

Original Research Article

Prevalence and factors associated with occupational health problems among leather footwear manufacturing workers in Ambur town, Thirupathur district, Tamil Nadu, India

Judyangel D.^{1*}, Thilagavathi R.², Prakash M.²

¹SRM School of Public Health, SRM Institute of Science and Technology, Chennai, Tamil Nadu, India

²Division of Biostatistics, SRM Institute of Science and Technology, Chennai, Tamil Nadu, India

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*Correspondence:

Dr. Judyangel D.,

E-mail: judyangel223@gmail.com

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ABSTRACT

Background: In India, the leather footwear manufacturing sector contributes to a significant segment of leather products, and workers were exposed to a wide range of hazardous substances during the manufacturing process. The present study was conducted to identify the prevalence of various work-related health complaints and the factors associated with occupational health problems among leather footwear workers in Tamil Nadu.

Methods: This cross-sectional study was conducted among 275 leather footwear workers in Ambur town, Thirupathur district, Tamil Nadu from June 2019 to July 2019. Data was collected using a semi-structured questionnaire consisting of socio-demographic and workplace characteristics, work-related self-reported health complaints, and use of personal protective equipment (PPE). Descriptive analysis and multivariate analysis were performed to identify factors associated with work-related health problems at a 5% level of significance.

Results: The study demonstrated a prevalence of 19.33% respiratory disorders, 16.4% skin ailments, and 37% musculoskeletal complaints. Workers involved in the scouring/finishing process had nearly two times the odds (95% CI: 0.977-3.923); workers who do not use PPE like gloves or masks had two times the odds (95% CI: 1.307-4.346); workers who reported inadequate windows/fans or blowers in their work station had four times the odds (95% CI: 1.421-12.413) and workers who reported lack of regular work training had 3.5 times odds (95% CI: 1.954-6.531) of occupational health problems.

Conclusions: Implementation of strict protocols on the use of PPE, periodic monitoring and safety training should be regulated to prevent the workers from these health problems.

Keywords: Occupational diseases, Occupational health, Shoes manufacturing industry

INTRODUCTION

India occupies the fifth position in exporting leather products ranking second, next to China among the leather footwear producing countries.¹ Approximately one lakh leather footwear workers were employed in India, with Tamil Nadu, Uttar Pradesh, and West Bengal together constituting a four-fifth of total employment.² In India, Tamil Nadu is one of the largest leather exporters and it

constitutes 70% of share in leather products. Ambur town is specialized in manufacturing leather footwear for exports and contributes to almost 37% of producing finished leathers and footwear products.^{2,3}

Footwear workers perform a variety of operations such as pattern making; preparation of the upper sole part including sewing/stitching, folding and gluing; assembling including shoe lasting, molding the finished upper part of

shoes in the shape of the foot through heat treatment, buffing, outsole joining, pressing, cooling, shoe last removing; and finally finishing the shoes.⁴⁻⁷

The footwear manufacturing process involves various occupational exposures such as allergens and potential irritants in the form of adhesives, solvents, additives, resins, dust, glues like neoprene and epoxy resin leading to health problems.³⁻⁶ Studies done by Febriana et al and Simamora et al in Indonesia.^{7,8} Almeida et al in Brazil, Deb et al in Bangladesh and Samsuzzaman et al in India have confirmed that most of the footwear workers were exposed to numerous hazards either physically or chemically and also another part of the workers were involved in ergonomic risks and thus leading to most of them suffering from various occupational health problems.⁹⁻¹¹

As the footwear manufacturing process is a labor-intensive process, exposure to numerous harmful substances is unavoidable.⁸⁻¹⁴ Therefore, to exempt the workers' health from the burden of disease, there exists a continuous need to do research in this sector in Tamil Nadu and this study was conducted to assess the prevalence of various occupational health problems like respiratory complaints, skin ailments and musculoskeletal disorders among the participants and also factors associated with these occupational health problems.

METHODS

This cross-sectional study was conducted among leather footwear manufacturing workers in Ambur town, Thirupathur district, Tamil Nadu during the month from June to July 2019. The sample size was estimated using the Cochran formula given below with a prevalence of occupational health problems as 17%, 95% confidence interval and absolute precision of 5%.⁸ Further, factoring for the 20% non-response rate, the required sample size was calculated as 275. Workers with experience in the leather footwear units for more than six months and willing to participate in the study were included for the study. Workers who are working in managerial and supervision departments, workers with work experience of fewer than six months, and those who expressed unwillingness were excluded from the study.

$$\text{Cochrane formula} = \frac{4pq}{d^2}.$$

Ethical clearance

Ethical committee clearance was obtained from the institutional review board (IRB) (Id: SPH/ST/2019/005). Informed consent was taken from the respondent after explaining the study.

Three leather full shoe manufacturing units were selected randomly. The employer list was collected and through simple random sampling, respondents were selected for the interview. Through this process, a total of two seventy-five

(275) leather footwear workers were interviewed. A semi-structured questionnaire was used to collect data on respondent socio-demographic characteristics, workplace-related characteristics, occupational health problems, use of protective measures and treatment-seeking behaviour information which was first pre-tested and converted to an electronic version.

The following operational definitions were followed to identify the various occupational health problems among the study population: occupational health problem is defined as the workers having at least any one of the respiratory complaints or the skin ailments or musculoskeletal complaints due to working in the leather footwear industry.

Respiratory complaints included: presence of frequently occurring any of the respiratory symptoms like scratchy throat, itching/stuffy nose/sneezing, dry cough, excessive coughing, cough with expectoration and breathing difficulty due to working in any of the sections or any medically diagnosed respiratory complaints after joining this work.⁹

Skin ailments included any self-reported or medically diagnosed skin ailments due to working in the leather footwear industry.¹⁰

Musculoskeletal complaints included presence of frequently occurring any of the musculoskeletal symptoms like pain or ache in one of nine body regions like neck, shoulders, elbows, wrists or hands, upper back, low back, hips or thighs, knees, ankles and feet.¹¹

Statistical analysis

Collected data were exported and analyzed using R software. Descriptive analysis was performed to understand the background characteristics of the respondents. Multivariate analysis was performed to identify the factors associated with various occupational health problems at a 5% alpha level.

RESULTS

The mean age of the sample population was 31.35 years with a standard deviation (SD) of 5.4 years. Out of 275 study participants, the majority (88%) of them were females and one-third of them (30.6%) were illiterates without any formal education.

The study revealed that the workers were employed in different sections namely cutting, sewing and gluing; shoe lasting and outsole joining; scouring, finishing and polishing. Among respondents, 52.4% attended workplace safety training and 68.7% reported supervision in their workplace. The environmental condition of the workplace in the leather footwear manufacturing units are as follows: 16.7% of respondents reported inadequate windows and fans, 15.3% of respondents reported

inadequate lighting in their working section, 11.3% of respondents reported working in a humid environment, 18.6% of respondents reported noisy machinery in their workplace and 11.3% of respondents reported odour complaints in their workplace (Table 1).

Table 1: Socio-demographic and work characteristics of the leather footwear workers (n=275).

Characteristics	Frequencies (%) (n=275)
Age (in years) (mean±SD)	31.4±5.4
Gender	
Female	242 (88)
Male	33 (12)
Education	
Illiterate	84 (30.6)
Literate	191 (69.4)
Place of residence	
Rural	209 (76)
Semi-urban	66 (24)
Monthly income (in Rs)	
8000-10000	59 (21.4)
11000-15000	116 (42.1)
More than 15000	100 (36.5)
Work section	
Cutting/sewing/glueing	82 (29.8)
Shoe lasting/outsole joining	104 (39.8)
Scouring/finishing/polishing	89 (32.4)
Work experience (in years)	
Less than or equal to 5	164 (59.6)
More than 5	111 (40.4)
Total working hours per week	
36	125 (45.4)
48	150 (54.6)
Work posture	
Sitting	83 (30.1)
Standing	45 (16.4)
Both	147 (53.5)
Workplace safety training	
Attended	144 (52.4)
Not attended	131 (47.6)
Supervision in work station	
Present	189 (68.7)
Absent	86 (31.3)

Respiratory problems among the workers in the leather footwear manufacturing units

Among the respondent, 19.2% reported some kind of frequently occurring respiratory problems. The main respiratory symptoms included 8.4% of respondents with a scratchy throat, 10.2% itchy/stuffy nose/sneezing, symptoms of rhinitis, 7.6% dry excessive coughing, 2.9% cough with expectoration and 6.2% with breathing difficulty.

Skin ailments among the workers in the leather footwear manufacturing units

Among the respondent, 16.3% reported some kind of self-reported skin problems due to working in this footwear manufacturing unit. Some of the skin problems included 9.8% of respondents with hardened thick bumps, callus, 2.5% of respondents with blisters due to handling chemicals in the workplace and 7.2% reported symptoms of dermatitis.

Musculoskeletal disorders among the workers in the leather footwear manufacturing units

Among the respondent, 37% reported pain or ache in one of nine body regions like neck, shoulders, elbows, wrists or hands, upper back, low back, hips or thighs, knees, ankles and feet due to working in this footwear manufacturing unit. Some of the musculoskeletal problems included 3% of respondents with knee/leg pain, 13.5% of respondents with shoulder pain, 5.5% of respondents with neck pain, 4.7% with lower backache, 19.3% with wrist pain, and 13.1% with pain in fingers/hands. Other complaints of the respondents included 13.82% of self-reported eye irritation, 5% minor cuts and lacerations, 4.7% sewing needle prick and 7.3% skin abrasions.

Personal protective equipment

61% of workers used masks, 66.9% used gloves and only one-third of the workers did not use either masks or gloves the leather footwear manufacturing workers. 16% of respondents reported discomfort during work, 12.7% felt masks were not required during work, and 9.8% reported a lack of availability of masks. 14.2% of respondents reported poor fit of gloves, 12.7% felt that they did not require gloves during work and 6.2% reported a lack of availability of gloves.

Treatment-seeking behaviour

Among the participants, 27.6% reported taking tablets from the Pharmacy for their ailments, 26% reported self-care practices, and only 12.6% sought qualified physicians for their self-reported health complaints due to working in the leather footwear industry (Table 1).

Factors that contributed to occupational health problems among leather footwear workers

Gender, education, working section, work experience, daily working hours, safety training, supervision at work, ventilation in a work environment and use of PPEs were the independent variables (Table 2).

Workers in the cutting/stitching/molding department were nearly two times (OR: 1.958; 95% CI: 0.977-3.923) more likely to develop occupational health problems than workers in the scouring/finishing/polishing department. Workers not attended periodic work-related training were

3.5 times (OR: 3.573, 95% CI: 1.954-6.531) more likely to develop occupational health problems than workers who were given safety training. Workers who reported no fan, blowers, or windows in their working section were four times (OR: 4.200; 95% CI: 1.421–12.413) more likely to develop occupational health problems than workers who

reported having adequate ventilation. Workers who do not use PPE like gloves and masks were two times (OR: 2.384; 95% CI: 1.307-4.346) more likely to develop occupational health problems than workers who reported using PPE (Table 3).

Table 2: Association between various socio-demographic and work characteristics and occupational health problems of the leather footwear workers (n=275).

Categories	Occupational health problems		P value
	Absent (n=94)	Present (n=181)	
Gender			
Female	79	163	0.172
Male	15	18	
Education			
Literate	73	118	<0.05**
Illiterate	21	63	
Work section			
Cutting/moulding/shoe lasting	62	124	0.685
Scouring/finishing/polishing	32	57	
Work experience			
Less than or equal to 5	46	94	0.703
Equal to 5	48	87	
Daily working hours			
Upto 8	84	148	0.116
More than 8	10	33	
Periodic work-related training			
Attended	72	72	<0.05**
Not attended	22	109	
Supervisor in work station			
Yes	74	115	<0.05**
No	20	66	
Windows/fans/blowers in work station			
Yes	88	141	<0.05**
No	6	40	
Use of PPE			
Users	60	61	<0.05**
Never users	34	120	

**Statistically significant.

Table 3: Factors associated with occupational health problems among leather footwear workers (n=275).

Categories	Occupational health problems		Significance	Odds ratio (95% confidence interval)
	Absent (n=94)	Present (n=181)		
Gender				
*Male	79	163	0.207	0.579 (0.248–1.352)
Female	15	18		
Education				
*Literate	73	118	0.294	1.420 (0.738–2.731)
Illiterate	21	63		
Work section				
*Scouring/finishing/polishing	32	57	<0.05**	1.958 (0.977–3.923)
Cutting/moulding/shoe lasting	62	124		
Work experience (years)				
*Less than or equal to 5	46	94	0.893	1.041 (0.578–1.875)
Equal to 5	48	87		

Continued.

Categories	Occupational health problems		Significance	Odds ratio (95% confidence interval)
	Absent (n=94)	Present (n=181)		
Daily working hours				
*Upto 8	84	148	0.064	2.280 (0.954–5.450)
More than 8	10	33		
Periodic work-related training				
*Attended	72	72	<0.05**	3.573 (1.954–6.531)
Not attended	22	109		
Supervisor in work station				
*Yes	74	115	0.324	1.401 (0.717–2.740)
No	20	66		
Windows/fans/blowers in work station				
*Yes	88	141	<0.05**	4.200 (1.421–12.413)
No	6	40		
PPE				
*Users	60	61	<0.05**	2.384 (1.307–4.346)
Never users	34	120		

*Reference category, **statistically significant.

DISCUSSION

This study reported majority of female workers (88%) and only (12%) were males. This was because of the difference in product manufactured and the nature of tasks involved.³ Women employees were involved in sewing, stitching, attaching, folding, scouring, finishing and polishing as helpers. However, heavy machines were used for making or cutting footwear components, and hence the concentration of male employees was only in this section.³ Our study further concluded the 19% prevalence of respiratory symptoms among the leather footwear workers and also demonstrated that workers in the scouring/finishing/polishing process were likely to develop respiratory problems. However, higher prevalence of respiratory symptoms in several other studies.^{1,4,8,17} This may be due to organic solvents used in several production processes.^{1,4,8} Gangopadhyay et al study revealed that workers were exposed to toxic solvents used in adhesives, and cleaners, and to airborne leather dust, and inhalation of the leather dust and toxic adhesives cause the deposition of small particles along the lining of alveoli that decreases the ventilation-perfusion ratio and thus reduces the lung capacity thereby leading to various respiratory problems.^{1,4} Further our study reported that workers who mentioned inadequate fans/blowers in their work station to more likely to report occupational health problems. Therefore, increasing ventilation in the work area may reduce a few of the complaints.

In addition, the study concluded the prevalence of 16% of skin problems. Febriana et al study reported a higher occupational skin disease prevalence of almost 29%.⁷ Other studies had also reported similar findings.^{14,15} All workers, especially in the preparing/upper sole and assembling department, were exposed to solvents, organic chemicals, and heat-generating machines leading to a high ambient temperature of 38 to 40 degrees Celsius and humidity of 80% leading to skin problems.^{7,13} Also,

workers who apply adhesives using different kinds of brushes without using PPE like hand gloves can suffer from skin irritation.¹³

The current study also concluded that 37% prevalence of musculoskeletal disorders. De Almeida et al study revealed the highest prevalence of about 66%; Samsuzzaman et al study demonstrated a prevalence of almost 38.75%.^{12,14} This may be due to repetitive tasks, awkward postures for long periods in cutting/sewing/gluing/molding, and outsole joining than workers in the finishing/polishing section.¹¹

Limitations

Occupational health problems were self-reported, thus leading to self-reported bias and subjectivity. But measures were taken to keep this subjectivity to a minimum by using the standard definition and asking for specific symptoms. Measurement of the exposure elements like aerosol, volatile organic compounds and organic dust in the workplace environment would have added to the accuracy in estimating workers' exposures to various elements during the manufacturing process.

CONCLUSION

Based on the findings of the study, workers who did not attend regular work-related training and workers who did not properly use PPE such as gloves and masks suffered from these occupational health problems. Therefore, the workers must be instructed and provided with necessary protective devices without supply gaps; trained, and supervised periodically to reduce the chance of them suffering from ill-health. In this manner, compliance with the provisions, guidelines, and protocols as per occupational safety and health standards should be strictly regulated with immediate monitoring and evaluation of policies and procedures.

Recommendations

Employers need to improve the required facilities in the workplace and ensure a safe, sound, and healthy environment for all their workers. Therefore, periodic monitoring and safety training should be regulated to protect workers' health and safety. PPE provision, training for all employees regularly, along with supervision, and protocol implementation are all to be regulated. Health education, appropriate counselling, and regular health check-ups are advised.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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