

Occupational Contact Dermatitis in Tertiary University Hospital: A 5-Year Retrospective Study

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Background: Thailand, an agricultural country developing into an industrial country, has differences in work environment, substance exposure, and climate. These factors may lead to a distinct epidemiology of occupational contact dermatitis (OCD).

Objective: To study the prevalence of allergic and irritant occupational contact dermatitis in Thailand.

Material and Method: The records of patients diagnosed of OCD and patch tested between 2006 and 2010 at Siriraj University Hospital were retrospectively reviewed.

Results: From 885 patch tested patients, 194 (21.9%) had OCD. Of those 194 patients, 76.8% were female and 23.2% were male. Allergic contact dermatitis (ACD; 76.3%) was found to be more common than irritant contact dermatitis (ICD; 24.2%). The common affected part was hands (51.5%). The most frequent occupation was wet work (35.1%), followed by office work (24.7%), industrial work (16%), and medical personnel (13.4%). The most common occupational allergens were nickel sulfate (33.1%), potassium dichromate (19.6%), and carba mix (15.5%). Water (56.1%), foods (4.9%), and oil/grease (2.4%) were the most common occupational irritants.

Conclusion: In our setting, allergic OCD was more common than irritant OCD. Nickel sulfate was the most common occupational allergen. Occupational ACD and ICD are most commonly found in industrial work and wet works, respectively.

Keywords: Prevalence, Epidemiology, Occupational contact dermatitis, Allergic contact dermatitis, Irritant contact dermatitis

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Ninety percent of occupational skin disease (OSD) cases are occupational contact dermatitis (OCD)⁽¹⁾. The present study is the most update epidemiologic study of occupational contact dermatitis in Thailand, an agricultural country developing into the industrial country. The difference in work environment, climate, substance exposure, worker profiles, and employment shift are important contributory factors that lead to distinct OCD information. Thailand has encountered a foreign workers influx since 2006⁽²⁾. Today, there are 80 times more workers from neighboring countries such as Burma, Cambodia, and Lao, than in 2005⁽²⁾.

Previous records in Thailand (in 2001 and in 2003) showed that OCD was the major cause of occupational skin disease and the proportion of irritant contact dermatitis (ICD) cases were higher than those of allergic contact dermatitis (ACD) cases⁽³⁾. The most frequent allergen was potassium dichromate, which is similar to the report of National Skin Centre

of Singapore at the same period⁽⁴⁾. To establish successful treatments and preventive measures, periodic revision of the epidemiology is required. Therefore, the purpose of the present study was to provide an updated epidemiology and reveal the common causative agents of OCD from Siriraj Contact Dermatitis Clinic (Si-CDC), Bangkok, Thailand.

Material and Method

Patients and study design

The Siriraj Institutional Review Board approved the use of clinical data from patients patch tested by Si-CDC between January 2006 and December 2010. Our practice setting is the biggest medical school and tertiary referral center in Bangkok, Thailand. We have varieties of patch test series covering allergens from occupational exposure.

Eight hundred eighty five patients were patch tested at Si-CDC during the 5-year period and 194 of those diagnosed with OCD were included. Patch testing was done with Siriraj standard series, which is combination of both European baseline series and International standard series, excluding primin, and additional allergens/series related to each individual's career. The allergens (Chemotechnique Diagnostics

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Table 1. Demographic and clinical data of OCD patients in different countries

Characters	Present study 2006-2010 (n = 194)	Singapore ⁽⁴⁾ 2003-2004 (n = 125)	US ⁽¹⁾ 1994-1999 (n = 135)	Denmark ⁽⁶⁾ 2001-2002 (n = 758)
Age, years (mean ± SD)	39.9±12.9	33.8	44±27	35.6
Sex ratio (male:female)	1:3.3	1:0.2	1:1.3	1:1.8
Personal history of atopy*, %	33.0	NA	10.0	NA
Prevalence of OCD, %	21.9	NA	25.0	NA
%ACD/%ICD	76.3/24.2	37.6/62.4	60.0/34.1	21.2/61.9
Top 3 allergens				
1 st	Nickel sulfate	Potassium dichromate	Nickel sulfate	Rubber additives
2 nd	Potassium dichromate	Rubber chemicals ⁺	Glutaraldehyde	Biocides [#]
3 rd	Carba mix	Cobalt	Thiuram mix	Nickel/cobalt

OCD = occupational contact dermatitis; ACD = allergic contact dermatitis; ICD = irritant contact dermatitis; NA = not available

* Personal history of atopy documented by having allergic rhinitis, allergic conjunctivitis, asthma or atopic dermatitis

⁺ Thiuram, mercapto/mercaptobenzothiazole and carba mix

[#] Formaldehyde (chloro) methyl-isothiazolinone, Euxyl k400, quaternium 15

AB, Vellinge Sweden) in aluminum Finn Chambers[®] (SmartPractice, Phoenix, Arizona, USA), were placed on unaffected skin on the upper back for two days, and the reactions were read on D2, D3, and D7, according to the guidelines of the International Contact Dermatitis Research Group⁽⁵⁾. Positive patch test reactions were read as 1+ to 3+ scoring system. Patch test results and patient data were collected by chart reviewed. ACD was diagnosed by positive patch test with clinical relevance. Si-CDC dermatologists evaluated the relevance with occupation in each individual. Demographic data and contributing factors were analyzed as well.

Statistical analysis

Data was analyzed by SPSS version 17.0. Descriptive statistics, e.g. mean, standard deviation, minimum, maximum and percentages, were performed to interpret demographic data. Contributory factors were compared using Pearson Chi-square test or Fisher's exact test as appropriate. The *p*-value of <0.05 was considered statistically significant.

Results

The prevalence of OCD in our clinic was 21.9% (194 cases from total of 885 patients). During the 5-year period, 45 (23.2%) were male and 149 (76.8%) were female (male:female ratio, 1:3.3), mean aged 39.9±12.9 years. Table 1 showed the demographic and clinical data of the patients compared them with other countries. Personal history of atopy and atopic dermatitis revealed no statistically significant

Table 2. Professions and clinical categories of our OCD patients

Group of jobs	ACD, n (%)	ICD, n (%)
Wet work ^a	41 (60.3)	27 (39.7)
Office work ^b	44 (91.7)	5 (10.4)
Industrial work ^c	29 (93.5)	2 (6.5)
Medical personnel ^d	20 (76.9)	7 (26.9)
Others	14 (66.7)	6 (28.6)
Total	148 (76.3)	47 (24.2)

^a Wet work; laundry, cleaning, hairdresser, food catering, gardener

^b Office work; teacher, dressmaker, secretary, researcher, cashier, bank clerk, computer technician, librarian

^c Industrial work; construction, chemical industry, electrical industry, metal industry

^d Medical personnel; doctor, nurse, physiotherapist, medical scientist, prostheses maker

correlation with the ACD cases in our study (*p* = 0.5 and 0.49, respectively). Among 148 cases of ACD, six patients had the component of ICD (4.1%). The affected areas were mainly hands (51.6%), feet (16.8%), and arms (9.5%). Hand dermatitis was also the most frequent presenting symptom of each top three allergens (82.8-95.7%). We defined patients' occupations into five groups and their clinical type of contact dermatitis in Table 2. The most frequent occupation diagnosed with OCD was wet work (35.1%), followed by office work (24.7%), industrial work (16.0%), and medical personnel (13.4%), respectively. Hairdresser was the subset of wet workers

in our study; half of them were diagnosed with ACD to p-phenylenediamine. Ammonium persulfate was accompanying in one case. Wet work was the profession with highest rate of irritant contact dermatitis (39.7%), compared to others. The most frequent occupational irritants were water/wet works and detergents (56.1%), foods (4.9%), oil/grease (2.4%), and cement (2.4%).

Fig. 1 demonstrated the top-5 common allergens, which were nickel sulfate (33.1%), potassium dichromate (19.6%), carba mix (15.5%), cobalt chloride (11.5%), and thiuram mix (10.1%). Potassium dichromate (31.6%) was the most common allergen found in male followed by cobalt, nickel, and carba mix (18.4% each). Nickel sulfate (38.2%) was predominantly found in female. Interestingly, fragrances (10.9%) were emerging allergens among female patients.

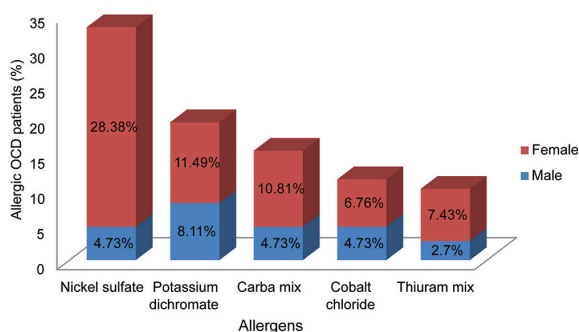


Fig. 1 Top 5 common allergens in allergic OCD patients according to sex.

Each career had its unique causative allergen. Cocamidopropyl betaine (CAPB) was distinctly found 14.6% in wet work patients; metals were also major contributing occupational ACD agents in industrial workers while rubber chemicals were the most common allergens found in medical personnel (Fig. 2). Fragrance was the cause of occupational ACD in all three massage therapists.

According to the additional allergens used for patch testing, the most common series were plastic and glue series (5.11%), textile series (3.40%), and hairdresser series (1.70%), respectively. Our standard series detected 79.6% of occupational allergens. The rest (20.4%) were identified by additional series, hairdresser series, botanical series, plastic & glue series, and textile series, including patients' own materials.

Discussion

The prevalence of OCD in the present study at Siriraj Contact Dermatitis Clinic, was 21.9%, comparable to previous reports in different regions^(1,7). Previous studies from our neighborhood country^(4,8-10) found that male was predominance in OCD. In the present study, we found that the male to female ratio of OCD was 1:3.3 whereas the ratio of ordinary Si-CDC patients was 1:4.5. There was male more prevalence among OCD patients compared to general contact dermatitis patients.

Among our OCD patients, ACD were found more common than ICD, 76.3% vs. 24.2%, respectively. The finding is different from previous studies in

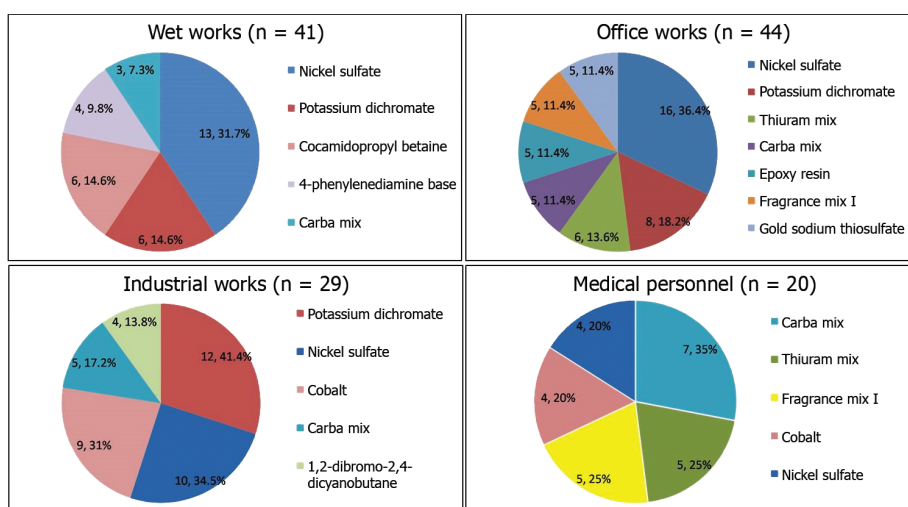


Fig. 2 Top 5 common allergens in allergic OCD patients* according to type of works.
* Some patients have more than one relevant allergens.

Thailand⁽³⁾ and other countries^(4,11) in which ICD cases were more often. It is similar to the OCD study of tertiary referral clinic in the United States⁽¹⁾. The higher proportion of ACD could be explained by the referral from the general dermatology clinic, so most of the patients were screened by dermatologists for suspicion of ACD, and then consulted Si-CDC for patch testing to confirm diagnosis. Furthermore, patients with mild ICD usually self-treated and improved without seeing the physician^(10,12). In addition, some of the allergens such as potassium dichromate, carba mix, and CAPB are irritants in nature. Hence, it was not easy to evaluate patch test results of these allergens, lead to higher number of contact allergy in the present study. However, we had a group of patients (4.1%) diagnosed with both ACD and ICD. Most of them were wet workers. The precedent of ICD for many years may increase the risk of contact allergy in these populations. The top three common allergens were the same as other reports (Table 1).

Neither atopic dermatitis nor other atopic diathesis predisposed to OCD. This is possibly a result of slack criteria used to identify patients as having atopic tendencies. The present study considered positive answers to history of allergic rhinitis, asthma or atopic dermatitis or a first-degree relative with any of these findings as inclusion criteria for atopic tendencies. Skin barrier impairment in AD indicates a probable susceptibility to both allergen absorption in ACD and also increased risk of irritation reaction in ICD⁽¹³⁻¹⁵⁾.

Metals were the main occupational allergens in both sexes. Potassium dichromate was the most frequent metal allergen in male (31.6%), while nickel sulfate was the first rank in female (38.2%). Most of the males were industrial employees, whereas office and wet works were the usual occupation for female. Fragrance was also the fourth common allergen in female due to the exposure to spices in food catering and to aroma oil in massage therapists⁽¹⁶⁾.

Wet works (laundry, cleaning, hairdresser, food catering, and gardener) offered up the largest number of patients seen with OCD (35.1%) divided into ACD (60.3%) and ICD (35.5%). Hairdresser was the occupation frequently affected by contact dermatitis, both ACD and ICD. Hair dressing chemicals and water were the major causes, respectively⁽¹⁷⁾. The main allergen in our study was the hair dye ingredient, *p*-phenylenediamine, which is similar to previous study⁽¹⁷⁾. CAPB, sources of occupational exposure included hair care products, hair colorants and liquid

soaps, were distinctly causative agent in wet workers; however, this may be due to both irritation and allergy⁽¹⁸⁾. Industrial works (construction, chemical industry, electrical industry, and metal industry) were the occupations most found causing allergic OCD (93.5%) which explained our top three common occupational allergens: nickel sulfate, potassium dichromate, and carba mix.

Nickel sulfate was presented as the most common occupational allergen (33.1%) in the present study, which was more prevalence in female (85.7%). Ninety percent of the affected patients were in young adult and middle age group. It highest prevalence was in office workers followed by wet workers and industrial workers. All of the patients had history of dermatitis caused by metal objects related to their career such as office equipment, metal fragments, chain saws, coins, and cooking utensils; however, they could have been exposed to nickel outside of the workplace. The frequency of positive reaction to nickel sulfate in our study was higher than the report from the Danish National Board of Industrial Injuries Registry (2001-2002)⁽⁶⁾ and National Skin Centre of Singapore (2003-2004)⁽⁴⁾. This could be explained by the national legislation of developed countries, by which nickel-sensitive subjects have been excluded before occupational exposure, so the OCD from nickel sulfate was gradually decreased⁽¹⁹⁾. Normally, reported prevalence of nickel allergy in our clinic was higher than other countries⁽²⁰⁾.

Potassium dichromate, which caused OCD 19.5% of the patients, was the second most common occupational allergen in our study, whereas it was usually the most common allergen in other countries^(3,4,8-10). Most of chromate-allergic patients were employed in industrial sectors, which ranged from construction, metal, chemical, and electronic industry and was similar to Bock et al study⁽¹²⁾. This could explain the higher proportion of male patients suffered from this allergen (Fig.1). The affected age groups were middle to old age in four-fifth of patients. Potassium dichromate was the most common allergen in construction industry and wet cement was the most frequent source. The European Union legislation concerning chromium content in cement mandate adding liquid ferrous sulfate to reduce hexavalent chromium to trivalent chromium⁽²¹⁾, which causes less skin sensitization. However, in Thailand, hexavalent chromium in wet cement remained higher than the European limitation (2 ppm), so chromate allergy in industrial workers is still an issue.

Rubber accelerators, carba mix, and thiuram mix, were the third and the fifth rank of occupational allergens in the present study. Sixty percent of medical personnel diagnosed with OCD had positive reaction to rubber chemicals, which corroborated with the studies in North American and Asian health care workers^(22,23). Because of the majority of rubber allergy to thiuram mix before mid-1990s, the glove manufacture production were changed, thiurams were replaced with dithiocarbamates, 2-mercaptobenzothiazole (MBT) or their derivatives, leading to decline thiurams allergy cases and raise carbamates allergy cases in recent years⁽²⁴⁻²⁷⁾.

The most common occupational irritant in the present study was water, followed by foods, oil/grease and cement. Water was an important cause of ICD in wet workers because of frequent hand washing, dishwashing, food handling, or repeated shampooing.

The limitations of the present study were the retrospective method that could miss some of the data and not all patients were followed-up in our clinic. The degree of relevance in some of our patients could consider only possible relevance. Therefore, the clinical and occupational relevance of the recorded contact allergies were not firmly noted. This may explain the higher proportion of ACD in our study.

In conclusion, our results were quite different from previous studies in other countries. This might be due to variation of prevention measures, national legislation, culture, patients' education, and awareness. We found that ACD was more common than ICD. The most common occupational allergen was nickel sulfate and water was the most frequent cause of occupational irritation.

What is already known on this topic?

Previous records in Thailand (in 2001-2003) showed that occupational contact dermatitis (OCD) was the major cause of occupational skin disease and the proportion of irritant contact dermatitis cases was higher than those of allergic contact dermatitis cases. The most frequent allergen was potassium dichromate, which is similar to the report of National Skin Centre of Singapore at the same period.

What this study adds?

The epidemiology of OCD should regularly update to identify the recent causative allergens, for establish the successful treatments and preventive measures.

This study showed that allergic contact dermatitis (ACD) was more common than irritant contact dermatitis (ICD) in occupational setting. Nickel sulfate was the most common occupational allergen, while water was the most common occupational irritant. Occupational ACD and ICD are most commonly found in industrial works and wet works, respectively.

Author contributions

Dr(s) Boonchai, Thanomkitti, Kasemsarn had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Boonchai. Acquisition of data: Thanomkitti, Analysis and interpretation of data: Boonchai, Thanomkitti, Kasemsarn. Drafting of the manuscript: Thanomkitti, Kasemsarn, Critical revision of the manuscript for important intellectual content: Boonchai, Kasemsarn. Administrative, technical, or material support: Thanomkitti. Study supervision: Boonchai.

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Potential conflicts of interest

None.

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การศึกษาด้านระบาดวิทยาย้อนหลัง 5 ปีของผู้ป่วยโรคผื่นสัมผัสที่เกิดจากการทำงานในโรงพยาบาลมหาวิทยาลัย
ระดับตติยภูมิ

วรรษญา บุญชัย, กัณฑ์ชลิศ ถนอมกิตติ, ปราณิ เกษมสานต์

ภูมิหลัง: ประเทศไทยเป็นประเทศเกษตรกรรมที่กำลังมีการพัฒนาด้านอุตสาหกรรม มีความหลากหลายทั้งทางสภาพแวดล้อมในการทำงาน สารที่สัมผัสในการปฏิบัติงาน และสภาพภูมิอากาศ ปัจจัยเหล่านี้มีผลต่อลักษณะทางระบาดวิทยาที่จำเพาะของผื่นสัมผัสที่เกิดจากการทำงาน

วัตถุประสงค์: เพื่อศึกษาข้อมูลด้านระบาดวิทยาของผู้ป่วยโรคผื่นสัมผัสที่เกิดจากการทำงานในประเทศไทย ทั้ง allergic contact dermatitis และ irritant contact dermatitis เพื่อให้ทราบถึงสาเหตุที่พบบ่อย และหามาตรการป้องกันโรคต่อไป

วัสดุและวิธีการ: คณะผู้นิพนธ์ได้ทำการศึกษาข้อมูลย้อนหลังจากแฟ้มเวชระเบียนรวมถึงผล patch test ในผู้ป่วยที่ได้รับการวินิจฉัยเป็นโรคผื่นสัมผัสที่เกิดจากการทำงานที่คลินิกผื่นแพ้สัมผัส โรงพยาบาลศิริราช ในช่วงระยะเวลา 5 ปี ระหว่าง พ.ศ. 2549 ถึง พ.ศ. 2553

ผลการศึกษา: ผู้ป่วยที่ได้รับการปิดแผ่นทดสอบ 894 ราย ได้รับการวินิจฉัยเป็นโรคผื่นสัมผัสที่เกิดจากการทำงาน 194 ราย (21.9%) เป็นหญิง 149 ราย (76.8%) และชาย 45 ราย (23.2%) โดยพบผู้ป่วยกลุ่ม allergic contact dermatitis (76.3%) มากกว่ากลุ่ม irritant contact dermatitis (24.2%) สำหรับบริเวณที่พบผื่นผิวหนังมากที่สุด คือ มือ (51.5%)

กลุ่มอาชีพที่พบอุบัติการณ์ของโรคมามากที่สุด คือ กลุ่มอาชีพที่สัมผัสความเปียกชื้น (wet works) 35% กลุ่มอาชีพรองลงมา ได้แก่ กลุ่มอาชีพพนักงานออฟฟิศ (office works) 24.7% กลุ่มอาชีพแรงงานภาคอุตสาหกรรม (industrial works) 15.9% และกลุ่มอาชีพบุคลากรทางการแพทย์ (medical personnel) 13.4%

สำหรับสารก่อภูมิแพ้ (allergens) ที่พบเป็นสาเหตุของโรคผิวหนังที่เกิดจากการทำงานได้บ่อยของการศึกษานี้ คือ nickel sulfate (33.1%), potassium dichromate (19.5%) และ carba mix (15.5%) ส่วนสารหรือสภาวะที่ก่อการระคายเคือง (irritants) ที่พบเป็นสาเหตุได้บ่อย คือ ความเปียกชื้น (56.1%) อาหาร (4.9%) และน้ำมันหล่อลื่น (2.4%)

สรุป: ข้อมูลจากคลินิกผื่นแพ้สัมผัส โรงพยาบาลศิริราช พบว่ามีผู้ป่วยกลุ่ม allergic contact dermatitis มากกว่ากลุ่ม irritant contact dermatitis สารก่อภูมิแพ้ที่พบเป็นสาเหตุได้บ่อยที่สุดคือ nickel sulfate โดยที่ allergic contact dermatitis และ irritant contact dermatitis จากการงานพบในกลุ่มอาชีพแรงงานภาคอุตสาหกรรมและกลุ่มอาชีพที่สัมผัสความเปียกชื้นมากที่สุดตามลำดับ
