Occupational Medicine & Health Affairs
ISSN: 2329-6879

Kashyap, et al., Occup Med Health Aff 2016, 4:6
DOI: 10.4172/2329-6879.1000254

Research Article OMICS International

Risk Assessment of Low-back Trouble among Male Tannery Workers: A Study of Kanpur City, India

Gyan Chandra Kashyap*, **Shri Kant Singh and Praveen Chokhandre**

International Institute for Population Sciences, Govandi Station Road Donor Mumbai, Maharashtra, India.

***Corresponding author:** Kashyap GC, International Institute for Population Sciences, Govandi Station Road Donor Mumbai, 400088, India, **Tel:** +91-9967162925; **E-mail:** statskashyap@gmail.com

Received: November 23, 2016; **Accepted:** December 14, 2016; **Published:** December 21, 2016

Abstract

Background: Low Back Trouble (LBT) is very common among tannery workers, it occurs due to the bend posture of low back during the material transfer.

Aim: This paper analyzes the prevalence of the self-reported LBT, its intensity and the potential risk factors among male tannery workers in Kanpur, India.

Methods: Data for the study were obtained from a cross-sectional household survey conducted during the period January-June, 2015. The study was conducted in the Jajmau area of Kanpur and interviewed 284 tannery workers selected using scientifically developed study design using probability sampling approach. Univariate and bivariate analyses were used to assess the prevalence and intensity of LBT. Logistic regression analysis was used to identify the potential risk factors for contracting LBT.

Results: Tannery workers aged 35 years and above had higher prevalence of LBT (57%). A significant association was observed between long working 11-12 h and the prevalence was (68%) of LBT. Among the workers aged 35+years, about a sixth (16%) reported daily recurrence of pain, and about a fifth (19%) experienced pain more than 10 times in the last 12 months. Tannery workers who were injured at work in the last 12 months was 2.09 and 2.42 times more likely to get LBT in Model-II and III. The adjusted effect of LBT was 1.8 times higher among tannery workers had severe mental health disorders.

Conclusions: The results reveal statistically significant association of LBT with age of tannery workers, educational attainments, type of job contract, type of work, daily working hours, manual loading and unloading, workplace injury in last 12 months and mental health disorders.

Keywords: Injury; Low back trouble; Mental health; Musculoskeletal disorder; Tannery workers

Introduction

Several studies have documented the epidemiology of LBT among workers engaged in various occupations worldwide. A study of the global burden of non-traumatic low back pain (LBP) reported that 37 percent of LBP was attributable to occupation. Work-related LBP was estimated to cause 818,000 disability-adjusted life years lost annually [1]. There is limited information available about the intensity of LBT or when the problem becomes chronic; nor is there a precise definition of a chronic condition. Many studies have attested to the high prevalence and incidence rates of lower back trouble in the general population as well as among working people. To understand the epidemiology of LBT, it is important to establish the linkages between chronic LBT and occupational stressors (physical and psychosocial) or the working environment at the workplace. Tanneries have attained considerable notoriety for the polluting nature of their work and the critical occupational health risks they pose such as musculoskeletal disorders, injuries, etc. Male tannery workers are usually involved in loading and unloading of raw hides, material handling, and movement, etc. There is a high risk of developing musculoskeletal disorder and injuries in such working conditions. The poor and unsafe working conditions act as stressors and increase the susceptibility of the workers to various ailments. Low back trouble is one of the commonly experienced health risk factors among tannery workers. The cause of the low back trouble is working posture, loading, and unloading of raw hides (frequent bending to lift the heavy objects) in tannery premises. The prevalence of low back trouble varies from 14 percent to 61 percent worldwide. Subjective evidence suggests that the working environment plays a significant role in the health of employees in almost all occupations throughout the world. A majority (ranging from 50 to 87%) of the workers involved in strenuous work reported MSD symptoms [2-7]. A large number of studies also reported the associations between occupational stressors or working environment and musculoskeletal symptoms. The most significant physical risk factor associated with musculoskeletal discomfort was bending the trunk forward slightly, repetitive work involving bent positions, the manual manipulation of heavy goods, hands above knee level, prolonged working hours, and job duration [8-15]. A comprehensive review of over 600 epidemiological studies concluded that there was evidence of a causal relationship between workplace exposures and environments and low-back injuries and disorders [16]. In continuation of that, several studies also have established an association between psychosocial work factors, job stress, and musculoskeletal disorders. It is also evident

from previous research that tedious work, high perceived workload, and time pressures are related to symptoms of musculoskeletal disorders [17-20]. Earlier studies have examined the association of prevalence of LBT with work-related characteristics of workers involved in the different occupation. While, the present study has estimated the intensity of LBT with its prevalence. More specifically, this study has tried to assess the association of LBT with the injuries and mental health, along with the socio-demographic and work-related variables. Concerns have also been raised about the possibility of high prevalence and intensity of LBT among male tannery workers. It is against this backdrop; this paper aims to analyze the prevalence of the self-reported LBT, its intensity and the potential risk factors among male tannery workers.

Materials and Methods

Study design and participants

Data for the present study were obtained from a cross-sectional household survey of tannery workers, conducted during the period January - June 2015. The study was part of a Ph.D. program and was conducted in the Jajmau area of Kanpur city in the state of Uttar Pradesh, India. Due to a large number of tanneries and production of superior leather products, Kanpur is also known as the 'Leather City of the World'.

The sample population included only those male workers who were at least 18 years old and had worked in tanneries for at least one year. Initially, 300 households of tannery workers in Jajmau were selected for the study out of which 284 tannery workers were interviewed with a response rate of 95%.

Sampling design

There were stages in the sample selection process. In the first stage, seven areas in Jajmau have selected in which most tannery workers lived. In the second stage, three areas were chosen according to probability proportion to size (PPS). In the third and final stage households with at least one tannery worker were listed. In households with more than one person working in a tannery, the respondent was selected with the help of a KISH table. From each of the three selected areas - Budhiyaghat, Tadbagiya, and Ashrafabad - 100 samples were chosen through systematic random sampling method.

Worker's classification

The tanning process begins with storage and marking of raw hides. Tanning and finishing are done in four main stages. Tannery workers are classified according to the stage of the tanning process they are involved. Thus, they would be engaged in beam housework, wet finishing work, dry finishing work and miscellaneous work [21]. In the beam house, the raw hides are set to dry by either stretching them on bamboo frames or pegs or spreading the hides on the ground in mild sunlight. Beam house workers are in frequent contact with water and chemicals during preparatory operations such as soaking, liming, fleshing, deliming, bating, and picking. The wet finishing process includes splitting, shaving, waxing, and oiling. The operations are mostly performed while standing at machines. Workers in the dry finishing stage are involved in operations such as drying, shaving, buffing, pressing, staking, padding, and spraping. There also groups of workers performing miscellaneous activities such as packers, sweepers, carriers, and mixers of chemicals. Carriers carry wet hides, and chemicals are usually mixed with bare hands. Moreover, this all type of work having a similar workload.

Study tools

A structured interview schedule was designed, which was based on extensive field visits that were undertaken before data collection. The schedule was translated into the local language and pre-tested before actual collection of data. Face to face interviews were conducted with the help of a structured, pre-tested questionnaire. The study also used several questions from National Institute for Occupational Safety and Health (NIOSH) and the Standardized Nordic Questionnaire which is designed to capture MSDs [22].

Variables used

Frequency of occurrence of LBT in last 12 months and intensity (in terms of LBT up to 10 times, more than 10 times but not every day and almost every day) in the last 12 months were considered as dependent variables for the study. Demographic and occupational variables such as age, years of working in the present occupation, job type (daily wage, monthly salaried workers), type of work engaged in (beam housework, wet finishing work, dry finishing work, miscellaneous work), average daily working, loading and unloading of raw hides manually or by trolley, injuries in the last 12 months and mental health status were considered as independent variables for the study.

General health questionnaire (GHQ-12) was used to assess the mental health status of male leather tannery workers [23]. The General Health Questionnaire consists of 12 items, each item an indicator of mental health problem over the few weeks preceding the study. This study used the four-point Likert scale (1-less than usual, 2-no more than usual, 3-rather more than usual, 4-much more than usual). After that, we have made dichotomous each of the response of all the items of GHQ-12. GHQ – 12 is a dimensional indicator of common mental disorders from which a summed score is produced. High scores indicate severe mental health. Based on the score, researchers can categorize mental as normal, moderate and severe by using the principal component analysis (PCA).

Statistical methods

The results were summarized in descriptive statistics. Univariate and bivariate analyses were used to estimate the prevalence and intensity of LBT by a few selected socio-economic and occupation related characteristics, and to describe these with a 95 percent confidence interval. $\chi 2$ Test was conducted to test the association between occupation related variables and LBT. Logistic regression analysis has been used to assess the associations between musculoskeletal disorders and the risk factors. Effect are measured by odds ratio (OR) estimated from logistic regressions underlying each of the three Models. The response variable is introduced by adding them to the set of predictor variables. Model-1 deals with the socio-economic and occupational characteristics including (age, education, job contract, type of work, daily working hours, loading or unloading methods of raw hides – manually or by trolley). Model-II included a variable (were you injured at work in the last 12 months?) additional to socio-economic and occupational characteristics. Model-III comprised the variable of mental health disorder with the socio-economic and occupational characteristics and injury at work the last 12 months preceding the survey. The analysis was performed with STATA-13 statistical analysis package [24].

Ethical Consideration

Ethical clearance was obtained from the Student Research Ethics Committee of International Institute for Population Sciences Mumbai, India. Formal written consent was obtained from all participants. Confidentiality of data was assured with the help of a coding system to conceal the identity of the respondents.

Results

Table 1 shows the descriptive findings of the study. The mean age of the tannery workers (as mentioned earlier, all respondents were male) was 38 years (SD=1.42). About 66 percent of the workers were illiterate, and only 12 percent had a high school education or higher. Average tannery experience was 18 years. The majority of tannery workers (89 %) were employed on daily wages with a mean duration of 10 years at their job (SD=0.92). The respondents were employed in various processes in the tanneries. Among them, 8 percent were engaged in beam house work, 24 percent in wet finishing, 50 percent in dry finishing and 17 percent in miscellaneous kind of work. According to the responds, they worked almost every day of the week. On average they worked 6.5 days a week and 9.5 hours (SD=0.19) a day.

Variables	Tannery workers	
	(N)	(%)
Age in years (Mean ± SD)	284	38.5 ± 1.4
Education		
Illiterate	188	66.3
Up to primary	38	13.3
Middle school	25	8.8
High school & above	33	11.6
Work experience in current tannery (Mean ± SD)	284	10.1 ± 0.9
Job contract		
Temporary job (daily wages)	253	89.1
Monthly wage salaried	31	10.9
Type of work		
Beam house work	24	8.4
Wet finishing work	69	24.2
Dry finishing work	143	50.5
Miscellaneous work	48	16.8
Average working hours in day (Mean ± SD)	284	9.5 ± 0.2
Average working days in a week (Mean ± SD)	284	6.5 ± 0.6
Religion		
Hindu	96	33.8
Muslim	188	66.2
Caste		
Schedule caste/Schedule tribes	185	65.4
Other backward class	53	18.5
None of them	16	5.6
Don't know	30	10.5
Total	284	100

Table 1: Socio-economic and occupational characteristics.

Independent variables	N	(%)	χ2
Age in years			
<35	108	20.7	7.42, p<0.006
35 & above	176	51.5	
Education			
Illiterate	188	56.7	10.536, p<0.015
Up to primary	38	44.7	
Middle school	25	48	
High school & above	33	27.3	
Type of work			
Beam house work	24	37.5	2.82, p<0.419
Wet finishing work	70	55.7	
Dry finishing work	143	49.7	
Miscellaneous work	47	55.3	
Job contract			
Temporary job (daily wages)	253	53	3.37, p<0.066
Monthly wage salaried	31	35.5	
Working hours in day			
Upto 8 hours	135	42.2	13.21, p<0.001
9 to 10 hours	71	49.3	
11 to 12 hours	78	68	
Loading or unloading of raw hides manually			
Yes	225	56	10.59, p<0.001
No	59	32.2	
Loading or unloading of raw hides by trolley			
Yes	24	45.8	0.28, p<0.593
No	260	51.5	
Overall	284	51.1	

Table 2: Prevalence of LBT among male tannery workers of Kanpur City.

About two-thirds of the workers were Muslim (66%) and the remaining Hindus. The majority of the tannery workers (65%) belonged to the SC/ST group. Only 6 percent came from the general castes.

Table 2 presents the prevalence of LBT in the past 12 months according to occupational characteristics. The overall prevalence of LBT was 51 percent among the male tannery workers. The prevalence of low-back pain was significantly higher among workers aged 35 years and above (52%).

Illiterate tannery workers reported significantly higher prevalence (57%) of LBT. It was the least (27%) among those who had studied high school and above. Further, the prevalence varied by the type of work. For instance, the prevalence of LBP was higher for workers engaged in wet finishing work (56%), miscellaneous work (55%), dry finishing work (50%) and beam house work (37%). Higher prevalence of LBT was observed among daily wage (non-permanent) employees (53%) than the salaried workers (35%). The result also shows the association of LBT and working hours. Workers who regularly put in 11-12 hours a day had a higher prevalence of LBT (68 %). Those involved in manual loading and unloading of raw hides also reported a higher prevalence of the LBT (67%).

The intensity of LBT experienced by the male tannery workers is presented in Table 3. Overall, 68 percent of workers reported LBT for at least 10 times during the past one year and around a sixth (17%) of the workers said LBT more than 10 times. Fifteen percent of the workers reported the daily occurrence of low back trouble those who worked Upto 10 years were considered to be chronically suffering from LBT. About a sixth (16 %) of the tannery workers aged 35 years and above reported chronic LBT. Those in the age group of 25 to 35 years with this conduction were slightly less (15%) in proportion. Percentage of workers suffering from chronic LBT varied from 16 to 18% depending on the level of education. Tannery workers engaged in miscellaneous work experienced the highest percentage of chronic LBT (31%) in comparison with wet finishing (15%) and dry finishing workers (11%). About 16% of tannery workers who are usually engaged in manual loading or unloading of the reported chronic LBT. Those working longer hours also had a higher percentage of chronic back trouble, which ranged from 15-18% in the three categories. A significant proportion of tannery workers on different job contracts also experienced chronic LBT.

Independent variables	Number (N)	Upto 10 times	More than 10 times but not every day	Almost every day
Age in years				
<35	44	72.7	13.6	13.6
35 & above	101	65.4	18.8	15.8
Work experience in current tannery				
Upto 10 years	84	64.29	20.24	15.48
11-20 years	44	77.27	13.64	9.09
21 and above years	17	58.82	11.76	29.41
Education				
Illiterate	106	68.9	15.1	16
Up to primary	17	76.5	5.9	17.7
Middle school	12	58.3	25	16.7
High school & above	10	55.6	44.4	0
Type of work				
Beam house work	9	66.7	33.3	0
Wet finishing work	39	76.9	7.7	15.4
Dry finishing work	71	66.2	22.5	11.3
Miscellaneous work	26	57.7	11.5	30.8
Job contract				
Temporary job (daily wages)	134	67.2	17.9	14.9
Permanent job	11	72.7	9.1	18.2
Working hours in day				
Upto 8 hours	57	68.4	14	17.5
9 to 10 hours	35	68.6	20	11.4
11 to 12 hours	53	66	18.9	15.1
Loading or unloading of raw hides manually				
Yes	126	66.7	17.5	15.9
No	19	73.7	15.8	10.5
Loading or unloading of raw hides by trolley				
Yes	11	63.6	27.3	9.1

No	134	67.9	16.4	15.7
Overall	145	67.6	17.2	15.2

Table 3: Intensity of low back trouble among male tannery workers of Kanpur city, 2015.

Table 4 shows the adjusted effect of injury and mental health disorder on the prevalence of LBT experienced by the tannery workers in the 12 months preceding the survey. The results show that LBT is clearly associated with increasing age of the workers. For example, odds ratio of LBT is higher among workers aged 35+years [OR=1.97**; CI: 1.15-3.36] times more likely in Model-I, [OR=2.03**; CI: 1.18-3.49] times more likely in Model-II and [OR=1.82**; CI: 1.05-3.18] times in Model-III compared to those aged below 35 years.

Tannery workers who worked on a temporary (daily wages) contract are more likely to experience lower back trouble in each of the three Models. Odds ratio [OR=2.21**; CI: 0.91-5.38] of lower back trouble was the highest in Model-II. In this study, the tannery workers were engaged in various kinds of strenuous physical activities that are related to LBT. Adjusted effect of LBT is most likely among workers who engaged in Model-III for dry finishing work [OR=3.87***; CI: 1.41-10.64], Model-II for wet finishing [OR=3.00*; CI: 1.07-8.40] and Model-III for miscellaneous work [OR=3.34**; CI: 1.10-10.19] in comparison with beam house workers. The results confirm that prolonged working hours has a strong association with lower back trouble. Male tannery workers who usually work for 11-12 hours a day had higher odds of lower back trouble [OR=2.85***; CI: 1.46-5.59], [OR=2.93***; CI: 1.49-5.77] and [OR=2.05**; CI: 0.92-4.56] times in Model-I, Model-II and Model-III respectively. Strenuous physical work like manually loading and unloading of raw hides has higher odds of LBT, which is [OR=2.1*; CI: 1.03-4.27], [OR=1.99*; CI: 0.97-4.07] and [OR=2.18**; CI: 1.04-4.55] times more likely in Model-I, Model-II, and Model-III respectively. Tannery workers who were injured at work in the last 12 months are more likely get LBT, which is [OR=2.09**; 95% CI: 0.87-5.01] and [OR=2.42**; 1.00-5.82] times more in Model-II and III. The result also shows the significant association between mental health disorder and LBT. The adjusted effect of LBT is higher among tannery workers with severe mental health disorders, [OR=1.80*; CI: 0.82-3.96] times in Model-III in comparison with those in normal mental health. An overview of the result of logistic regression shows strong association between LBT and predictor variables like age of the tannery workers, educational attainments, type of job contract, type of work, duration of working day, manual loading and unloading of raw hides, workplace injury in the last 12 months and mental health disorder, all of which have statistically significant effects on the odds of LBT.

	Model I		**Model II**		**Model III**	
Independent variables	**O.R.**	**C.I.**	**O.R.**	**C.I.**	**O.R.**	**C.I.**
Age in years						
<35®						
35 & above	1.97**	[1.15-3.36]	2.03**	[1.18-3.49]	1.82**	[1.05-3.18]
Education						
Illiterate®						
Up to primary	1.02	[0.47-2.24]	0.93	[0.42-2.06]	1	[0.44-2.25]
Middle school	1.32	[0.53-3.30]	1.25	[0.49-3.16]	1.44	[0.56-3.69]
High school & above	0.44*	[0.18-1.08]	0.42*	[0.17-1.05]	0.53*	[0.21-1.36]
Job contract						
Monthly wage salaried®						
Temporary job (daily wages)	1.95*	[0.82-4.62]	2.21**	[0.91-5.38]	1.86*	[0.74-4.65]
Type of work						
Beam house work®						
Wet finishing work	2.85**	[1.02-7.90]	3.00*	[1.07-8.40]	2.81*	[0.99-7.94]
Dry finishing work	3.85**	[1.29-9.37]	3.77***	[1.39-10.26]	3.87***	[1.41-10.64]
Miscellaneous work	3.27**	[1.10-9.76]	3.32**	[1.10-9.96]	3.34**	[1.10-10.19]
Working hours in day						

Upto 8 hours®						
9 to 10 hours	1.26	[0.67-2.34]	1.30**	[0.69-2.43]	0.97	[0.48-1.92]
11 to 12 hours	2.85***	[1.46-5.59]	2.93***	[1.49-5.77]	2.05**	[0.92-4.56]
Loading or unloading of raw hides manually						
No®						
Yes	2.1*	[1.03-4.27]	1.99*	[0.97-4.07]	2.18**	[1.04-4.55]
Loading or unloading of raw hides by trolley						
No®						
Yes	0.93	[0.35-2.45]	0.89*	[0.33-2.37]	1.23	[0.45-3.35]
In the last 12 months have you been injured during work						
No®						
Yes			2.09**	[0.87-5.01]	2.42**	[1.00-5.82]
GHQ-12 (Mental Score)						
Normal®						
Moderate					0.50**	[0.26-0.97]
Severe					1.80*	[0.82-3.96]
Note: ® Reference category, ***P<0.01, **P<0.05, *P<0.1.						

Table 4: Odds ratio showing risk factors for low-back trouble among tannery workers (in the past 12 months).

Discussion

The aim of this study was to assess the prevalence of LBT among tannery workers in Kanpur, and its intensity. The study was limited to the LBT among the respondent population. Overall, the prevalence of LBT was 51 percent. However, a past study of Kanpur's tannery workers of Kanpur reported a higher prevalence of low back pain (61%) [21]. This reduction in the prevalence of LBT can be explained by increased mechanization of tanning processes that may have resulted in reduced manual work and altered postures. Education has a strong association with LBT. It was the least among workers with high school and above in comparison with tannery workers who had no education [10].

The study shows linkages between the age of tannery workers and the LBT the prevalence of which increased with age. A cross-sectional study of musculoskeletal complaints in past week and year had a significant association with job duration and age in these workers [12]. It is also evident that the average age (38 years) of the tannery workers and their length of their experience (18 years) in the industry as well as their working hours (9.54 h a day) and the number of days (6.5) they worked in a week. Results show the association of LBT and working hours. Sixty-eight percent of the tannery workers who regularly worked 11-12 hours a day reported LBT. A comprehensive review of past studies shows the linkage between workers' age and working hours [8-10, 12, 25-31]. The present study illustrates the prevalence of LBTs according to the different works in the tanneries. More than half of the of the tannery workers (56%) who are usually engaged in wet finishing work, 55 percent of those in miscellaneous work, and 50 percent in dry finishing work 37 % in beam housework reported LBT in the last 12 months. Since a limited number of occupation-based studies are conducted, it would be difficult to compare the findings with previous studies, especially for tanneries.

More than half the tannery workers (53%) who worked on daily wages basis had a higher prevalence of lower back trouble than the permanent workers. Around two-thirds of tannery workers (67%) who involved in manual and unloading work reported LBT. It was also seen that temporary workers were engaged for doing work that was more strenuous and hazardous. The present study also tried to analyze the intensity of LBT among the tannery workers. Chronic sufferers are those that have an 'almost daily' occurrence of lower back trouble. It was about 16 percent among workers aged 35 years and above. Chronic lower back trouble was the highest (31%) among carriers. Carriers carry wet hides, mix chemicals and perform other hazardous work. Chronic lower back trouble was also significant among the workers engaged in miscellaneous work like packing, cleaning, carrying and mixing chemicals. The workers engaged in loading or unloading of the raw hides manually (16%) reported the chronic LBT.

Long working hours have a clear association with chronic LBT which ranges 15 to18 percent in the three categories. The effect of LBT was measured by odds ratio (OR) estimated from logistic regressions underlying each of the three Models. The odds ratio of LBT is higher among the workers aged 35+years in each of the three Models. Analyses show significant association of age of the tannery workers with LBT in the 12 months immediately preceding the survey. As mentioned, tannery workers on temporary job contracts were more likely to experience LBT. This was established in all the three Models. The study also found statistically significant associations with type of

work. The odds of LBT is higher among workers who manually load and unload raw hides. This involved bending of the low back, which may be a possible cause of LBT as documented in some studies [14-15,32-34]. Tannery workers who were injured at their workplaces in the last 12 months during work are more likely get LBT [1,16,35].

Studies have established a strong association of stress and LBT [17-20,36]. The adjusted effect of LBT is higher for tannery workers having severe mental health disorder in comparison with those in normal mental health. Occupational health is an issue of critical concern in most developing countries like India. A huge proportion of the world's workforce is to be found in the developing countries. At the same time, there is insufficient research into occupational health hazards in a range of occupations. However, with growing industrialization and socio-economic progress, occupational health concerns are gradually gaining importance in developing countries. This study of LBT among tannery workers reflects that concern. Chronic low back pain is prevalent in a range of occupations worldwide. It is associated with injuries, mental stress, has a substantial cost by way of loss of productivity and loss of quality of life. Based on existing literature, which attests the associations between work and musculoskeletal symptoms have been broadly conveyed. This study has found the predictor variables which have the significant association with LBT among male tannery workers. The age of the tannery workers, type of job contracts, nature of work, hours worked daily, manual loading and unloading of raw hides, workplace injury in the last 12 months, and mental health have statistically significant effects on the odds of LBT.

Conclusion

This cross-sectional study concludes that LBT is prevalent with its high intensity among tannery workers. The results reveal the statistically significant association of lower back trouble with the age of tannery workers, educational attainments, type of job contract, type of work, daily working hours, manual loading and unloading, workplace injury in last 12 months and mental health disorders. LBT is very common among tannery workers, and it occurs due to the frequent bend posture of low back during the material transfer. The study praises mechanization of tannery activities at workplaces so that episodes of LBT can be minimized among tannery workers.

Acknowledgement

The authors are thankful to all the participants in the survey.

References

1. Punnett L, Prüss-Utün A, Nelson DI, Fingerhut MA, Leigh J, et al. (2005). Estimating the global burden of low back pain attributable to combined occupational exposures. Am J Ind Med 48: 459-469.
2. Gbiri CA, Osho AO, Olumiji A (2012) Prevalence, Pattern and Impact of Work-related Musculoskeletal Disorders on Functional Performance of Welders in a Nigeria Rural-Urban Centre. JOHE, summer 2014: 1.
3. Nasaruddin AFA, Tamrin SBM, Karuppiah K (2014) The Prevalence of Musculoskeletal Disorder and the Association with Risk Factors among Auto Repair Mechanics in Klang Valley, Malaysia. Iran J Public Healt 43: 34-41.
4. Bodhare T, Valsangkar S, Bele S (2011) An epidemiological study of work-related musculoskeletal disorders among construction workers in Karimnagar, Andhra Pradesh. Indian J Community Med 36: 304-307.
5. Choobineh A, Tabatabaei SH, Mokhtarzadeh A, Salehi M (2007) Musculoskeletal problems among workers of an Iranian rubber factory. J Occup Health 49: 418-423.
6. Hussain T (2004) Musculoskeletal symptoms among truck assembly workers. Occup Med (Lond) 54: 506-512.
7. Joshi TK, Menon KK, Kishore J (2001) Musculoskeletal Discorders in Industrial Workers of Delhi. Int J Occup Environ Health 7: 217-221.
8. Mirta W, Siti ZMD, Nukman Y (2016) The Relation of Risk Factors and Musculoskeletal Discomfort among Manual Material Handling Workers in Malaysian automotive Industries. Malaysian Journal of Public Health Medicine 16: 124-133.
9. Baqar M, Arslan M, Jamil N, Zahid H (2015) Prevalence of Work-Related Musculoskeletal Symptoms (WMSS) among the Motorcycle Mechanics of Lahore, Pakistan. Iran J Public Health 44: 1708-1709.
10. Ekpenyong CE, Inyang UC (2014) Associations between worker characteristics, workplace factors, and work-related musculoskeletal disorders: a cross-sectional study of male construction workers in Nigeria. Int J Occup Saf Ergon 20: 447-462.
11. Inbaraj LR, Haebar OJ, Saj F, Dawson S, Paul P, et al. (2013) Prevalence of musculoskeletal disorders among brick kiln workers in rural Southern India. Indian J Occup Environ Med 17: 71-75.
12. Aghilinejad M, Javad Mousavi SA, Nouri MK, Ahmadi AB (2012) Work-related musculoskeletal complaints among workers of Iranian aluminum industries. Arch Environ Occup Health 67: 98-102.
13. Latza U, Pfahlberg A, Gefeller O (2002) Impact of repetitive manual materials handling and psychosocial work factors on the future prevalence of chronic low-back pain among construction workers. Scand J Work Environ Health 28: 314-323.
14. Ory FG, Rahman FU, Katagade V, Shukla A, Burdorf A (1997) Respiratory disorders, skin complaints, and low-back trouble among tannery workers in Kanpur, India. Am Ind Hyg Assoc J 58: 740-746.
15. Walsh K, Varnes N, Osmond C, Styles R, Coggon D (1989) Occupational causes of low-back pain. Scand J Work Environ Health 15: 54-59.
16. Keyserling WM (2000) Workplace risk factors and occupational musculoskeletal disorders, Part 2: A review of biomechanical and psychophysical research on risk factors associated with upper extremity disorders. AIHAJ 61: 231-243.
17. Devereux JJ, Buckle PW, Vlachonikolis IG (1999) Interactions between physical and psychosocial risk factors at work increase the risk of back disorders: an epidemiological approach. Occup Environ Med 56: 343-353.
18. Yu S, Nakata A, Gu G, Swanson NG, He L, et al. (2013) Job Strain, Effort-reward Imbalance and Neck, Shoulder and Wrist Symptoms among Chinese Workers. Ind Health 51: 180-192.
19. Mathew L (2014) Influence of Job Stress on Musculoskeletal Disorders among Employees in Construction Industries in Kerala. International Journal of Engineering Trends and Technology (IJETT) 17: 361-368.
20. Bongers PM, de Winter CR, Kompier MA, Hildebrandt VH (1993) Psychosocial factors at work and musculoskeletal disease. Scand J Work Environ Health 19: 297-312.
21. Ory FG, Rahman FU, Katagade V, Shukla A, Burdorf A (1997) Assessment of exposure to chemical agents and ergonomic stressors in tanneries in Kanpur, India. Am Ind Hyg Assoc J 58: 732-739.
22. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, et al. (1987) Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 18: 233-237.
23. Goldberg D, Williams P (1991) A User's Guide to the General Health Questionnaire. Windsor: NFER-Nelson. pp: 1-129.
24. Stata Corp. Stata Statistical Software: Release 13. (2013). College Station, TX: Stata Corp LP.
25. Singh S, Chokhandre P (2015) Assessing the impact of waste picking on musculoskeletal disorders among waste pickers in Mumbai, India: a cross-sectional study. BMJ open 5: e008474.
26. Singh LP (2013) Prevalence of low back injury (lbi) risk due to manual lifting tasks among small scale casting industry workers. Wyno Academic Journal of Engineering and Technology Research 1: 30-36.

27. Murtezani A, Ibraimi Z, Petrela E, Osmani-vllasolli T (2012) Low back pain among Kosovo power plant workers: a survey. Italian Journal of Public Health 9: e8661.1-e866.7.
28. Guo HR, Chang YC, Yeh WY, Chen CW, Guo YL (2004) Prevalence of musculoskeletal disorder among workers in Taiwan: a nationwide study. J Occup Health 46: 26-36.
29. Andersson GB (1999) Epidemiological features of chronic low-back pain. Lancet 354: 581-585.
30. Zamanian Z, Daneshmandi H, Setoodeh H, Nazaripoor E, Haghayegh A, et al. (2014) Risk Assessment of Musculoskeletal Disorders and Determination of the Associated Factors among Workers of a Dairy Products Factory. Journal of health sciences and surveillance system. 2: 134-139.
31. Kezunovic L, Stamatovic S, Stamatovic B, Jovanovic J (2004) One-year prevalence of musculoskeletal symptoms in aluminium industry potroom workers. Facta Universi tatis 11: 148-153.
32. L Elders, A Burdorf (2001) Interrelations of risk factors and low back pain in scaffolders. Occup Environ Med 58: 597-603.
33. Toroptsova NV, Benevolenskaya LI, Karyakin AN, Sergeev IL, Erdesz S (1995) "Cross-sectional" study of low back pain among workers at an industrial enterprise in Russia. Spine 20: 328-332.
34. Burdorf A, Naaktgeboren B, de Groot HC (1993) Occupational risk factors for low back pain among sedentary workers. J Occup Med 35: 1213-1220.
35. Rothenbacher D, Brenner H, Arndt V, Fraisse E, Zschenderlein B, et al. (1997) Disorders of the back and spine in construction workers: prevalence and prognostic value for disability. Spine 22: 1481-1486.
36. Chen WQ, Yu IT, Wong TW (2005) Impact of occupational stress and other psychosocial factors on musculoskeletal pain among Chinese offshore oil installation workers. Occup Environ Med 62: 251-256.