

Occupational health hazards and safety practices among the workers of tannery industry in Bangladesh

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Abstract

In Bangladesh, workers of the tannery industries are commonly affected with several health hazards. The aim of this study was to determine the prevalence and patterns of health problems of the tannery workers, and to find out the factors associated with those health problems. A cross sectional study was conducted on 316 general tannery workers (who work with raw hides and chemicals only) from 22 different tanneries in Hazaribagh, Dhaka, Bangladesh. A standardized, structured face to face interviewer-administered close ended questionnaire was used for data collection. Data were analyzed using descriptive statistics, logistic regression models and chi-square test. Around 63.3% of workers were affected with at least one health problems. Majority of the workers were suffering from skin problem (25.3%), gastrointestinal problem (8.5%), chronic headache (8.2%), allergies (5.7%), respiratory system problem (6.3%), cardiovascular problem (6.3%) and eye problem (3.5%). Only 36.7% respondents used personal protective equipment (PPE). The tanneries did not have any effluents or wastes treatment facilities. Smoking and monthly low household income were significantly associated with the morbidity of the tannery workers. The government should take adequate measures to mitigate the health hazards in the tannery industry.

Key words: Health hazard, safety practices, tannery workers, Bangladesh.

INTRODUCTION

Tanning industry in Bangladesh is one of the oldest manufacturing sub-sectors for over six decades and this sector contributes 3-4% growth of the total economy of the country (GTZ, 2010; Azom *et al.*, 2012). Among 313 leather and manufacturing units in Bangladesh, approximately 300 of the tanneries are situated in Hazaribagh, Dhaka (Billah, 2000). In developed countries, the production of leather has been tremendously reduced due to the closure of tanneries brought about by strict environmental laws. Developing countries have inadequate environmental protection measures due to limited relevant policies and lack of enforcement of existing legislation (Febrina *et al.*, 2012; Were *et al.*, 2013). The third world countries, especially Bangladesh is now in a vulnerable position regarding the industrial pollution issues (Nuruzzaman *et al.*, 1992). It has been reported that these tanneries are responsible for serious environmental threats by discharging untreated liquid effluents and solid wastes directly into the surrounding low lying areas which contains high amount of heavy metals such as Cr, Cu, As, Cd, Fe, Hg, Mn, Ni, Pb and Zn (Larson *et al.*, 1975; Huq, 1998; Human Rights Watch, 2012). Previous studies reported that residents near the Hazaribagh tannery had higher morbidity

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compared to people living 2 to 3 km apart (Huq, 1998; Chowdhury, 2011; Human Rights Watch, 2012). Therefore, it is important to know the level of health of the tannery workers and take remedial action. This study was designed to determine the tannery induced disease prevalence and patterns among the tannery workers and to identify the health hazards of the tannery workers. It was also decided to measure the knowledge, attitude and practice of the personal protective equipments use among the tannery workers and finally to explore the health seeking behaviors of the tannery workers in Bangladesh.

MATERIALS AND METHODS

Study area and population: The study was conducted at Hazaribagh area under Hazaribagh Thana in Dhaka City Corporation where approximately 300 tanneries are located. Voluntary participation of full time tannery workers with all ages (both male and female), who worked with raw hides and chemicals, were only included in the study.

Study design and sampling: A cross sectional study was conducted among 316 tannery workers of 22 different tannery industries following quantitative data collection methods. The tanneries were selected purposively and the workers were selected randomly. Before data collection, pilot study among 46 tannery workers were conducted. From pilot study, the disease prevalence rate was 72%, keeping 95% confidence interval (CI) and absolute precision required 0.05, minimum sample size came out 310.

Data collection: A standardized structured close-ended questionnaire was used for data collection. The questionnaire was prepared in English and asked directly by translating into Bangla. A trained data collection team consisting of 12 members collected data using face to face interviews. Permissions from every tannery industry authority and verbal consent from the tannery workers were taken in advance. Respondents had complete liberty not to response to any of the questions and leave the interview at any time during the study. The interviewer-administered questionnaire included socio-demographic (age, sex, education, marital status, and family background, including saving status, water source and income levels), working information knowledge and personal protective equipment's use (working hour, duration of job, training status, knowledge regarding chemicals and hand washing practice), working environment characteristics (ventilation, lighting, temperature, noise, smell, waste management facilities of the tannery and smoking status), health problems and treatment status of the tannery workers.

Data analysis: Data were analyzed by using SPSS (Statistical Package for Social Science, version 20) software and Microsoft excel (version 2010). Descriptive statistics for categorical variables frequencies and proportions; means and standard deviations for continuous were calculated. Logistic regression and chi-square test were used to explore significant association between health problems and others variables (age, sex, education, income, duration of job in year, working hours, protective equipment use, smoking status of the tannery workers, marital status, knowledge about chemicals and working environments). Odds ratio (OR), 95% CI and p-value (significant at $P < 0.05$) were used for interpretation.

RESULTS AND DISCUSSION

Socio-demographic characteristics of the respondents are presented in Table 1. Among 316 respondents, 290 were male and 26 were female. The data showed that majority (46.5%) of the tannery workers were young adult aged between 21 years and 30 years.

Table 1. Socio-demographic characteristics of the tannery workers, Hazaribagh, Bangladesh

Background characteristics	Percentage (%)	Number of tannery workers (N=316)
Sex		
Male	92.0	290
Female	8.0	26
Age (year)		
<20	5.4	17
21-30	46.5	147
31-40	32.9	104
41+	15.2	48
Education		
No education	37.3	118
Primary incomplete	28.2	89
Primary complete	16.8	53
Secondary incomplete	13.6	43
Secondary complete or higher	4.1	13
Monthly income (taka) of the tannery workers		
Less than 8000	10.1	32
8000-10000	53.8	170
10000-12000	27.5	87
More than 12000	8.5	27
Duration of job (year)		
<5	54.4	172
6-10	31.3	99
10+	14.2	45
Daily working hours		
6-7	2.5	8
8-9	81.0	256
10+	16.5	52
Smoking status of the tannery workers		
Smoke	54.0	171
Do not smoke	46.0	145

The study showed that maximum workers were illiterate, 37.3% workers were with little education at all. The study demonstrated that job duration of 54.4% tannery workers was less than 5 years, 31.3 % was 6 years to 10 years and 14.2% was above 10 years. Most of the tannery workers (54%) smoked and all of them were male moreover, all of them smoked inside the workplace that is responsible for passive smoking for other workers thus the unhealthy tannery environment and smoking practice is the big concern for tannery workers.

The results revealed that the tannery workers enters into their works without prior training though 73.7% of them agreed that they require training before entering into the job. (Table 2) In this study, 84.2 % respondents believed that the chemicals used in the tannery are harmful for health and 64.1% the respondents knew that these chemicals can cause cancers. The results showed that 90.5% the respondents know that protective equipment's can reduce the exposure of the chemicals. Among 316 tannery workers 116 (36.7%) used personal protective equipment's and 200 (63.3%) workers did not use personal protective equipment's. This study also showed that the workers were working in the unhealthy environment for long time without using protective equipment's which might cause many health problems to the tannery workers.

Table 2. Training status, Knowledge and use of Personal Protective Equipment's by the tannery workers, Hazaribagh, Bangladesh

Training status, Knowledge and PPE use	Percentage (%)	Number of tannery workers (N= 316)
Formal training status before working with tannery machines and chemicals*		
With training	0.0	0
Without training*	100	314
Do the workers believe before entering into job the workers require training?		
Yes	73.7	233
No	26.3	83
Do the workers know chemicals used in the tannery are harmful for health?		
Yes	84.2	266
No	15.8	50
Do the workers think chemicals used in the tannery can cause cancer? **		
Yes	64.1	202
No	35.9	113
Do the workers know personal Protective equipment's can reduce the exposure of the chemicals?		
Yes	90.5	286
No	9.5	30
Do the workers use protective equipment's?		
Yes	36.7	116
No	63.3	200
Source of protective equipment's used by the workers		(n= 116)
Self	49.0	57
Tannery	60.0	59

*There was two case missing

**There was one case missing

Tannery workers suffer from many health problems, among them Skin problem, Gastrointestinal problem, Chronic head ache, Respiratory system problem (Asthma, COPD, chronic bronchitis), Cardiovascular problem (Hypertension/stroke/heart disease) are more common. Table 3 shows the prevalence and patterns of various health problems of the tannery workers due to tannery activities. Among 316 workers, 200 (63.3%) were suffering from health problems. During the present study, it was recorded that 25.3% of the tannery workers were suffering from Skin Disorder.

Table 3. Prevalence and patterns of health problems of the tannery workers, Hazaribagh, Bangladesh

Health problems of the tannery workers	Percentage (%)	Number of tannery workers (N=316)	Average suffering from disease (in months) with(SD)
Suffering from health problems			
Yes	63.3	200	
No	36.7	116	
Disease specific sufferings of the tannery workers out of 316			
Skin problem	25.3	80	50.5 (41.1)
Gastrointestinal problem	8.5	27	39.1(23.4)
Chronic head ache	8.2	26	25.3(14.8)
Sterility/ loss of libido	0.9	3	48.0(12.0)
Eye problem	3.5	11	37.0 (32.8)
Allergies	5.7	18	74.0 (39.1)
Diarrhea	4.1	13	29.3 (29.6)
Leprosy	1.9	6	42.0 (14.6)
Tuberculosis	1.3	4	63.0 (26.6)
Respiratory system problem (Asthma, COPD, chronic bronchitis)	6.3	20	45.6 (37.4)
Jaundice	1.6	5	34.8 (30.7)
Fever	2.5	8	13.8 (11.1)
Low birth weight or immature babies	0.6	2	24.0 (16.9)
Abortion	0.6	2	42.0 (8.48)
Hearing problem	2.2	7	49.7 (28.1)
Cardiovascular problem (Hypertension/stroke/heart disease)	6.3	20	50.0 (27.4)
Musculo-skeletal problem	3.2	10	45.6 (37.4)
Neurological disorders	0.6	2	46.5 (53.03)
Mental health problem (psychological problem/depression/anxiety)	0.9	3	116.0 (55.42)
Renal problem (Urinary tract problems)	1.3	4	27.0 (11.4)
Trauma/ injury	3.2	10	17.0 (14.4)
Loss of appetite	2.5	8	24.2 (15.0)
Sleep disturbance	0.6	2	30.0 (8.4)
Nail problem	0.6	2	24.0 (0.0)
Loss of smell (Anosmia)	3.2	10	48.0 (76.73)

* SD-Standard Deviation

This study indicates that 8.5% of the respondents were suffering from Gastrointestinal problem whereas in the previous study of Yogaraj *et al.* (2014) it was 2.6% and 13.9% was stated by the study of Arjunan (2015). On the other hand, 8.2 % of the respondents had been found to be suffering from chronic headache whereas Arjunan (2015) found 47.9 % that was higher than the present study. The study reported that 9% of the respondents were suffered from Sterility/ loss of libido that was higher than the findings of the study of Arjunan (2015) which was 6.8%. Rastogi *et al.* (2008) reported that 14.7% of the tannery workers were suffering from eye problem whereas this study found that

only 3.5% of the responded were in eye problems. Arjunan (2015) reported that 7.1 % of the tannery workers were suffered from allergy whereas in this study 5.7% of the respondents were suffering from allergy. Previously Gangopadhyay *et al.* (2011) found that 16.7% of the tannery workers suffered from respiratory system problem (Asthma, COPD, chronic bronchitis) but in this study found that only 6.3% of the workers were suffering from this health problem. The tannery workers did not get proper training before entering into the job. The workers were handling the machines and drums improperly that caused trauma/ injury (mainly hand and leg injury).

Environmental condition of the working place in the tannery industry is very important for maintaining good health of the tannery workers. Table 4 demonstrates the environmental conditions of the workplace in the tannery industry. Among 22 tanneries, 20 were poorly ventilated and 200 workers were suffering from different diseases, 183 (91.5%) workers were working in this poor ventilated environment. These unhealthy activities of the tanneries were responsible for environmental pollution and health problems of the tannery workers and residents in Hazaribagh area.

Table 4. Environmental condition of the workplace in the tannery industry Hazaribagh, Bangladesh

Environmental condition in the tannery industry	No. of the tannery (N=22)	No. of workers N=316	Suffering of the workers from health problem (%)	No. of respondents (n=200)	OR	CI (95%)	P-value
Ventilation well ventilated	2	23	8.5	17	1.70	0.65-4.45	0.27
poor ventilated	20	293	91.5	183			
Lighting adequate lighting	3	29	11.0	22	1.92	0.79-4.65	0.14
poor lighting	19	287	89.0	178			
Temperature comfortable temperature	1	5	1.5	3	0.87	0.14-5.27	0.87
Not comfortable temperature	21	311	98.5	197			
Chemical no fume	1	5	1.5	3	0.87	0.14-5.27	0.87
Fume with fume	21	311	98.5	197			
Noise free from noise	0	0	0	0	0.58		0.00
(mainly machinery) Noisy	22	316	100	200			
Smell normal	0	0	0	0	0.58		0.00
bad smell	22	316	100	200			
Effluents Yes	0	0	0	0	0.58		0.00
and wastes No	22	316	100	200			
treatment facility of the tannery							

* CI-Confidence Interval

Table 5 shows the association between disease and other risk factors. This study showed that females were more susceptible to disease (p-value 0.28). Seventy percent (p-value 0.28) respondents were suffering from diseases whose age ranged between 31 to 40 years. The result revealed an insignificant association between duration of job and disease (p-value 0.62). The study revealed that long time tannery working has a negative impact on health, 75% respondents were suffering from diseases who worked above 16 years in the tannery (p-value 0.62). An insignificant association (p-value 0.53) were also recorded between disease and personal protective equipment's use. Only 36.7% workers used protective equipment's and they were using protective equipment's improperly which might cause health problem of the workers. For this reason, in this study an insignificant association between personal protective equipment's use and disease were found. It was noted that smokers were more likely to suffer from diseases (p-value 0.003).

Table 5. Association of health problems of the tannery workers with different risk factors

Background characteristics		Health problems percentage	Number (N=316)	P-value
Sex	Male	62.4	290	0.28
	Female	73.1	26	
Age	<20	58.8	17	0.28
	21-30	58.5	147	
	31-40	70.2	104	
	41+	64.6	48	
	No education	63.6	118	
Education	Primary incomplete	64.0	89	0.39
	Primary complete	66.0	53	
	Secondary incomplete	65.1	43	
	Secondary complete	45.5	13	
Income per month (taka)	<8000	62.5	32	0.62
	8001-10000	60.6	170	
	10001-12000	69.0	87	
	>12001	63.0	27	
Duration of job (year)	<5	62.8	172	0.62
	6-10	63.6	99	
	11-15	56.0	25	
	16-20	75.0	20	
Working hours (hour)	6-7	62.5	8	0.99
	8-9	63.3	256	
	10+	63.5	52	
Protective equipment use	Yes	65.5	116	0.53
	No	62.0	200	
Smoking status of the tannery workers	Yes (Smoke)	70.8	171	0.003
	No (Do not smoke)	54.5	145	

The relation between health problems of the tannery workers and certain risk factors has been illustrated in Table 6. Most of the respondents (53.5%) reported that they were not satisfied with their household income. A significant relation between household economic status and suffering from diseases were found in this study. Workers whose household

status was deficient throughout the year were 1.86 time higher chance to suffer from diseases (CI: 1.15-3.00, p-value 0.01). Smokers were 0.50 time higher chance to suffer from diseases (CI: 0.31-0.78, p-value 0.003).

Table 6. Health problems of the tannery workers and certain risk factors, Hazaribagh, Bangladesh

Factor	Any one health problem frequency (n=200)		OR	95% CI	P-value
		%			
Age					
<35	139	69.5	0.86	0.52-1.44	0.58
>35	61	30.5			
Sex					
Male	181	90.5	0.61	0.24-1.50	0.28
Female	19	9.5			
Marital status					
Married	168	84	0.63	0.35-2.82	0.11
Single	32	16			
Education					
Illiterate	75	37.5	0.98	0.61-1.57	0.93
literate	125	62.5			
Household economic status (year)					
Deficient	107	53.5	1.86	1.15-3.00	0.01
Not deficient	93	46.5			
Duration of working in the tannery (year)					
<5	108	54.0	0.94	0.60-1.51	0.84
>5	92	46.0			
Daily working hour					
<8	133	66.5	0.71	0.44-1.14	0.16
>8	67	33.5			
PPE use status of the workers					
Yes	76	38.0	0.82	0.53-1.38	0.53
No	124	62.0			
Chemicals can cause health problems					
Yes	172	86.0	0.70	0.37-1.28	0.24
No	28	14.0			
Smoking status					
Yes	121	60.5	0.50	0.31-0.78	0.003
No	79	39.5			

* CI-Confidence Interval

This poor economic status affects their health seeking behaviors as well as maintaining their health; moreover, they did not get any medical support from the tannery owners. Among 200 workers with diseases 161 workers received medical treatment and they attended different health care services centers for treatment at a time. The data also showed that 23.1% respondents seek advice from self-care/family/relative/neighbor/friend, 26.9% from qualified allopathic doctors, 4.7 % from para-professional, 11.1% from

unqualified allopathic (local drug store/ pharmacy). All the respondents reported that no tannery industry provided medical treatment to the sick workers and there were no healthcare facilities or healthcare personnel of the tannery. (Table 7)

Table 7. Health seeking behavior of the tannery workers, Hazaribagh, Bangladesh

Seeking advice or treatment status of the tannery workers	Number of workers (N=316)	Percentage
Receive treatment	161	50.9
Do not receive treatment	155	49.1
Medical treatment suppliment to the sick workers by the management***		
Yes	0	0.0
No	307	97.2
Availability of health care facility of the tannery****		
Yes	0	0.0
No	307	97.2
Health care Provider for the tannery workers		
Self-care/Family/relative/Neighbor/friend	73	23.1
Para-professional	15	4.7
Qualified allopathic(MBBS),	85	26.9
Unqualified allopathic(local drug store/ pharmacy)	35	11.1
Homeopathy/ Ayurvedic / Kabiraj	5	1.6
Traditional healers (Imam/Ojhaetc	4	1.3

*** There were 9 case missing

**** There were 9 case missing

According to the findings of this study, working environment, types of work, way of work, smoking, use of PPE and lifestyle has a great impact on the health of the tannery workers. Smoking and household income of the respondents were found significantly associated with the morbidity of the tannery workers. Strict enforcements of Bangladesh's Labour Act (2006) along with more concern on OHAS issue are strongly recommended for both government and tannery employers as soon as possible. Exclusive hospital, proper training focusing on PPE use and chemicals along with safe housing for tannery workers would be beneficial to the tannery workers. For bright future of tannery industries the government of Bangladesh should take adequate preventive measures in tannery industrial activities to ensure safe, sound and healthy environment.

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