International Journal of Community Medicine and Public Health
Raj IS et al. Int J Community Med Public Health. 2021 Dec;8(12):6040-6046
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20214612

Original Research Article

Morbidity profile of workers and workplace assessment in selected soap industries in Puducherry

Iniyaazh Sundar Raj[1], Shanthosh Priyan Sundaram[2]*

[1]JIPMER, Puducherry, India
[2]Department of Community Medicine, NEIGRIHMS, Shillong, Meghalaya, India

Received: 02 October 2021
Accepted: 08 November 2021

***Correspondence:**
Dr. Shanthosh Priyan Sundaram,
E-mail: dr.shanthosh@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The high risk, fast-paced industrial expansion reflects unique health and safety challenges for occupational health and safety resulting in increasing incidence of various injuries and health morbidities. This warrants the assessment of morbidity profile and workplace assessment of the workers.
Methods: A facility based cross sectional descriptive study was carried out among 305 workers of selected soap industries in Puducherry for a period of four months from September to December 2018. Workers were interviewed using a semi-structured questionnaire for their morbidity profile and work ability along with skin patch test and spirometry. Finally, workplace assessment was done.
Results: Of 305 workers interviewed, eczema was reported in two workers and generalized pruritus in 4.9% of the workers. In patch test, 9 (34.6%) workers were sensitive to Paraphenylenediamine among 26 workers tested. Upper respiratory tract infection was reported in 17.3% and breathlessness in 4.6% of the employees. Spirometer was abnormal in 5.9% of the workers. Hypertension was diagnosed for the first time in 10.3% of the workers. Work ability index was good in 99.0% of the workers. The most common illness in the past six months was febrile illness. Workers who availed treatment from the private facility were 35.9%. Working environment was better in large-scale industries as compared to the small-scale industries.
Conclusions: The morbidity of workers in selected soap industries were very less as majority of the workers was from the organized sectors with regular periodic examination. Hence further studies concentrating only on the unorganized small-scale industries are recommended.

Keywords: Cross sectional descriptive, Patch test, Spirometry

INTRODUCTION

WHO had defined occupational health as 'Promotion and maintenance of the highest degree of physical, mental and social well- being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of workers in an occupational environment adopted to his physiological and psychological capabilities'.[1]

WHO estimates show that occupational health risks are the tenth leading cause of morbidity and mortality.[2] Of 2.9 billion workers exposed globally, developing countries account for 80% of the total burden of harmful risks at their workplace.[3] Unintentional injuries (41%) are the leading cause followed by Chronic obstructive pulmonary disease (COPD) (40%) and cancer of respiratory tract (13%). There were about 3,10,000 deaths due to injuries followed by 2,43,000 dust-related deaths.[4]

According to National Institute of Family and Health Welfare report, India accounts for 1.9 million cases

(17%) out of 11 million occupational disease cases and 0.12 (17%) million occupational disease deaths in the world.[5] In India, occupational asthma and COPD are the main causes followed by cancers, heart diseases, reproductive and skin disorders.[6]

In India, soap industries are the second largest industry of all industries, which includes both toilet and detergent soap. Ministry of Environment and Forestry, Government of India has categorized soap industries under RED (heavily polluting) industry.[7] The most common ingredients are sodium lauryl sulphate and potassium hydroxide which causes deleterious effects on respiratory system, skin and eyesight. Lushniak et al stated that detergents cause effects after repeated exposures.[8] Emerging occupational problems pose a great threat to the health of the community that it has to be tackled along with the existing public health problems like communicable diseases, and malnutrition.

In order to understand more about the setting where employees work and the physical factors of the worksite that alters employee's health, an environment assessment is an opportunity. Physical work environment assessment can identify a number of opportunities for employers to improve the employees' health status.

Data on morbidity profile of workers in soap industries is scanty in our country and in particular in Southern India. The aim of the study was conducted among the workers in selected soap industries in Puducherry, to describe the morbidity profile, their health seeking behavior and to assess work environment.

METHODS

A facility based cross sectional descriptive study was done among workers of selected soap industries in Puducherry for a period of four months from September to December 2018. All the workers in selected soap industries in Puducherry working for not less than six months were included in the study.

Based on the expected proportion of workers with dermatological problems as 73% with an absolute precision of 5% and 95% confidence interval, the minimum of 303 samples was required. Soap industries were selected based on convenience after obtaining permissions from the industries. Once a soap industry was selected, all the eligible workers in the soap industry were included for the study.

Workers were interviewed about their socio demographic characteristics, type and duration of the work, history of eczema in hands or forearms, history of any illness in the last six months and type of health care sought for the illness and history of any respiratory illness using a semi-structured questionnaire. Anthropometric measurements like height, weight and waist circumference and blood pressure were measured. Blood pressure was measured on the left forearm in sitting posture twice after five minutes interval. According to Joint National Committee, hypertension was defined as systolic BP level of ≥140 mmHg and/or diastolic BP level ≥90 mmHg.

With special reference to dermatological problems, the patch test was done after proper training, if required. Patch test is a method to determine the sensitization to Indian Standard Series set of allergens. It involved applying the allergens using Finn chambers on Scanpor tape to the back of the individuals, which was kept undisturbed for 48 hours. Readings were taken after 48 hours.

For assessing the respiratory function, the investigator performed spirometry for all the individuals. Prior to performing spirometry, the workers' details like age, gender, height, weight and their smoking status was collected. Spirometry was then performed using a portable hand-held spirometer. The worker was asked to perform a quick full forced expiration while using the mouthpiece, followed by a further quick, full inspiration. Spirometry indicated the presence of an abnormality if FEV_1/FVC ratio was<0.7.

A separate Work ability index (WAI) questionnaire was used to evaluate the work ability. WAI questionnaire is a validated instrument used in occupational health care and research to assess work ability of workers through self-assessment questionnaire during health examinations and workplace surveys.[9] The purpose of WAI is to help define necessary actions to maintain and promote work ability. It consists of seven items and each answer has a different score, with users calculating their point scores to determine their final score. The minimum score is 7 and the maximum score is 49. WAI was considered to be very good, good, moderate and bad when the scores were 44-49, 37-43, 28-36 and 7-27 respectively. Finally, workplace assessment was carried out as per 'Occupational health and safety workplace assessment inspection checklist'.

Statistical analysis

Data was entered using Epi Data Manager v2.0.10.59 (Epi Data association, Odense, Denmark) and analysed using Stata software v12.0. Continuous variables like age, Body mass index (BMI) and waist circumference are summarized as mean (standard deviation) or median (inter quartile range). Categorical variables like gender, type of work in soap industry are summarized as proportions. Presence of any dermatological problems, respiratory problems, any illness in the past, sensitization to patch test and work ability index are summarized as proportions.

Ethical issues and administrative approval

Permission for performing the study and ethical approval was obtained from JIPMER Scientific and Institutional

Ethical Committee. After the approval, permission was sought from the soap industries.

RESULTS

Out of seven industries included in the study, two industries were large scale and five were small-scale industries. Of total 313 workers, 305 (97.4%) were interviewed.

Table 1 shows that more than half (54.1%) of the workers were females. Mean age of the workers was 37 (8.9) years with a maximum of 58 years and a minimum of 18 years. More than half (57.3%) of the workers were in the age group of 30-44 years. About one-fourth (23.6%) of the workers were obese and 29.2% of the workers were having normal BMI. Self-reported hypertension and diabetes was present in six (2.0%) and four (1.3%) workers respectively. Hypertension was diagnosed for the first time in 31 (10.3%) of the workers.

Table 2 shows that nearly half (42.4%) of the workers had been employed for 10 years and above with the median work experience of 10 (4-13) years. About three fourths (75.4%) of the workers were working in the detergent department. Packaging was the major activity of work (53.4%) among the workers followed by manufacturing (33.1%). Around 5% of the workers had worked in other soap/ detergent industry before joining the present industry. About one- fifth (17.1%) of the workers reported of having illness in the past six months of which fever (28.8%), Upper respiratory tract infection (URTI) (17.3%) and backache (17.3%) were the major illnesses reported. More than one third (35.9%) of the workers availed treatment from the private facility, whereas six of them did not avail any treatment. Eczema was present only in two workers. However, generalized pruritis over the body was present in 15 (4.9%) workers. Out of 26 workers who underwent patch test, nine workers (34.6%) were sensitive to Paraphenylenediamine. However, there was no sensitization to other 18 antigens used.

Work ability index was found to be very good in nearly 3/4th (72.5%) of the workers and was moderate only in three workers. However, none of the workers work ability index was bad.

Table 3 shows that musculoskeletal disorders (18.3%) were the major morbidity among the workers followed by accidents (11.2%). Breathlessness during daytime following strenuous activity (4.6%) was the major respiratory illness following by wheezing (1.0%), breathlessness during daytime at rest and night (1.0%). Spirometry was abnormal in (5.9%) workers.

Table 4 shows that both the large-scale industries followed the management and workplace safety procedures as per the standards whereas only two out of five small scale followed the display of safe operating procedure guidelines and only one small scale industry had displayed key safety rules in the working area and had effective system for reporting and correcting hazards. The work environment was good in all the aspects in all the large scale and most of the small-scale industries. However, both the large and small-scale industries neither had any measures for prevention from exposure to noise nor any hearing testing program. One out of five small-scale industries did not comply with any of the work environment guidelines. Personal protective equipment was provided in all the large scale and only in two small-scale industries. However, use of the PPE was poor among all the workers regardless of type of the industry. The emergency procedures with proper first aid kit were present in all the large-scale industries whereas it was not present in most of the small-scale industries.

Table 1: Socio-demographic and clinical characteristics of workers in selected soap industries, Puducherry (n=305).

Characteristics	N	%
Gender		
Male	140	45.9
Female	165	54.1
Age group (years)		
<30	63	20.7
30-44	175	57.3
≥45	67	22.0
Body mass index (BMI)		
Underweight (<18.5)	11	3.6
Normal (18.5-22.9)	89	29.2
Overweight (23-24.99)	133	43.6
Obese (25 and more)	72	23.6
Waist circumference (central obesity)*		
Yes	71	23.2
No	234	76.8
Known history of diabetes	4	1.3
Known history of hypertension	6	2.0

Continued.

Characteristics	N	%
Newly diagnosed hypertension (n=299)†		
Yes	31	10.3
No	268	89.7

Note: *Waist circumference of ≥102 cm for males and ≥88cm for females was taken as cut off; † Hypertension was defined as systolic blood pressure ≥140 mmHg and diastolic blood pressure ≥90 mmHg.

Table 2: Occupational characteristics and health seeking behavior of workers in selected soap industries, Puducherry (n=305).

Characteristics	N	%
Department		
Detergent	230	75.4
Soap	69	22.6
Shampoo	6	2.0
Work experience in years		
Less than 5	54	32.8
5-9	41	24.8
10 and above	70	42.4
Major activity at work		
Packaging	163	53.4
Manufacturing	101	33.1
Loading	41	13.5
Illness in the past six months	52	17.1
Type of illness (n=52)		
Fever	15	28.8
Upper respiratory infection (URI)	9	17.3
Backache	9	17.3
Accident/injury	6	11.5
Others*	14	25.1
Place of treatment (n=52)		
Government health facility	28	52.8
Private health facility	19	35.9
None	6	11.3

Note: *Others include abdominal pain, headache, hypo/hyperthyroidism, cataract and menstrual problems including fibroid uterus.

Table 3: Morbidity profile of workers in selected soap industries, Puducherry (n=305).

Characteristics	N	%
Musculoskeletal disorders	56	18.3
Accidents	34	11.2
Digestive diseases	11	3.6
Endocrine diseases	11	3.6
Neurological disorder	6	2.0
Cardio vascular diseases	3	1.0
Mental disorder	2	0.7
Genitourinary diseases	2	0.7
Tumor	2	0.7
Blood diseases	2	0.7
Respiratory illness		
Breathlessness during daytime following strenuous activity	14	4.6
Wheezing	3	1.0
Breathlessness during daytime at rest	3	1.0
Shortness of breath during night	3	1.0
Cough at night	2	0.7
Tightness of chest at night	1	0.3
Spirometry		
Abnormal (FEV_1/FVC ratio<0.7)	18	5.9

Continued.

Characteristics	N	%
Normal (FEV_1/FVC ratio≥0.7)	287	94.1

Table 4: Work place assessment of selected soap industries, Puducherry.

Variables	Large scale industries	Small scale industries
Overall n=7	**n=2**	**n=5**
Management and workplace		
Presence and awareness of written safe operating procedures and safety guidelines at work area	2	2
Display of key safety rules and effective system for managing hazards in work areas	2	1
Work environment		
Sufficient general ventilation and local exhaust systems	2	4
Prevention from exposure to noise/presence of hearing testing program	0	0
Sufficient lighting	2	5
Housekeeping and waste management		
Avoidance of excessively repetitive tasks	2	5
Separate and clean meal-rooms and system for the safe disposal of general waste	0	0
Safe drinking water, adequate washing facilities and separate toilets for males and females	2	2
Personal protective equipment (PPE) details		
Assessment of need for personal protective equipment	2	4
Provision of PPE, if required	2	2
Training provided on the use of PPE	2	1
Availability and information on emergency procedures		
Display of emergency contact number and emergency procedures available	2	1
Periodical testing and regular training in the use of safety equipment	2	2
Availability of first aid kit	2	3
Trained first aid officers	2	1

DISCUSSION

This is one of the fewer studies conducted in this part of the country to get an insight into the morbidity profile of the workers along with the assessment of workplace of the soap industries.

The study showed that all the workers worked daily for eight hours or more and over 2/3rd of the workers were overweight/obese, of which majority were more than 35 years of age. Data from large population studies have shown that BMI gradually increase during most of the adult life and reach peak values at 50-59 years of age.[10,11] Inadequate working conditions linked to the induction of the stress response, and poor lifestyle factors such as long working hours, may increase the risk for obesity. During stress glucocorticoids are released which inhibit the positive effects of the growth and thyroid hormones on lipolysis and muscle anabolism.[12]

Poor lifestyle factors have also been linked to hormonal factors such as reduced levels of leptin that increases the risk for obesity.[13] Obesity in turn might lead on to hypertension, diabetes and stroke among these patients. About 10.3% of the workers were diagnosed of having hypertension for the first time during this study, which is consistent with this finding. The current study revealed that musculoskeletal disorders were present in 18.3% of the workers. This finding is consistent with other study conducted by Engholm et al.[14] He found that physical factors such as awkward posture and associated psychosocial factors were the risks. This is consistent with the situation in soap factory workers in India who often work for prolonged hours in awkward positions due to lack of ergonomic training. Moreover, repetitive movements and prolonged working hours with inadequate rests are also found to be the precipitators. Static posture and repetition can produce injury when there is no break from muscle contraction.[14] Silverstein et al found that workers in high-repetition jobs had a greater risk of cumulative trauma disorders of the hand and wrist.[15]

Detergents and soaps are cumulative irritants that require repeated application to exert their noxious effects. Sodium lauryl sulphate (SLS), most widely used in toilet soaps and less commonly in detergents, can cause contact dermatitis and eczema on repeated exposure. In this study, eczema was present only in two workers. Study

done by Sorensen et al reported that dermatitis was noted in 16% of the workers. A study done by Fischer et al had reported that repeated exposure to SLS resulted in a significantly higher increase in dermatitis.[16,17] The lesser frequency of skin conditions in this study might be due to the fact that more than 3/4th of the workers were employed in detergent manufacturing industry rather than toilet soaps or shampoos, which uses more of SLS.

Positive reaction to paraphenylenediamine, substance commonly used in hair dyes and less commonly as fragrance in soaps was noted in 34.6% of the workers in the patch test. This is in contrast to a study done by Narendra et al where positive reaction was observed more to nickel sulphate- 12 (15%), potassium dichromate- 11 (13.75%) and neomycin sulphate- 10 (12.5%).[18]

In this study, breathlessness during daytime following strenuous activity (4.6%) was the major respiratory illness followed by wheezing (1.0%) which is much lower when compared to study conducted by Ibraheem et al, who reported that 9.0% of the employees suffered from deprived respiratory function.[19] Respiratory symptoms in detergent-industry workers have been associated with exposure to the dust of proteolytic enzymes derived from Bacillus subtilis. Spirometry was abnormal in 5.9% of the workers which is in contrast to the study conducted by Cathcart et al where there was a fall of 10% in FEVI and 12% in FVC with time and smoking habit.[20]

Assessment of work ability using work ability index questionnaire showed that none of the workers ability to work was poor and only three (1.0%) workers had moderate ability. Whereas a study conducted in Iran showed that work ability was poor in 34.7% of the workers. Similarly studies conducted by Suguna Anbazhagan et al showed that work ability was good only in 9.6% of the employees and a study by Kujala et al concluded that poor work ability was present in 13.4% of the workers.[21,22] This striking difference might be due to the fact that most of the study participants were from the large scale industries where pre-placement examination and periodic examination of the employees every six months was in place when compared to unorganized small scale industries which lacks these facilities.

Use of the PPE was poor among all the workers regardless of type of the industry. Hence, there is a need of health education regarding use of personal protective devices. Availability of accurate figures through routine reporting and registering systems need to be developed on the lines of the Sample registration system of NSSO. The ESI corporation, which aims to deliver comprehensive occupational health services to all workers, should also be integrated with the general health services.

Strengths and limitations

The study employed larger sample of workers which included both small and large-scale industries. Spirometer was used to assess pulmonary function test and patch test was used to identify the components of skin allergy, which added more objectiveness to this study.

The major limitation of the study was that the information provided here pertains mostly to the organized sector, which constitutes only about 10% of the manufacturing sector. There was a chance for social desirability bias which could have resulted in the underreporting of certain conditions by the workers. Similarly, there was also a chance for healthy worker effect; since the workers with any morbidity could have been removed from/left the work. As with all other cross-sectional studies, cause effect relationship could not be ascertained in this study.

CONCLUSION

The morbidity of workers employed in soap industries were very less and musculoskeletal disorder was the most common morbidity. Majority of the workers were from the organized sectors. Hence further studies concentrating only on the unorganized small-scale industries are recommended.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Health, Environment & Work. What is Occupational Health?, 2019. Available at: http://www.agius.com/hew/resource/ohs. Accessed on 24 October 2021.
2. WHO. Regional Strategy on Occupational Health and Safety in SEAR Countries, 2005. Available at: https://apps.who.int/iris/handle/10665/. Accessed on 24 October 2021.
3. Meswani HR. Safety and occupational health: challenges and opportunities in emerging economies. Indian J Occup Environ Med. 2008;12(1):3-9.
4. Ezzati, Majid, Lopez, Alan D, Rodgers, Anthony A, et al. Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors, 2004. Available at: https://apps.who.int/iris/handle/10665. Accessed on 24 October 2021.
5. National Institute of Health & Family Welfare. National programme for control & treatment of occupational diseases, 2014. Available at: http://www.nihfw.org/NationalHealthProgramme/NATIONALPROGRAMMEFORCON. Accessed on 24 October 2021.
6. Leigh J, Macaskill P, Kuosma E, Mandryk J. Global burden of disease and injury due to occupational factors. Epidemiology. 1999;10(5):626-31.
7. Ministry of Environment and Forests. Classification of industries for consent management (Red, Orange

& Green Categories), 2015. Available at: http://envfor.nic.in/legis/ucp/ucpsch8. Accessed on 24 October 2021.
8. Lushniak BD. The importance of occupational skin diseases in the United States. Int Arch Occup Environ Health. 2003;76(5):325-30.
9. EU-OSHA. Work Ability Index, 2019. Available at: https://healthyworkplaces.eu/previous/allages2016/en/tools-and-publications/practical-tools/workability-index. Accessed on 24 October 2021.
10. Flegal KM, Carroll MD, Kuczmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960-1994. Int J Obes Relat Metab Disord. 1998;22(1):39-47.
11. Mokdad AH, Bowman BA, Ford ES, Vinicor F, Marks JS, Koplan JP. The continuing epidemics of obesity and diabetes in the United States. JAMA. 2001;286(10):1195-200.
12. Smith SM, Vale WW. The role of the hypothalamic-pituitary-adrenal axis in neuroendocrine responses to stress. Dialogues Clin Neurosci. 2006;8(4):383-95.
13. Schmidt S, Monk JM, Robinson LE, Mourtzakis M. The integrative role of leptin, oestrogen and the insulin family in obesity-associated breast cancer: potential effects of exercise. Obes Rev. 2015;16(6):473-87.
14. Engholm G, Holmström E. Dose-response associations between musculoskeletal disorders and physical and psychosocial factors among construction workers. Scand J Work Environ Health. 2005;31(2):57-67.
15. Silverstein BA, Fine LJ, Armstrong TJ. Hand wrist cumulative trauma disorders in industry. Br J Ind Med. 1986;43(11):779-84.
16. Sørensen L. Occupational skin diseases: reliability and utility of the data in the various registers; the course from notification to compensation and the costs. A case study from Denmark. Contact Dermatitis. 1998;39(2):71-8.
17. Fischer I, Hoek AK, Dapic I, Jakasa I, Kezic S, Fischer TW, et al. Barrier function and natural moisturizing factor levels after cumulative exposure to a fruit-derived organic acid and a detergent: different outcomes in atopic and healthy skin and relevance for occupational contact dermatitis in the food industry. Contact Dermatitis. 2015;73(6):358-63.
18. Narendra G, Srinivas CR. Patch testing with Indian standard series. Indian J Dermatol Venereol Leprol. 2002;68(5):281-2.
19. Ibraheem TM, Momen M, Mostafa NS. Survey of respiratory symptoms, spirometry, and RAST and their relation to occupational exposures among detergent products staff. Egypt J Occup Med. 2015;39(2):231-41.
20. Cathcart M, Nicholson P, Roberts D, Bazley M, Juniper C, Murray P, et al. Enzyme exposure, smoking and lung function in employees in the detergent industry over 20 years. Medical Subcommittee of the UK Soap and Detergent Industry Association. Occup Med. 1997;47(8):473-8.
21. Anbazhagan S, Ramesh N, Surekha A, Fathima FN, Melina, Anjali. Estimation of work capacity and work ability among plantation workers in South India. Indian J Occup Environ Med. 2016;20(2):79-83.
22. Kujala V, Tammelin T, Remes J, Vammavaara E, Ek E, Laitinen J. Work ability index of young employees and their sickness absence during the following year. Scand J Work Environ Health. 2006;32(1):75-84.

Cite this article as: Raj IS, Sundaram SP. Morbidity profile of workers and workplace assessment in selected soap industries in Puducherry. Int J Community Med Public Health 2021;8:6040-6.