

Prevalence of musculoskeletal ailments and associated factors among shoemakers in Kolkata, West Bengal

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ABSTRACT

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Date of submission: 10.12.2023

Date of acceptance: 16.08.2024

Date of publication: 01.10.2024

Conflicts of interest: None

Supporting agencies: None

DOI: <https://doi.org/10.3126/ijosh.v14i4.60388>



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Introduction: Foot covering was one of the first things made by our primitive ancestors. Shoes have played an important role in human culture throughout history. Shoemakers and their health have attracted less attention than the shoes themselves. Musculoskeletal problems were explored in this study to find out the prevalence and associated factors among the workers of the shoe making community in Kolkata, West Bengal.

Methods: Community-based cross-sectional study design was adopted and data collection was done through observation, interview and clinical examination. 160 shoe-makers were selected using simple random sampling after line listing in the Raja Bazar area for a period of 1 month (December 2021 to January 2022).

Results: This study found a high prevalence (45.6%) of musculoskeletal ailments among the shoe-making workers and among all the ailments considered, most of them were suffering from 'pain in limb joints' (34.3%) followed by 'low back pain' (32.9%) and 'neck pain' (31.5%). Linear trend analysis showed an increasing odds ratio from 1 to 11.16 when the total duration of work for the shoemakers increased from less than 5 years to more than 21 years which was also statistically significant. A similar trend was observed where the odd ratio increased from 1 to 2.95 when daily working hours increased from less than 9 hours to more than 12 hours.

Conclusion: The study concluded a high prevalence of musculoskeletal ailments among shoe-making workers and those are increasing in linear trend analysis.

Keywords: Musculoskeletal ailments, prevalence, shoemakers

Introduction

There is much evidence that foot covering was one of the first things made by our primitive ancestors.¹ The history of footwear making and use of the same is ancient enough to be mentioned. Necessity compelled human to invent some methods of protecting their feet from the jagged rocks, burning sands, and rugged terrain over which they ranged in pursuit of food and shelter. The history of human development shows that the importance of protecting the foot was very much early recognized.¹ Culture of footwear has been

evolving and ever-changing from then and gaining much popularity from the consumer section but on the other side the footwear makers are facing a plethora of health problems related to their work.¹ They are being continuously exposed to various materials used in footwear making that are harmful to their health like leather dust, chemicals, adhesives or glues, etc. These can cause respiratory ailments, skin diseases and other health-related problems. Even these chemical compounds like adhesives can cause irritation and

lacrimation of the eyes. In addition, poor illumination of the working place can cause eyestrain. Exposures to the toxic solvents used in adhesives and cleaners and to airborne leather dust are of particular concern.² Shoes have played an important role in human culture throughout history. Shoemakers and their health, however, have attracted less attention than the shoes themselves.³ Mass production in the shoe industry started in the late 1850s but changes in production methods did not improve poor working conditions and related occupational health problems among shoemakers, particularly in less developed countries.³ The total size of the leather and footwear industry in India in 2006-07 was USD 5 billion.⁴ The leather and footwear industry ranks eighth in terms of foreign exchange earnings for India with exports of around USD 3.2 billion in 2006-07.⁵ The total share of India in global leather trade during 2005 was around 3%.⁵ Various risk factors including leather dust, petroleum products, metals and solvents-deteriorate shoemakers' health. Other studies report chemical exposures, noise, vibration, stress and ergonomic problems as the main causes of health problems.⁶ Musculoskeletal disorder (e.g. low back pain), skin problems (e.g. contact dermatitis, occupational vitiligo due to contact with benzene and para-tertiary butyl-phenol in glues and adhesives), neuropsychiatric disorders (e.g. peripheral neuropathy, carpal tunnel syndrome, depression), occupational cancer (e.g. carcinoma of nose and paranasal sinuses, malignant neoplasm of larynx and lung in males and gallbladder and lung in females), Occupational injury, communicable diseases (e.g. scabies and tuberculosis due to poor workplace environment), non-communicable diseases (e.g. Hypertension and Diabetes) and others like eyestrain, headache, stress etc. With this background, musculoskeletal problems were explored in this study to find out the prevalence and associated factors among the workers of the shoemaking community in Kolkata, West Bengal.

Methods

The study was done for a month (December 2021

to January 2022) and the shoemakers of the study area were considered and basic information on socio-economic status, demographic characteristics, and patterns of musculoskeletal morbidities. Community-based cross-sectional study design was adopted and data collection was done through observation, interview and clinical examination. The study area was footwear-making factories in a slum area in Kolkata Municipal Corporation. This is an urban community with a very high population density and under the jurisdiction of Kolkata Municipal Corporation.

All shoemakers involved in different steps of shoemaking, living and working in the study area will be the reference population. After doing a line listing, it has been found that a total of 1121 shoemakers are presently working in that area concerned. Among them, 160 were selected for this study after taking the prevalence of pain in both hands 28%.⁷ A line listing of all shoemakers was done after conducting line listing in the study area. The list contained all necessary information (name, address, age, sex etc.) of each shoemaker working in the study area. From the list, 160 persons were randomly selected by a simple random sampling method with the help of a random number table without any replacement and applying inclusion and exclusion criteria. Inclusion criteria are considered as workers who are working and living for a minimum of 1 year in that area. Unwilling shoemakers were excluded. The ethics committee of Medical College, Kolkata cleared the research proposal and granted the permission of conduction. The modified BG Prasad scale (May 2021) was used to determine the socio-economic class using per capita family income.

Data were concurrently entered into an EXCEL worksheet and used for the calculation of frequency and percentages. Statistical packages for social science (SPSS) version 16 and Epi info 7 were used for suitable statistical operation. Based on these data, various outcome variables relevant to predefined objectives were computed and discussed. Simple proportions were used for

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descriptive statistics. The odds ratio and χ^2 test were used to find out the relationship between the outcome and predictor variables.

Results

In this study, we found 26.9% of the study participants were from 26 to 45 years of age group. Majorities (80.6%) of them were married and 55% were from the lower middle class followed by the lower class (30.6%) according to the modified BG Prasad scale of socio-economic status. 45% of the shoemakers only completed primary education level and 8.7% were found to be illiterate. Most of the participants belong to a joint family (72.5%) background. Regarding BMI, 90.1% were found to have normal BMI but 5.3% were

underweight and 4.6% were overweight. Regarding the history of addiction, multiple responses were found and majorities (98.85%) were addicted to some form of smoking tobacco followed by non-smoking tobacco (51%) and alcohol (31.1%) (Table1).

All the participants were enquired about their daily working hours and total duration of involvement in shoemaking. Majorities of them were working there for 5-10 years (34.4%) and 11-20 years (34.4%) and 18% were working more than 21 years. A whopping 63.7% of the study participants were working more than 12 hours a day and only 14.4% were working below 9 hours daily (Table 2).

Table 1: Socio-demographic factors and general information (n=160)

| Socio-demographic factors | | No. (%) |
|----------------------------|-----------------------|------------|
| Age group(Years) | 17-25 | 35 (21.9) |
| | 26-35 | 39 (24.4) |
| | 36-45 | 43 (26.9) |
| | 46-55 | 33 (20.6) |
| | 56-65 | 10 (6.2) |
| Level of education | Illiterate | 14 (8.7) |
| | Primary | 72 (45) |
| | Middle | 42 (26.3) |
| | Secondary | 26 (16.2) |
| | Higher secondary | 06 (3.8) |
| Family type | Nuclear | 44 (27.5) |
| | Joint | 116 (72.5) |
| | Total | 160 (100) |
| Type of addiction * | Tobacco (Smoking) | 86 (98.85) |
| | Tobacco (Non-smoking) | 36 (51) |
| | Alcohol | 27 (31.1) |

* Multiple Responses

Table 2: Working duration and working hours (n=160)

| Working duration and hours | | No. (%) |
|---------------------------------------|--------------|------------|
| Total duration of work (years) | <5 | 21 (13.1) |
| | 5-10 | 55 (34.4) |
| | 11-20 | 55 (34.4) |
| | 21-30 | 26 (16.2) |
| | 31 and above | 03 (1.9) |
| Daily working hours | < 9 | 23 (14.4) |
| | 9-12 | 35 (21.9) |
| | > 12 | 102 (63.7) |

Regarding the musculoskeletal ailments of the study participants, the prevalence was found to be very high as 73 participants (45.6%) among 160 were reported to be suffering from one or more problems associated with the musculoskeletal system. Majorities were suffering from pain in limb joints (34.3%) followed by low back pain (32.9%) and neck pain (31.5%) (Table 3).

Assessment of the trend of musculoskeletal ailments with total duration of work and daily

working hours was done. Chi-square for linear trend analysis showed an increasing odds ratio from 1 to 11.16 when the total duration of work for the shoemakers increased from less than 5 years to more than 21 years which was also statistically significant ($\chi^2 = 21.82$; $p < 0.01$). A similar trend was observed where the odd ratio increased from 1 to 2.95 when daily working hours increased from less than 9 hours to more than 12 hours though this finding was statistically not significant ($\chi^2 = 2.95$; $p < 0.09$) (Table 4).

Table 3: Musculoskeletal ailments among the shoe-makers (n=73)

| Sl. No. | Musculoskeletal ailments * | No. (%) |
|---------|----------------------------|-----------|
| 1. | Pain in limb joints | 25 (34.3) |
| 2. | Low back pain | 24 (32.9) |
| 3. | Neck pain | 23 (31.5) |
| 4. | Stiffness of joint | 17 (23.3) |
| 5. | Muscle strain | 07 (9.6) |

* Multiple responses

Table 4: Trend of musculoskeletal problems with increasing work duration and working hours (n=160)

| | | Musculoskeletal problems | | |
|---|------------|--------------------------|-------------------|-------|
| | | Present No. (%) | Absent No. (%) | OR |
| Total duration of work (years) | < 5 | 4 (19) | 17 (81) | 1 |
| | 5-10 | 16 (29.1) | 39 (70.9) | 1.75 |
| | 11-20 | 32 (58.2) | 23 (41.8) | 5.91 |
| | 21 & above | 21 (72.4) | 8 (27.6) | 11.16 |
| χ^2 for linear trend= 21.82, p< 0.01 | | | | |
| Duration of work (Hours) | <9 | 6 (26.1) | 17 (73.9) | 1 |
| | 9-12 | 18 (51.4) | 17 (48.6) | 3 |
| | >12 | 52 (51) | 50 (49) | 2.95 |
| χ^2 for linear trend= 2.95, p = 0.09 | | | | |

Discussion

The present study shows that in all age groups,

males (87.5%) were the major population among the shoemakers in the area. The mean age (SD) of

the study population was found to be 39.91 (11.42) years. A similar type of study among shoemakers was conducted in France and the result showed mean age (SD) of the study subjects was 40.2 (7.3) years.⁸ Another cross-sectional study on the working process and skin disease of shoemakers was conducted in East Java in Indonesia in 2010 and showed similar results and found that 96.5% of the shoemakers were male. They also calculated the mean age groups of the shoemakers with respect to involvement in different steps of the process and the commonest mean age was 32 years with an SD of 5.⁹ A cross-sectional study was done among hand-sewn shoe workers in Kermanshah and Kordestan provinces in the western part of Iran to investigate their working conditions in relation to musculoskeletal symptoms.¹⁰ In this study majority of the shoemakers were found females (79.4%). The study showed the mean age (SD) of the study participants was found to be 40.2 (14.5) years.¹⁰ A similar cross-sectional study was conducted in Kolkata, West Bengal and results showed a majority of the subjects were male (85%) but the major age group (35%) was found to be 15-29 years.¹¹ There were variations found in the results in the other studies those may be due to differences in study area, study population, sampling frame, etc.¹² The present study was urban community-based and shows that the majority of the study population (45%) were primarily educated followed by 26.3% of the shoemakers who passed middle school level of education. A cross-sectional study was conducted in Turkey to investigate the working conditions and related neuropsychiatric problems of shoemakers and here result showed majority of the shoemakers (86.2%) were primarily educated.¹² A similar type of study was conducted in Iran among hand-sewn shoe workers and the result showed majority of the study subjects (55.5%) were illiterate.¹⁰ A similar cross-sectional study was conducted in Kolkata, West Bengal and the result showed a majority of the study subjects (60%) were just literate.¹¹ The result of the present study shows a huge variation in per capita

monthly income of the shoemakers and a variation in family size and number of earning members though a majority of the families belonged to a joint structure. The mean value (SD) of per capita income in the present study was found to be Rs. 1152.8 (535.85). After applying the modified B.G. Prasad scale (July 2022), it was found that the majority of the population (55%) belonged to class IV (lower middle) socio-economic status. A cross-sectional study was done in Turkey to investigate the working conditions and related neuropsychiatric problems and the result showed that 51.3% of the shoemakers who participated earned an average wage of more than \$200 per month.¹² A similar study was conducted in Kolkata, West Bengal showed average per capita monthly income of the shoemakers was Rs. 3430.¹¹ In the present study tobacco smoking, non-smoking tobacco use and alcohol consumption were found among the shoemakers. The most prevalent addiction was tobacco smoking (98.85%) among the shoemakers who were users of these three substances. A cross-sectional study done in Turkey among shoemakers showed a majority of the study shoemakers (58.8%) were current smokers and 45.6% were alcohol consumers.¹² A similar study was done among hand-sewn shoe workers in the western part of Iran showed different results regarding smoking and the majority of the shoemakers (85.6%) were found to be non-smokers. This may be due to the majority of the subjects being female in this study.¹⁰ A similar study was conducted in Kolkata, West Bengal and the result showed smokeless tobacco addiction (48.75%) was highest among the shoemakers.¹¹ Majority of other studies showed similar results and smoking was a prevalent addiction among shoemaking workers. Regarding the duration of exposure, the present study reveals the duration of exposure to the shoemakers was of various lengths of time in their working environment. The present study shows the total duration of work and daily working time of all the participating shoemakers. The majority of the shoemakers (68.8%) were found to be working for 5-20 years in this occupation with a

mean (SD) total duration of work of 13.66 (8.61) years. Regarding daily exposure, the current study shows majority of the shoemakers (63.7%) were working more than 12 hours in a day with a mean (SD) daily working hours was 11.09 (2.01) hours. A cross-sectional study was done in Turkey to investigate the working conditions and related neuropsychiatric problems of shoemakers showed majority of the shoemakers (90.6%) worked more than 8 hours per day.¹² An active epidemiological surveillance of musculoskeletal disorders was done in a shoe factory in France and the result showed mean years (SD) of service of the shoe workers was 20.3 (4.4) years.⁸ A similar cross-sectional study was conducted among shoemakers in east Java in Indonesia showed mean (SD) working time of the workers involved in shoemaking was calculated to be 97 (66) months. The mean working hours/week (SD) of the shoemakers was calculated with respect to involvement in different steps in the shoemaking process. The mean working hours/week (SD) of the shoemakers involved in shoe designing and cutting was 51 (10). The mean working hours/week (SD) of the shoemakers involved in the preparation of upper sole and sewing was 47 (7). The mean working hours/week (SD) of the shoemakers involved in assembling was 49 (9). The mean working hours/week (SD) of the shoemakers involved in finishing was 48 (7). The mean working hours/week (SD) of the shoemakers involved in packing was 49 (13). Overall mean working hours/week (SD) of the shoemakers involved in different steps was found to be 48 (8) hours per week.⁹ A similar study was done among hand-sewn shoe workers in Iran and the result showed mean (SD) job experience was 17.2 (11.6) years. The mean (SD) daily working time of the shoemakers was found to be 6.6 (2.3) hours and the range was 1-10 hours. The mean (SD) weekly working time of the participants was found to be 44.4 (17.2) and the range was 6-70 hours per week.¹⁰ A similar study was done among shoemakers of manufacturing workshops in east Tehran and results showed mean (SD) work experience of shoemakers was 18 (14.9)

years.¹³ A similar study conducted in Kolkata, West Bengal revealed, that the average total duration of work was 12.35 years among all shoemakers. A total of 33.13% of the shoemakers are involved in shoemaking for 6-10 years and 81.87% are working more than 12 hours per day. This study also showed mean (SD) daily duration of work of the shoemakers was 11.34 (2.07) hours.¹¹ The present study showed that the prevalence of musculoskeletal ailments was found to be very high (45.6%) and various types of complaints were found. The major complaint was pain in limb joints (34.3%) followed by low back pain (32.9%). Other common complaints were neck pain (31.5%) and stiffness of joints (23.3%). The result also shows that an increase in the total duration of the work period is significantly associated with increased musculoskeletal morbidities ($p < 0.01$). Active epidemiological surveillance on musculoskeletal disorders was conducted in a shoe factory among 253 workers in France. Results showed the prevalence rates of musculoskeletal disorders (MSDs) studied were very high in the whole shoe factory.⁸ A cross-sectional descriptive study was conducted on working conditions and associated musculoskeletal symptoms among shoe workers in Iran. A total of 77.8% of the study population reported some kind of musculoskeletal symptom at some time during the 12 months preceding data collection. The majority of those who reported symptoms indicated more than one location of pain or discomfort (97.1%). The most commonly affected body regions among the workers were shoulders (72.2%), neck (68.9%), upper back (63.9%), lower back (41.7%), knees (30.5%) and wrists/hands (13.3%). High to very high complaints in the shoulders, neck, upper back and lower back were reported by 66.6%, 61.6%, 55.5% and 34.4% of the respondents, respectively.¹⁰ A similar study conducted in Kolkata, West Bengal also showed similar results and found a high prevalence of musculoskeletal problems (38.75%) among the shoemakers and the majority of the study population (61.29%) complained of pain in the lower back region.¹¹ Results of various studies

showed consistency with the present study result and musculoskeletal morbidities were found to be very high among the shoemakers.

Conclusions

This study concluded that there is a high prevalence (45.6%) of musculoskeletal ailments among the shoe making workers and among all the ailments considered, most of them were suffering from 'pain in limb joints' (34.3%) followed by 'low back pain' (32.9%) and 'neck pain' (31.5%). Chi-square for linear trend analysis showed an increasing odds ratio from 1 to 11.16 when the total duration of work for the shoemakers increased from less than 5 years to more than 21 years which was also statistically significant ($\chi^2 = 21.82$; $p < 0.01$). A similar trend was observed where the odd ratio increased from 1 to 2.95 when daily working hours increased from less than 9 hours to more than 12 hours though this finding was statistically not significant ($\chi^2 =$

2.95; $p < 0.09$).

Limitations

As it is a cross-sectional study, temporal association and causality establishment is not possible between work patterns and musculoskeletal problems.

Recommendations

A prospective study for a longer duration may be able to establish the causality and proper ergonomic changes like reducing the duration of sitting as well as reducing the long working hours and on-job periodical preventive health check-ups can be recommended accordingly.

Acknowledgment

The authors wholeheartedly thank the shoemakers who participated and helped this research to materialize despite their very busy and rigorous work schedules.

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