Work-related Injury and Disability among Tannery Workers of Kanpur, India

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ABSTRACT

Introduction: Occupational fatalities remain a complex issue despite many scientific research and development efforts made to resolve the problems, especially in the developing world. Due to that, occupational accidents continue to contribute a significant proportion of the total burden of disease. In the case of India, it is difficult to get the data on occupation injuries and fatalities across the different occupational groups. Objectives: The objective of the study is to estimate the prevalence and risk factors of occupational injury among the tannery workers of Kanpur, India. Methods: A cross-sectional study design was adopted; a total of 284 tannery workers were interviewed during January-June 2015 from Kanpur, Uttar Pradesh, using a three-stage sampling design to fulfill the study objective. Multivariable analyses were employed to see the effect of explanatory variables on the injury. Results: Over one-tenth of the tannery workers (11%) experienced work-related injuries in the past 12 months. Eighty percent of the injured workers had received medical care and 13 out of 30 wounded workers become physically disabled. Tannery workers involved in loading and unloading of raw hides—manually and by trolleys—were 2.0 (p<0.1) times and 2.1 (p<0.1) times more likely to experience a work-related injury. Conclusion: To conclude, the increased risk factors of occupational injuries are loading and unloading raw hides—manually and by trolleys—were the significant risk factors. Key words: Injuries, Disability, Tannery Workers, Kanpur, Leather, India. Key Messages: • Tannery workers are at higher risk of experienced work-related injuries and physical disability. • The study found a statistically significant association between loading and unloading raw hides—manually and by trolleys and injury at work.

INTRODUCTION

The International Labour Organization estimated that around 2.3 million workers (Men and Women) worldwide concede to work-related accidents every year and as an outcome of that, over 6000 deaths every day. There are around 340 million occupational accidents worldwide and 160 million victims of work-related fatalities annually. The possible reason for this enormous disease burden would be the poor working conditions. Occupational fatalities remain a complex issue despite many scientific research and development efforts made to resolve the problems, especially in the developing world. Due to that, occupational accidents continue to contribute a significant proportion of the total burden of disease. In the case of India, it is difficult to get the data on occupation injuries and fatalities across the different occupational groups.

The world's most contaminated industry is recognized as the tanning industry because of the extensive use of chemicals in different processes. Leather tannery workers are susceptible to many chemicals and physical hazards just because they are liable to be affected by their exposure to lots of hazardous materials and their processes during tanning work in such a dangerous working environment. Chromium exposure during the tanning process, leather dust, exposure to chemical agents, ergonomic stressor increases their susceptibility. They are even involved in different works like material transferring, wet finishing, dry finishing, etc. These workers touch with leather hides during the various work processes, which are very hazardous and release many dangerous tissues during the tanning process.

The leather industry clutches a prominent place in the Indian economy. India is the fifth largest exporter of leather goods and accessories in the world. That is why the leather industry is one of the focused sectors under India's foreign trade policy. The leather industry has massive potential for employment, growth and exports. The leather industry is $12 billion in size and it is expected to reach up to $27 billion by 2020 (Council for leather exports, 2015-2016). According to the Central Leather Research Institute (CLRI, 2013) report, 2091 leather tanneries are functioning across the country and approximately 186 million square meters of raw leather is produced annually. Kanpur has...
conventionally been a manufacturing city and a major economic center in Uttar Pradesh. There are currently 402 registered leather tanneries in the eastern part of the city, with an estimated 20,000 tannery workers. In a developing country like India, where it is very difficult to get information on the occupational injury. It is worth mentioning that only a few studies have been done on occupational injuries in India. Therefore, most of the time, occupational injuries are unreported and it may lead to permanent disability and the loss of a job. The tannery workers are engaged in beam housework, wet finishing, dry finishing and miscellaneous work that demands many manual works such as loading and unloading raw hides in tannery premises, sometimes manually or sometimes through trolley. Tannery workers often experience an injury because of the nature of their work: lifting of heavy material like rawhides and transporting material and other manual labour. Despite having many health issues among tannery workers, limited studies have been conducted to assess the prevalence and risk factors associated with physical injuries among tannery workers. With this background, the objective of the study is to estimate the prevalence and risk factors of occupational injury among the tannery workers of Kanpur, India.

SUBJECTS AND METHODS

Sample Size
A cross-sectional study design was implemented to collect information from the household of tannery workers in the Jajmau area of Kanpur, India. The data collection period was from January-June 2015. A total of 284 tannery workers from the study area were studied.

Study Area
Since the British administration, Kanpur is known as the leading leather-processing region in India. The area Jajmau suburb is located near the southern bank of the river Ganga. Kanpur has conventionally been a manufacturing and trade city and a main economic centre in Uttar Pradesh. At present, more than 20000 tannery workers are engaged in this occupation in 402 registered leather tanneries. The majority of tannery workers live in the Jajmau area, which is why Jajmau was selected for the study.

 Sampling Design
A study has considered the three-stage sampling design. At the first stage, seven localities in the Jajmau area, namely Tadbagiya, Kailash Nagar, J.K. colony, Ashtarfabad, Motinagar, Chabeelapurwa and Budhiyaghat, were selected based on the higher concentration of leather tannery worker’s population in these areas as reported by various stakeholders in the city. At the second stage, three out of the seven localities, namely Budhiyaghat, Tadbagiya and Ashtarfabad, were chosen using probability proportional to size (PPS) sampling technique after arranging them in increasing order of estimated number of HHs of leather tannery workers. After completion of the sampling frame in each of the three localities, a circular systematic random sampling was applied to select households at the third stage. In each of the three designated areas, 100 households were selected for tannery workers, using a circular systematic random sampling procedure. Thus, a total of 300 HHs were chosen for the interview and a total of 284 were interviewed successively.

Statistical Analysis
This study has considered experiencing an injury in the last 12 months as an outcome variable and predictor variables were age, education, work experience, job status, type of work, working hours, working days, religion, caste, media exposure, the standard of living index, medical care and disability due to injury. Data entry was done using Epi Info 7 and data analysis was done using STATA software. Simple frequency and bivariate analysis of categorical variables were done to understand tannery workers’ profiles (socio-economic, demographic and work-related characteristics). The adjusted odds ratio was estimated from the logistic regression analysis for two different models. Model-I deals with the socio-demographic variables and Model-II considers the work-related characteristics and socio-demographic factors in the present study.

Ethical approval
This work being based on the Ph.D. work of the senior author, we have received the ethical clearance from the Student Research Ethics Committee of International Institute for Population Sciences, Mumbai, India. We have also received a consent to participate from each of the respondents before starting the interview.

Inclusion and exclusion criteria
The study comprised 284 male tannery workers of the age group 18–70 years from the study area, Kanpur. Households were included those having at least one tannery worker in the household, irrespective of having or not having any non-tannery worker, households having non-tannery worker(s) and households having no worker. The first two groups of households constituted two independent sampling frames in each of the three selected localities. At the same time, the third group of households was excluded from the study.

RESULTS
Table 1 presents the profile of the study participants. The average age of tannery workers was 38 years. Around two-thirds of the tannery workers were illiterate (66%) and only 11 percent had attended school up to high school and above level. Most tannery workers were on temporary job contracts (89%) and their average working years at present workplaces was 10 (SD=0.92) years. We have categorized tannery workers into four broad work categories and they are working in beam housework (8.4% of the workers), wet finishing (24.2%), dry finishing (50.5%) and miscellaneous (16.8%). Tannery workers stated that they worked nearly every day 9-10 hr (average working hours in a day) and the average working days in a week was 6.5 days. Tannery workers belong to Muslims (66.2%) and Hindus (33.8%) communities. Sixty-five percent of the tannery workers belonged to SC/ST caste groups. Significantly, 16 percent belonged to the general castes.

Prevalence of injuries and physical disability among tannery workers
Tannery workers often experience an injury because of the nature of their work: lifting of heavy material like rawhides and transporting material and other manual labour. The prevalence of injury and medical care received are presented in Table 2. It is seen that a little over one-tenth of the tannery workers (11%) experienced work-related injuries in the past 12 months. Eighty percent of the injured workers had received medical care and 13 out of 30 wounded workers become physically disabled.

The odds ratio showing the risk factors for injury among tannery workers is presented in Table 3. Among the two models used to assess the risk factors for the injuries among tannery workers, Model-I considers socio-economic variables including (age, education and media exposure). Model-II includes work-related variables (work experience in the current tannery, type of work, type of job contract and the extent of a worker’s involvement in loading and unloading of raw hides—manually and by trolley) in addition to socio-economic variables. Tannery workers
DISCUSSION

On the record, an inadequate number of studies on injuries among tannery workers were conducted since industrialization and development occur in India. This cross-sectional study expounds on the prevalence and disability experienced by the tannery workers of Kanpur, India. The study's significant findings stated that around two-thirds of the tannery workers were illiterate. An equal proportion of workers (66%) belong to SC/ST caste groups and the Muslim community, which indicates that the workers involved in this occupation belong to the marginalized and weaker section of the society. Global estimates reveal the number of occupational accidents and work-related illnesses, which are 2.78 million deaths annually across the countries attributed to work, higher than the 2.33 million deaths estimated in 2014. Work-related mortality accounted for 5% of the total global deaths. The most significant share of work-related mortality came from work-related diseases, which accounted for 2.4 million (86.3%) of the total estimated deaths. Fatal accidents accounted for the remaining 13.7%. Across the globe, hazardous conditions in the workplace were responsible for a minimum of 312,000 fatal occupational injuries. Occupational risk factors are accountable for 8.8% of the global burden of mortality due to accidental injuries and 8.1% of DALYs due to this outcome. Eleven percent of the tannery workers experienced work-related injuries in the past 12 months. Eighty percent of the injured workers had received medical care and 13 out of 30 wounded workers became physically disabled. Along with these statistics, several studies on occupational injury reported the prevalence and risk factors (depends on the nature of the job) of fatalities worldwide. This study stated that average working hours in a day and working days in the week are more than the standard protocols. Tannery workers with high exposure to media were less likely to experience an injury at work; however, workers involved in loading and unloading of raw hides—manually and by trolleys—were more likely to experience a work-related injury.

The prevalence of injury among bridge-making workers was 26 percent. The risk factors were not using protective devices, smoking, tobacco

### Table 1: Socio-economic and work-related characteristics of tannery workers in Kanpur city, India, 2015.

| Variables                        | Tannery workers (%) | (Numbers, N) |
|----------------------------------|---------------------|--------------|
| Age in years                     | 38.53 ±12.24        | 284          |
| Education                        |                     |              |
| Illiterate                       | 66.1                | 188          |
| Up to primary                    | 13.4                | 38           |
| Middle school                    | 8.8                 | 25           |
| High school and above            | 11.7                | 33           |
| Work experience in current tannery | 10.14 ± 7.97       | 284          |
| Work experience in previous tannery | 7.96 ± 6.30        | 99           |
| Job status                       |                     |              |
| Temporary job (daily wages)      | 89.08               | 253          |
| Permanent job                    | 10.92               | 31           |
| Type of work                     |                     |              |
| Beam housework                   | 8.4                 | 24           |
| Wet finishing work               | 24.2                | 69           |
| Dry finishing work               | 50.5                | 142          |
| Miscellaneous work               | 16.8                | 49           |
| Average working hours in day     | 9.55 ± 1.69         | 284          |
| Average working days in a week   | 6.51 ± 0.52         | 284          |
| Religion                         |                     |              |
| Hindu                            | 33.8                | 96           |
| Muslim                           | 66.2                | 188          |
| Caste                            |                     |              |
| Schedule caste                   | 65.5                | 186          |
| Other backward class             | 18.3                | 52           |
| Others                           | 16.2                | 46           |
| Media exposure                   |                     |              |
| Low                              | 22.9                | 65           |
| Medium                           | 48.6                | 138          |
| High                             | 28.5                | 81           |
| Standard of living index         |                     |              |
| Low                              | 37.7                | 107          |
| Medium                           | 31.3                | 89           |
| High                             | 31.0                | 88           |
| Total                            | 100.0               | 284          |

### Table 2: Percent distribution of tannery workers who experienced injury, medical care and physical disability due to work in a tannery in Kanpur, India, 2015.

| Tannery workers | Percent (%) | Number (N) |
|-----------------|-------------|------------|
| Injured during work in tannery |             |            |
| Yes             | 10.6        | 30         |
| No              | 89.4        | 254        |
| Received medical care for the injury |         |            |
| Yes             | 80.0        | 24         |
| No              | 20.0        | 06         |
| Experienced physical disability due to the injury | | |
| Yes             | 4.6         | 13         |
| No              | 95.4        | 271        |
| Total           | 100.0       | 284        |
Table 3: Odds ratio showing the risk of injury among tannery workers in Kanpur, India, 2015.

| Variables                              | Injury during work in tannery | Model-I     | C.I.       | Model-II    | C.I.       |
|----------------------------------------|-------------------------------|-------------|------------|-------------|------------|
| Age in years                           |                               |             |            |             |            |
| 16-24*                                 |                               | 1.01        | [0.24-4.10]| 1.29        | [0.27-6.29]|
| 25-35                                  |                               | 0.99        | [0.25-3.94]| 0.98        | [0.20-4.77]|
| Education                              |                               |             |            |             |            |
| Illiterate*                            |                               |             |            |             |            |
| Up to primary                          |                               | 3.34**      | [1.20-9.29]| 4.76***     | [1.54-14.70]| |
| Middle school                          |                               | 3.24*       | [0.88-11.91]| 4.72**      | [1.16-19.28]| |
| High school and above                  |                               | 3.00        | [0.74-12.12]| 4.10        | [0.92-18.30]| |
| Media exposure                         |                               |             |            |             |            |
| Low exposure*                          |                               |             |            |             |            |
| Medium exposure                        |                               | 0.51        | [0.20-1.27]| 0.54        | [0.21-1.40]|
| High exposure                          |                               | 0.27**      | [0.08-0.94]| 0.24*       | [0.06-0.91]|
| Work experience in current tannery     |                               |             |            |             |            |
| Up to 5 yrs.*                          |                               |             |            |             |            |
| 6 to 10 yrs.                           |                               | 1.44        | [0.49-4.28]|             |            |
| 11 and above yrs.                      |                               | 1.98        | [0.66-5.94]|             |            |
| Type of work                           |                               |             |            |             |            |
| Beam housework*                        |                               |             |            |             |            |
| Wet finishing work                     |                               | 0.59        | [0.15-2.36]|             |            |
| Dry finishing work                     |                               | 0.43        | [0.11-1.63]|             |            |
| Miscellaneous work                     |                               | 1.01        | [0.25-4.13]|             |            |
| Type of Job contract                   |                               |             |            |             |            |
| Temporary job (daily wages)*           |                               |             |            |             |            |
| Permanent job                          |                               | 4.04        | [1.32-12.34]|             |            |
| Involved in loading and unloading of raw hides manually in leather tannery premises? | | | | | |
| No*                                    |                               |             |            |             |            |
| Yes                                    |                               | 2.04*       | [0.58-7.13]|             |            |
| Involved in loading and unloading of raw hides by trolley in leather tannery premises? | | | | | |
| No*                                    |                               |             |            |             |            |
| Yes                                    |                               | 2.10*       | [0.52-8.51]|             |            |

Note: * Reference category, **P<0.01, *P<0.05, *P<0.1.
CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ILO: International Labour Organization; CLRI: Central Leather Research Institute; PPS: Probability Proportional to Size; HHS: Households; SD: Standard Deviation; SC: Scheduled caste; ST: Scheduled Tribes; DALYs: Disability Adjusted Life Years; CI: Confidence Interval.

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