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Food allergies and perceptions towards food allergen labelling in Mauritius

Abstract

There remains a paucity of research in food allergies in Sub-saharan Africa. It is the aim of this study to determine the self-reported prevalence of food allergies and consumers' perceptions towards food allergen labelling in Mauritius. A survey was conducted in four supermarkets in the Municipalities of Vacoas-Phoenix, Quatre-Bornes and Moka during the period of September to November 2017. The questionnaire was designed based on previous studies and administered using a face-to-face interview approach to increase completion rate. Descriptive analysis and one-way ANOVA between subjects design were conducted. Shellfish was reported as the most common causative agent followed by fish, egg and peanut. Respondents were satisfied with the current font size and general information provided in food labels. Respondents agreed that it could be problematic to identify suitable foods for individuals suffering from food allergies or intolerances. Variations of PAL statements and generic terms provided in food labels, and location of allergy warnings were cause for concern. More than 80% of the respondents felt that allergens in ingredient list should be emphasised (e.g. bold font) and plain English or French language should be used to describe allergenic ingredients. The findings in this study provide practical insights on food allergen labelling issues for policy makers and stakeholders in the food supply chain. Determining the prevalence of food allergies in the country will inform policy makers to consider adding shellfish and other major allergenic ingredients to the list of ingredients requiring mandatory allergen warning label in Mauritius.

Keywords: food allergy; food regulations; precautionary allergen labelling; shellfish

Introduction

Food allergy is a specific immunological adverse reaction to a trigger food while food intolerance is a form of non-immunologically mediated reaction (Fraser, Sumar, & Sumar, 2000). Examples of food intolerance include lactose intolerance where the individual lacks the ability to produce sufficient lactase needed to digest lactose. Food allergies can cause life-threatening anaphylactic reactions and reduce the quality of life of individuals with food allergies (Franzese, 2017). Food allergy affects up to

10% of the global population (Sicherer, & Sampson, 2018) and is increasingly reported in developed nations. For example, the prevalence of food allergy is estimated to be 5 – 10% in infants and 5% in young children in Japan (Ebisawa *et al.*, 2017), 6% in Europe (Nwaru *et al.*, 2014) and 8% of children in US (Gupta *et al.*, 2011). Codex stated that the eight common food allergens (cereals containing gluten, egg, milk, soy, peanuts, tree nuts, fish and shellfish) shall be declared (Codex Stan 1-1985). There is still a paucity of research in less developing countries such as in the Africa region (Prescott *et al.*, 2013). Africa is also burdened by infectious and non-communicable diseases and lack of recognition of allergy as a clinical specialty due to limited health care infrastructure (El-Gamal, Hossny, El-Sayed, & Reda, 2017; Potter *et al.*, 2010). To date there are some reports of surrogate measures of food allergy such as self-reported reactions or sensitisation to food (Kung, Steenhoff, & Gray, 2014) such as those reported in Mozambique (Lunet, Falcao, Sousa, Bay, & Barros, 2005) and Tanzania (Justin-Temu, Risha, Aba, & Massawe, 2008). Gray *et al.* (2014) and Basera *et al.* (2015) also assessed the prevalence of food allergy in South Africa using questionnaires, skin prick testing and oral food challenge whilst Obeng *et al.* (2011) studied the prevalence of food sensitisation and reported food allergy among schoolchildren in Ghana. There is one report of food hypersensitivity in Mauritius which revealed that 20% of the participants reported symptoms of food allergies (Pugo-Gunsam, Cahoolessur, & Subratty, 2008).

Mauritius is a small island nation in the Indian Ocean with a population of more than 1.2 million (Naidoo, & Ramseook-Munhurrin, 2016). It is also a thriving international tourism hub since 1974 where the travel and leisure industry contributed more than 10% of the total Gross Domestic Product (Ladkin, & Juwaheer, 2000; Statistics Mauritius, 2017). Protecting both local and international visitors are key and the Mauritian government has reinforced and updated the Food and Drugs Act with Food Act 1998 and Food Regulations (1999) since 1st January 2000 (Ministry of Health and Quality of Life, n.d.). The current food labelling regulations establish the standard labelling requirements of pre-packed food. There are currently no regulations requiring the mandatory labelling of food allergens in food products containing such ingredients (Food Regulations, 1999). This is understandable as the true prevalence of food allergy in Mauritius and a number of African countries are not known. However, there has been a report stating high self-reported symptoms of food sensitivity especially

towards seafood (Pugo-Gunsam *et al.*, 2008). Other food safety associated studies such as food additives (Koyratty, Aumjaud, & Neeliah, 2014), food hygiene practices (Subratty, Beeharry, & Chan Sun, 2006) and food safety management in fish industry (Ramnauth, Driver, & Vial, 2008) had been conducted in Mauritius. There is no cure for immunologically mediated food allergy and the main treatment or preventative step is avoidance of the trigger food. One of the key strategies to avoid food allergens is clear and accurate labelling. Studies on consumers' attitudes towards food allergen labelling were conducted mostly in developed nations (Cornelisse-Vermaat, Voordouw, Yiakoumaki, Theodoridis, & Frewer, 2007; Voordouw *et al.*, 2007). Food allergen labelling plays a crucial role in preventing development of food allergies among allergic individuals. Mfueni *et al.* (2018) carried out a study in Malawi and found that the country's food allergen labelling was the least demanding compared to other international regulations. This study aims to determine the self-reported incidence of food allergies and awareness of food allergen labelling in Mauritius.

Methodology

The questionnaire was constructed and divided into 3 sections: (i) demographics; (ii) self-reported food allergies and (iii) food allergen labelling. Several questions on using food labels in managing food allergies were included in Section III. Respondents were asked 'to what extent they agree or disagree on how serious a problem it is to identify suitable foods for individuals with food allergies or intolerances'. This was followed by a section on 'Improvements of food allergen labelling' and respondents were asked how important the improvements or changes were. The questions were developed based on Choi & Choi (2016), Cornelisse-Vermaat *et al.* (2007) and Pugo-Gunsam *et al.* (2008). A pilot study was conducted among 20 participants who were not included in the actual study to evaluate the language, clarity and suitability of wording. Four supermarkets in Municipalities of Vacoas-Phoenix, Quatre-Bornes and Moka were visited during the period of September to November 2017. The supermarkets were visited on both weekdays and weekends as types of shoppers may differ. Individuals visiting the supermarkets in were approached and the purpose of the study was explained to them. The study targeted both males and females of different ages to represent a snapshot of the demographic characteristics of the participants. Participants were invited to participate in the study and interested participants were asked for their signed consent before

answering the survey questions. Young respondents (< 18 years old) could only participate in the survey if their parents provided the consent. The questionnaire was administered using a face-to-face interview approach as this helps to increase response and completion rate (Koyratty *et al.*, 2014). One hundred and thirteen respondents completed the survey. This is similar to Pugo-Gunsam *et al.* (2008) and Greiwe, Pazheri, & Schroer (2015).

Statistical analysis

Statistical analyses were carried out using SPSS 24.0 (IBM Corp., NY, USA). Differences between age, gender and education levels were first analysed using one-way ANOVA between subjects design followed by pairwise comparison with Bonferroni's correction. Results were expressed as mean \pm SD and significance level was set at $p < 0.05$.

Results and Discussion

A total of 113 consumers participated in the study with more females (64.6%) responding to the survey compared to males. This is similar to other studies and reflect the demographics of mostly female adults conducting the shopping as they take more responsibility for shopping and preparing meals (Helgesen & Nasset, 2010; Juwaheer, Pudaruth, & Ramdin, 2013; Liu, & Niyongira, 2017). Participants mostly belong to the age bracket 25 – 54 years (62.83%), highly educated (53.98% held at least a degree) and tend to report their knowledge on food allergen labelling as somewhat knowledgeable (79.65%). Curtin, Presser, & Singer (2000) stated that more educated people are more likely to respond to surveys and this could be largely attributable to the subject matter. All respondents reported symptoms of food allergies (including those experienced by their family members). Shellfish, egg, milk and peanuts were the most commonly reported trigger food (Table 1). Most allergic reactions to seafood are IgE-mediated and can cause rapid onset of symptoms ranging from mild symptoms such as cutaneous reactions to severe anaphylactic reaction (Bahna, 2016). Shellfish was the most commonly reported causative agent in Mauritius (Pugo-Gunsam *et al.*, 2008) and Asia (Boye, 2012; Chiang *et al.*, 2007). Lunet *et al.* (2005) reported seafood allergy as the most frequent in Mozambique whilst crab was one of the major allergenic food in Zimbabwe (Westritschnig *et al.*, 2003). Based on Pugo-Gunsam *et al.* (2008) and this study, shellfish is reported

as one of the common allergenic food. Fish is an important component of Mauritian diet (Daby, & Sigurlinnason, 2003) and the strategic location enable the expansion of the fish industry in Mauritius (Ramnauth, Vial, & Driver, 2008). Due to the availability and frequency of consumption of seafood, this may have led to a higher increase in prevalence of seafood allergy (Lopata, O'Hehir, & Lehrer, 2014; Sharp, & Lopata, 2014) as evident in regions such as Japan (Ebisawa *et al.*, 2017), Spain (Pascual *et al.*, 2008) and Philippines (Connett *et al.*, 2012).

Insert Table 1 here

Other food products reported to cause allergies among the respondents of this study were eggplant, food colourings, mushroom, chocolate, taro leaves and red and white beans. There are similar reports of unique ethnic food allergens such as eggplant allergy among Indians residing in US (Dinakar, Kamdar, Yarbrough, & Gupta, 2015) and India (Babu, Mahesh, & Venkatesh, 2008) and mushroom allergy (Hegde, Das, & Venkatesh, 2002). Subjects experiencing adverse reactions to eggplants could be due to pharmacologic action of histamine and other non-protein components (Babu *et al.*, 2008). Kumar *et al.* (2011) demonstrated that red beans showed cross reactivity with other legumes such as peanuts, soybean and chickpea and may induce allergic reactions in humans. Novel food allergens reported elsewhere in Africa include pineapple in Ghana, okra in Nigeria and mopane worm in Botswana (Kung *et al.*, 2014). Similarly, chocolate can trigger headache and migraine due to consumption of increased level of tyramine, which is naturally present in cocoa products (Finocchi, & Sivori, 2012). There is also a possibility of presence of milk and or nuts in chocolate that caused the sensitivity (Bedford, Yu, Wang, Garber, & Jackson, 2017).

Respondents reported having experienced symptoms mostly affecting their cutaneous (e.g. hives, eczema) and gastrointestinal (e.g. vomiting) systems followed by respiratory (e.g. shortness of breath), and circulatory systems (e.g. low blood pressure). Although not determined from this survey, anaphylactic reaction can cause hypotension or severe drop in blood pressure. Fourteen respondents reported either themselves or their family members have had experience of hypotension as one of the reactions to food. Food anaphylaxis can occur rapidly or within a few hours and is often

accompanied by angioedema in the lips, eye or tongue, followed by symptoms associated with other organ systems (e.g. wheezing / bronchospasm, hypotension and vomiting) (Sarinho, & Lins, 2017). In this case, epinephrine is the first line of treatment (Kemp *et al.*, 2008; Sarinho & Lins, 2017). About 16% of the respondents indicated that they bring some forms of medications (e.g. anti-histamines or epi-pen) to treat a food allergic reaction. Forty percent of the respondents opted to see their general practitioner if they suffer from food allergic reactions. However, on the other end of the spectrum, 37.2% of the respondents chose not to consult any healthcare professionals if they suffer from food allergic reactions (Table 1). Similar to cases of foodborne illnesses, patrons who experienced food poisoning often do not report the incident (Harrison *et al.*, 2014) or seek medical advice (Soon, Singh, & Baines, 2011).

More than 60% of the respondents agreed that the information provided in the ingredient list are easy to understand and the font size is sufficient for reading (Figure 1). This is in contrast to Cornelisse-Vermaat *et al.* (2007) and Voordouw *et al.* (2007) where the food allergic consumers reported that font sizes were too small and terminologies used in ingredients as difficult to understand. Singla (2010) also reported difficult terminologies and small font sizes were some of the major problems encountered by consumers. Fifty-nine percent of the respondents in this study felt that the ingredient list could provide more information about food allergens in the label. However, space limitation on the label limits how much information can be included (Verbeke, & Ward, 2006). There is also the potential of information overload to consider as excessive information may create confusion or even boredom among consumers (Salaun, & Flores, 2001).

Insert Figure 1

The consumers' responses were further evaluated in terms of their perceptions towards the food labels. 56.6% of the respondents agreed that it will be difficult for respondents with food allergies or intolerances if there are different variations of food labels among imported products. Males (3.85 ± 0.86) were more concerned about the different labelling of imported food products ($F = 5.97$, $p =$

0.016, $p\eta^2 = 0.05$) compared to females (3.42 ± 0.89). Lack of harmonisation in food labelling practices across imported countries can cause confusion among consumers and may even restrict consumers' diet (Voordouw *et al.*, 2007). Gender also revealed significant difference in the information provided in E-numbers. Females (3.74 ± 1.07) were more concerned about details of food additives in the E-numbers ($F=6.21$, $p = 0.014$, $p\eta^2 = 0.05$) compared to males (3.20 ± 1.16). There were strong agreement regarding the location of allergy warnings and usage of generic terms in ingredient lists (e.g. spices, vegetable oil). Ambiguous labels or terms may compromise consumers' ability to determine the safety of the food products (Joshi, Mofidi, & Sicherer, 2002). Consumers also felt that there is currently lack of manufacturers' or packers' details in the food labelling and that E-numbers should also provide an indication of types of ingredients. Interestingly, there were no significant differences between education levels. This could be explained by the fact that all respondents reported having experienced food allergies or intolerances themselves or by their family members. This represents a motivated group of respondents who may be keen to see changes in the current food labelling practices.

Insert Table 2

More than 80% felt that allergens in the ingredient list should be emphasised using bold or capitalised font or highlighted with suitable background colour. Different styles of emphasis could be used to emphasise the presence of allergens in the ingredient list or precautionary allergen labelling. Mfueni *et al.* (2018) revealed that bold font was the most frequently used font when declaring allergens in ingredient list. Other emphasis include contrasting colour, italics or enlarged font. Simple terms should be used to inform customers of the presence of allergens in the ingredients and this could either be in English or French terms. Complex ingredient terminology such as casein and whey for milk may compromise consumers' safety especially if they do not understand the terminologies for milk protein (Joshi *et al.*, 2002). In Joshi *et al.* (2002)'s study, only 4 of 60 parents correctly identified all the labels that indicated milk. Simons, Weiss, Furlong, & Sicherer (2005) reported that allergic reactions were attributed to misunderstanding of label terms or usage of generic terms (e.g. flavour or spice). A large proportion of the respondents felt that symbols could be used to indicate the

presence of allergens (87.6%) while 73.5% indicated that allergy warning could be placed adjacent to the ingredient list. Symbols such as asterisks (*) were used in food labels to indicate presence of allergens. For example, an asterisk could be placed on vitamins* to inform consumers that the vitamins *contain soybean oil or sulphur dioxide* to declare that the product *contains preservative as sulphite in some fruits. Alternatively, internationally recognised symbol such as the Crossed Grain Symbol is used across Europe to signify gluten-free products that conform to high and safe standards of production (Association of European Coeliac Societies, 2015). Slightly more than 60% indicated that contact details should be included in the labelling and similar number of respondents reported that percentage of allergenic ingredients could be shown in the ingredient list. There were significant difference between age groups regarding manufacturer's contact details ($F = 3.49$, $p = 0.003$, $\eta^2 = 0.17$). Consumers under 17 years old (3.50 ± 1.23) were significantly less concern about the details compared to other age groups (more than 4.00 score). This is understandable as adults may be contacting the manufacturer on behalf of their allergic children and are responsible for finding out further information about usage of allergenic ingredients in the manufacturing environment. Contact details will enable consumers to communicate with manufacturers as indicated by Simons *et al.* (2005) where 86% consumers ($n=486$) in their study contacted the manufacturers for more information. The Internet of Things (IoT) technologies could be utilised in future by integrating Quick-Response (QR) codes and radio frequency identification tag to food products to enable information sharing within the supply chain and consumers. QR codes that are a form of 2D barcodes will be useful in providing detailed information for allergic consumers (Kerbach *et al.*, 2009).

Shellfish is considered a major (self-reported) cause of food allergies in Mauritius. In the current Mauritian Food Regulations (1999), there is no specification requiring food manufacturers to declare the listing of foods causing hypersensitivity. The Codex General Standard for the Labelling of Pre-packaged Foods could be used as an international benchmark with reference to the foods and ingredients known to cause hypersensitivity (Codex Stan 1-1985). The eight foods listed in Codex – cereals containing gluten, eggs, milk, peanuts & soybeans (legumes), tree nuts & nuts, fish, crustacean and sulphite (> 10 mg/kg) contribute to 90% of food allergic reactions (Bush, & Hefle, 1996). This study is also of value to the food industry and healthcare practitioners as the findings

represent a snapshot of the food allergy status in Mauritius. Limited countries in Africa had carried out research in this area (Basma et al., 2015; Gray et al., 2014; Kung et al., 2014) and there remains numerous research and development opportunities for Mauritius and other African countries.

Determining the prevalence of food allergies in the country will inform policy makers to consider adding shellfish and other major allergenic ingredients to the list of ingredients requiring mandatory allergen warning label in Mauritius. Studies on assessment of food allergen management in food facilities such as those conducted by Dzwolak (2017) in Poland and Thailand (Waisarayutt et al., 2014) and costs for implementation of food safety and allergen management systems (Cusato et al., 2014) will be beneficial. Studies looking into the knowledge and practices of food handlers in food services (Ajala et al., 2010; Dupuis et al., 2017; Soon, in press) can also be carried out.

Conclusion

The only current treatment for food allergies is to avoid the trigger food. This relies on accurate and clear declaration of allergens in ingredient list and unambiguous precautionary allergen labelling to inform consumers regarding the presence of allergens. Food allergy is a concern in Mauritius and more resources need to be allocated to determine the prevalence of food allergies. Mauritian consumers would like to see improvements in food allergen labelling such as using bold font to emphasise allergens in the ingredient list, plain English or French terminologies, symbol to indicate presence of allergen and the location of allergy warning adjacent to the ingredient list. Consumers would also like manufacturers or packers to include contact details on the food labels as this would allow consumers to enquire or to seek confirmation about the ingredients used and handling of food allergens on their premises. At this time, there remains extensive work in determining the prevalence of food allergies, investigating current food allergen labelling practices in pre-packaged food, and benchmarking and re-aligning the list of food allergens requiring mandatory declaration in food labels. Studies on consumers' attitudes and purchasing habits of food products with allergens will further identify the needs of public.

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