques, encouraged patients' responsibility, increased the use of mechanical aids, increased administrative aids, increased patient; care time, increased use of other personnel, stopped working when hurt, took a rest break and use improved body mechanics all as a coping strategy.

Finally, this study revealed a high prevalence of WRMSD among dental workers in the Enugu metropolis. This is consequent to an adverse effect on their work habit and can contribute considerably to sick leaves, reduced productivity, and the future possibility of leaving the profession at an early age as opined by Leggat et al.[5] as recommended in the work of Ambarwati et al.[22], there is a high need for interventions that help reduce the risk of WRMSD among dental workers as well as other health workers considering the manual and ergonomic dynamics of their work. Such intervention could include educating them on the basic principles of ergonomics and providing ergonomic chairs and proper working tools that are designed with ergonomic sense.

Study limitations: Being a cross-sectional design its utilization of self-report for the assessment of the ergonomics practices may have a diminishing effect on the study findings. Nevertheless, this study adds valuable information to the literature on the knowledge gaps and poor ergonomics practices of dental workers in the Enugu metropolis with their resultant prevalence of high WRMSDs.

Conclusion

This study showed a high prevalence of WRMSD among dental workers in the Enugu metropolis with a consequent negative effect on their work habits and reduced productivity mostly due to loss in man-hours. Interventions to promote ergonomic work settings are suggested to foster a healthier working experience among dental workers. In addition, because most of the affected clinicians resorted to self-medication; there is a need to educate the working population on management and preventive measures against WRMSDs.

Authors contribution: CCA, FNE, and SSE conceptualized and designed the study. CCA, FNE, CFE, OKO, and CIE were involved in data collection/acquisition and statistical analysis; All authors (SSE, CCA, FNE, CFE, OKO, and CIE) were involved in the writing and revising of the manuscript for intellectual content. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

Ethical approval: The ethical approval for this study was obtained from the University of Nigeria Teaching Hospital Research Ethics Committee (NHREC/05/01/2008B-FWA00002458-1RB00002323).

Informed consent: All participants gave their written informed consent before enrollment into the study.

Declaration of Helsinki: the study was conducted following the ethical principles of the Declaration of Helsinki.

Availability of research data: Authors are available and ready to supply the data upon request through the corresponding author.

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Table 1: General characteristics of participants

Variables		Frequency	Percentage
Sex	Male	81	57.4

	Female	59	41.8
Marital status	Single	40	28.4
	Married	91	64.5
Religion	Islamic	03	2.1
	Christianity	129	91.5
Tribe	Igbo	21	85
	Hausa	1	0.7
	Yoruba	6	4.3
Year of Experience	1	20	14.2
	2	16	11.3
	3	23	16.3
	4	27	19.1
	>5	54	38.3

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306 Table 2: The pattern and prevalence of WRMSDs among dental workers in Enugu metropolis.

Variables	Frequency	Percentage

Have sustained WRMSD		136	96.5
Have not sustained WRMSD		5	3.6
Have sustained WRMSD at	Neck	72	51.1
	Shoulder	67	47.5
	Hip	65	46.1
	Upper back	83	58.9
	Elbow	35	24.8
	Knee	42	29.8
	Wrist/hand	34	24.1
		32	22.7

307 Key: WRMSD= Work Related Musculo-Skeletal Disease

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311 Table 3: Distribution of WRMSD across work characteristics among dental workers

Variables	Frequency	Percentage

Applying modalities	60	42.6
Repetitive task	82	58.2
Bending	93	65.0
Transferring Patient (s)	27	19.1
Lifting heavy equipment	49	34.8

323 Table 4: Type of treatment used by the subjects who sustained WRMSDs

Variables	Frequency	Percentage
Surgery	37	26.2
Medical	74	52
Rest	81	57.4
Exercise	72	51.1
Postural adaptation	43	30.5

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335 Table 5: Adjustment of work tasks due to WRMSDs

Variables	Frequency	Percentage
Avoid lifting	75	53.2
Frequently Change working position	50	35.5
Change schedule	34	24.1
Decrease manual techniques	30	21.3
Encourage patients' Responsibility	25	17.7
Increase use of mechanical aids	70	49.6
Increase administrative time	5	3.5
Decrease patients' care time	25	17.7
Increase use of other personnel	60	42.6
Stop working when hurt or Symptom occur	43	30.5
Take rest breaks or pause during work day	71	50.4
Use improved body mechanics	20	14.2

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