

# Prevalence of occupational contact dermatitis, knowledge, and adaption of preventive measures by chemical industries workers of Pune: An observational study

Ateequr Rahman<sup>1</sup>, Arshiya Sultana<sup>2</sup>, Khaleequr Rahman<sup>3</sup>, Syed Taher Ali Bilgrami

# ABSTRACT

Objective: The aim was to study the prevalence of occupational contact dermatitis (OCD), knowledge and adaption of preventive measures by chemical industries workers in Pimpri Chinchwad, Pune. Materials and Methods: A cross-sectional study was conducted from August 2010 to July 2011 on five hundred randomly chosen participants from varnish, cement, nickel salt, and oil paint industries. A semi-structured interview questionnaire was used to record details regarding socio-demographic data, knowledge and preventive measures adapted toward occupational hazards. Nordic occupational skin questionnaire and occupational contact dermatitis disease severity index (ODDI) were used to record the data related to the disease. **Results:** Overall prevalence of OCD was 5.20% (n = 26/500). The prevalence in varnish, oil paint, nickel salt, and cement exposed workers was 9.82% (n = 11/112), 6.42% (n = 7/109), 3.72% (n = 6/161) and 1.69% (n = 2/118), respectively. The ODDI mean (standard deviation) score of severity index was 4.2 (1.44). The prevalence regarding poor, average and good knowledge of occupational hazards was 7.22% (n = 12/166), 4.24% (n = 12/283) and 3.92% (n = 2/51) respectively. The prevalence regarding not at all, irregularly and regularly adapting preventive measures was 11.11% (n = 13/117), 4.67% (n = 10/214) and 1.78% (n = 3/169), respectively. **Conclusion:** The workers involved in varnish chemical industry are more susceptible to OCD than workers involved in nickel salt, cement, and oil paint industries. This study clearly indicates that knowledge regarding the occupational hazards and adaption of preventive measures are prerequisite to lower the prevalence of OCD in chemical industries workers as prevalence was higher in poor knowledge workers and workers who had not adapted any preventive measures.

<sup>1</sup>Department of Tahaffuzi wa Samaji Tib (Preventive and Social Medicine), Younis Fazlan Unani Medical College, Kunj Keda, Maharashtr, India, <sup>2</sup>Department of Amraze Niswan wa Ilmul Qabalat (Obstetrics and Gynecology), National Institute of Unani Medicine, Bengaluru, Karnataka, India, <sup>3</sup>Department of Ilmul Saidla (Pharmacy), National Institute of Unani Medicine, Bengaluru, Karnataka, India, <sup>4</sup>Department of Tahaffuzi wa Samaii Tib (Preventive and Social Medicine), ZVM Unani Medical College & Hospital, Azam Campus, Pune, Maharashtra, India

# Address for correspondence:

Arshiya Sultana, Department of Amraze Niswan wa Ilmul Qabalat (Obstetrics and Gynecology), National Institute of Unani Medicine, Kottigepalya, Magadi Main Road, Bengaluru - 560 091, Karnataka, India. Phone: +91-9740915911, E-mail: drasnium@gmail. com

Received: September 26, 2014 Accepted: November 06, 2014 Published: November 18, 2014

**KEY WORDS:** Chemical industries, cross-sectional study, occupational contact dermatitis, occupational contact dermatitis disease severity index, occupational hazards

# INTRODUCTION

Skin problems are generally among the most common diseases seen in primary care settings in tropical areas [1]. In India, recent industrialization and globalizations changed the occupational morbidity drastically, the new pathologies such as occupational skin diseases, AIDS, psychological disorders, cancers, and heart diseases are on the increase [2]. Occupational dermatoses are skin diseases induced by or aggravated by exposure to substances in occupational environment and account for 20-80% of all occupational health diseases in various countries. It accounts for a large number of occupational diseases and could even exceed all other industrial diseases put together [3]. Though, they are not life-threatening, they are responsible for physical, psychological, and economical discomfort to the affected workers [4].

Occupational skin dermatoses can manifest themselves in a variety of ways including contact dermatitis, skin injuries, skin infections, skin cancer, and large group of miscellaneous skin diseases. With increased use of chemicals in industries, incidence of contact dermatitis is increasing everywhere [5].

Contact dermatitis is thought to be occupational if it is the direct result of a cutaneous contact with materials used in the workplace [6]. It accounts for 90-95% of work-related dermatoses [7] occupational contact dermatitis (OCD) (both irritant and allergic), is an inflammatory skin reaction to direct contact with noxious agents in the environment was most probably recognized as an entity even in ancient times, since it must have accompanied mankind throughout history [8]. Irritant dermatitis is the most common type of contact dermatitis. It involves inflammation resulting from contact with acids, alkaline materials such as soaps and detergents, solvents, or other chemicals. Allergic contact dermatitis, is the second most common type of contact dermatitis, is caused by exposure to a substance or material to which skin have become extra sensitive or allergic. Irritant cause as much as 80% of cases of contact dermatitis [9].

The condition also has a significant impact on the quality-oflife of an individual and his or her family [10]. Thus, it is a significant cause of morbidity with resultant absence from work and loss of productivity.

In a contemporary industrial society, exposures will change over time, and updated exposure assessment for OCD is therefore necessary. Abound researches are carried out to assess the prevalence, incidence, preventive measures, etiological factors and managements of occupation-related health disorders in developed countries [11]. Though, few studies were documented regarding prevalence of occupational dermatitis in different industries and workplace in India, [2-4,12-14] however, none of the studies showed the prevalence of eczema (OCD), knowledge and adaption of preventive measures toward occupational hazards in workers of chemical industries in Maharashtra Industrial Development Corporation (MIDC) area of Pimpri Chinchwad, Pune. Hence, this study was conducted.

#### **Study Design**

A cross-sectional field survey was conducted from August 2010 to July 2011 after the approval of the Institutional Ethical Committee (IEC letter No: MMERL/EC/2009/1), ZVM Unani Medical College, Pune. The survey was conducted in MIDC area of Pimpri Chinchwad Muncipal Corporation (PCMC) limit, near Pune city on Mumbai Pune highway (NH 4). PCMC has 1.44 million population with 12% population living in slums, which are the main source of workforce in the industries located in this area. Several kinds of well-developed industries such as automobile, paints, tires, printing, pharmacy electronics, woodworks etc., are situated in this area. These companies provide employment for thousands of people. Various types of chemicals are used in these industries during manufacturing processes. However, 500 participants were selected from varnish, cement, nickel salt and oil paint industries in this study.

#### Randomization

With the help of Industrial Web Directory, 15 industries were selected with simple randomization. However, only 8 industries gave permission for the survey. These included varnish, cement, nickel salt and oil paint industries. Participants were selected randomly and interviewed.

# Participants

Workers (unskilled, semiskilled and skilled) of both genders who directly came in contact of chemicals used in industries with age more than 25 years, service of 2 years or more at same place were included. Workers with known dermatological disorders not related to their occupation were excluded.

# **Data Collection**

Social workers, union leaders, supervisors, and medical officers attached to the establishment helped to convince the workers for interview. Workers who were regularly doing 8 h duty were only asked to participate. Data were collected from the workers by a face-to-face confidential interview at the worksite and written informed consent was obtained. The interview for each worker took about 20-25 min.

### **Data Collection Tool**

A semi-structured interview questionnaire was used. This questionnaire consists of a combination of closed- and openended questions. The questionnaire included information that addressed socio-demographic data, duration of service, daily working hour, history, and clinical features of occupational skin diseases, knowledge and preventive measures adapted by workers toward occupational hazards. Exact type and nature of work was also noted to evaluate and confirm the contact with chemicals used in the industry. Questionnaire included following information:

#### Socio-demographic data

It included age, sex, habits, education level, total income, occupation, religion, total income, socio-economic status (SES) and marital status. Kuppuswamy's SES scale for the urban population was used to assess SES. This scale comprises education, occupation and income of the family to classify study groups into high, middle and low SES, summarized in Table 1 [15]. In this study, all participants were workers categorized as: (i) Skilled workers who efficiently exercising considerable independent judgment and possess a thorough and comprehensive knowledge of the industry. (ii) Semiskilled workers, work was limited to the performance of routine operations of limited scope with minimum judgment taking skills and important decisions were taken by others. (iii) Unskilled workers, who performed simple duties or physical exertion work and were not able to take independent judgment. However, they were familiar with work environment and goods use in the industry. These workers were less educated or uneducated.

#### Disease related data

Nordic occupational skin questionnaire and ODDI were used to record the data related to the disease. Questionnaire was prepared with the help of Nordic Occupational Skin Questionnaire [16] to record the dermatological history. If the findings were positive for OCD then severity of the disease was assessed with occupational contact dermatitis disease severity index (ODDI). The ODDI includes assessment in

#### Table 1: Kuppuswamy's socio-ecosnomic scale (update in 2007)

Education score	
Profession or honours	7
Graduate or post graduate	6
Intermediate or post high school diploma	5
High school certificate	4
Middle school certificate	3
Primary school certificate	2
Illiterate	1
Occupation score	
Profession	10
Semi-profession	6
Clerical, shop-owner, Farmer	5
Skilled worker	4
Semi-skilled worker	3
Unskilled worker	2
Unemployed	1
Family income per month (in Rs) for 2007	
=19575	12
9788-19574	10
7323-9787	6
4894-7322	4
2936-4893	3
980-2935	2
=979	1
Total score socioeconomic class	
26-29	Upper (I)
16-25	Upper middle (II)
11-15	Lower middle (III)
5-10	Upper lower (IV)
<5	Lower (V)

four areas: Disease course, response to treatment, clinical signs at the time of assessment and work related activities. These four areas are split into two sections to create both a clinical assessment of disease severity (disease course, response to treatment and clinical signs) and an assessment of the impact of OCD on work-related activities. Both sections are scored from 1 to 5. To create an ODDI score, the two scores are added together to give a score range of 2-10. Clinical dermatological findings were recorded in a separate sheet. This instrument had high content validity and was found to be acceptable and easy to use. The construct validity of the instrument was moderate (Pearson's correlation coefficient was 0.54, P < 0.002) and reliability of the instrument was moderate (intra class correlation coefficient, was 0.62-0.75, P < 0.001). Internal consistency was almost perfect (intra class correlation coefficient, 0.94-0.99, P < 0.001) [17].

#### Knowledge regarding occupational hazards

The knowledge of the workers regarding occupational hazards of chemical industries included four questions covering awareness about chemical used in industry, knowledge of workplace hazard, effects of chemicals on health, and protective measures and devices used. Zero point was allotted for the wrong answer and one point if the answer was correct. The total points were calculated for each worker by summing up the points obtained. The overall level of knowledge was categorized as poor, average and good if the worker correctly answered one, two and  $\geq$  three questions respectively.

#### Adaption of preventive measures

Worker's adaption of preventive measures included the frequency of using the protective equipment, which were regarded as regular, irregular and nil corresponding to all the time, sometimes, and never adapted, respectively.

The general and systemic examination was conducted to exclude autoimmune and systemic disorders related to dermatoses.

#### **Data Analysis**

The results were analyzed statistically using Graph Pad Instat version 3.00 for window (Graph Pad Software, San Diego, Calif, USA) at completion of the study. The descriptive statistical analysis has been carried out in the present study. Results on the categorical measurements were presented in number (%) with 95% confidence interval. The sample size was calculated as 500 participants with 10% allowable error, based on 5.2% estimated prevalence of OCD in male [18].

#### RESULTS

The socio-demographic data with prevalence, clinical features and site of lesions are summarized in Table 2. The overall prevalence of OCD was 5.20% (n = 26/500). Among the 26 participants, ODDI score ranged from 2 to 7 and mean (standard deviation [SD]) was 4.2 (1.44).

# **Duration of Exposure**

The majority of the study population (n = 456, 91.20%) were working in the same industry from 2 to 6 years with 5.48% prevalence of OCD, whereas only 44 (8.8%) participants were

Table 2: Socio-demographic data, clinical features and site of lesion

Socio-demographic	Total	Participants	Participants	P value/
data	participants	without OCD	with OCD	Chi-square
	( <i>n</i> =500)	( <i>n</i> =474)	( <i>n</i> =26)	or Fisher
				exact test
Age (years): <i>N</i> (%)				
25-34	374 (74.80)	354 (74.68)	20 (76.92)	P=0.92
35-44	121 (24.20)	115 (24.26)	6 (23.07)	P=0.91
45-54	4 (0.8)	4 (0.8)	0	P=0.63
55-64	1 (0.2)	1(0.2)	0	P=0.81
≥65	0	0	0	
Marital status: N (%)				
Married	398 (79.6)	382 (80.59)	16 (61.53)	P=0.40
Unmarried	102 (20.4)	92 (19.4)	10 (38.4)	P=0.07
Religion: N (%)				
Hindu	292 (58.4)	276 (58.22)	16 (61.53)	<i>P</i> =0.86
Muslim	190 (38.0)	181 (38.18)	9 (34.61)	P=0.80
Christian	18 (3.6)	17 (3.58)	1 (3.84)	P=0.94
Diet: N (%)				
Non-vegetarians	247 (49.4)	237 (50)	10 (38.4)	P=0.48
Vegetarians	253 (50.6)	237 (50)	16 (61.53)	P=0.52
Education status:				
N (%)				
Illiterate	81 (16.20)	74 (15.61)	7 (26.92)	P=0.21
Primary school	46 (9.20)	45 (9.49)	01 (3.84)	P=0.58
Middle school	186 (37.20)	180 (37.97)	06 (23.07)	P=0.27
Higher secondary school	187 (37.40)	175 (36.91)	12 (46.15)	P=0.53
Intermediate	0	0	0	
Graduate/PG	0	0	0	
Professional	0	0	0	
Occupations: N (%)				
Unskilled	326 (65.2)	304 (64.13)	22 (84.61)	P=0.35
Semiskilled	147 (29.4)	143 (30.18)	4 (15.38)	P=0.30
Skilled	27 (5.4)	27 (5.4)	0	P=0.45
SES: N (%)				
Lower	0	0	0	
Upper lower	330 (66)	308 (64.97)	22 (84.61)	P=0.37
Lower middle	144 (28.8)	140 (29.53)	04 (15.38)	P=0.32
Upper middle	26 (5.20)	26 (5.20)	0 (0)	P = 0.46
Upper	0	0	0	
Clinical features:				
N (%)			0((100)	
Itching			26 (100)	
Redness			21 (80.76)	
Papule			15 (57.69)	
Blister			5 (19.23)	
Uozing Dww/aaalu			3 (11.53)	
Dry/scaly			10 (58.4)	
Site of lesions: // (%)			1 ( ( ( 1 5 2 )	
			10 (01.53)	
Arms, Turearms			02 (19.23)	
Lower legs			02(7.09)	
Head neck			01(2.04) 02(7.60)	
Generalized			02 (7.09)	
GENELANZEU			0	

Data presented: Number (Percentage); Test used: Chi-square test/Fisher exact test. OCD: Occupational contact dermatitis, SES: Socio-economic status

exposed for more than 7 years with 2.63% prevalence, P = 0.953, not statistically significant [Table 3].

#### **Type of Chemical Exposure**

Of 500 participants, 161 (32.20%) participants were exposed to nickel salts, followed by 118 (23.60%), 112 (22.40%) and 109 (21.80%) participants exposed to cement, varnish, and oil paint respectively. The prevalence of OCD was 9.82% (n = 11/112) in varnish, 6.42% (n = 7/109) in oil paint, 3.72% (n = 6/161) in nickel salt, and 1.69% (n = 2/118) in cement exposed workers, P = 0.04, statistically considered as significant and  $\chi^2 = 7.87$ .

#### **Knowledge of Occupational Hazards**

The knowledge regarding occupational hazards was poor, average and good in 166/500 (33.2%), 283/500 (56.6%) and 51/500 (10.2%) participants, respectively. The prevalence of OCD in participants who had poor and average knowledge of occupational hazards was 7.22% (n = 12/166) and 4.24% (n = 12/283) respectively, whereas 3.92% (n = 2/51) had good knowledge, P = 0.39, statistically insignificant,  $\chi^2 = 1.86$ .

#### **Adaption of Preventive Measures**

Preventive measures were not adapted by 117 (23.4%) participants, whereas 214 (42.8%) and 169 (33.8%) participants adapted preventive measures irregularly and regularly respectively. The prevalence of OCD in participants who did not adapted any preventive measures was 11.11% (n = 13/117), whereas 4.67% (n = 10/214) and 1.78% (n = 3/169) followed irregular and regular preventive measures respectively, P = 0.004, considered as statistically significant,  $\chi^2 = 10.9$ .

#### DISCUSSION

# Socio-demographic Data

Age

The prevalence in the present study decreased with the increasing age which is in accordance with publication from Netherlands, Sweden and Norway, whereas the prevalence in the United States

Table 3: Prevalence of the OCD according to the duration of	
exposure to chemical industries	

Duration of exposure to chemical (years)	Total participants ( <i>n</i> =500)	Participants without 0CD ( <i>n</i> =474)	Participants with OCD (n=26)	<i>P</i> value/ Chi-square T		
2-6	456 (91.20)	431 (90.92)	25 (96.2)	$P=0.84; \chi^2=0.03$		
7-11	38 (7.60)	37 (7.80)	1 (3.84)	$P=0.75; \chi^2=0.09$		
12-16	4 (0.8)	4 (0.84)	0	P=0.63		
17-21	1 (0.20)	1(0.20)	0	P=0.81		
22-26	1 (0.20)	1(0.20)	0	P=0.81		

Data presented: Number (percentage); Test used: Chi-square test/Fisher exact test. OCD: Occupational contact dermatitis

seems to increase with age [8]. In this study, the prevalence of dermatitis was noticed more in younger age group, consistent with many previous studies, which also showed that the incidence of OCD is high among young age group people. Further, many studies were conducted to analyze the relative contribution of age and occupation to the prevalence of occupational OCD and found that the relationship with age disappeared after controlling for occupation. It is strongly suggested that age is not a risk factors for OCD. Age-dependent immunological reactivity was less important than differences in exposure between age groups and difference in sensitization pattern between ages seem to be caused by different exposures [8].

#### Sex

In this study, though the sample was selected with randomization, all participants were male. Few female employees were seen working in industries, but they were not willing to participate in the study. It was due to scarcity of female workers in these types of industries, as this sector of industries is totally subjugated by male workers and women do not like to involve in this type of vocation or does not get opportunity of job especially in India. This finding was supportive to the previous studies [13].

#### Religion

The prevalence of eczema in Hindus, Christians, and Muslims was approximately similar, statistically not significant. It shows that customs and habits associated to religion are not interrelated to the OCD.

#### Education status

Chadha *et al.*, [19] showed that in India 12% industry workers are illiterate and 37% are below or up to matriculation, which approximately agrees with the present study finding where prevalence of illiteracy was 16.20%. The prevalence of OCD in this study shows that only school education is not enough to get ride off occupational disease. This finding is in agreement to the Iranian publication who stated that "level of education or knowledge alone," will not lead to positive attitudes or safe behaviors. There should be suitable planning to increase workers' level of knowledge about workplace health and safety behaviors. To promote safety culture, we need to design specific educational program, which consider the characteristics of workers and their workplace conditions" [20].

#### Occupation

The prevalence of OCD was statistically not significant, in skilled and unskilled workers. We did not found any such study in which work skill and prevalence of OCD was correlated. However, a prospective cohort study of 2078 apprentices in car industry showed that incidence of eczema was 9.2% in metalworkers, 8.8% in blue-collar workers and 4.6% in white-collar apprentices [21]. This suggests that improvement in work skill keeps the subject safe from occupational diseases or being away from direct contact with chemical may be the cause of less prevalence of eczema in skilled workers.

# SES

Maximum participants belonged to low SES (6.67%) in the present study and correlates with Montnemery *et al.*, study. They found that the prevalence rates varied with the SES, highest rates among those with low SES. However, they found that when the data were analyzed using multiple logistic regression analysis controlling for age, gender and risk occupation there was no association to socio economic position [22].

#### Duration of exposure

In the present study, prevalence decreased as the duration of exposure increased. In one of the prospective cohort study of 2352 hairdressing apprentices, demonstrates that apprentices with skin problems leave the work force more often than healthy apprentices [23]. It is hypothesized that in this study prevalence was higher in participants with less duration of exposure because workers with skin problems usually change the job.

#### Type of chemicals

The prevalence of OCD was higher in workers exposed to varnish (9.82%), followed by oil paint workers (6.42%) in which was significantly higher than earlier study. This has shown painters especially varnishers to be at increased risk.

Shum et al., conducted a retrospective study with the help of occupational surveillance reporting data to examine whether nickel exposure play a role in OCD in the UK. They observed that according to dermatologists report OCD associated with nickel exposure accounted for 12% of cases, but only 2% of cases reported by occupational physicians. This difference may reflect the different population presenting to the two specialties. In addition, occupational physicians do not generally perform patch tests; this may mean an under-reporting of figures for occupational dermatitis associated with nickel exposure [24]. However, in this study the prevalence in nickel salt workers was 3.72%, which was to some extent similar with finding reported by occupational physicians as patch test was not performed. A study conducted by Varigos and Dunt showed that the prevalence rate of OCD in cement companies was 68/1000 [8]. This finding is contradictory with our study since; the prevalence of eczema in workers exposed to cement was only 1.69%. The probable reason for variation in our study was nature of work of participants, as most of the participants were non process and non-plant workers or workers not directly exposed to the cement. Another reason may be the smaller sample size of population.

The constituents of varnishes and paints are very similar except varnishes lack pigments. There are few previous reports about the prevalence of dermatitis among persons who work professionally with paints and varnishes. Dermatitis among them was investigated for the first time in 1947 A.D, by Pirila. He found a prevalence of dermatitis in 6.5% of these workers. Hogberg and Wahlberg observed a prevalence of 3.9% for contact dermatitis among painters [25].

# **Clinical features**

In this study, all 26 participants of OCD had itching. It is mentioned that pruritus is the fundamental symptom of irritant and allergic contact dermatitis thus; it is in accordance to the literature [8].

# Site of lesion

Hands were the most frequent location of OCD (n = 16, 61.53%) in this study. However, in spite of the high and slightly increasing number of OCD cases, recent data from the healthcare sector show that only 12% of cases with current handeczema were notified to the authorities, indicating that it is still only the tip of the iceberg that is being reported [26].

In many previous studies, it was observed that the hands are most commonly affected by OCD, and thereafter the wrists, forearms, face, foot and trunk [27]. Frosch and Kugler also mentioned that the dermatitis in occupational cases is usually localized on the hands and most prominent on those parts that have the highest frequency of contact with the occupational irritant(s) and/or allergen(s). In this study, eczema of hand was found in 61.53% workers that confirms the previous studies. It is obvious that involvement of hand, wrist, and forearms was due to direct contact with irritant or allergens whereas head, neck and trunk were implicated due to deposition of dust [8].

# Severity Index

Among 26 participants, ODDI ranged from 2 to 7 with mean of  $4.2 \pm 1.44$ . This finding is approximate to the observation of Curr *et al.*, that among the 95 subjects attended OCD clinic in Melbourne, ODDI score ranged from 2 to 8 with a mean of 5.6 and standard deviation (SD) of  $\pm 1.4$  [17].

# **Knowledge of Occupational Hazards**

In this study, it clearly shows that prevalence of occupational dermatitis is inversely proportional to the knowledge of occupational hazards.

Many previous studies related to educational programs for occupational diseases with verbal or written advice or formal nurse-led training have been reported. The outcome of these different interventions varies, some having no demonstrable effect [28].

# **Adaption of Preventive Measures**

It was observed that the prevalence of OCD was highest (11.11%) in workers who did not adapt any preventive measures than workers who adapted preventive measures regularly. In one large study and one small case series of OCD, advice about work practices, personal protective equipment or job changes appeared to make no difference to clinical improvement [28].

Conversely, six small case series in specific occupational settings found a positive outcome in workers with OCD or urticaria from the introduction of exposure controls, or the use of gloves or protective clothing. Though the evidence of a beneficial effect of personal protective equipment is contradictory but the use of gloves reduced dermatitis, enabling 21 workers to continue in the same occupation. However, one study showed glove use can worsen irritant hand dermatitis, although the use of cotton lined gloves may mitigate this [27]. In this study, the researchers found that workers who adapted regular preventive measures had less prevalence of eczema, which is in accordance with previous studies. Hence, it confirms that adaption of preventive measures prevents the workers to come in direct contact with irritants or allergens that can provoke OCD.

Numerous studies have also been carried out on Knowledge, Attitude and Practice (KAP) of workers in various fields. Earlier study on knowledge, attitude, and practice regarding organic solvents among 501 printing workers in 28 factories in Hong Kong revealed a low level of knowledge (20.4%), appropriate attitude (38.4%), and safe practice (22%) among the workers. Safe practice did not depend on knowledge and attitude but was positively associated with being informed of safety precautions and being supplied with chemical information by supervisors. Another study also reported a huge gap between the knowledge and practice of salt workers with protective devices. KAP related to occupational health problems among garment workers in Tamil Nadu, India, revealed that the workers employed in the three sections had high levels of knowledge of health problems, but the knowledge of PPE differed by section. There was a wide gap between their knowledge level and practice of using protective devices. The KAP study of pesticide sprayers in agricultural farms indicated that careful working was considered to be very important by 93% of the pesticide sprayers while 7% suggested the use of personal protective devices (PPD). The hygiene and sanitation practices of the sprayers require much improvement with attitudinal change along with the provision of better facilities and infrastructure [29].

The strength of this study is until date none of the studies have been carried out to study the prevalence of OCD, knowledge of occupational diseases and adaption of preventive measures in Pimpri Chinchwad, Pune. The limitation of present study was four types of chemical industries were studied; patch test was not carried out because of financial burden and non-availability of resources. Inclusion of patch test might have given us exact prevalence rate of OCD. Moreover, the patch test would have help to diagnose and differentiate between allergic and irritant contact dermatitis. In addition, the white collar workers (supervisor, clerk staff and officers) were not cooperative; hence, they were not included in the study. Contact dermatitis due potassium dichromate, thiuram and other chemicals present in protective equipments should also be considered to identify allergic OCD.

Further, it is recommended that only one type of chemical industry should have been studied with sufficient sample size. Research approach should be controlled in respect of scale of industry, job identify, occupational condition and identification of additional confounder. From the preventive point of view, initially we need more focus on epidemiological data for decision making and setting priorities.

#### CONCLUSION

The authors conclude that the workers involved in varnish chemical industry are more vulnerable to OCD than workers involved in nickel salt, cement, and oil paint industries. This study clearly indicates that knowledge regarding the occupational hazards and adaption of preventive measures are prerequisite to lower the prevalence of OCD in chemical industries workers as prevalence was higher in poor knowledge workers and workers who had not adapted any preventive measures. Further patch test is recommended for differential diagnosis between allergic and irritant OCD.

#### REFERENCES

- Hay R, Bendeck SE, Chen S, Estrada R, Haddix A, McLeod T, et al. Skin diseases. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, *et al*, editors. Disease Control Priorities in Developing Countries. 2<sup>nd</sup> ed., Ch. 37. Washington, DC: World Bank; 2006. p. 707-21.
- Agnihotram RV. An overview of occupational health research in India. Indian J Occup Environ Med 2005;9:10-4.
- Singhi MK, Menghani PR, Gupta LK, Kachhawa D, Bansal M. Occupational contact dermatitis among the traditional 'tie and dye' cottage industry in Western Rajasthan. Indian J Dermatol Venereol Leprol 2005;71:329-32.
- Rai R, Ahmed T, Nair KR, Srinivas CR. Occupational dermatosis among kitchen workers in chain of vegetarian hotels. Indian J Dermatol 2003;48:151-3.
- Behl PN. Practice of Dermatology. 4<sup>th</sup> ed. New Delhi: CBS Publisher and Distributors; 1996. p. 129-31.
- Halioua B, Bensefa-Colas L, Bouquiaux B, Crépy MN, Assier H, Billon S, *et al.* Occupational contact dermatitis in 10,582 French patients reported between 2004 and 2007: A descriptive study. Dermatology 2012;225:354-63.
- Fathi F, Jafarpoor M. Matching evaluation between occupational contact dermatitis and various jobs in Yazd in during 2007-2012. Acta Med Iran 2013;51:793-8.
- Johansen JD, Frosch PJ, Lepoittevin JP, editors. Contact Dermatitis. 5<sup>th</sup> ed. New York: Springer Heidelberg Dordrecht; 2011. p. 1, 204, 288-291, 831, 833, 838, 964-5.
- Tahiraj D. Epidemiological study of occupational dermatitis in Elbasan District. Anglisticum J (IJLLIS) 2013;2:186-90.
- Carøe TK, Ebbehøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. Contact Dermatitis 2014;70:56-62.
- 11. Lushniak BD. Occupational contact dermatitis. Dermatol Ther 2004;17:272-7.
- 12. Ashish T, Yogesh P, Niraj P, Bharat B. Prevalence of skin morbidity among construction site workers working at Vadodara. Health Line 2011;2:31-3.

- Sarma N. Occupational allergic contact dermatitis among construction workers in India. Indian J Dermatol 2009;54:137-41.
- Davis SV, Nayak U, Mehta V, Shenoni SD. Survey of food handlers for dermatological problems. Indian J Dermatol 2003;48:92-93.
- Kumar N, Shekhar C, Kumar P, Kundu AS. Kuppuswamy's socioeconomic status scale-updating for 2007. Indian J Pediatr 2007;74:1131-2.
- Susitaival P, Flyvholm MA, Meding B, Kanerva L, Lindberg M, Svensson A, *et al.* Nordic Occupational Skin Questionnaire (NOSQ-2002): A new tool for surveying occupational skin diseases and exposure. Contact Dermatitis 2003;49:70-6.
- Curr N, Dharmage S, Keegel T, Lee A, Saunders H, Nixon R. The validity and reliability of the occupational contact dermatitis disease severity index. Contact Dermatitis 2008;59:157-64.
- Rycroft RJ, Menne T, Frosch PJ, Lepoittevin JP. Textbook of Contact Dermatitis. 3<sup>rd</sup> ed. New York: Springer Publications; 2001. p. 199.
- Chadha GK, Sahu PP, Rout B. Education, skills, and working environments of workers in India's rural industry. Int J Occup Environ Health 2001;7:153-64.
- Nasab HS, Ghofranipour F, Kazemnejad A, Khavanin A, Tavakoli R. Evaluation of knowledge, attitude and behaviour of workers towards occupational health and safety. Iran J Public Health 2009;38:125-9.
- Funke U, Fartasch M, Diepgen TL. Incidence of work-related hand eczema during apprenticeship: First results of a prospective cohort study in the car industry. Contact Dermatitis 2001;44:166-72.
- Montnemery P, Nihlén U, Göran Löfdahl C, Nyberg P, Svensson Å. Prevalence of self-reported eczema in relation to living environment, socio-economic status and respiratory symptoms assessed in a questionnaire study. BMC Dermatol 2003;3:4.
- Uter W, Pfahlberg A, Gefeller O, Schwanitz HJ. Prevalence and incidence of hand dermatitis in hairdressing apprentices: Results of the POSH study. Prevention of occupational skin disease in hairdressers. Int Arch Occup Environ Health 1998;71:487-92.
- Shum KW, Meyer JD, Chen Y, Cherry N, Gawkrodger DJ. Occupational contact dermatitis to nickel: Experience of the British dermatologists (EPIDERM) and occupational physicians (OPRA) surveillance schemes. Occup Environ Med 2003;60:954-7.
- 25. Conde-Salazar L, Vargas I, Tévar E, Barchino L, Heras F. Sensitization to acrylates in varnishes. Dermatitis 2007;18:45-8.
- Ibler KS, Jemec GB, Flyvholm MA, Diepgen TL, Jensen A, Agner T. Hand eczema: Prevalence and risk factors of hand eczema in a population of 2274 healthcare workers. Contact Dermatitis 2012;67:200-7.
- Nicholson PJ, Llewellyn D, editors. Occupational contact dermatitis & urticaria. Vol. 7. London: British Occupational Health Research Foundation; 2010. p. 19-21.
- Adisesh A, Meyer JD, Cherry NM. Prognosis and work absence due to occupational contact dermatitis. Contact Dermatitis 2002;46:273-9.
- Baack BR, Holguin TA, Holmes HS, Prawer SE, Scheman AJ. Use of a semipermeable glove during treatment of hand dermatitis. Cutis 1996;58:423-4.

© GESDAV; licensee GESDAV. This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/3.0/) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.

Source of Support: Nil, Conflict of Interest: None declared.