

Occupational dermatoses in restaurant, catering and fast-food outlets in Singapore

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Background	The restaurant industry is a rapidly growing sector in Singapore and workers in this industry are trained in culinary skills but not on recognition of safety and health hazards and their control measures. Anecdotal clinical evidence has suggested an increased prevalence of occupational dermatoses among restaurant workers.
Aims	To determine the prevalence and risk factors for contact dermatitis and burns among restaurant, catering and fast-food outlet (FFO) staff.
Methods	Workers were interviewed and then clinical examination and patch and/or prick tests were conducted in selected individuals.
Results	In total, 335 of 457 workers (73% response) were interviewed and 65 (19%) had occupational dermatitis or burns and were examined. Of these, contact dermatitis was the commonest diagnosis, with a 12-month period prevalence of 10% (35 workers) and 3-month period prevalence of 8% (26 workers). All 35 workers had irritant contact dermatitis (ICD) and there were no cases of allergic contact dermatitis. The adjusted prevalence rate ratios of risk factors for ICD were 2.78 (95% CI 1.36–5.72) for frequent hand washing >20 times per day, 3.87 (95% CI 1.89–7.93) for atopy and 2.57 (95% CI 1.21–5.47) for contact with squid. The 3-month period prevalence for burns was 6% (20 workers). Ten workers had other occupational dermatoses such as work-related calluses, paronychia, heat rash and allergic contact urticaria to prawn and lobster.
Conclusion	ICD and burns are common occupational skin disorders among restaurant, catering and FFO workers.
Key words	Burns; contact dermatitis; restaurant industry.

Introduction

From 1994 to 2004, restaurants and other eating and drinking establishments experienced a 54% increase in employment, the highest in Singapore's services sector [1].

A previous report showed that 4% of 525 patients seen in a tertiary skin centre with occupational skin diseases in Singapore from 1984 to 1985 were caterers [2]. Subsequently, the food industry contributed to 10% of 965 patients with occupational skin disease seen at the same centre from 1989 to 1998 [3]. In 2003, occupational skin

diseases accounted for 14% (67 cases) of the total number of notified occupational diseases in Singapore. Of these, 30% were contributed by the restaurant industry [4]. The National Institute for Safety and Health (NIOSH) had reported that the restaurant industry and other retail businesses rank high among US industries for risk of adolescents' injuries, including burns [5].

The aim of this study was to determine the type, prevalence and risk factors for occupational dermatoses among restaurant, catering and fast-food outlet (FFO) staff. A further aim was to propose recommendations on prevention of occupational contact dermatitis and burns in the restaurant industry.

Methods

This cross-sectional study was granted ethical clearance by the Domain-Specific Research Board, National Healthcare Group, Singapore. It focused on the 12-month period and 3-month period prevalence (August

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to October 2003) of contact dermatitis and burns in the study population.

In July 2003, 14 Chinese restaurants (CR), 5 Western restaurants (WR), 3 catering kitchens (caterer) and 4 FFOs who were committee members of the Restaurant Association of Singapore were approached to take part in a study of occupational skin disorders. These restaurants were selected based on size of the workforce (minimum of 20 workers). Of these, five CR, two WR, one Chinese caterer and one FFO agreed to participate. Workers surveyed were service staff (waiters/waitresses, bartenders) or kitchen staff (cooks, kitchen cleaners, raw food handlers, kitchen assistants). Administrators, management and finance staff were excluded.

Visits were conducted on days where close to maximal service and kitchen staff strength (>80%) were expected to be present. Two visits were made to each participating outlet within the same day as work is conducted in split shifts with a rest break in the afternoon. Hence, the 'non-participants' were those working on a different shift, on leave or declined to be interviewed (about 5–10% from each outlet).

All participating workers answered an interviewer-administered questionnaire asking about demographic factors, main job tasks, hours of work per day, duration of service, atopic status [defined as one with a personal or family (first-degree relatives) history of atopic eczema, asthma or allergic rhinitis], type of glove worn and compliance with usage, hand washing frequency (≤ 20 times per day or > 20 times per day), exposure to detergents/chemicals/raw foods and presence of hand dermatitis, urticaria or burns in the last year. The interviews were conducted either in English or Mandarin by the investigator, assisted by an officer, trained in occupational medicine. The investigator, trained and with experience in occupational dermatology, examined the skin of all workers interviewed.

The definition of occupational dermatoses included any skin lesion that appeared after the start of the job and improved when the person was away from work. Burns sustained in the course of work were also included. Occupational contact dermatitis was defined as a rash that appeared after the start of the job at sites in contact with known workplace irritants/allergens, which improved when the person was away from work. The diagnosis was based on history and clinical examination. Only those suspected to have allergic contact dermatitis (ACD) were referred for patch tests and those with suspected contact urticaria were referred for prick tests. Patch test results were scored according to the International Contact Dermatitis Research Group criteria. The allergens of the standard and food handler's series from Chemo-technique (Malmo, Sweden) were applied on Finn chambers and secured onto the patients' backs. Patches were removed after 48 h and the results read on days 3 and 7.

Data obtained from the questionnaire were analysed using the Statistical Package for Social Sciences for Win-

dows version 9.0. For comparison between two groups (proportions), Fischer's exact test was used. A multivariate stepwise Cox logistic regression analysis was performed to determine the risk factors for occupational hand dermatitis. Only statistically significant results at the 5% level are presented.

Results

In total, 335 workers of 457 eligible kitchen and service workers participated in the study (participation rate 73%). In all, 176 were service staff and 159 were kitchen staff. The participation rates by worksites were 72% for CR, 76% for WR, 71% for the caterer and 73% for the FFO.

The sociodemographic characteristics of the survey population are presented in Table 1. In total, 65 of the 335 workers interviewed were diagnosed to have occupational dermatoses (Table 2). Of these, 35 workers were diagnosed by the investigator to have occupational contact dermatitis. Ten of the 35 workers were referred to the dermatologist for prick/patch testing as they had contact with known allergens (raw foods or gloves) at work. All 10 were suspected to have ACD, but 6 of these 10 workers were suspected to have both ACD and contact urticaria. These included two CR workers (a raw food handler and kitchen helper) prick tested to seafood (prawn, lobsters, fish and squid) and vegetables (ginger, capsicum, carrot, spring onion and cucumber); one caterer prick tested to salted eggs; one CR dim sum cook prick tested to minced meat, shrimp and vinyl gloves and two WR fillet cooks prick tested to tenderized and non-tenderized squid, dory, prawn and vinyl gloves. Two other WR fillet cooks handling tenderized squid were lost to follow-up.

Patch testing was negative for all 10 workers tested. Prick testing was negative for five cases. One kitchen assistant (0.4%) with a history of itch, tingling and burning of his fingers whenever he had to wash or shell seafood had a positive prick test to raw prawn and lobster.

The other 25 workers were diagnosed to have irritant contact dermatitis (ICD) based on history of contact with known workplace irritants (oils, water or detergents) and no contact with known allergens. The 12-month and 3-month period prevalence of ICD was 10% (35 cases) and 8% (26 cases) (Table 2). The causative irritants included wet work/detergent (27 cases), oil (three cases), salted eggs (one case) and squid tenderized with papain (four cases).

Thirty workers with non-eczematous occupational skin disease included one case each of paronychia, heat rash and contact urticaria; seven cases with calluses and 20 cases with burns (period prevalence of 6%).

Table 3 compares compliance with usage of gloves among kitchen staff.

Table 1. Comparison of demographic and service-related factors in restaurants, a caterer and a FFO

	Restaurant (<i>n</i> = 254) <i>n</i> (%)	Catering (<i>n</i> = 30) <i>n</i> (%)	Fast food (<i>n</i> = 51) <i>n</i> (%)
Age (years)			
10–20	47 (19)	3 (10)	34 (67)
21–30	100 (39)	8 (27)	1 (2)
31–40	45 (18)	9 (30)	11 (22)
41–50	37 (15)	4 (13)	5 (10)
≥51	25 (10)	6 (20)	0
Sex			
Male (<i>n</i> = 172)	144 (57)	17 (57)	11 (28)
Female (<i>n</i> = 163)	110 (43)	13 (43)	40 (78)
Race			
Chinese	203 (80)	29 (97)	39 (77)
Malay	26 (10)	0	2 (4)
Indian	10 (4)	0	8 (16)
Others ^a	15 (6)	1 (3)	1 (4)
Hours of work/day			
<8.0	45 (18)	0	37 (73)
8–8.9	67 (26)	23 (77)	14 (28)
≥9.0	142 (56)	7 (23)	0
Service in industry (years)			
≤5.0	141 (55)	19 (63)	51 (100)
>5.0	113 (45)	11 (37)	0
Mean (SD)	6.7 (7.2)	6.1 (5.7)	0.8 (0.6)
Main job task			
Raw food handler	20 (8)	11 (37)	0
Cook/pastry	76 (30)	7 (23)	13 (26)
Kitchen cleaner	14 (6)	7 (23)	0
Waitress/general work	103 (41)	0	38 (75)
Kitchen assistant	41 (16)	5 (17)	0
History of skin atopy			
Yes	29 (11)	2 (7)	2 (4)
No	225 (89)	28 (93)	49 (96)
Frequency of hand wash/day			
≤20 times	145 (57)	18 (60)	51 (100)
>20 times	109 (43)	12 (40)	0
Compliance with use of gloves			
Not at all	95 (37)	11 (37)	8 (16)
>50%	37 (15)	6 (20)	1 (2)
<50%	39 (15)	4 (13)	8 (16)
All the time	83 (33)	9 (30)	34 (66)
Type of glove used			
Cotton (inner lining)	2 (1)	3 (15)	0
Rubber	57 (35)	6 (32)	1 (2)
Plastic	25 (15)	4 (21)	42 (98)
Vinyl	71 (44)	6 (32)	0
Others (nitrile, canvass)	8 (5)	0	0

^aOthers were from Nepal, Thailand, Bangladesh and Myanmar.

Risk factors for ICD are shown in Table 4. Factors such as age, gender, race, nationality, type of company, duration of service in industry, duration of service in company, contact with detergent, prawn, fish, crab, meat or garlic and compliance with glove usage were not statistically significantly associated with presence of ICD.

Burns were the second commonest diagnosis seen after contact dermatitis. Splashes by hot oil/grease caused eight cases of burns in restaurants and two cases in caterers. Two cases in restaurants were caused by contact with hot surfaces of the grill, oven or stove.

Six (four females and two males) of the eight workers in FFOs were teenagers aged 15–17 years working as full-time staff (6–8 h/day, 6 days/week) with mean employment duration of 5.8 months. The burn marks were sustained within the first few weeks of employment. The burns were caused by hot oil splashes or contact with hot surfaces (warming bin, fries basket and hot grill).

Discussion

Contact dermatitis was the commonest dermatosis seen in our study, while the commonest irritant was wet work/detergent (77%), similar to the study of Goon *et al.* [3]. We did not detect any cases of ACD and all cases of ICD were generally mild. A survivor population effect may be a possible explanation for this. However, the number of cases of ACD could be under diagnosed since not all cases were patch tested. Even then, we expected the numbers of ACD to be small since only 10 cases were suspected to have ACD clinically. ICD is still the commonest dermatosis reported in the food industry worldwide [2,3,6–9].

Wet work or frequent hand washing is a significant factor in the development of ICD [10]. The prevalence rate ratio (2.8) of those who washed their hands >20 times per day compared to those who washed their hands ≤20 times per day was similar to that found in the study by Bauer *et al.* [6] in apprentice bakers and confectioners. ICD has been well reported among cooks, food handlers and bakers [9,11,12] but not waitresses or kitchen assistants. Compared to restaurants, there were no cases of ICD among waitresses and cooks from FFO. This is likely to be because at FFOs, disposable utensils are used while cooks handle only frozen, pre-cut meats, rather than moist raw foods. A recommendation that restaurant workers should use impermeable gloves of appropriate length during wet work may be of benefit to them. Gloves, however, if worn for long periods without breaks or with profuse sweating, can cause ICD [13]. Proper education of glove use is therefore important in untrained workers.

The prevalence of history of atopic status in this study was only 10% (33 cases) compared to 21% reported by Tay *et al.* [14] among schoolchildren in Singapore. This could be explained by the healthy worker effect, as those with more severe dermatoses would have left the industry early. Still, a prevalence of 10% is high for an industry known for contact with wet work. Our finding of a 3.8-times increased risk of developing ICD in atopics, when in contact with irritants, is similar to Meding's Swedish population-based study, which found a 3-fold increase in the prevalence of hand eczema among atopic

Table 2. Comparison of prevalence of contact dermatitis, contact urticaria and burns between the main job categories in restaurants, a caterer and an FFO

	Main job task	ICD, <i>n</i> (%)	Contact urticaria, <i>n</i> (%)	Burn, <i>n</i> (%)	Others ^a , <i>n</i> (%)
Restaurants (<i>n</i> = 254)	Raw food handler	2 (6)	0	0	1 (25)
	Cook/pastry	11 (34)	0	9 (90)	1 (25)
	Kitchen cleaner	3 (9)	0	0	0
	Waitress	11 (34)	0	1 (10)	1 (25)
	Kitchen assistant	5 (16)	1 (100)	0	1 (25)
	Total	32	1	10	4
	Prevalence (%)	13	0.4	4	2
Catering (<i>n</i> = 30)	Raw food handler	1 (33)	0	0	3 (60)
	Cook/pastry	0	0	2 (100)	2 (40)
	Kitchen cleaner	0	0	0	0
	Kitchen assistant	2 (67)	0	0	0
	Total	3	0	2	5
	Prevalence (%)	10	0	77	17
FFO (<i>n</i> = 51)	Cook/pastry	0	0	8 (100)	0
	Waitress	0	0	0	0
	Total	0	0	8	0
	Prevalence (%)	0	0	16	0
Grand total (<i>n</i> = 355)		35	1	20	9
Overall prevalence (%)		10	0.4	6	0

^aOthers refer to work-related calluses, paronychia and heat rash.

Table 3. Distribution by compliance with use of gloves and main job task in restaurants, a caterer and an FFO

	Use of gloves	Raw food handler, <i>n</i> (%)	Cook, <i>n</i> (%)	Kitchen cleaner, <i>n</i> (%)	Waiter, <i>n</i> (%)	Kitchen assistant, <i>n</i> (%)
Restaurant	Yes	14 (70)	59 (78)	10 (71)	58 (56)	22 (54)
	No	6 (30)	17 (22)	4 (29)	45 (44)	19 (46)
	Total	20 (100)	76 (100)	14 (100)	103 (100)	41 (100)
Catering	Yes	9 (82)	1 (14)	6 (86)	NA	3 (60)
	No	2 (18)	6 (86)	1 (14)	NA	2 (40)
	Total	11 (100)	7 (100)	7 (100)	NA	5 (100)
Fast food	Yes	NA	13 (100)	NA	30 (79)	NA
	No	NA	0	NA	8 (21)	NA
	Total	NA	13 (100)	NA	38 (100)	NA

NA, not applicable.

Table 4. Crude and adjusted prevalence rate ratios of significant risk factors for irritant contact dermatitis

Risk factor		ICD, <i>n</i> (%)	Normal, <i>n</i> (%)	Crude prevalence rate ratios (95% CI)	Adjusted prevalence rate ratios (95% CI) ^a
Frequency hand wash/day	>20 times	12 (6)	202 (94)	3.4 (1.8–6.6)	2.8 (1.4–5.7)
	≤20 times	23 (19)	98 (81)	1	1
Atopy	Yes	11 (33)	22 (67)	4.2 (2.3–7.8)	3.9 (1.9–8.0)
	No	24 (8)	278 (92)	1	1
Contact with squid ^b	Yes	10 (30)	23 (70)	3.7 (1.9–6.9)	2.6 (1.2–5.5)
	No	25 (8)	277 (92)	1	1

^aAdjusted for frequency of hand wash, history of atopy and contact with squid.

^bSuspect papain (a tenderizer).

individuals [15]. Hence, this emphasizes the need for early screening and vocational guidance of susceptible individuals.

Thirty-two of 33 subjects who handled squid at work were restaurant workers. Of these, four male cooks from a Western seafood restaurant had itch, pain and redness of their hands while washing and filleting raw squid tenderized with papain. They were exposed to papain when water seeped into their short wrist-length vinyl gloves. One of the cooks who stopped handling the tenderized squid improved symptomatically. Papain, a proteolytic enzyme extracted from the latex of the papaya tree and fruit, is used as a tenderizer. It can cause ICD [16], ACD [17] and contact urticaria [18]. ACD to squid/cuttlefish has also been reported [19]. Seafood is the commonest type-1 allergen on the hands of caterers and is also known to cause ICD [20]. The use of papain as a tenderizer for squid was unique to only one WR. We found no cases of ACD to squid. This may be due to underdiagnosis since only 2 out of 10 workers (six not tested and two lost to follow-up) with a history of contact with squid and clinical evidence of contact dermatitis were patch/prick tested.

Risk factors for sustaining burns could not be analysed in this study as the numbers were small. Hendricks *et al.* [8] reported that adolescents in the 15–17 age group working in FFOs had a 1.7-increased risk of sustaining injuries compared to all other industries combined. Similar to that study, 75% of those who sustained burns in our study were aged 15–17 years. Possible reasons include a lack of experience, unfamiliarity with job tasks or physical characteristics such as small or short stature [21]. Being new and unfamiliar with a job task may be a reason since all eight FFO workers with burns sustained the injury in the early weeks of employment (mean employment duration was 5.8 months). Our workers, particularly the novices, should be trained on safe work practices and provided with mittens to prevent burns from hot oil and accidental contact with hot surfaces.

Singapore has 1111 restaurant establishments registered, 308 FFO establishments, 273 food caterers and 2648 'other' establishments [22]. The 'other' establishments (coffee shops, cafes, canteens, bars, pubs and snack bars) were not represented in this study and there was an overrepresentation of restaurants. Hence, the prevalence of occupational dermatitis and burns in our study population cannot be extrapolated to the entire restaurant industry in Singapore. In our study, another potential weakness is that quantification of exposures was estimated and hence could have been inaccurate. Non-occupational (e.g. domestic) exposures, which could have been significant, were not asked about and this could be a further bias to our study. However, this is the only population-based study on the restaurant/catering industry conducted in Singapore.

Our study shows that caterers are at risk for the development of ICD and burns, requiring the need for the

implementation of an effective occupational health programme in the industry.

Key points

- ICD and burns were the commonest occupational dermatoses in the restaurant/catering industry.
- Significant risk factors for ICD were frequent hand washing >20 times per day, atopy and contact with squid.
- Papain, a tenderizer, was found to be the cause of contact dermatitis.

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Conflicts of interests

None declared.

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