

Original Article

PERCEIVED WORKPLACE HAZARDS AND HEALTH PROBLEMS AMONG THE WORKERS OF TANNERY INDUSTRIES

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ABSTRACT

Background: Tannery is one of the key export-oriented sectors in Bangladesh and plays an important role in the country's economy. But the manufacturing process in the tannery industry is hazardous for both workers, and the environment. This study was carried out to assess the perception and understanding of the tannery workers about the hazards in their workplace and related health problems suffered by them.

Methods: It was a cross-sectional study carried out in 25 tannery industries. A total of 200 workers who had at least one-year working experience in the studied tannery industries were included as the respondent of the study. Interviewer semi-structured questionnaire and hazard assessment checklist was used for data collection,

Results: Of the total participants' majority (74%) were male and the mean age was 31.1±11.57 years. Most of the workers did not get any training related to their job and safety measures. The common hazards mentioned by the respondents were unsafe handling of chemicals (45.5%), unsafe machinery (37.0%), tanning process (24.5%), handling of machines/materials (23.5%) and poor housekeeping (25.5%). Other hazards as perceived by the participants were inadequate lighting, dust, noise, improper ventilation system, heat, slippery floor and inappropriate use of PPE. A majority (68.0%) of the respondents mentioned that they suffered from illnesses which were related to their work. The illnesses were skin problems (49.0%), respiratory problems (36.5%), musculoskeletal disorders (32.5%), eye problems (18.5%) and gastrointestinal problems (17.5%). The participant workers also mentioned the lack of first aid and treatment facilities, no canteen and child's room and limited welfare facilities in their industry.

Conclusion: The workplace hazards perceived by the tannery workers revealed the real situation of the work process and the work environment, and did not differ much with the findings of the walk-through survey. The tannery workers also reported being suffered from several general and work-related diseases.

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INTRODUCTION

The leather tanning is one of ancient human activities for using leather as clothing, or tents. The earliest use of leather as shoe had been evident 3500 years back while a shoe made by a single piece of cowhide was discovered in an Armenian cave at an archaeological digging in 2008. The tanning of leather for the use of mankind had been initiated in the Indian Sub-continent about 7000 years BC. The earliest method of tanning was done by fats and oils in combination with wood smoke. Later between 3000 BC and 400 BC in Egypt or the Greek, vegetable tanning was discovered. The modern process of leather tanning is chrome tanning invented in 1880 by Knapp and Cavalin from Germany and Sweden, respectively. Chromium tanning became popular worldwide because of the very short duration of the tanning process, and cost savings.¹⁻³ In Bangladesh, the first tannery industry was established in

Narayanganj in 1940. As the demand for tanneries was increasing the tannery industries were being shifted in Hazaribagh of Dhaka city after the British rule in 1947. In 1949, a leather college was established in Hazaribagh to cater skilled manpower for quality production by the tannery industries with an aim to meet the demand of export market. Over 30 tanneries were operating in Hazaribagh by the year 1965.^{4,5} After independence, Bangladesh government undertook several steps to increase the leather production both qualitatively and quantitatively specially to increase the acceptance in the foreign market. Hence, the demand of Bangladesh leather had been increased around the world for its high qualities of fine grain, uniform fiber structure, smooth feel and natural texture. As a result, to meet the demand of the foreign market, the tannery industries had being increased tremendously.^{3,6} In 2010 the number of tannery industries in Bangladesh were 206 and in 2017 the tannery industries were increased to 220 and most of these in Hazaribagh.^{3,6-8} To protect the inhabitants of the Hazaribagh area and the environment specifically the Buriganga river from the harmful effects of the tannery pollutants, the tannery industries had been moved at Savar Tannery industrial area Dhaka in the year 2017. So far, 155 tannery industries were moved in the Tannery Industrial Estate, Savar.^{6,9}

Leather and leather goods play a vital role in the Bangladesh economy and have been declared as a priority sector. This sector is the second-largest export earning sector in the country, in 2014-15, Bangladesh exported leather and leather goods a worth of \$1.13 billion, compared with \$1.12 billion in the previous fiscal year and was increased to \$1.23 billion in 2017, accounting for a share of 3.5 percent of Bangladesh's total merchandise exports.^{6,8} The export-oriented leather sector's contribution to GDP is estimated to be 0.35 percent. The total employment in the leather sector was 129,000 in 2016 which was increased from 91,000 in 2013, and in total employment, this was raised 0.16 percent to 0.22 percent.^{6,10} Tanneries and leather goods industries of Bangladesh produce a full range of leather, from wet blue to finished leather, and leather products. Leather goods include a large bag, shopping bags, shoulder bags, document cases, wallets, key case etc. The tannery industry is labor intensive and is based on domestic raw materials, i.e. hides and skins of cows, buffalo and goats which are sufficiently available in Bangladesh. Thus, Bangladesh is an important place for leather and leather products manufacturing at low-cost but high quality. About 10% of the world's total leather market has been met by Bangladesh product.^{6,9-11} The processes involved in the tannery

industry by nature is not a clean task. The workers in these industries have to work in hazardous conditions; in the poor work environment, poor workplace floor, chemicals; dealing with machines and equipment, and so on. Thus, the workers are at the potential risk of development of various health problems because of hazards in the tannery industry. Studies revealed that the tannery workers have a double burden of health problems; as a tannery worker they are exposed to various chemicals and suffer from toxic effects chemicals and wastes which are generated in the manufacturing process, and as an inhabitant, they are exposed to various pollutant from surrounding the environment which is released from the tannery industry and suffered from various diseases.^{3,7,12-14} However, the risk can be minimized if the workers know about the hazards; and undertake proper care and control measures by themselves and by management. So, far no such study could be located in Bangladesh which revealed the perception and understanding of the tannery workers regarding the hazards in their job, and to undertake care to protect themselves from exposure to hazards. This study was carried out among the tannery workers to explore their perceived hazards, and the measures to protect themselves.

METHODS

This cross-sectional study was conducted in 25 tannery industries situated in Savar Dhaka. The workers working in these tannery industries were the study population. Workers irrespective of age, sex and worked in the respective tannery industry at least one year, and who agreed to participate in the study were selected as the respondents. The workers who were available during

the data collection period and the met the criteria, were interviewed face to face for data collection by utilizing semi-structured questionnaire. Ultimately a total of 200 workers from 25 tannery industries were included for this study. A walk-through survey was carried out by the researchers to observe the working situation and the environment in 25 industries. The observations were noted in the hazard assessment checklist (Figure).¹⁵ The findings observed during the walk-through survey for each of the industry were regarded as the workplace, and environmental conditions of the studied industries. The observations were categorised into good, average and poor based on the scores as allocated in the checklist and the average findings were presented in the table. After face to face interview all questionnaire were reviewed and checked thoroughly for consistency and completeness of data. Statistical analysis was

performed using the computer software SPSS version 16.0. All data were expressed concerning frequency, percentage, mean \pm SD and significance test as appropriate.

RESULTS

Among the total 200 respondents, 74% were male and 26% were female. The mean age of the respondents was 31.1 ± 11.57 years and almost half of (49.5%) of them were up to 25 years of age. Majority of (71.5%) of the respondents were married. Regarding the educational level, three-fourths (74.5%) of the respondents had education up to primary level and a few of them were illiterate (6.0%). The mean income of the respondents was Taka 11067 ± 3819 and a half (50.5%) of them had a monthly income up to Taka 10,000 (Table-1). Most (73.5%) of the respondents had experience of working in the respective industry up to 10 years, and mean working years was 8.75 ± 8.30 years. The respondents worked daily on an average of 8.86 hours and maximum working hours was 13 hours. Almost 90% of the respondents had no tannery industry-related training such as proper use of PPE, proper handling of chemicals and safe operation of different types of machinery. Of the total respondent, 57.5% worked by operating different tannery

machines, almost one-third (32.0%) worked by utilizing different chemicals, remaining respondents (10.5%) used various cutting instruments, weapons glue and resins etc. (Table-2). Most (78.5%) of the tannery workers believed that they worked into hazardous conditions. The perceived workplace hazards, as mentioned by the workers, were categorized as hazards related to the manufacturing process and hazards in the working environment (table-3). Regarding the hazards related to the manufacturing process, a higher proportion (45.5%) of the respondents mentioned chemical use or handling chemicals was most hazardous followed by operating machinery (37.0%). Other hazards in the manufacturing process as mentioned by the respondents were the tanning (24.5%), handling preparatory materials and raw hides (23.5%) and handling instruments (14.5%). The hazards in the working environment mentioned by the respondents were inadequate lighting (33.5%), poor housekeeping (25.5%), noise (21.5%), dust (19/0%) wet/slippy floor (16.5%), improper ventilation/heat (15.5%); and more than one-fifth (21.5%) of the respondents mentioned that carelessness or ignorance of the workers was responsible for the occurrence of various illnesses including injuries and accidents.

Table: 1 Socio-demographic distribution of respondents (n=200)

| Sex | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Male | 148 | 74% |
| Female | 52 | 26% |
| Age group | | |
| Up to 25 | 99 | 49.5% |
| 26 to 35 | 41 | 20.5% |
| 36 to 45 | 34 | 17.0% |
| above 45 | 26 | 13.0% |
| Mean 31.1 ± 11.57 years | | |
| Marital Status | | |
| Unmarried | 57 | 28.5% |
| Married | 143 | 71.5% |

| Sex | Frequency | Percentage |
|-------------------------------|-----------|------------|
| Male | 148 | 74% |
| Female | 52 | 26% |
| Age group | | |
| Up to 25 | 99 | 49.5% |
| 26 to 35 | 41 | 20.5% |
| 36 to 45 | 34 | 17.0% |
| above 45 | 26 | 13.0% |
| Education | | |
| Illiterate | 12 | 6.0% |
| Primary | 149 | 74.5% |
| Secondary | 39 | 19.5% |
| Family income (in BDT) | | |
| Up to 10000 | 101 | 50.5% |
| 11000 to 15000 | 74 | 37.0% |
| above 15000 | 25 | 12.5% |
| Mean 11067± 3819 Taka | | |

Table-4 shows the status of PPE used by the workers, it was found that less than one-third (30.5%) of the respondents did not use PPE. Gloves and mask was commonly (62.5% and 53.3% respectively) used PPE and others were boot (33.8%) and goggles (12.3%). However, more than two-thirds (68.4%) of the respondents mentioned that PPEs were supplied by

the management. The health problems suffered by the respondents (68%) in the recent past and perceived as related to their work were skin problems (49.0%), respiratory(36.5%), musculoskeletal disorders (32.5%), eye problems (18.5%) and gastrointestinal problems (17,5%).

Table 2: Job related information of the respondents (n=200)

| Job related information | Frequency | Percentage |
|-------------------------|-----------|------------|
| Work experience | | |
| Up to 10 | 138 | 69.5 |
| 11 to 20 | 31 | 15.5 |
| 21 to 30 | 31 | 15.5 |
| Mean 8.75± 8.301 year | | |

| Work hour | | |
|------------------------|-----|---------|
| 8-10 hours | 165 | 82.5% |
| 11-13 hours | 35 | 17.5% |
| Mean 8.86±1.44 hour | | |
| Training status | | |
| Yes | 21 | 10.5% |
| No | 179 | 89.5% |
| Mode of work | | |
| Using machine | 115 | (57.5%) |
| Using Chemicals | 64 | (32.0%) |
| Others* | 21 | (10.5%) |

*cutting instrument, glue, rexins etc.

About one-fourths (24.5%) of the respondents suffered from headache and they mentioned that the headache was related to their work. Among the problems' dermatitis (59.2%), knee and back pain (63.1%) and redness/conjunctivitis of the eye (67.1%) were the common health problems (Table-5). While comparing the illnesses suffered by the participant workers with their overall perceived hazards, it was found all the illnesses were found in a higher proportion among the workers who perceived hazards. However, the skin problems and musculoskeletal problems were found

significantly high (Table -6). During the walk-through survey in 25 tanneries (Table-7), it was observed that, overall 46.2% of the industries' working condition and workplace environment was poor and 27.3% was good. Hazardous condition was found in a higher proportion (73%) of the industries with the operating machine and instruments followed by poor housekeeping (59%). Long-standing and sitting working posture (57%), humidity (52%), dust (52%), container without a proper label (52%), use of chemicals (49%), poor cleanliness (49%), noise (48%), high temperature (48%) and improper

Table 3: Perceived Hazards in Tannery Industries (n=200)

| Perceived Hazards* | Frequency | Percentage |
|--------------------------------|------------------|-------------------|
| Hazardous | | |
| Yes | 157 | 78.5 |
| No | 43 | 21.5 |
| Manufacturing process | | |
| Using chemicals | 91 | 45.5% |
| Unsafe machinery | 74 | 37.0% |
| Tanning Process (Barrel) | 49 | 24.5% |
| Handling of instruments | 29 | 14.5% |
| Handling preparatory materials | 47 | 23.5% |

| Working Environment | | |
|----------------------------|----|---------|
| Inadequate lighting | 66 | 33.5% |
| Dust | 38 | 19.0% |
| Excessive Noise | 42 | 21.0% |
| Improper ventilation /Heat | 29 | 14.5% |
| Wet/Slippery floor | 28 | 14.0% |
| Poor housekeeping | 51 | 25.5 0% |

*Multiple responses

Table 4: Types of PPE used by the respondents (n=200)

| PPE | Frequency | Percent |
|----------------------|------------------|----------------|
| Use of PPE | | |
| Yes | 143 | 71.5% |
| No | 57 | 29.5 % |
| Types of PPE | | |
| Gloves | 87 | 60.1 |
| Mask | 74 | 51.3 |
| Boot | 47 | 32.8 |
| Goggles | 17 | 11.9 |
| Source of PPE | | |
| Self arrangement | 42 | 29.4 |
| From factory | 101 | 70.6 |

Table 5: Health problems as suffered by the respondents

| Health Problems | Frequency | Percentage |
|---------------------------|------------------|-------------------|
| Suffered | 136 | 68..0 |
| Skin Problems | 98 | 49.0 |
| Skin Burning | 37 | 37.8 |
| Itiching/ ulcer | 58 | 59.2 |
| Allergy | 27 | 27.5 |
| Musculoskeletal disorders | 65 | 32.5 |

| | | |
|----------------------------|----|------|
| Pain in hand & leg | 27 | 41.5 |
| Knee & Back Pain | 41 | 63.1 |
| Respiratory problems | 73 | 36.5 |
| Chest Pain | 16 | 21.9 |
| Cough | 26 | 35.6 |
| Breathing Problem | 45 | 61.6 |
| Nasal irritation | 19 | 26.0 |
| Eye problems | 37 | 18.5 |
| Conjunctivitis | 25 | 67.5 |
| Eye Irritation | 14 | 42.9 |
| Gastro-intestinal problems | 35 | 17.5 |
| Diarrhea | 12 | 34.2 |
| Gastritis | 19 | 54.2 |
| Jaundice | 9 | 25.7 |
| Headache | 49 | 24.5 |
| Fever | 27 | 13.5 |
| Hearing Problem | 15 | 7.5 |

Table -6 Perceived hazards and illnesses of the participants

| Characteristics | Hazardous | | Total (n=200) | Test of Significance p-value |
|----------------------------|-------------|-----------|------------------|---------------------------------|
| | Yes (n=157) | No (n=43) | | |
| Suffered | 111 | 25 | 136 | |
| Skin Problems | 68 | 30 | 98 | .025 |
| Musculoskeletal disorders | 42 | 23 | 65 | .051 |
| Respiratory problems | 42 | 31 | 73 | .137 |
| Eye problems | 24 | 13 | 37 | .365 |
| Gastro-intestinal problems | 21 | 14 | 35 | .603 |
| Headache | 26 | 23 | 49 | 1.00 |

Table-7 Observations on walk-through survey

| Factors | Good (%) | Average (%) | Poor (%) |
|---------------------------|----------|-------------|----------|
| Ventilation | 32 | 35 | 33 |
| Machine/ Instrument | 10 | 17 | 73 |
| Housekeeping | 20 | 21 | 59 |
| Seating/standing posture | 20 | 23 | 57 |
| Dust | 26 | 22 | 52 |
| Humidity | 26 | 22 | 52 |
| Container with label | 32 | 16 | 52 |
| Cleanliness | 20 | 31 | 49 |
| Light | 20 | 31 | 49 |
| Noise | 26 | 26 | 48 |
| Temperature | 26 | 26 | 48 |
| Personal Clearing | 21 | 31 | 48 |
| Chemicals use | 20 | 31 | 49 |
| Tools/ Chair | 32 | 31 | 37 |
| Working Table | 32 | 31 | 37 |
| Disposal of used chemical | 26 | 37 | 37 |
| Fire extinguisher | 51 | 21 | 28 |
| Electrical wirings | 51 | 26 | 23 |
| Total = 18 | 27.3 | 26.6 | 46.2 |

people cleaning arrangement (47%) were also found high. While a higher proportion of good condition was found with only fire fighting arrangements (51%) and electrical wirings (51%). However, in 6 industries to some extent the ventilation, dust, temperature, humidity, the label of the chemical container, disposal of chemicals, personal cleaning, working tools/chair and table condition was good. It was reported that in almost all the studied tanneries the welfare facilities were limited. There was a poor facility for first aid and treatment, no canteen, dining room, restroom and child's room, and have no welfare officer, safety committee and proper washing facilities.

Table-8 shows the distribution of perceived hazards and the socio-demographic characteristics of the respondents. It was found that significantly

($\chi^2=15.411$; $p=.000$) a higher proportion of the aged respondents (>30 years) mentioned that their working condition and working environment was hazardous. Similarly, the workers who worked for long years significantly ($\chi^2= 6.411$; $p=.041$) a higher proportion of them also believed that they worked in hazardous conditions. As per the mode of work the worker who worked by operating machine (84.3%) and using chemicals (75.0%), significantly ($\chi^2=8.470$; $p=.014$) a higher proportion of them mentioned regarding hazardous conditions in the tannery industry. However, except age categories of different socio-demographic factors did not show any significant difference in the perceived hazards. Regarding preventing illnesses majority of the workers mentioned proper use of PPE (49.5%) and work attentively and carefully (51.6%). Other measures mentioned by them were to make-sure good working

environment and provision of proper treatment facilities (Table-9)

Table -8 Perceived hazards and socio demographic characteristics and experience

| Characteristics | Hazardous | | Total (n=200) | Test of Significance p-value |
|----------------------------|-------------|-----------|------------------|----------------------------------|
| | Yes (n=157) | No (n=43) | | |
| Sex | | | | |
| Male | 117 (79.1) | 31 (20.9) | 148 (74.0) | $\chi^2=.104$; p=.748 |
| Female | 40 (76.9) | 12 (23.1) | 52 (26.0) | |
| Age | | | | |
| up to 30 | 79 (68.7) | 36 (31.3) | 115 (57.5) | $\chi^2=15.411$; p=.000 |
| Above 30 | 78 (91.8) | 7 (8.2) | 85 (42.5) | |
| Education | | | | |
| Illiterate | 7 (58.3) | 5 (41.7) | 12 (6.0) | $\chi^2=4.939$; p=.085 |
| Primary | 122 (81.9) | 27 (18.1) | 149 (74.5) | |
| Secondary | 28 (71.8) | 11 (28.2) | 39 (19.5) | |
| Family income (BDT) | | | | |
| up to 10000 | 81 (80.2) | 20 (19.8) | 101 (50.5) | $\chi^2=.556$; p=.556 |
| 11000 to 15000 | 56 (75.7) | 18 (24.3) | 74 (37.0) | |
| above 15000 | 20 (80.0) | 5 (20.0) | 25 (12.5) | |
| Work experience | | | | |
| up to 10 | 102 (73.9) | 36 (26.1) | 138 (69.0) | $\chi^2=6.41$; p=.041 |
| 11 to 20 | 26 (83.9) | 5 (16.1) | 31 (15.5) | |
| 21 to 30 | 29 (93.5) | 2 (6.5) | 31 (15.5) | |
| Work hour | | | | |
| 8-10 hours | 129 (78.2) | 36 (21.8) | 165 (82.5) | $\chi^2=.057$; p=.812 |
| 11-13 hours | 28 (80.0) | 7 (20.0) | 35 (17.5) | |
| Mode of work | | | | |
| Using machine | 97 (84.3) | 18 (15.7) | 115 (57.5) | $\chi^2=8.470$; p=.014 |
| Using Chemicals | 48 (75.0) | 16 (25.0) | 64 (32.0) | |
| Others* | 12 (57.1) | 9 (42.9) | 21 (10.5) | |

Table 9: Preventive measures mentioned by the workers for their health problems

| Preventive measures | Frequency | Percentage |
|---------------------|-----------|------------|
| Use of PPE | 45 | 49.5% |

| | | |
|---------------------------|----|-------|
| Work carefully | 47 | 51.6% |
| Good working environment | 20 | 22.0% |
| Well treatment facilities | 11 | 12.1% |
| Proper ventilation system | 17 | 18.7% |
| Adequate lighting system | 9 | 9.4% |

DISCUSSION

Tannery industry involves a hazardous manufacturing process. Workers in these industries work in a poor working environment, and have exposures to various chemicals. These chemicals are irritant, corrosive, sensitive and even some chemicals are carcinogenic.^{12-14,16} The Bangladesh government has declared leather tanning as hazardous work and children are not allowed to work in the tannery.¹⁷ To protect the workers from the exposure to various hazards in the tannery industry, elimination of hazards or reduction of hazards are essential, but not workable in many steps of the tannery manufacturing process. Therefore, the last resort for protecting the workers from the hazard, the use of PPE would be one measure for the workers in the tannery industry. But PPE is not an effective protective measure if right PPE is not used properly when it is needed.¹⁷⁻¹⁹ So, for the appropriate use of PPE by the workers, the worker's perception and understanding regarding the hazards in relation to the tannery industry must be considered. Studies carried out in Bangladesh revealed that a lower proportion of the tannery workers used PPE^{12,13} while in this study over two-thirds (69.5%) of the study participants were found to use PPE. However, during the walk-through survey, it was reported that the use of PPE among most of the study participants were not appropriate in terms of shape and size and made of improper materials. The PPEs commonly used by the workers were gloves (60.1%) and mask (51.3%) and majority of the PPEs were supplied by the management (70.6%).

The current study revealed the perception and understanding of the workers working in the tannery industries and it was found that most (78.5%) of the respondents mentioned the hazards in their workplace. Respondents specifically mentioned the hazards in relation to their working section or process and the mode of work. Common hazards perceived by the participant workers were handling chemicals or utilizing chemicals (45.5%), working with machinery particularly during shaping and thinning (37.0%), and tanning process (24.5%) in which skins

are tanned in large barrels. Other hazards mentioned by the workers were handling the instrument like scissor, knife, needle etc. The participant workers also mentioned the hazards in their work environment, which was inadequate lighting (33.5%), poor housekeeping (25.5%), noise (21.0%), dust especially the skin dust during thinning of tanned skin (19.0%), poor ventilation particularly hot and humid condition (14.5%); and wet and slippery floor (14.0%). Findings, as observed during the walk-through survey had a similarity with the perceived hazards by the participant workers such as machinery use, poor housekeeping, dust, humidity, light, noise, etc. Further, in the walk-through survey, poor ergonomic factors like long-standing and sitting posture, inappropriate working table and chair, poor cleaning facilities and no Material Safety Data Sheet (MSDS) for chemicals were also noticed. Thus, the current study revealed that the awareness and understanding of the workers regarding their working section and environment were almost similar with the findings as observed in the walk-through survey. This study further revealed that the perceived hazardous conditions were mentioned in a higher proportion by the workers who are aged and had a long years of work experiences. Chemicals use in the manufacturing process is an important risk factors for the workers' health because some chemicals are known carcinogenic,^{12,14,16} and significantly a higher proportion of the workers knowingly or unknowingly perceived most of the chemicals were hazardous. Studies conducted elsewhere revealed the existence of more or less similar hazards in tannery industries as reported in the current study.^{3,13,19}

It is well reported that the tannery workers by nature of their work are exposed to various types of hazards and are at the risk of developing many illnesses attributable to the hazards.^{7,12,13,16} This study found that a majority (68.0%) of the participants' workers had a recent history of suffering from various illnesses. Most of these illnesses were attributable to various chemicals, ergonomic and physical hazards. The common illnesses as mentioned by the study participants were skin problems (49.0%), respiratory problems (36.5%), musculoskeletal disorders

(32.5%) and headache (24.5%). Other problems found in this study like eye problems, gastrointestinal problems and fever, in the studies carried out elsewhere also reported similar illnesses among the tannery workers.^{7,12,13, 16} This study further revealed that a higher proportion (68.0%) of workers were found to suffer from illnesses attributable to the hazards in the tannery industry, while almost similar (69.5%) proportion of the workers was found to use PPE. Thus, it could be said that the use of PPE could not protect the workers properly from the exposure to hazards, and which might be due to the inappropriate and improper use of PPE as reported in the walk-through survey of this study. Further, the participants perceived that the proper and appropriate use of PPE; and work attentively and carefully could prevent them from the occurrence of many illnesses and injuries. Based on existing perception and understanding of the workers, awareness and motivational; and a training program should be undertaken for the appropriate and effective use of PPE by the workers to protect them from the exposures to tannery hazards.

The study participants in the current study was mostly young adult and the average age was thirty-one years. Only a few of the participants had up to a secondary level of education and remaining had education up to primary level; and over two-thirds of them had experience of work for up to 10 years. Thus, explored that in the tannery industry, not much education was needed for employment, young people could get a job and the workers did not continue to work for long years. A study conducted among the tannery workers in Dhaka also reported similar findings.¹³ Tannery industries are mostly export-oriented and as a foreign currency earner playing an important role in the country's economy. But the benefit of the workers was rare, the salary of the workers was poor, more than half of the participants of this study had a monthly income Taka up to 10,000/-. The workers had to work in a hazardous condition for long hours, sometimes over 10 hours. Majority of the workers had no training on the proper use of PPE and proper handling of chemicals and machinery. There was no or inadequate welfare facilities such as medical care, canteen, restroom, dining room and child's room and washing facilities. There was no post for a welfare officer/safety officer in the studied industries. As reported in other studies, this study also revealed that in the tannery industries the workers' rights were not protected properly, the benefits for the workers were few, and welfare facilities of the workers were neglected.^{11,12}

CONCLUSION

The tannery workers were exposed to various hazards in the manufacturing process during performing their work. They used varieties of chemicals, most of them very toxic to human health. This study revealed that most of the tannery workers suffered from a number of general and work-related diseases. The workplace hazards perceived by the workers reflected the real situation of the work processes and environment and did not differ much with the findings of the walk-through survey. The perception and understandings of the workers of the respective industry must be considered for a participatory and effective measure for the improvement of workplace conditions and to protect the workers from exposure to hazards at least by using appropriate PPE.

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