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Original Article

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

Gyan Chandra Kashyap

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 fulfil 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.[1] 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.[2-5]

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.[6] Kanpur has

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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.[2]

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.[2] 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, Asharfabad, Motinagar, Chabeelepurwa 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 Asharfabad, 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

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**

with high exposure to media were 0.27 ($p<0.05$) times and 0.24 ($p<0.1$) times less likely in Model-I and Model-II to experience an injury at work; however, 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.

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%.[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.[8,9]

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 become 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 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 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.

	Injury during work in tannery			
Variables	**Model-I**	**C.I.**	**Model-II**	**C.I.**
Age in years				
16-24®				
25-35	1.00	[0.24-4.10]	1.29	[0.27-6.29]
36+	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.

chewing, lack of sleep and work experience associated with suffering.[10] Further, forty-four percent of the industrial workers were affected by external injuries during their working time.[11] Twenty-one percent of the welders suffered from work-related injuries.[12] Among the welders in coastal south India experienced more than two injuries and 44% (92) had more than ten injuries. Welders had abrasions and more than three-fourths of them had each of lacerations, foreign body in the eye, flash burns and contusions.[13] Work-related injuries among farmers were 69 % in the last 12 months. Common injuries among the farmers were cuts, puncture wounds and lacerations.[14]

Occupational injuries were stated by 46.2% of building construction workers. The significant injury was on upper and lower limbs, injuries cut/lacerations and contusions, falls and injuries by manual tools were the leading causes of injuries.[15] The prevalence of injury among building construction employees was reported to be 38 percent. Use of personal protective equipment, work experience and khat chewing was significantly associated with injury.[16] Furthermore, the extended working hours, poor safety, duration of work, job dissatisfaction, age and job stress were significant risk factors of occupational injuries among building construction workers.[15] Of the total morbidities, i.e., 442 in glass factory workers, injury constituted 251 (56.9%) and incised injury 156 (59.3%) in the workers and 32 (12.2%) in the comparison group.[17] The prevalence of study-defined occupational injury among the workers engaged in small-scale manufacturing was 35.6%.[18]

The factors such as age, job duration and stress at work were associated with a significantly higher risk of occupational injuries among steel plant workers.[19] Young age, male gender, health and safety training, sleeping disturbance and job stress were significant predictors of occupation injury among textile factory workers in Amhara Regional State, Ethiopia.[20] The most common injuries sustained were burns, cuts, eye injuries inflicted by foreign objects, electric shock, arc eyes and bone fracture. Most occurred on the hands among workers in a welding company.[21] Injury-related individual-related and job-related risk factors were age, work type, workplace and length of shift work among coal workers of Shanxi Province.[22] A recent estimate shows around 11,614 Indian construction workers from 2008 to 2012 would have died annually was 11,614.[23] Many incidences of limbs injuries have taken place due to stepping / striking against objects. In this study, the exertion / wrong movements of the workers and handling tools with work injuries were observed. It highlighted the necessity of proper safety training of the metal smelting industry workers.[24] Occupational injury, causality and risks are not well characterized in in terms of burden assessments in different studies.[25-30]

CONCLUSION

This study reveals the increased risk factors of occupational injuries are loading and unloading raw hides—manually and by trolleys—were the significant risk factors. Therefore, it is necessary to implement safety measures to reduce the prevalence of injuries and disability and along with that, the employer can promote safer work practices among tannery workers.

Limitations of the Study

Information collected through a cross-sectional survey may have underestimated the accurate prevalence of injury. The self-reported injury results could be prejudiced due to subjectivity in responses as the severity was not quantified. Recall prejudice may also have influenced the anticipated prevalence of injury.

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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:** Schedule caste; **ST:** Schedule Tribes; **DALYs:** Disability Adjusted Life Years; **CI:** Confidence Interval.

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