Occupational Safety and Health Practices in Leather Industry in Punjab 2021

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List of Figures

List of Table

List of abbreviation

ACGIH	American Conference of Governmental Industrial Hygienists
ADP	Annual Development Programme
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers
BMI	Body Mass Index
BSI	British Standard Institution
COVID-19	Corona Virus Disease, 2019
ILO	International Labour Organisation
L&HR	Labour & Human Resource
NIOSH	National Institute for Occupational Safety and Health
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PEQS	Punjab Environmental Quality Standards
PPEs	Personnel ProtectiveEquipment's
REL	Recommended Exposure Limit
SAACIWCE	Saeed Ahmed Awan Centre for the Improvement of Working Conditions & Environment

1. Introduction

The leather industry, including leather products, is the second-largest export earning sector after textiles in Pakistan **[1].** In the early days of independence, some tanneries were established in Karachi, others in Lahore and 1960s in other parts of the country like Multan, Sahiwal, Kasur, Gujranwala and Sialkot. These units were well-equipped with the latest and modern facilities. More advanced units were established in the 1970s when Pakistan started the production of finished leather. The era of the 1980s saw a period of improved quality production. In 1990 the leather sector jumped to become the country's second largest foreign exchange earner by contributing 10.41 percent toward the total export revenue **[2;3].** Leather is the material made from the skin and hides of the animals by tanning or similar processing. Pakistan is fortunate that the raw material required by the leather industry is available in the country in abundance. This industry's main types of primary raw materials are cow hides, buffalo hides, goatskins, and sheepskins **[4].**

Punjab has a flourishing leather industry, which contributes significantly to the national economy. Local availability of raw material for the leather sector is having a significant effect on the job market of Punjab as leather is a labour-intensive sector, and 75% of exporters of leather are based in Punjab **[5].** The largest concentration of leather garments production in Pakistan is found in Sialkot, which has 186 units and having around 52 percent of the total number of units located in Pakistan. In contrast, Karachi is the second largest, with 130 units. Lahore and its suburbs have 21 units, nearly 6% of the total number of units. According to the Trade Development Authority of Pakistan, Pakistan stands at the 21st position in the world market of finished leather, having a percentage contribution of 0.99% **[4].** In Pakistan, there are more than 2500 tanneries (registered & unregistered) **[6].** Some of the leading importers of Pakistan's leather and its products include the USA (10.69%), Germany (9.33%), UK (7.35%), China (7.1%) and Italy (6.54%) (Industrial Information Network, 2010) **[7].** According to a study conducted by Blacksmith Institute, roughly about 75% of chromium sites are located in South Asia **[8].**

Hence, considering the leather industry's economic importance, growing concerns of eco-safety and impairment of human health, the present study was designed to investigate occupational safety and health hazards in the leather industries of Punjab, Pakistan. This study was designed "Capacity Building of Occupational Safety & Health (CBOSH) Regime to Promote Safer Working Condition at Workplaces" under the Annual Development Programme (ADP) of Government of the Punjab, Pakistan. ADP is the instrument through which the Government of the Punjab plans, executes and monitors a significant proportion of development spending in the province.

2. The Tanning Process

The tanning process consists of four steps: beam house operation, wet finishing, dry finishing, and packing**.** Tanneries in developed countries like the United States, Australia, and Europe are highly mechanized and use closed automatic systems and many chemicals **[9;10;11],** whereas in developing countries like Pakistan, Bangladesh, Afghanistan even India still uses primarily manual work and natural tanning substances with techniques remaining unchanged over a long period **[12].**

About 130 different chemicals are used in leather manufacturing, ranging from common salt (sodium chloride) to costly chrome sulphate **[13].** Leather manufacturing involves the following major steps:

1. Pre-Process
2. Pre-Tanning Process
3. Tanning Processes
4. Wet Finishing Process
5. Dry Machining
6. Finishing

In pre-processing, skins/hides are received, and salt is applied on the flesh side of the skins/hides. Then, skin trimming is done to remove unwanted parts. After pre-processing, the pre-tanning process starts with the soaking process in which skins are made flaccid by soaking them in water. Lime is used to make hair loose. Unwanted flesh is removed with the help of fleshing machines after the liming process. Subsequently, the skins are delimed using ammonium sulphate and then washed. Bating is done for further purification of the hide; after that, degreasing is done with the help of detergents. The tanning process starts with pickling, which is the treatment of skin with acids and salts to bring it to the desired pH level. This process stabilizes the collagen network of skin, and the product is called wet blue and then sorted out according to quality.

In order to give desired softness, colour, strength, and quality to the leather wet blue skins are processed further through a wet finishing process. The fatliquoring process is carried out to impart desired softness, and dyeing gives it colour. After the wet process, different drying processes are carried out to dry the processed leather. These processes include smaying/setting, vacuum drying, stacking/toggling, buffing/shaving, trimming, pressing, and segregation of the leather. Finally, finishing processes are carried out to impart durability and beauty to the leather. The chemicals used in the leather industry can be divided into three broad categories:

1. Pre-tanning Chemicals
2. Tanning Chemicals
3. Finishing Chemicals

Health problems, pollution and environmental degradation arising from tanneries originate from the nature of the process, raw materials and chemicals consumed in processing **[14]**. Around 40 heavy metals and acids are used for processing rawhides. As a result, 58% of tannery workers suffer from gastrointestinal disease, 31% from skin diseases, 12% from hypertension and 19% from jaundice. Furthermore, the toxic tanneries breach the health and safety of both employees and residents near the factory as the morbidity rate is also high for both tannery workers and the neighbourhoods **[15].**

3. The leading causes of accidents in tanneries

Health and safety are ensured only by knowing risks and hazards at the workplace and by properly guarding workers until the risks and hazards have been eliminated **[16].** The main contributing factors to accidents are

i. **Machines and Equipment**: As tannery industries are heavy industries, they use heavy machinery in almost all stages of their production. But it is a matter of great regret that many of them are not operating according to the safety manuals. For example, sensors are not useable in about 45% of cases of machinery. Lack of knowledge of proper maintenance is one of the reasons. For this reason, the highest risk of accident is conducting in the mechanical zone **[17].**

ii. **Chemicals**: As mentioned above, chemical substances applied before or during the leather production process can impact the health and safety of people exposed to these during work **[16].**

iii. **Hydrogen sulphide (H_2S)**: H_2S is a colourless flammable gas, heavier than air. A strong, pungent and unpleasant odour is generally felt in and around poorly managed/ maintained tanneries and effluent treatment plants. Exposure to H_2S can cause headaches, nausea, possible damage to the eye and even death if exposed at higher levels. **[18].**

iv. **Electrical setup:** Unplanned wiring, overusing load, open phase electrical installation etc., are the leading cause of the accident events. It was assessed that about 10% to 15% of injuries happened due to the industry's poor electrical condition **[17].**

v. **Physical hazards**: Following working environmental factors can cause accidents or health risks at the workplace **[16].**
    - Disorder at the workplace;
    - Noise
    - Temperature and humidity;
    - Ventilation;
    - Lighting

vi. **People**: Managers' and supervisors' performance and behaviour influence those of the workers concerning following good work practices and responding correctly in case of an emergency. Essential factors to be taken into account are **[16].**

- job experience and training;
- information and instructions on working practices. and hazards involved;
- supervision by managers and skilled workers

4. Objectives of the Study

The main objectives of this literature review are to explore specific workplace hazards in leather and tanneries processing units to investigate the safety and health risks associated with the workers.

i. To conduct occupational safety and health risk assessment of leather and tanneries in the Punjab
ii. To formulate an analysis report on occupational diseases to suggest control measures.

5. Legal Obligation

According to common-law jurisdiction, neglecting occupational health and safety regulations may lead to prosecution. The OSH legislation worldwide requires an employer to ensure their employees' safety, welfare, and health. It is an employer's reasonability to ensure all work activities are conducted safely and controlled, according to the required OSH standards **[19].** A prime mover in international standards in Health and Safety is the International Labour Organisation (ILO). Most countries are members of the ILO. The two primary outputs of the ILO are "Conventions" and "Recommendations". These set international standards. In 1981, the ILO adopted the Occupational Health and Safety Convention (C155). These legal standards also place a duty on workers to look after their own and other people's Health and Safety **(20).** Other ILO Conventions and Recommendations related to Health and Safety include Labour Inspection Convention (C081) - 1947 (No. 81) and its Recommendations (R081) - 1947 (No. 81), Working Environment (Air Pollution, Noise and Vibration) Convention (C148) - 1977 (No. 148) and its Recommendations **(**R156) - 1977 (No. 156) **(21).**

As a member country of ILO, Pakistan has ratified ILO Recommendations & Conventions and has legislated to put their requirements into national and provincial Occupational Health and Safety laws. In Pakistan, Punjab occupational health and safety regulations include Punjab Factories Act 1934 (Chapter-III, Health and Safety) **[20],** Punjab Factories Rules, 1978 **[21]** and recently promulgated The Punjab Occupational Safety and Health act, 2019 **[22].** These acts require an employer to ensure the safety and health of the employees at the workplace, identify existing and new hazards at the workplace regularly; and make arrangements to control and prevent physical, chemical, biological,

radiological, ergonomics and psychosocial or any other hazards to the employees and other persons at the workplace. Finally, OSH is about protecting every company's most valuable asset – its workforce.

6. Study area and constraints in the field

A total of six potential tanneries were selected from Kasur, Sheikhupura and Multan districts of Punjab for the risk assessment, testing and analysis. Three tanneries were selected from Kasur district, a hub of leather processing industries in the province. Two tanneries were selected from Sheikhupura and one from Multan, one of Punjab's essential industrial districts. During this study, the team of experts from the SAACIWCE and L&HR Department also faced some constraints. As the activity started, the global COVID-19 pandemic appeared in 2020, with non-technical field staff of the department and non-cooperative behaviour of the employers of the industries. Despite all the constraints, the main objectives of this study were achieved.

7. Materials and Methods

Data was collected by visiting the sites, and risk assessment activity was done using checklists based on the International 5x5 Risk Matrix. In the risk assessment process, all the significant hazards associated with the work had been identified and their target workforce. Then risks were evaluated and calculated by looking at the likelihood of the harm and severity of the consequences.

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$

The risks were categorized as low, medium or high, as shown in **Table-I**. The risk classification baseline for safety action implementation as proposed by the BSI in **Table-II** was applied**.** Questionnaires regarding workers' health were also individually filled in to assess the effects of pollutants and other industrial hazards on their health. After implementing new control measures, the risks should be re-assessed to verify if it has been lowered. For some risks, particular control measures are required by law.

Table I: Simple Risk Estimator proposed by British Standards 8800 (BSI, 2008) **[23]**

Likelihood of harm	**Severity of Harm**		
	Slight of Harm	**Moderate Harm**	**Extreme Harm**
Very unlikely	Very Low Risk	Very Low Risk	High Risk
Unlikely	Very Low Risk	Medium Risk	Very High Risk
Likely	Low Risk	High Risk	Very High Risk
Very Likely	Low Risk	Very High Risk	Very High Risk

Table II: Risk Categorization (BSI, 2004) **[23]**		
Category of risk	**Evaluation of tolerability**	**Guidance on necessary action and timescale**
Very low	Acceptable	These risks are considered acceptable. Therefore, no further action is necessary other than to ensure that the controls are maintained.
Low	Risks that should be reduced so that they are tolerable or acceptable.	No additional controls are required unless they can be implemented at a low cost (in terms of time, money and effort). Actions to further reduce these risks are assigned a low priority. Arrangements should be made to ensure that the controls are maintained.
Medium		Consideration should be given as to whether the risks can be lowered, where applicable, to an acceptable level. Still, the costs of additional risk reduction measures should be taken into account. The risk reduction measures should be implemented within a defined time period. Arrangements should be made to ensure that the controls are maintained, particularly if the risk levels are associated with harmful consequences.
High		Substantial efforts should be made to reduce the risk. Risk reduction measures should be implemented urgently within a defined time period and it might be necessary to consider suspending or restricting the activity, or to apply interim risk control measures, until this has been completed. Considerable resources might have to be allocated to additional control measures. Arrangements should be made to ensure that the controls are maintained, particularly if the risk levels are associated with extremely harmful consequences and very harmful consequences.
Very High	Unacceptable	These risks are unacceptable. Substantial improvements in risks controls are necessary, so that the risk is reduced to a tolerable or acceptable level. The work activity should be halted until risk controls are implemented that reduces the risk so that it is no longer very high. If it is not possible to reduce risk the work should remain prohibited.

7.1. Testing and analysis

The noise level monitoring was carried out to measure noise levels at the workplace and noise exposure to employees using a **Casella Precision Sound Level Meter Type 2100**. The light intensity monitoring was carried out to find out illumination levels in different sections/areas and the impacts of light intensity on the performance of employees. The measurement was carried out by Lux Meter **(EXTECH, Color LED Light Meter LT-45)**. General and localized lighting were measured at the site. The section-wise light intensity was calculated as the average of values taken at the workplace.

Exposure monitoring of total dust (personnel exposure) was carried out in different industries sections by using a dust sampler. The workers in the industry at their workplaces are exposed to dust and fumes during their routine activities. **Testo 350 emissions analyzer** was used for analysing the selected pollutant exhaust gases, i.e. Carbon monoxide (CO), Sulphur dioxide (SO_2), Oxides of nitrogen (NO & NO_2). Heat stress monitoring and airflow measurement had been carried out using **QUESTemp-36 Thermal Environment monitor** and **Digi-sense anemometer.** The stain tube detection method was used to detect H_2S and CO_2 gases in tanneries using **Gastec detector tubes**. To check the occupational health of workers, audiometry and spirometry tests were conducted. Audiometry testing of randomly selected industries' workers was carried out using Sibelmed audiometer while spirometry testing was performed using **MIR Spirodoc Spirometer** to diagnose respiratory problems.

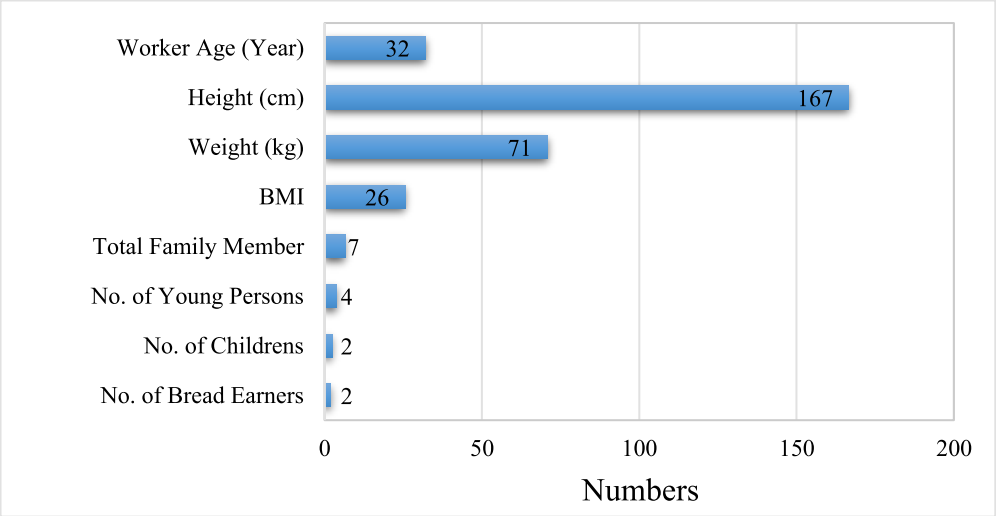
8. Results and discussion

8.1 Sociodemographic status of workers

A modified National Institute of Occupational Safety and Health (NIOSH) questionnaire regarding the sociodemographic and health of workers was administered during the data collection activity.

8.1.1 Worker's Personnel Information

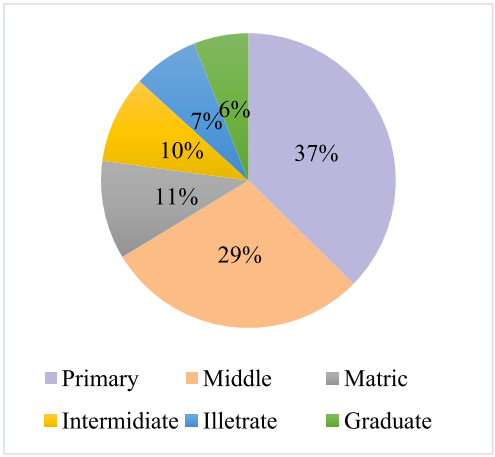
Workers' personnel information showed that the average weight and height of workers ranged to 71 kg and 167 cm, respectively. The average age of workers was 32 years with a body mass index (BMI) of 25.5 kg/m^2 (Overweight). Being overweight or underweight can have significant health effects. The average number of family members obtained was 7 persons per worker, with 4 young persons. Each worker, on average, had two children, and the average number of bread earners were two persons per family, as shown in **Graph-I**.



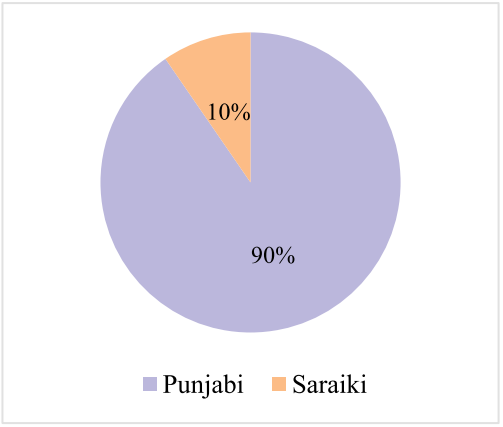
Graph-I: Worker's Personnel Information

8.1.2 Educational & social status of workers

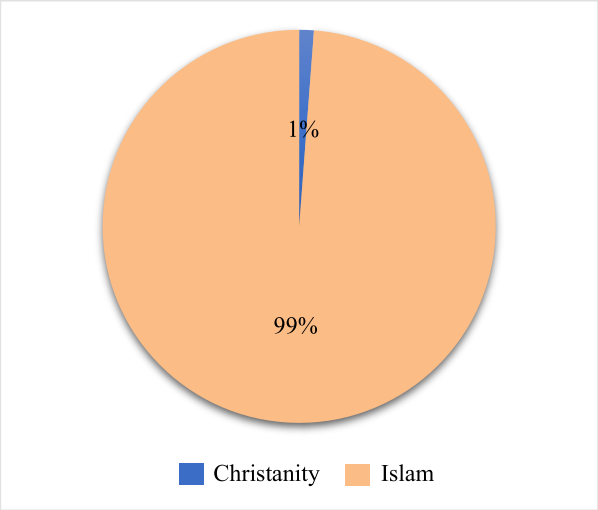
The educational status of workers shows that 37% of workers had primary education, 29% middle, 11% matric, 10% intermediate, 7% illiterate and only 6% were graduate. Among them, 90% were from Southern parts of the province, around 99% Muslim and 69% were married.



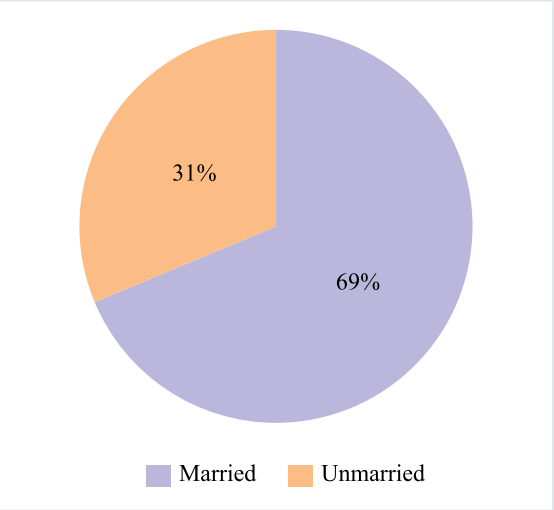
Graph II: Education Level of workers



Graph III: Social status of workers



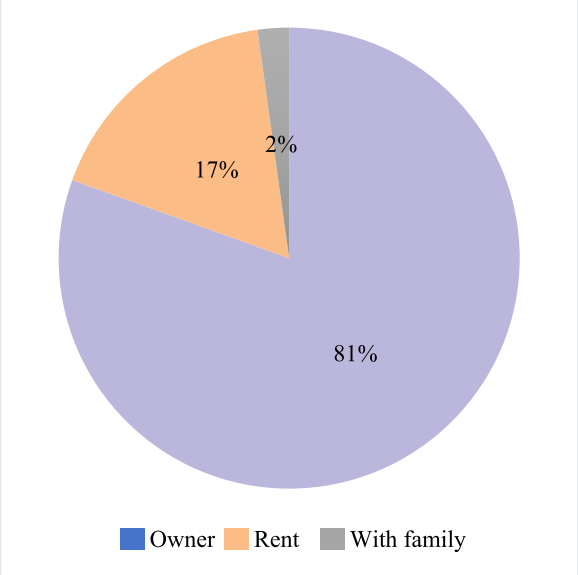
Graph IV: Religion of workers



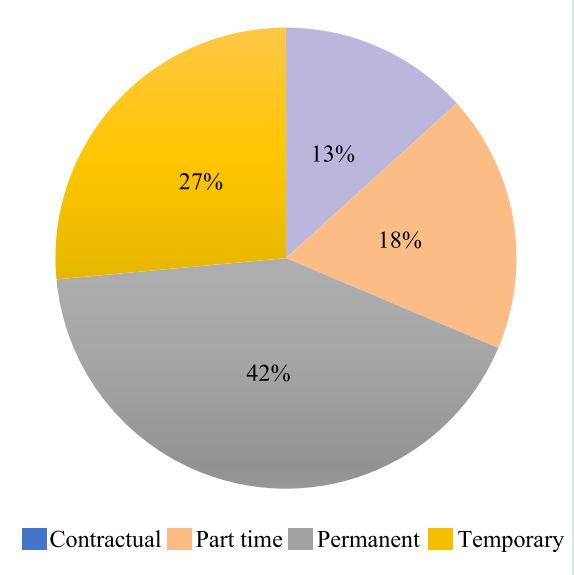
Graph V: Marital status of workers

8.1.3 Job-status and Housing details

Most of the workers were permanent, 42%, 27% workers on a temporary basis, 18% part-time, and 13% contractual. In addition, 81% of the target population enjoyed their residential facility while 17% were living in a rented house, and 2% had a joint family.



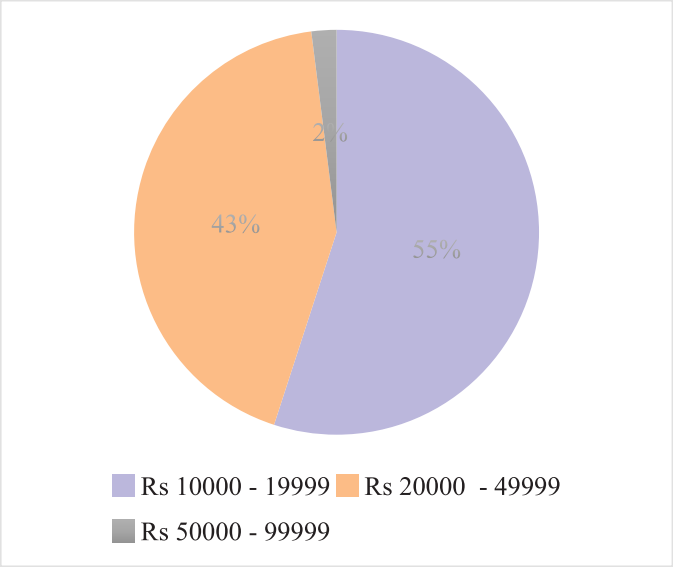
Graph VI: Housing details of workers



Graph VII: Job status of workers

8.1.4 Wage status

Fifty five percent of workers had salaries (Rs. 10,000 to Rs. 19,999), 43% (Rs. 20,000 to Rs. 49,999) while 2% (Rs. 50,000 to Rs. 99,999).



Graph VIII: Wages of workers

8.2 Risk Classification

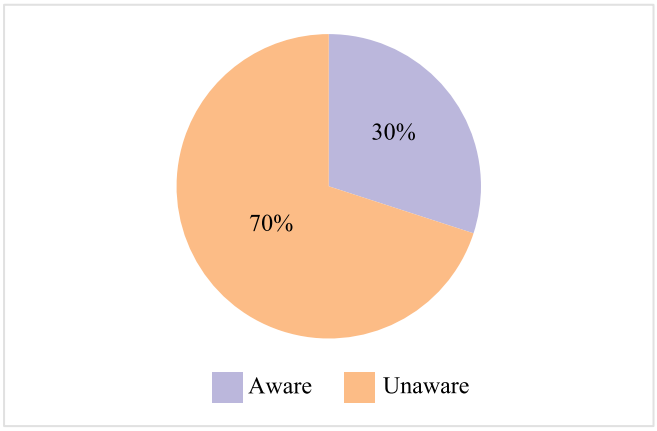
After a detailed risk assessment of selected six tanneries of Kasur, Sheikhupura and Multan, main hazards were identified, and risks were categorized as given in **Table III.**

Table III: Risk Categorization

Sr.#	Hazards	Category of Risks
1.	Chemical	Very High
2.	Dust	High
3.	Fire	
4.	Mechanical	
5.	Electrical	
6.	Ergonomics	
7.	Biological	
8.	Noise	Medium
9.	Illumination	
10.	Workers not wearing PPEs	
11.	Poor Housekeeping	
12.	Temperature/Humidity/Ventilation	
13.	No safety signs	
14.	Stack emission	Low

8.3 Chemical Hazards

According to Punjab Factories Act 1934 (Chapter III-Health and Safety), Section 16 "Dust and fumes", and Punjab Factories Rules 1978, Section 23 ensures that if dust, fumes or any other impurities that are injurious to the health of the workers are being produced from any manufacturing process of a factory, effective measures shall be taken to control them **[22;23].**



Graph IX: Chemical exposure to workers

- The main chemical hazards observed in tanneries were Hydrogen Sulfide, Toxic chemicals handling and Welding Fumes. Control measures suggested includes; Respirators must be provided to workers involved in processing animal skins, and hydrogen sulfide monitoring must be carried out regularly. PPEs, especially nylon gloves, must be provided to workers engaged in handling dyeing chemicals. Personal Protective Equipment must be provided to welders. In addition, fume hoods must be installed in the welding section.

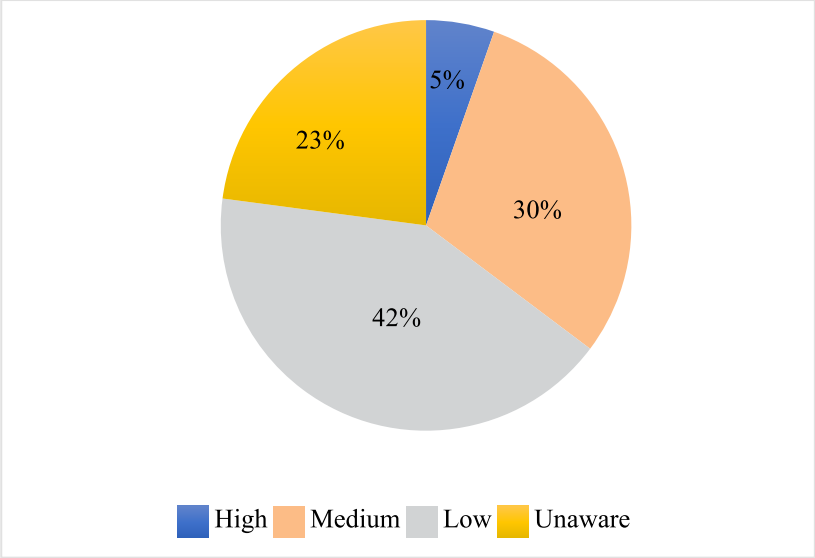
  Graph IX shows that 30% of workers were aware they had exposure to chemicals during work, while 70% had no awareness of them during work.

Figure 1: Improperly placed chemical drums without any labelling

8.4 Dust

- The maximum concentration value of total dust was observed in the vacuum & electrical workshop with avg of 1.96 mg/m^{3,} which is less than the threshold limit of 10mg/m^3 as per ACGIH & NIOSH standards. **Table IV** shows personnel dust exposure levels in tanneries**.**

- **Graph X** shows that 5% of workers were aware of high dust exposure, 30% medium dust exposure, 42% low dust exposure, and 23% of workers were unaware of dust exposure.

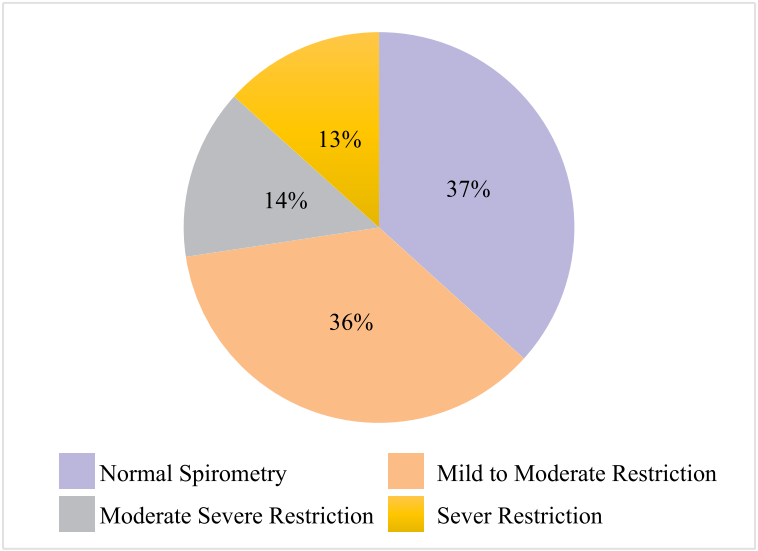


Graph X: Dust exposure awareness among workers

Table IV: Personnel Dust exposure levels in tanneries		
Sr. No.	**Location / Machine**	**Total dust Conc (mg/m^3)**
1.	Mechanical workshop	0.43
2.	Mixing Machine	0.45
3.	Mini chemical store	0.64
4.	Stack Machine	0.86
5.	Canteen	0.87
6.	Blue Section	0.91
7.	Carpenter	1.11
8.	Crust	1.20
9.	Raw material trimming	1.28
10.	Main chemical store	1.47
11.	Finishing	1.55
12.	Stock	1.62
13.	Drumming	1.64
14.	Buffing Section	1.85
15.	Vacuum	1.96
16.	Electrical workshop	1.96

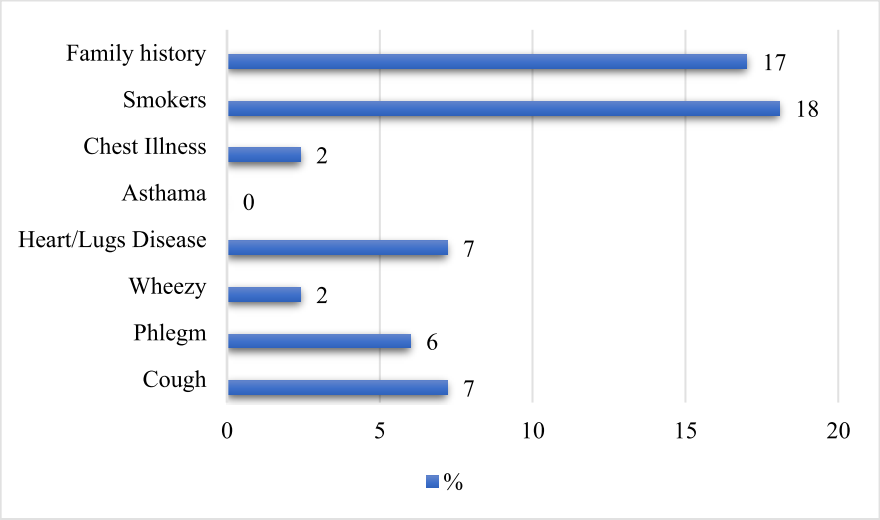
- **Spirometry** tests of a total of 128 workers had been performed. **Graph XI** shows that 47 (37 %) of workers had normal spirometry. However, 46 (36%) workers had mild to moderate-severe respiratory problems, 18 (14%) workers had moderate to severe respiratory problems, and 17 (13%) workers had severe respiratory issues that may be attributed to workplace chemical agents or smoking. A pulmonologist should properly check such workers.

Figure 2: Spirometry test of workers



Graph XI: Spirometry results of workers

Graph XII shows that 7% of workers had coughing problems, 6% phlegm, 2% wheezy, 7% heart/lungs disease, 0% asthma problems, 2% chest illness, 18% smokers, and 17% of workers had a family history having a respiratory problem.



Graph XII: Respiratory problem awareness among workers in tanneries

8.5 Fire Hazards

According to Punjab Factories Act 1934 (Chapter-III Health & Safety) Section 25, Precautions in case of fire, recommends that in every factory effective measure shall be taken to control fire at a workplace and proper means of escape, including exit doors, shall be provided and they will not be blocked or locked. A free passageway giving access to each means of escape in case of fire shall be maintained for the use of all workers in every room of the factory. Punjab Factories Rules, 1978, Section 49 explains fire extinguishers, hydrants, buckets filled with sand or water, and fire alarm shall be provided at every workplace, and all apparatus for extinguishing fires shall be kept in good order and shall be examined and tested once in 14 months **[22;23].**

- Fire hazards were observed in chemical storage areas, welding, mechanical & electrical workshops. Fire extinguishers were found expired. Control measures suggested were to provide sufficient fire extinguishers. When working with flammable and combustible liquids, eliminate ignition sources (sparks, smoking, flames, hot surfaces). Use the required amount of flammable liquid in the work area. Keep storage areas cool and dry and store flammable and combustible liquids away from incompatible materials.

Figure 3: Expired fire extinguishers

- Emergency exits were found locked near the forklift workshop. Control measures were suggested to regularly check fire doors, escape routes, associated lighting and safety signboards. The first aid box was found absent during the risk assessment of the enterprises.

Figure 4: Damaged fire hose and blocked emergency exit

- In one of the tanneries, welding activity was ongoing without barricading the vicinity (outside of workshop premises) that can cause a fire hazard**.** Control measures suggested include appropriate PPEs, ensuring fire extinguisher presence and barricading the area before starting the welding activity.

Figure 5: Chemical containers placed at an improper place and empty sand buckets

8.6 Mechanical Hazards

According to Punjab Factories Act 1934, Chapter-III, Section 31 Casing of new machinery and Punjab Factories Rules, 1978, Fencing, Section 59 to 61 ensures that all machine parts shall be effectively guarded in every factory or fenced as to prevent danger **[22;23].**

The Punjab Occupational Safety and Health Act 2019, Section 4. Duties of employees, (a) (c) states that it is the duty of employees to take care of their safety and that of other person's safety. He will not interference or misuse appliances & equipment. Section 8. Safety and Health, (C) (f) (g) ensures the design, construction, use, maintenance, testing and inspection of machinery, guarding and fencing of the machinery and instructions, training and supervision in relation to employment on a dangerous machine and fencing or casing of machinery **[24].**

- Presence sensing devices of tanning mixing drum were found partially operational. Some of the devices were not working. Controls suggested include carrying out proper maintenance of presence sensing devices. The tanning mixing drum must be guarded appropriately. Safety signboards must be displayed on safeguards
- There was an improper stacking of material, tools, machinery in the Electrical / Mechanical store. Controls suggested include material/tools/machinery must be properly stacked. Additionally, scrap/damaged material must be separated.
- Lathe machine, bench cutting machine, buff machine belts were found unguarded. Controls suggested include all components of mechanical systems that transmit energy must be guarded, machines must be appropriately safeguarded to avoid entanglement /draw in / cut/ crushing hazard. It was suggested that maintenance of forklift was required. In addition, it was recommended that damaged seats be repaired/ replaced.


Figure 6: Unguarded machines

8.7 Electrical Hazards

Punjab Factories Rules, 1978, Fencing, Section 61 recommends that in every factory, all electrical circuits or part of such circuits or any objects electrically connected with them, whether commonly or occasionally in an electrified condition, which by reason of their position could cause injury to any person, shall be protected adequately, either by non-metallic fencing or insulation or by both in such manner as to remove the danger of injury **[23].**

The Punjab Occupational Safety and Health Act 2019, Section 8 Safety and Health (g) ensures instructions, training, and supervision concerning employment on open wiring, safe electric wiring and fitting, etc. **[24].**

- Switch sockets and electrical motors were dirty and full of mud. Controls suggested include switch sockets must be clean and dry. As wet and muddy switch sockets increase the chance of electrical shock, electrical motors must be covered and shielded from mud and kept in dry condition.



Figure 7: Improper and live wiring in tanneries

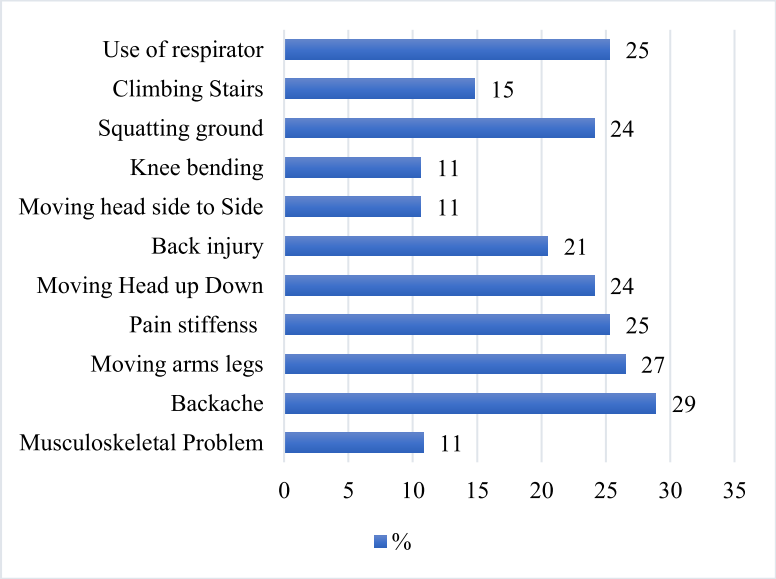
8.8 Ergonomics Hazards

The Punjab Occupational Safety and Health Act 2019, Section 8 Safety and Health (d) (e) (n) (o) (p) ensures prevention of harmful physical or mental stress due to conditions of work and use, handling and storage of excessive weights **[24].**

- Awkward postures were observed in wet blue, crust, setting and finishing sections while performing tasks (forcing, kneeling, overreaching, bending, repetition of work & twisting during task completion). To control awkward postures, employees must be educated through training about ergonomics hazards. In addition, safety signs representing ergonomic hazards must be displayed at different locations.
- It was also observed that there were outdated stools in different locations, so control measures suggested were to provide the stools with back and footrest. Similarly, ergonomics chairs must be provided for the areas highlighted earlier to prevent musculoskeletal disorders.

Figure 8: Improper posture of workers during transportation

- **Graph XIII** shows that 11% of workers were aware that they had an ergonomic problem, 29 % had backache, 27% had difficulty in moving arms and legs, 25% had pain stiffness, 24% had difficulty in moving the head up and down, 21% were suffering from back injuries, 10.6% had difficulty in moving head side to side and problem in knee bending, 24% had difficulty in squatting, 15% had difficulty in climbing stairs while carrying a load of more than 12kg, while 25% were having muscle-skeletal problem by a respirator.



Graph XIII: Awareness among workers about Musculoskeletal disorders in tanneries

8.9 Biological Hazards

According to the "Punjab Factories Act 1934", Chapter-III, Section 23 & 23-A, Precautions against contagious or infectious disease, i.e. each worker in a factory shall be provided with a "Hygiene Card" in January and July every year after examination by appointed factory doctor to check if the worker is not suffering from any contagious or infectious disease **[22].** Furthermore**,** Punjab Factories Rules, 1978, Hygiene card, Section 47 recommends that each worker in a factory be vaccinated and inoculated for cholera, smallpox, and typhoid every year **[23].**

If the employee is found suffering from any contagious, occupational or infectious disease, on an examination, he shall not be permitted to work till declared fit by the medical practitioner **[24].**

- Leptospirosis & Cryptosporidium while handling animal skin was observed. It was recommended that PPEs be used by workers involved in handling, segregating, processing, and storing animal skin.

Figure 10: **Noise monitoring**

Figure 9: **Worker in contaminated clothes**

8.10 Physical Hazards

8.10.1 Noise

Noise, or unwanted sound, is one of the most common health problems in Pakistani workplaces. A high noise level was observed in many areas of surgical industries **≥ 85 dB(A),** as shown in **Table V**. As local legislations do not cover indoor workplace noise limits in Pakistan, we must look for international standards such as OSHA **[26].** OSHA suggests controls, i.e., if the noise level is above 85 dB(A), a noise assessment be carried out, and noise exposure be reduced by engineering means. If noise is still above 85dB(A), then:

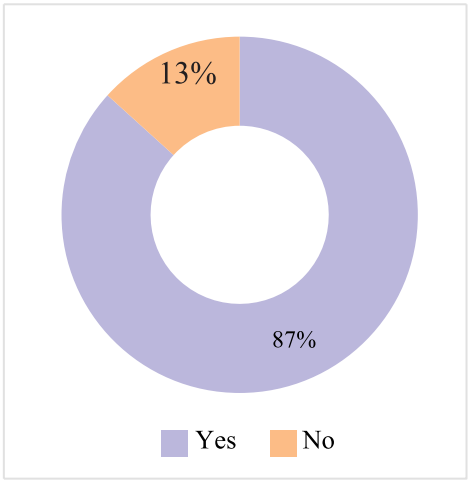
- A mandatory hearing-protection zone must be provided
- Information, instruction, and training of workers must be conducted
- Hearing protection must be provided and its usage enforced
- Health surveillance of workers must be done.

Table V: Noise monitoring areas of tanneries

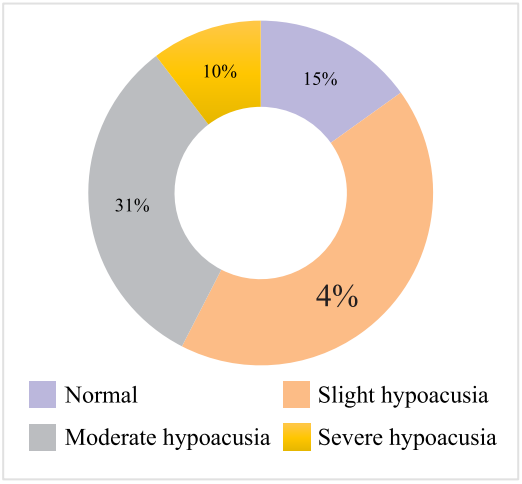
Sr. No.	Departments/ Sections	Noise Level dB (A)
1.	Near main gate	60.1
2.	Packing section	67.1
3.	Electrical work shop	77.9
4.	Packing section near measuring machine	79.8
5.	Waste water treatment plant	82.2
6.	Toggle section Hang and dry area	82.4
7.	Research & Development Lab	83.2
8.	Finishing area near Barnini machine	86.0
9.	Research & Development Lab near hood	87.1
10.	Spray plant	87.1
11.	Split section	88.2
12.	Finishing area	88.9
13.	Boiler house	89.6
14.	Fork lifter workshop	90.1
15.	Vacuum setting area	90.5
16.	Beam house near flesh machine	90.9
17.	Crust area	93.9
18.	Dye drum area	94.3
19.	Buffing section	94.8
20.	Wet/Mechanical/Operational area near setting machine	94.6
21.	Crust area near TG-01 towel machine	96.9
22.	Crust area (trimming)	97.9
23.	Crust area near Stacking machine (Cartigliano)	101.2

- **Audiometry** tests of workers indicated that some workers had slight to severe hypoacusia during their ear testing. The total no. of tested workers was **109. Graph XIV** shows that 9 (15%) workers of overall tested workers had normal audiometry, 45 (41%) slight hypoacusia, 34 (31%) moderate hypoacusia and 11 (10%) severe hypoacusia. Therefore, those workers must be properly checked by a medical doctor for further medical treatment. However, the employer must provide hearing protection to workers.

Figure 11: **Audiometry testing of workers**



Graph XV: **Details of PPE's provided by employers**



Graph XIV: **Audiometry results of tanneries**

8.10.2 Illumination

According to Punjab Factories Act 1934, Chapter-III, Section 19 Lighting, in every part of a factory where workers are working or passing, there shall be provided and maintained sufficient and suitable natural or artificial lighting **[22].** Punjab Factories Rules, 1978, Section 39 Lighting (2) (a) ensures 8 feet candles (86.15 lux) illumination level at the workplace where work is actually being done that is insufficient for the workplace, so we have to follow international standards **[23].**

- The reference standard DIN was used to compare illumination levels **[27].** The permissible limit for rough and bookkeeping /office work is 250 (lux) & 500 (lux), respectively and Precise assembly work/ Precise work on tool making machine if 1000 (lux) for eight hours work shift.

Table VI: Different Illumination levels in tanneries

Sr. No.	Departments/Sections	Illumination Level (lux)
1	Crust area near TG-01 towel machine	041.5
2	Packing section	068.3
3	Finishing area	077.4
4	Dye lab	155.2
5	Wet/Mechanical/Operational area near setting machine	167.9
6	Finishing area near Barnini machine	202.5
7	Split section	211.3
8	Spray plant	271.0
9	Buffing section	290.1
10	Near stake machine	300.4
11	Crust area (trimming)	385.6
12	Vacuum setting area	400.2
13	Toggle section Hang and dry area	400.3
14	Research & Development Lab	523.0
15	Crust area	541.0
16	Electrical work shop	530.0
17	Beam house near flesh machine	530.0
18	Dye drum area	567.0

8.10.3 Workers not wearing PPEs

The Punjab Occupational Safety and Health Act, 2019, Section 3. Duties of the employer, (k) state that it is the employer's responsibility to provide adequate protective clothing and protective equipment where required. Section 4, Duties of employees (b) states that it is duty of employer to properly use protective clothing and protective equipment provided to them. Section 8. Safety and Health (l). ensures design, manufacture, supply, use, maintenance and testing of personal protective equipment and protective clothing **[24].**

Figure 12: Illumination level monitoring

- Machine operators were operating machines without PPEs and were wearing loose clothing and slippers**.** Control measures suggested were to provide workers with suitable uniforms and PPEs.
- Workers must not be allowed to work without proper PPEs, and proper usage of PPEs should be made mandatory for every worker.
    - **Graph XV** shows that PPE'S had been provided to 87% by employers to workers, but they are not using them, and 13% of workers had not been provided with PPE'S.

Figure 13: **Workers in loose dress and clothes hanging at workplace**

Figure 14: **Empty PPE'S Box**

8.10.4 Poor Housekeeping

The Punjab Occupational Safety and Health Act 2019, Section 3. Duties of employer, (i) describes employer must keep the workplace in safe, clean orderly and harm-free condition. Section 8 Safety and Health (b) ensures the cleanliness of workplaces **[24].**

- Poor housekeeping was observed due to spillage of hazardous chemicals in Soaking & Liming Processing Areas. In addition, broken floors were also observed. Controls suggested were that all workplaces, including passageways, storerooms and service areas, must be kept clean, orderly, dry and in good hygienic condition. Furthermore, walkways and floors must be kept free from oil, chemicals and water solution. Decontamination of floors in working areas must be carried out weekly.

Figure 15: Poorhouse keeping and broken floors in tanneries

- Stagnant water was found in some areas of tanneries which may cause slip & fall, broken bones, head injury, material and property damage. Control measures suggested were to remove all waste material. In addition, a separate waste collection area must be made and marked, and daily inspection, maintenance, cleaning, and housekeeping must be ensured.

8.10.5

Temperature/Humidity/Ventilation

According to Punjab Factories Act 1934, Chapter III-Health and Safety, Section 15 Ventilation and temperature, i.e., proper temperature and ventilation shall be maintained at every workplace for comfort and prevent injury to workers' health **[22].** Punjab Factories Rules, 1978, Section 22 states that ventilating openings shall be provided in the proportion of five square feet for each person at every workplace for a continuous supply of fresh air **[23].**

Figure 16: Stagnant water in tanneries

The "Punjab Occupational Safety and Health Act 2019", Section 3. Duties of employer (g) describe that it is the duty of employer to make arrangements to control and prevent physical hazards at the workplace. Section 8 Safety and Health 2 (b) (i) (j) ensures maintenance of temperature, artificial humidification at the workplace, control of the atmosphere and other ambient factors of workplaces and prevention and control of hazards due to high and low barometric pressures at the workplace **[24].**

Figure 17: Heat Stress monitoring

8.10.6 No Safety signs

No safety signs were observed in industries, and it was recommended to post the safety signboards

8.10.7 Stack Emission monitoring

During stack emission testing of boilers, the measured values of CO (Carbon monoxide) & NO_x (Oxides of nitrogen) were less than the permissible limit of PEQS **(28).** The results are summarized in **Table VII**.

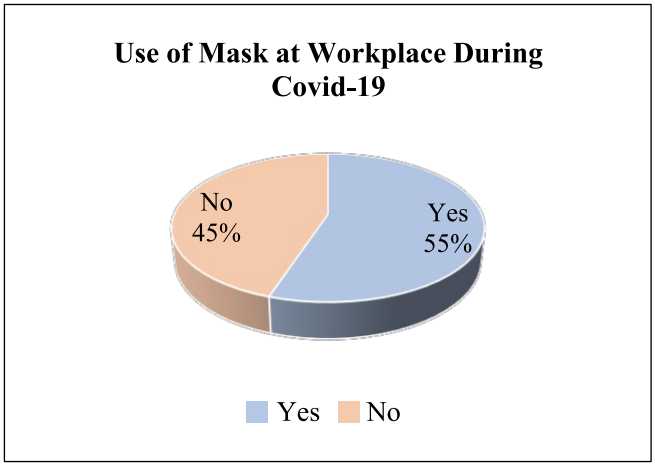
Figure 18: Stack emission monitoring

Table VII - Stack Emission testing				
Parameters	Unit	PEQS	Boiler - I	Boiler - II
Capacity	Ton	--	3	150
Load	kVA	--	60	110
Fuel	--	--	Wood + Natural Gas	HFO
O_2	%	NGVS	16.63	3.87
CO	mg/Nm^3	800	912	80
NO_x	mg/Nm^3	600	29.73	155.2
NO	mg/Nm^3	NGVS	28.09	155.2
NO_2	mg/Nm^3	NGVS	1.64	0.0
CO_2	%	NGVS	4.25	12.88
SO_2	mg/Nm^3	1700	0	3457.05
H_2S	mg/Nm^3	10	8.5	0.0
Eff. N	%	NGVS	77.4	92.9
Eff. G	%	NGVS	71.3	82.8
Final Temp	°C	NGVS	155.7	177.7
Smoke	% or Ringlemann Scale	40 % or 2	20 % or 1	20 % or 1

*The sum of NO and NO_2 values used for the calculation of NOx value.
**The mixed fuel is used for boiler
***NGVS: No guideline value set
****PEQS: Punjab Environmental Quality Standard

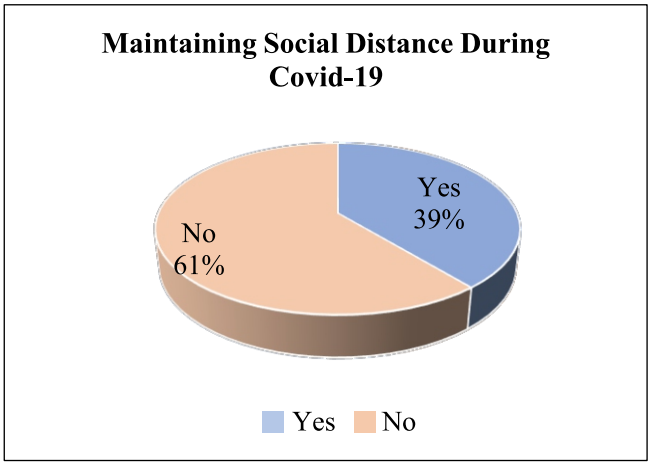
It is the obligation of the employers, workers, and their organizations to collaborate with health authorities to prevent and control COVID-19. Cooperation between management and workers and their representatives is essential for workplace-related prevention measures. Workers are responsible for following measures for occupational safety and health, infection prevention and control established for their workplace, and participating in training provided by the employer. Workers should immediately report to their supervisor any situation which may present an imminent and severe danger to their life or health. Even workers have the right to remove themselves from any workplace that they reasonably believe presents an imminent and serious threat to their life or health and should be protected from any undue consequences as a result of exercising this right (POSH Act 2019).

The pandemic has severely hampered the risk assessment activities on OSH during the field visits while maintaining the day-to-day guidelines issued by the Primary and Secondary Health Care Department, Government of the Punjab in accordance with the National Command Operation Centre (NCOC). During the OSH risk assessment activity, some questions related to the COVID-19 were also incorporated into the questionnaire. Analysis of the data showed that in the Leather & Tanneries sector, as handwashing facilities were provided to the workers, on the average, every worker washed their hands nine times daily. In these times of the pandemic, wearing a mask at the workplace is mandatory.



Around 55% of workers responded they were using a mask at the workplace. An average of Rs.293/- per month was being spent on purchasing them by the employer.

The data showed that around 39% of the workers and their co-workers maintained social distancing while at work. By applying statistical tools on the data, it was evident that the respiratory problems among the workers were more who were repeatedly using the mask due to non-availability of sufficient financial resources or carelessness in using them. These results are in agreement with the research studies conducted by the University of Health Sciences Lahore.



Workers were asked about the psychological behaviour during the covid-19 times. 47% of the workers responded to the behaviour as good, 25% normal, while 28% bad.

11. Conclusion and Recommendations

Considering growing demand, the tannery industry in Punjab, Pakistan, is a potential sector. But unfortunately, this sector is not well promoted and managed. In the light of hazards and risk assessment and review of data obtained from tanneries, it can be concluded that

- Compliance is a continuous improvement process, and every time there would be new findings for continual improvement. Therefore, it is recommended to perform risk assessments regularly to keep them relevant and updated, as some new findings regarding a control measure or risk or hazard can emerge.
- Chemical hazards were identified as very high in tanneries. Therefore, PPE's must be provided to the workers.
- Periodic training and supervision must be provided to workers for awareness about occupational health, safety and work environment issues
- Risk reduction measures must be implemented urgently to reduce the risk of dust, fire, mechanical, electrical and ergonomics hazards identified as high risk.
- Physical hazards identified as medium risk must be controlled per control measures given in this report.
- Local standards of indoor noise, illumination, H_2S and personal dust exposure limits must be designed and implemented.
- Arrangements should be made to ensure that all controls that have been identified in this report must be implemented and maintained.
- Capacity building of field staff of Labour & HR department to identify hazards at workplaces and promote safety culture in industries must be repeated carried out.

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ATS-DLD-78-A

ADULT QUESTIONNAIRE - SELF COMPLETION

(for those 13 years of age and older)

Thank you for your willingness to participate. You were selected by a scientific sampling procedure, and your cooperation is very important to the success of this study.

This is a questionnaire you are asked to fill out. Please answer the questions as frankly and accurately as possible. ALL INFORMATION OBTAINED IN THE STUDY WILL BE KEPT CONFIDENTIAL AND USED FOR MEDICAL RESEARCH ONLY. Your personal physician will be informed about the test results if you desire.

IDENTIFICATION

IDENTIFICATION NUMBER: #####

NAME:_____ _____ ___
(Last) (First) (MI)

STREET _____

CITY _____ STATE ____ ZIP _____

PHONE NUMBER: ( ) _____-_____

INTERVIEWER: ###

DATE: _____
MO DAY YR

1. BIRTHDATE: _____ ____ _____
Month Day Year

2. Place of Birth: _____

3. Sex:
1. Male ____
2. Female ____

4. What is your marital status?
1. Single ____
2. Married ____
3. Widowed ____
4. Separated/Divorced ____

5. Race:
1. White ____
2. Black ____
3. Oriental ____
4. Other ____

6. What is the highest grade completed in school? _____
(For example: 12 years is completion of high school)

SYMPTOMS

These questions pertain mainly to your chest. Please answer yes or no if possible. If a question does not appear to be applicable to you, check the does not apply space. If you are in doubt about whether your answer is yes or no, record no.

COUGH

7A. Do you usually have a cough? 1. Yes ___ 2. No ___
(Count a cough with first smoke or on first going out-of-doors. Exclude clearing of throat.)[If no, skip to question 7C.]

B. Do you usually cough as much as 4 to 6 times a 1. Yes ___ 2. No ___

day, 4 or more days out of the week?

C. Do you usually cough at all on getting up, or first thing in the morning? — 1. Yes ___ 2. No ___

D. Do you usually cough at all during the rest of the day or at night? — 1. Yes ___ 2. No ___

IF YES TO ANY OF THE ABOVE(7A,7B,7C, OR 7D), ANSWER THE FOLLOWING:
IF NO TO ALL, CHECK DOES NOT APPLY AND SKIP TO 8A.

E. Do you usually cough like this on most days for 5 consecutive months or more during the year? — 1. Yes ___ 2. No ___
8. Does not apply __

F. For how many years have you had this cough? — _____ Number of years
88. Does not apply __

==========

PHLEGM

8A. Do you usually bring up phlegm from your chest? (Count phlegm with the first smoke or on first going out-of-doors. Exclude phlegm from the nose. Count swallowed phlegm) [If no, skip to 8C.] — 1. Yes ___ 2. No ___

B. Do you usually bring up phlegm like this as much as twice a day, 4 or more days out of the week? — 1. Yes ___ 2. No ___

C. Do you usually bring up phlegm at all on getting up or first thing in the morning? — 1. Yes ___ 2. No ___

D. Do you usually bring up phlegm at all during the rest of the day or at night? — 1. Yes ___ 2. No ___

IF YES TO ANY OF THE ABOVE (8A, B, C, OR D), ANSWER THE FOLLOWING:
IF NO TO ALL, CHECK DOES NOT APPLY AND SKIP TO 9A.

E. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year? — 1. Yes ___ 2. No ___
8. Does not apply __

F. For how many years have you had trouble with phlegm? — _____ Number of years
88. Does not apply __

==========

EPISODES OF COUGH AND PHLEGM

9A. Have you had periods or episodes of (increased*) cough and phelgm lasting for 3 weeks or more each year? *(For individuals who usually have cough and/or phlegm) — 1. Yes ___ 2. No ___

IF YES TO 9A:

B. For how long have you had at least 1 such episode per year? — _____ Number of years
88. Does not apply __

==========

WHEEZING

10A. Does your chest ever sound wheezy or whistling:

1. When you have a cold?	1. Yes ___ 2. No ___
2. Occaisonally apart from colds?	1. Yes ___ 2. No ___
3. Most days or nights?	1. Yes ___ 2. No ___

IF YES TO 1, 2, OR 3 IN 10A:

B. For how many years has this been present? _____ Number of years
88. Does not apply __

11A. Have you ever had an ATTACK of wheezing that has made you feel short of breath? 1. Yes ___ 2. No ___

IF YES TO 11A:

B. How old were you when you had your first such attack? _____ Age in years
88. Does not apply __

C. Have you had 2 or more such episodes? 1. Yes ___ 2. No ___
8. Does not apply __

D. Have you ever required medicine or treatment for the(se) attack(s)? 1. Yes ___ 2. No ___
8. Does not apply __

==========

BREATHLESSNESS

12. If disabled from walking by any condition other than heart or lung disease, please describe and proceed to Question 14A.

Nature of condition(s):_____

13A. Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill? 1. Yes ___ 2. No ___

IF YES TO 13A:

B. Do you have to walk slower than people of your age on level because of breathlessness? 1. Yes ___ 2. No ___
8. Does not apply __

C. Do you ever have to stop for breath when walking at your own pace on the level? 1. Yes ___ 2. No ___
8. Does not apply __

D. Do you ever have to stop for breath after walking about 100 yards(or after a few minutes) on the level? 1. Yes ___ 2. No ___
8. Does not apply __

E. Are you too breathless to leave the house or breathless on dressing or undressing? 1. Yes ___ 2. No ___
8. Does not apply __

==========

CHEST COLDS AND CHEST ILLNESSES

14A. If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time) 1. Yes ___ 2. No ___
8. Don't get colds__

15A. During the past 3 years, have you had any chest illnesses that have kept you off work, indoors at home, or in bed? 1. Yes ___ 2. No ___

IF YES TO 15A:

B. Did you produce phlegm with any of these chest illnesses? 1. Yes ___ 2. No ___ 8. Does not apply __

C. In the last 3 years, how many such illnesses, with (increased) phlegm, did you have which lasted a week or more? _____Number of illnesses _____No such illnesses _____Does not apply

==========

PAST ILLNESSES

16. Did you have any lung trouble before the age of 16? 1. Yes ___ 2. No ___

17. Have you ever had any of the following:
1A. Attacks of Bronchitis? 1. Yes ___ 2. No ___

IF YES TO 1A:
B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 8. Does not apply __

C. At what age was your first attack? _____ Age in years 88. Does not apply __

2A. Pneumonia (include bronchopneumonia)? 1. Yes ___ 2. No ___

IF YES TO 2A:
B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 8. Does not apply __

C. At what age did you first have it? _____ Age in years 88. Does not apply __

3A. Hayfever? 1. Yes ___ 2. No ___

IF YES TO 3A:
B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 8. Does not apply __

C. At what age did it start? _____ Age in years 88. Does not apply __

18A. Have you ever had chronic bronchitis? 1. Yes ___ 2. No ___

IF YES TO 18A:
B. Do you still have it? 1. Yes ___ 2. No ___ 8. Does not apply __

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 8. Does not apply __

D. At what age did it start? _____ Age in years 88. Does not apply __

19A. Have you ever had emphysema? 1. Yes ___ 2. No ___

IF YES TO 19A:
B. Do you still have it? 1. Yes ___ 2. No ___ 8. Does not apply __

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 8. Does not apply __

D. At what age did it start? _____ Age in years 88. Does not apply __

20A. Have you ever had asthma? 1. Yes ___ 2. No ___

IF YES TO 20A:

B. Do you still have it? 1. Yes ___ 2. No ___
8. Does not apply __

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___
8. Does not apply __

D. At what age did it start? _____ Age in years
88. Does not apply __

E. If you no longer have it, at what age did it stop? _____ Age stopped
88. Does not apply __

21. Have you ever had:

A. Any other chest illnesses? 1. Yes ___ 2. No ___
If yes, please specify _____

B. Any chest operations? 1. Yes ___ 2. No ___
If yes, please specify _____

C. Any chest injuries? 1. Yes ___ 2. No ___
If yes, please specify _____

22A. Has doctor ever told you that you had heart trouble? 1. Yes ___ 2. No ___

IF YES to 22A:

B. Have you ever had treatment for heart trouble in the past 10 years? 1. Yes ___ 2. No ___
8. Does not apply __

23A. Has a doctor ever told you that you have high blood pressure? 1. Yes ___ 2. No ___

IF YES to 23A:

B. Have you had any treatment for high blood pressure (hypertension) in the past 10 years? 1. Yes ___ 2. No ___
8. Does not apply __

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OCCUPATIONAL HISTORY

24A. Have you ever worked full time (30 hours per week or more) for 6 months or more? 1. Yes ___ 2. No ___

IF YES to 24A:

B. Have you ever worked for a year or more in any dusty job? 1. Yes ___ 2. No ___
8. Does not apply __

Specify job/industry: _____ Total years worked __
Was dust exposure 1. Mild ___ 2. Moderate ___ 3. Severe ___ ?

C. Have you ever been exposed to gas or chemical fumes in your work? 1. Yes ___ 2. No ___
8. Does not apply __

Specify job/industry: _____ Total years worked __
Was dust exposure 1. Mild ___ 2. Moderate ___ 3. Severe ___ ?

D. What has been your usual occupation or job -- the one you have worked at the longest?

1. Job-occupation: _____
2. Number of years employed in this occupation:_____
3. Position-job title: _____
4. Business, field, or industry: _____

TOBACCO SMOKING

25A. Have you ever smoked cigarettes? (NO means less than 20 packs of cigarettes or 12 oz. of tobacco in a lifetime or less than 1 cigarette a day for 1 year. — 1. Yes ___ 2. No ___

IF YES to 25A:

B. Do you now smoke cigarettes (as of 1 month ago)? — 1. Yes ___ 2. No ___ 8. Does not apply __

C. How old were you when you first started reg-cigarette smoking? — ____ Age in Years 88. Does not apply __

D. If you have stopped smoking cigarettes completely, how old were you when you stopped? — ____ Age stopped Check if still smoking ___ 88. Does not apply __

E. How many cigarettes do you smoke per day now? — ___ Cigarettes/day 88. Does not apply __

F. On the average of the entire time you smoked, how many cigarettes did you smoke per day? — ___ Cigarettes/day 88. Does not apply __

G. Do or did you inhale the cigarette smoke? — 1. Does not apply __ 2. Not at all _____ 3. Slightly _____ 4. Moderately _____ 5. Deeply _____

26A. Have you ever smoked a pipe regularly? (YES means more than 12 oz tobacco in a lifetime.) — 1. Yes ___ 2. No ___

IF YES to 26A:

B1. How old were you when you started to smoke a pipe regularly? — ____ Age

2. If you have stopped smoking a pipe completely, how old were you when you stopped? — ____ Age stopped Check if still smoking pipe ____ 88. Does not apply __

C. On the average over the entire time you smoked a pipe, how much pipe tobacco did you smoke per week ? — ____ oz per week (a standard pouch of tobacco contains 1 1/2 oz) 88. Does not apply __

D. How much pipe tobacco are you smoking now? — ___ oz per week 88. Not currently smoking a pipe ___

E. Do or did you inhale the pipe smoke? — 1. Never smoked ____ 2. Not at all _____ 3. Slightly _____ 4. Moderately _____ 5. Deeply _____

27A. Have you ever smoked cigars regularly? (Yes means more than 1 cigar a week for a year). — 1. Yes ___ 2. No ___

IF YES to 27A:

B1. How old were you when you started smoking cigars regularly? ____ Age

2. If you have stopped smoking cigars completely, how old were you when you stopped? ____ Age stopped
Check if still smoking cigars___
88.Does not apply __

C. On the average over the entire time you smoked cigars, how many cigars did you smoke per week ? ___ Cigars per week
88.Does not apply __

D. How many cigars are you smoking per week now? ___ Cigars per week
88. Check if not smoking cigars currently __

E. Do or did you inhale the cigar smoke?
1. Never smoked ____
2. Not at all _____
3. Slightly _____
4. Moderately _____
5. Deeply _____

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FAMILY HISTORY

28. Were either of your natural parents ever told by a doctor that they had a chronic lung condition such as:

	FATHER			MOTHER		
	1. YES	2. NO	3. DON'T KNOW	1. YES	2. NO	3. DON'T KNOW
A. Chronic brochitis?	_____	_____	_____	_____	_____	_____
B. Emphysema?	_____	_____	_____	_____	_____	_____
C. Asthma?	_____	_____	_____	_____	_____	_____
D. Lung cancer?	_____	_____	_____	_____	_____	_____
E. Other chest conditions?	_____	_____	_____	_____	_____	_____

29A. Is parent currently alive?

	_____	_____	_____	_____	_____	_____

B. Please Specify:

_____ Age if living	_____ Age if living
_____ Age at death	_____ Age at death
8. Don't know _____	8. Don't know _____

C. Please specify cause of death.

_____ _____

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Under ADP Scheme "Capacity Building of Occupational Safety and Health (OSH) Regime to Promote Safer Working Conditions at Workplaces"

Centre for the Improvement of Working Conditions & Environment

Directorate General Labour Welfare Punjab

Labour & Human Resource Department Government of the Punjab

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