

# Common Dermatoses and Predisposing Factors in Food Handlers in a University Campus: A Cross-sectional Study

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**Abstract:** Behind food industries are the food handlers that thoroughly prepare the meals we consume on a daily basis. Food and food preparation activities are noted to be a cause of skin conditions. Since dermatoses are often multifactorial in origin, the various contributing factors to disease can be difficult to determine. The objectives of this study are to describe the demographic characteristics of food handlers, identify the common dermatoses seen and possible inherent individual factors, work-related events and external triggers in the workplace that contribute to the common skin conditions. A prospective cross-sectional study was done. 160 food handlers participated in this study. All went to the UP Health Service and underwent a complete dermatologic history and physical examination, and managed accordingly. The most common diagnoses of food handlers are xerosis, post-inflammatory hyperpigmentation (PIH) secondary to burn, melasma, chronic hand dermatitis and verruca plana, atopic dermatitis and dermatophytoses. Melasma, solar lentigenes, dermatosis papulosa nigra and compound nevus were significantly associated to sun exposure. Exposure to cleaning agents was significantly associated with xerosis, chronic hand dermatitis and acne vulgaris. Food handlers exposed to heat were significantly associated with PIH secondary to burn. Skin disease has a large number of factors instrumental in the development and progression of disease. All food handlers should be encouraged to report all potential work-related dermatoses and seek consult for full evaluation by a physician. Further research on occupational skin disease is vital towards improving environmental and occupational research in the Philippines.

## 1 INTRODUCTION

Food is a basic necessity. With this, the food service industry is and will always remain in high demand. Behind the various food industries in our country are the food handlers that thoroughly prepare and deliver the meals we consume on a daily basis and they play a paramount role in ensuring food safety and prevention of food poisoning. Food handlers in the University of the Philippines Diliman (UPD) are present in basically every building in the university. They can be seen in various food establishments, restaurants, cafeterias, indoor and outdoor food stalls, and even on the streets pushing food carts or carrying baskets of their products. And due to the number of students they cater to, efforts have been established to ensure food safety management procedures. Hence, it is imperative to examine them for any sign of disease that could predispose to the spread of infection, as contamination of food may progress into an outbreak.

A significant proportion of occupational disease is accounted for by occupational contact dermatitis. Several studies have stressed the frequency of these dermatologic conditions in food handlers. However, the National Institute of Occupational Safety and Health still emphasized that there has been relatively scarce occupational studies to establish a clear connection between the occupational setting and the cutaneous presentation. This is important as measures could be done to be able to assist workers who have developed skin conditions that commonly afflict them for the rest of their lives. Therefore, there continues to be a need to further research on this subject as local studies have not been made.

## 2 METHODS

A prospective cross-sectional study on the common skin conditions in food handlers was conducted at the University of the Philippines Diliman Health Service (UPHS). 160 food handlers working at the

UPD participated. The participants went to the UPHS for assessment by a Primary Care Physician for their annual medical examination. All participants were directed to the dermatology clinic for a full cutaneous assessment by dermatologists. The participants were briefed on the purpose of the study, assured confidentiality and were asked to sign an informed consent form if willing to participate in the study. Those who have agreed to participate and who have signed an informed consent form were included and were assigned case numbers. All subjects underwent a complete dermatologic history and physical examination by the investigators and were managed accordingly.

All valid data from evaluable subjects were included in the analysis. Input and descriptive analyses of data was performed using Microsoft Excel. Mann Whitney U test was used to compare averages. Chi-square test, Fisher's exact test or Yates' chi-square test was used to compare proportions. Statistical significance was based on p-values  $\leq 0.05$ . STATA v13 was used in data processing and analysis.

### 3 RESULTS

A total of 160 food handlers participated in the study, with no noted refusals to participate nor dropouts. 95.6% (153) of the study participants were assessed to have dermatoses. Of the patients with dermatoses, majority of them were females (87, 56.9%). Age of study participants ranged from 19-79 years old, wherein the average age of those with dermatoses was 38 years. The types of work were food serving (79.7%), food preparation (68%), cleaning (64.1%), and cooking (62.7%). It was found that the food handlers with dermatoses had longer length of service ( $p=0.049$ ).

#### 3.1 History of Atopy

A few of the food handlers with dermatoses had a personal history of asthma (17, 11.1%), allergies (21, 13.7%), atopic dermatitis (AD) (4, 2.6%), and

allergic rhinitis (AR) (9, 5.9%). Some also had a family history of asthma (28, 18.3%), allergies (8, 5.2%), AD (2, 1.3%) and AR (7, 4.6%). About 37.3% (57) had a history of previous skin conditions. However, there was insufficient evidence to show significant association between personal and family history of atopy and the presence of dermatoses. History of present skin condition was significantly associated with dermatoses ( $p<0.0001$ ).

#### 3.2 External (Occupational and Environmental) and Inherent Factors

About 86.9% (133) food handlers with dermatoses had contact with food such as vegetables (98, 73.7%), fruits (56, 42.1%), meat (112, 84.2%) and dairy (28, 21.1%). About 64.7% (99) had contact with cleaning agents like soap or detergent (98, 99%) and solutions (45, 45.5%). About 79.7% (122) had contact with pans. Of the 72.5% (111) food handlers with common dermatoses, 89.2% (99) had contact with hot containers and 10.8% (12) with cold containers. Out of those with outdoor food establishments, food kiosks/stalls comprised of 62.5% (35) while ambulant vendors made up 37.5% (21). Cafeterias were the majority of the indoor food establishments at 48.5% (47), followed by food kiosks/stalls (28, 28.9%) and restaurants (22, 22.7%).

#### 3.3 Common Diagnoses

The top 10 most common diagnoses of food handlers in the study are as follows: xerosis (54, 35.3%), post-inflammatory hyperpigmentation (PIH) secondary to burn (37, 24.2%), melasma (22, 14.4%), chronic hand dermatitis (CHD) and verruca plana (VP) (19, 12.4%), atopic dermatitis (AD) and dermatophytoses (18, 11.8%), acne vulgaris and dermatosis papulosa nigra (DPN) (17, 11.1%), solar lentigenes (15, 9.8%), contact dermatitis (13, 8.5%), burn scar (12, 7.8%) and scar secondary to knife cut (11, 7.2%) (*Table 1*).

Table 1: Diagnoses of food handlers with dermatosis

	n = 153
Xerosis	54 (35.3%)
Post-inflammatory hyperpigmentation (PIH) secondary to Burn	37 (24.2%)
Melasma	22 (14.4%)
Chronic hand dermatitis (CHD)	19 (12.4%)
Verucca plana	19 (12.4%)
Atopic dermatitis (AD)	18 (11.8%)
Dermatophytoses	18 (11.8%)
Acne vulgaris	17 (11.1%)
Dermatosis Papulosa Nigra (DPN)	17 (11.1%)
Solar lentigenes	15 (9.8%)
Contact Dermatitis	13 (8.5%)
Allergic Contact Dermatitis (ACD)	9
Irritant Contact Dermatitis (ICD)	4
Burn scar	12 (7.8%)
Scar 2 knife cut	11 (7.2%)
Compound nevus (CN)	10 (6.5%)
Insect bite derm (IBD)	9 (5.9%)
Rhytides	8 (5.2%)
Folliculitis	7 (4.6%)
Acrochordon	5 (3.3%)
Stasis dermatitis	5 (3.3%)
Xanthelasma	5 (3.3%)
Seborrheic derm	4 (2.5%)
Acitinic keratosis	4 (2.6%)
Verucca vulgaris	4 (2.6%)
Miliaria rubra	3 (2.0%)
Onychomycosis	3 (2.0%)
Callus	2 (1.3%)
Keratosis pilaris (KP)	2 (1.3%)
Neurodermatitis	2 (1.3%)
Paronychia	2 (1.3%)
Sebaceous hyperplasia	2 (1.3%)
Syringoma	2 (1.3%)
Acute urticaria	1 (0.7%)
Pityriasis versicolor	1 (0.7%)

n: count; Data presented as n (%). \* Significant at 5% level.

### 3.4 Environmental Factors

Exposure to outdoor environmental factors was significantly associated with the following diagnoses: 28.6% (16) had melasma ( $p < 0.0001$ ), 23.2% (13) had solar lentigenes ( $p < 0.0001$ ), 25% (14) had DPN ( $p < 0.0001$ ), and 12.5% (7) had compound nevus ( $p = 0.038$ ).

### 3.5 Exposure to Cleaning Agents

Exposure to cleaning agents was significantly associated with the following diagnoses: 43.4% (43) xerosis ( $p = 0.005$ ), 17.2% (17) chronic hand dermatitis (CHD) ( $p = 0.019$ ) and 15.2% (15) acne vulgaris ( $p = 0.033$ ).

### 3.6 Exposure to Extreme Temperature

About 28.8% (32) of food handlers exposed to extreme temperature were diagnosed with post-inflammatory hyperpigmentation (PIH) secondary to burn ( $p = 0.034$ ), which was noted to be significant.

## 4 DISCUSSION

Food handlers are at high-risk for developing occupational skin disease (OSD) as they habitually come into contact with a wide range of hazards potentially responsible for causing skin disease. A review of several articles discussed the influence of age, gender, endogenous conditions associated with atopic constitution, or exogenous triggers such as environmental factors and specific occupational risks, on the occurrence of occupational dermatitis (Iston et al., 2007, Warshat et al., 2007).

### 4.1 Demographic Data

In our study, most of the participants with dermatoses were female. This is consistent with a study by Kibret in 2012, who reported that majority (73.4%) of the food handlers were females while (26.6%) were males (Kibret, 2012). Another study by Warshaw et al also mentioned that women were found to have a higher prevalence of hand dermatitis compared to men primarily because females washed

their hands more than males (Warshaw et al., 2007; Williams, 2009; Kibret, 2012). Age of our study participants ranged from 19-79 years old, wherein the average age of those with dermatoses was 38 years. According to the *The European Agency for Occupational Safety and Health at Work (EU-OSHA)*, workers between 15–44 years old have a slightly higher risk of being affected by skin diseases than workers over 45 (Warshaw et al., 2007). It could be presumed that those among the older age group have been employed for a longer amount of time, which is consistent in our study that the food handlers with dermatoses had significantly longer length of service.

#### 4.2 History of Atopy

There was insufficient evidence to show a significant association between a personal and family history of atopy and the resulting common dermatoses. Previous studies have showed that a history of atopy and pre-existing skin disease are influential factors for the development of the work-related skin conditions, and that these workers were also observed to fare worse in severity and are more likely to have persistent disease than non-atopic workers (Belsito, 2005; Saary et al., 2005). This finding was not evident in our study probably because only a small portion of our participants had a history of atopy (36 out of 153). However, among the 36 people noted with atopy, all presented with a skin condition: 18 (50%) were noted to have AD, 13 (36%) had xerosis, 10 (27.8%) had CHD, 3 (8.3%) ACD, 2 (5.5%) with ICD and KP were noted.

#### 4.3 Common Dermatoses

The statistics on occupational skin diseases (OSD) are different for each country because of the different definitions used to classify occupational diseases (Lee et al., 2017). Based on literature, those dermatoses we expect to see in association with food preparation, cooking, serving and cleaning would be xerosis, PIH secondary to burn, CHD, contact dermatitis, burn scar, and scar secondary to knife cut. These were all significant in our study. For our setting, we have noted the numerous various food establishments in the university as well as the multitude of food handlers seen in practically every corner. Given that our food handlers are subject to various environmental factors, such as exposure to sunlight and humidity, the presence of the other noted dermatoses in our study may be justified.

#### 4.4 Exposure to Environmental Factors

There is a different impact depending on the geographic region, being worse in places where the weather is always warm, and the skin becomes more exposed (Warshaw et al., 2007). Consequently, the Philippine weather and environment is very different from that in Western and first-world countries where majority of studies were conducted. This could probably explain the significance of why most of those diagnosed with melasma, dermatosis papulosa nigra, solar lentigenes and compound nevus were noted to have been observed mostly in food handlers who worked outdoors as these diseases are all associated with sun exposure.

#### 4.5 Exposure to Cleaning Agents

Another environmental risk factor is “wet work,” wherein the cumulative effects of water, soaps and detergents induces maceration of the skin, leading to increased penetration of irritants and allergens (Jones & Horn, 2014). This is consistent with the significant finding that those with xerosis and chronic hand dermatitis mostly had cleaning as part of their job. Acne was also found to be significantly associated to exposure to cleaning agents. We could probably attribute this to wearing of protective clothing such as caps and masks, which could trigger *acne mechanica*. We also note that the food handlers with acne are in the 19-30 year old age range, which we can all deduce that they must have gotten acne due to more common factors- increase in sebum production and proliferation of *P. acnes*.

#### 4.6 Exposure to Extreme Temperature

PIH is characterized by increased pigmentation acquired after a cutaneous inflammatory process. People with higher skin phototypes such as Filipinos, are more prone to this skin condition, because they already have a higher basal amount of epidermal melanin (Cestari et al., 2014). Frequent contact with hot containers such as pans while cooking predisposes one to burns, with subsequent post-inflammatory hyperpigmentation after the burn has healed on the area of contact. With that, we have found an association between exposure to hot containers and burn post-inflammatory hyperpigmentation. There was no association evident between cold containers (ice cream vendors mostly) and dermatoses.

## 5 CONCLUSION

It could not be emphasized more that skin disease has a large number of occupational and non-occupational predisposing factors that are instrumental in the development and progression of disease. Several factors were identified throughout the course of the study that may differentiate our study population from those in foreign studies, thus affecting the results of the study. In summation, it was found that food handlers with dermatoses had significantly longer length in service. Our study also shows that the common dermatoses found in the food handlers in UP Diliman are more dependent on occupational and environmental factors and not so much on inherent factors or atopy. The location of the food establishment, as well as their type of work proved to be major contributing factors to the skin conditions noted. Food handlers who worked outdoors and had considerable sun exposure were significantly associated with solar-induced dermatoses such as melasma, dermatosis papulosa nigra, solar lentigenes and compound nevus. Those that had daily exposure to cleaning agents were mostly found with xerosis, chronic hand dermatitis and acne vulgaris. Lastly, food handlers who are in constant contact with hot containers had a significant association with post-inflammatory hyperpigmentation secondary to burn. Studies on the prognosis of occupational dermatoses point out that primary prevention is very important. Hence, further research on OSDs is indeed vital towards improving environmental and occupational research in the Philippines.

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