International Journal of Chronic Diseases & Therapy (IJCDT)
ISSN: 2572-7613

Occupational Contact Dermatitis in the Food Industry

Research Article

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Abstract

Background: Contact dermatitis accounts for 90% of all occupational skin diseases which is considered a costly occupational disease. The aim of the present study was to investigate contact dermatitis and relevant occupational factors among food industry workers.
Study Design: The present cross-sectional study was carried out among food supply, production, distribution and preservation centers of Mashhad, Iran from 2017 to 2018.
Methods: Workers in food industry who were referred to periodic training centers for employees entered the study with at least one year of work experience. The two-part questionnaire including demographic and occupational information and the occupational skin questionnaire (Nordic Occupational Skin Questionnaire (NOSQ-2002/SHORT), which is validated in Persian, was filled by the participants. Individuals with dermatitis were examined and the results were recorded.
Results: A total of 384 food industry workers entered the study including 316 (82.3%) men and 68 (17.7%) women. 32 (8.4%) subjects were suffering from eczema, among which 25 (78.1%) had hand eczema, 6 (18.8%) had both wrist and hand eczema and 1 (3.1%) had eczema confined to the wrist. The statistical analysis revealed that gender and previous familial and personal history of atopy were significantly correlated with hand and wrist eczema (P-value ≤0.05 was significant).
Conclusion: Prevalence of dermatitis varies in food industry workers regarding the job status. In this study, occupational dermatitis proved to be more prevalent among men and individuals with a personal or family history of atopy, thus these people should be under strict supervision of health practitioners working in the food industry. Further studies are recommended among the employees of certain subunits of the food industry.

Keywords: Occupational Dermatitis; Contact Dermatitis; Nordic Occupational Skin Questionnaire; Food Industry Workers.

Introduction

Occupational dermatosis (OD) or occupational skin disease (OSD) is described as any pathological condition of the skin, which is caused or worsened by an occupational exposure [1]. Skin diseases account for more than 30% of all occupational diseases, affecting approximately 1 per 1000 workers annually and are responsible for decreased productivity and lost workdays in different industries [1]. Environmental chemicals are among the main causes of OSDs and there are about 2000 substances known as contact allergens [1]. Approximately 90% of all OSDs are reported as contact dermatitis [9, 10]. The food and catering industries account for more than 10% of all occupational dermatitis, which is considered as a major occupational health threat. The most important workers at risk include chefs, cooks, kitchen and catering assistants and counter hands. Waiters, cleaners, bakers, confectioners, greengrocers and meat, poultry and fish handlers are among other workers at risk in this area [5]. In most of the food and catering jobs, prolonged contact with water, soap and disinfectants required for hygiene issues causes more than 55% of dermatitis cases. More than 40% of occupational dermatitis in industry is due to contact with foods, including sugar, flour, fruits, vegetables, seasonings, seafood, meat and poultry [5]. Occupational dermatitis may be seen mainly as irritant contact dermatitis and allergic contact dermatitis [6]. Various host factors may have a role in developing occupational dermatitis, such as history

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Received: November 01, 2021
Accepted: November 22, 2021
Published: November 23, 2021

Citation: Lahya Afshari Saleh, Nasrin Anvari, Bita Kiafar, Farzaneh Rahimpour. Occupational Contact Dermatitis in the Food Industry. *Int J Chronic Dis Ther.* 2021;7(2):118-122. doi: http://dx.doi.org/10.19070/2572-7613-2100024

of atopy, pigmented skins, old and wrinkled skins and immune deficient workers. White people, compared with blacks are more prone to dermatitis [7, 8]. The primary aim of this research was to investigate contact dermatitis and its related occupational factors among food handlers and sellers.

Materials and Methods

This cross-sectional study was carried out under supervision of Mashhad University of Medical Sciences form 2017 to 2018. Regular training courses are conducted in Iran for food preparers, distributers and sellers including greengrocers, butchers, bakers, confectioners and restaurant, catering and fast-food staff. Subjects referred to these training centers were studied using random sampling method within one year period. Those who had food-related occupations for at least one year in the city of Mashhad were included in this study and exclusion criteria were as follows: dissatisfaction for entering the study, immunocompromised cases, using immunosuppressive drugs and previous history of a skin disease before employment. A two-part questionnaire, including a demographic checklist designed by the author and the validated Nordic Occupational Skin Questionnaire (NOSQ-2002/SHORT) was used. Cases with dermatitis were examined by occupational medicine specialists and referred to our dermatologist colleague for a precise diagnosis. Data were collected and entered into the SPSS V.20 Software. The relationship between the frequency of dermatitis and job-related factors were evaluated with the T-test, chi-squared test and Fisher's exact test. The level of significance was 0.05 for all tests.

Findings

Demographic indices

A total of 384 food handlers in the city of Mashhad were studied. 316 (82.3%) cases were male and 68 (17.7%) cases were female. Among the participants, 288 (75%) cases were married and 96 (25%) were single. According to education levels, 6 were illiterate (1.6%), 340 had a high school diploma or less (88.5%) and 38 had higher education (9.9%). Among the participants of this study 32 (8.3%) cases had a pet. 32 (8.4%) subjects were suffering from eczema, 25 (78.1%) of those had hand eczema, 6 (18.8%) had both wrist and hand eczema and 1 (3.1%) had eczema confined to the wrist. Subjects with hand and/or wrist eczema were asked regarding probable factors of dermatitis in or out of the work place. Among them 4 (12.5%) cases believed that the probable factor was outside the workplace while 17 (58.6%) cases blamed workplace for developing the disease. The number of subjects suffered from itchy, dry and scaly skin were 2 (0.5%), 54 (14.1%) and 2 (0.5%), respectively. 18 (4.7%) cases reported more than one skin symptom and 308 (80.2%) cases showed no skin symptoms. 42 (10.9%) cases stated that seasonal changes altered the skin symptoms and 342 (89.1%) believed that seasonal changes had no effect on their skin. Table 1 shows the frequency of hand eczema according to the time of occurrence.

The relationship between the quantitative and qualitative demographic and occupational variables was appropriate according to the statistical tests. Table 2 illustrates the qualitative demographic and occupational variables in two groups of patients with hand eczema and healthy individuals.

Table 3 shows the frequency of occupations in both study groups. Chi-squared test was used to compare the frequency of jobs in both study groups, through which no significant difference was detected between the two groups, in terms of current jobs (P=0.49).

Moreover, table 4 depicts the quantitative demographic and job variables in two groups of patients with hand eczema and healthy individuals. The relationship between annual eczema recurrence while working and occupation types was studied based on an appropriate statistical test and no significant relationship was found (P=0.67) (Table 5).

The relationship between eczema improvement during weekends within a year and occupation types was studies and no significant relationship was detected (P=0.86) (Table 6).

Discussion and Conclusion

Of the 345 employees working as food preparers, distributers and sellers 32 (8.4%) subjects had eczema. The annual prevalence of dermatitis was 7.5% in this study. Recent studies on occupational health indicate that food-related occupations are among the major factors contributing to contact dermatitis [2, 5]. Smith et al. reported the annual prevalence of skin disorders in food industry among kitchen workers was 1414 people per million. The study was performed on 193,132 personnel using a questionnaire. Skin disorders were higher among cases who had wet-work exposure [21]. In another study on 1052 food industry workers in Finland in 1985, Peltonen et al. showed that 17% of their study population were suffering from skin diseases. The frequency of occupational eczema was 8.5% which was twice higher among fish, meat and vegetable handlers and also confectioners. Hand eczema existed in 15% of the food handlers and 6% of the office employees [19]. Other studies reported a higher prevalence. According to a study by Sylvia Teo et al. (2003), the prevalence of occupational dermatitis among 457 restaurant, catering and fast-food staff in Singapore was 10% within a year [22]. The incidence of occupational dermatitis was reported 34% among 90 food services workers in Poland [18] and in another research the annual inci-

Table 1. Timing of Skin Symptoms in Patients with Dermatitis.

Last skin eczema symptoms seen	Number of patients	Percentage of patients
Patients at present	19	5
Within the last 3 months	3	0.8
Within the last 3-12 months ago	6	1.6
More than 12 months ago	4	1
total	32	8.4

Table 2. Evaluating the Qualitative Demographic and Occupational Variables in Two Groups of Patients with Hand Eczema and Healthy Individuals.

Variable	group	With hand eczema		Without hand eczema		Test statistic
	subgroup	No.	Percentage	No.	Percentage	(P-value)
Sex	male	21	6.6	295	93.4	0.01
	female	11	16.2	57	83.8	
Education	Illiterate	0	0	6	1.7	0.41
	High school diploma and lower	27	84.4	313	88.9	
	Higher than high school diploma	5	15.6	33	9.4	
Keeping pets	Own a pet	30	93/83	322	91/5	0.56
	Do not own a pet	2	6/3	30	8/5	
Previous job	No previous job	23	71/9	231	65/6	0.63
	Related job in food industry	3	4/9	28	8	
	Work experience in other fields	6	18/8	93	26/4	
Second job	With no second job	32	100	345	98	0.42
	With a second job	0	0	7	2	
Use of cosmetics and sanitary materials and skin creams	Yes	24	75	297	4/84	0.17
	No	8	25	55	6/15	
Use of gloves	No	7	21/9	54	15/33	0.33
	Yes	25	78/1	295	84/7	
The material of gloves used	Cotton	0	0	18	6	0.34
	Latex	14	56	120	3/40	
	Nylon	3	12	46	4/15	
	Plastic	8	38/3	114	32	
Hand hygiene procedure	Low	6	18/8	71	20/2	0.29
	Average	12	37/5	173	49/1	
	High	14	43/8	108	30/7	
Use of disinfectants	No	1	3/1	20	5/7	0.73
	Especial liquid	26	81/3	254	72/2	
	Especial solid	2	6/3	32	9/1	
	Others (not specific for hands)	3	9/4	46	13/1	
Marital status	Single	9	28/1	87	27/7	0.67
	Married	23	71/9	265	75/3	
History of chronic diseases	No record	21	65/6	294	83	0.13
	Asthma	0	0	2	0/6	
	Diabetes	0	0	3	9/0	
	Hypertension	1	3/1	7	2	
	Heart diseases	0	0	2	0/6	
	Thyroid disorders	0	0	3	0/9	
	Anemia	2	6/3	16	4/5	
	Allergy	6	18/8	22	5/4	
	Others	2	6/3	5	6/3	
History of drug consumption	No record	30	93/8	336	95/5	0.66
	Yes	2	6/3	16	4/5	
Smoking	No	29	90/6	315	89/5	0.84
	Yes	3	9/4	37	10/5	
History of family atopy	Yes	24	75	322	91/5	0.00
	No	8	25	30	8/5	
History of atopy	Yes	8	80	2	20	0.00
	No	22	6/0	343	94/0	
	N/A	2	22/2	7	77/8	

dence rates of occupational dermatoses in Germany were 33.2% and 23.9% among bakers and pastry cooks, respectively [23]. In a similar study conducted in Iran by Fathi et al., the incidence of occupational dermatitis among the food industry staff was 9.5% in a 5-year period in the city of Yazd [15]. In the present study, the one-year prevalence of dermatitis among food industry workers was 7.3%. The following factors may account for the significant difference in the rate of occupational dermatitis between Iranians and other populations:

1- Genetic: Genetic effects, particularly atopic backgrounds, vary in different populations (7 and 8).
2- Risk factors for contact dermatitis: Food consumption patterns of Iran is different from other countries. For example, mustard which is a popular ingredient of salad dressings and induces contact dermatitis, is less commonly used in our country (7 and 8).

Furthermore, seafood types, meat types and spices are different from each other in East Asia, Europe and Iran. In addition, cooking traditions in some countries are different from our country.

3- Hand washing: Based on the guideline for the workplace and environmental health center, the workers of food supply, distribution and preservation units should frequently wash their hands with a particular method. Considering the significant role of soap and water in developing contact dermatitis, dermatitis types in different countries may be due to the number of hand-washing episodes per day. In this study, 77 participants (20%) reported a

Table 3. Comparing the Frequency of Jobs in Both Groups of Patients with Hand Eczema and Healthy Individuals.

Job groups	hotel maid	Baker	Seller of vegetables	Cook	Grocery worker	Bucher	Coffee shop worker	Confectioner	Milk seller	Vegetable cleaner	Total
Eczema	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)	NO. (Percentage)
Without hand eczema	10 (8/2%)	22 (3/6%)	28 (8%)	155 (44%)	33 (4/9%)	19 (4/5%)	17 (8/4%)	49 (9/13%)	14 (4%)	5 (4/1%)	352 (100%)
With hand eczema	0 (0 %)	2 (3/6 %)	4 (5/12%)	18 (3/56%)	2 (3/6 %)	0 (0 %)	0 (0 %)	6 (8/18%)	0 (0 %)	0 (0 %)	32 (100 %)
Total	10 (6/2%)	24 (3/6%)	32 (8.3 %)	173 (1/45%)	35 (1/9 %)	19 (9/4%)	17 (4/4%)	55 (3/14%)	14 (6/3%)	5 (3/1%)	384 (100%)

Table 4. Evaluating the Quantitative Demographic and Job Variables in Two Groups of Patients with Hand Eczema and Healthy Individuals.

Group	Average		Test statistic (P-value)
Variable	With hand eczema	Without hand eczema	T Test
Age	32/44±7/82	32/68 ± 9/64	0/39
No. of children under 4	0/49±0/37	0/46 ± 0/24	0/32
Duration of the first work experience	7/06±7/01	6/19 ± 4/90	0/31
Work hours per week	62/03±15/39	66/45 ± 17/70	0/71
Duration of the second work experience	0	0/34 ± 3/52	0/80
Duration of the last work experience	2/27±1/15	4/66 ± 2/19	0/85

Table 5. The Relationship between Annual Eczema Recurrence while Working and Occupation Types.

Skin Condition	Recurrence		No recurrence		Total	Test statistic
job	No.	Percentage	No.	Percentage		
Baker	1	50	1	50	2	0/67
Greengrocer	1	33/3	2	66/7	3	
Cook	13	72/2	5	27/8	18	
Grocery worker	1	50	1	50	2	
Confectioner	2	50	2	50	4	
Total	18		11		29	

Table 6. The Relationship between Eczema Improvement during weekends within a Year and Occupation Types.

Skin Condition	Not improved		Improved		Total	Test statistic
job	No.	Percentage	No.	Percentage		
Baker	1	50	1	50	2	0/86
Greengrocer	1	33/3	2	666/7	3	
Cook	9	50	9	50	18	
Grocery worker	1	50	1	50	2	
Confectioner	3	75	1	25	4	
Total	15		14		29	

low frequency of daily hand-washing. In addition, despite ensuring confidentiality, honesty of workers in completing questionnaires is still doubtful.

4- Unbalanced job distribution of the subjects: In the current study, different jobs related to raw foods, food preparation and preservation and food products were assessed. Similar studies were mostly concentrated on fast-food employees, bakers and confectioners. Hence, a reason for the presence of various prevalence rates may be the diversified variable in the subcategories of industry.

5- No defined job duty: Another distribution difference may be the duty of individuals in some units, so that there are no factors related to dermatitis. For example the exposure factors would change for a cook assistant working the whole day or all days of the week.

6- Climate conditions: The amount of moisture alters the frequency of dermatitis [2].

Current study demonstrated that a personal or family history of

atopy and also gender differences affected the prevalence of the contact dermatitis, highlights the role of genetics in the outbreak of dermatitis in the study population. Similar studies showed a significant relationship between the hand washing frequency, job safety and etc., and the prevalence of contact dermatitis [22]. In this study, the aforementioned factors were different between dermatitis patients and healthy subjects. Nevertheless, no statistically significant difference was detected. The reasons to explain this issue may be explained as follows:

1- The presence of recall bias in symptom improvement during the holiday period. Considering the fact that symptom improvement requires at least one week off, the employees had probably no such long holidays since Mashhad is a touristic city.
2. The presence of reporting bias in hand washing frequency and using personal protective equipment, which is less frequent considering the random sampling.
3. Short-term employment record, economic status of the country and new employments may be among other influencing factors.

The number of children under 4 years was considered as a contributing factor to dermatitis but no statistically significant result was achieved in our study. This outcome could be explained as the lower percentage of females (17.7%), who are more responsible for child care in our country (24). In this article, the average employment period in dermatitis group was more than the healthy group, however, the difference was not statistically significant. This may be due to a relatively low average of working years in the study population (7 years on average) according to the employment of young persons and frequent job change in industry. The findings of this study indicate that the annual prevalence of dermatitis is higher among men, which is probably because of the job type (women mostly work as packaging staff and men work as food preparers and have direct contact with raw materials). The incidence of chronic diseases was low in the study population (probably due to a lower average age) which made the application of statistical tests difficult. The level of education had no relationship with the prevalence of dermatitis, because of the proximity of the educational levels in the study groups. Moreover, the reporting bias (inaccurate reporting of educational level) was inevitable.

Advantages

The translation and assessment of reliability and validity of Nordic skin Questionnaire was a major advantage of this study. The study sample is relatively larger than similar studies.

Disadvantages

It was not possible to assure the job relatedness of a skin disease due to the unavailability of a certain paraclinical test for food materials and high costs of testing procedures.

Suggestions

1- Developing electronic records related to the information of personnel is one of the main infrastructure actions. Considering the reasonable initial costs of launching this system as well as training people, the industrial system and related occupational diseases could be assessed more accurately. Finally, this could lessen the financial burden of insurance and corporations and also reduces the inconvenience of employees in the upcoming years.
2- Detecting patients with atopy during periodical job examinations helps to regularly track any probable skin disorder in future.

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