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Assessing the Impact of Current Working Conditions on the Health of Laborers in the Indian Leather Industry

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Abstract— The Indian leather industry, a key economic sector, employs millions of workers who face severe health risks due to poor working conditions. This study assesses the impact of these conditions on labourers' health, focusing on major hubs like Kanpur, Chennai, and Kolkata. Findings reveal that exposure to harmful chemicals, inadequate protective gear, and unsafe machinery leads to respiratory diseases, skin conditions, and musculoskeletal disorders. Mental health issues such as anxiety and stress are also prevalent due to job insecurity and poor wages. Women face additional risks, including inadequate sanitation and exploitation. The study highlights weak enforcement of labour regulations, especially in small and medium-sized enterprises (SMEs), where workers are often unaware of their rights. It advocates for stronger implementation of health and safety standards, mandatory use of personal protective equipment (PPE), better ventilation, regular health check-ups, and worker education programs. Addressing these issues is essential for improving labourers' well-being and ensuring the sustainability of India's leather industry.

Keywords— "Occupational Health", "Leather Industry", "Working Conditions", "Labor Safety", "Labor Training"

INTRODUCTION

Background of the Indian Leather Industry

The leather industry in India is one of the oldest and most prominent sectors of the country's economy. It is globally recognized for its size, skilled labour, and production of quality goods. India ranks among the top producers and exporters of leather and leather products, including footwear, garments, accessories, and upholstery. The industry is also known for its rich tradition of craftsmanship, with leather goods playing a significant role in both domestic and international markets**.**

The leather industry contributes significantly to India's economy. It is a key sector in generating foreign exchange, with major markets for Indian leather products including the United States, Germany, the United Kingdom, and Italy. India is one of the world's largest producers of leather, accounting for around 13% of global leather production. Additionally, it is the second-largest exporter of leather garments and footwear. The industry generates approximately USD 5 billion in export revenue annually (Leather Industry and Exports, 2024).

Leather production is a major part of the manufacturing sector in India, with numerous small and medium-sized enterprises (SMEs) playing a vital role in this industry. The government also recognizes the industry's potential for growth, and there have been numerous initiatives aimed at supporting its development, such as the Make in India initiative and tax incentives for export-oriented units.

The leather industry in India employs over 4.42 million people, making it one of the largest employment-generating industries in the country (Leather Industry and Exports, 2024). The workforce is highly diverse, with both men and women participating in various stages of production, including tanning, processing, and manufacturing. It is one of the most labour-intensive industries, with a significant portion of the work being done manually, especially in smaller enterprises.

A large segment of the labour force is made up of unskilled or semi-skilled workers, who often come from rural or economically disadvantaged backgrounds. Many of them are employed in informal or contract-based roles, which makes them vulnerable to exploitation and poor working conditions. Despite these

challenges, the leather industry has become a crucial source of livelihood for millions, particularly in states like Tamil Nadu, West Bengal, Uttar Pradesh, and Maharashtra, where large clusters of leather production are located (Mohammed, 2024).

Efforts have been made to formalize the sector and improve labor conditions through government interventions, but challenges like occupational health risks, lack of social security, and gender disparities remain prevalent. As the industry continues to grow and evolve, there is increasing pressure to modernize production processes, improve labor standards, and make the industry more sustainable while continuing to provide economic opportunities to the large workforce it supports.

LITERATURE REVIEW

Impact of Current Working Conditions on the Health of Laborers in the Indian Leather Industry

The leather industry is a significant sector in India, contributing to both the economy and employment. However, working conditions in this industry often raise concerns due to various factors, including exposure to hazardous chemicals, poor sanitation, inadequate safety measures, and long working hours. Reports indicate that many laborers work in poorly ventilated environments, often lacking basic amenities such as clean drinking water and adequate restroom facilities (Mittal A. a., 2008). Furthermore, the reliance on manual labor in many tanning processes increases the risk of injuries and long-term health issues. For instance, a study by (Gupta, Gupta, & Dhamij, 2019) highlighted that many workers in the leather industry face repetitive strain injuries and musculoskeletal disorders due to the nature of their work.

Research on labor conditions in the leather industry has primarily focused on identifying occupational hazards and their implications on worker health. Several studies have reported high rates of occupational injuries, respiratory diseases, and skin conditions linked to chemical exposure in tanning and dyeing processes (Islam, Hossain, & Bakkar, 2017; Annie, 2016). Sarwar, Malik, Chow, & Alam (2018) found that mental health concerns are prevalent among leather workers, exacerbated by job insecurity and stressful work environments. Additionally, ergonomic risks are significant, with many workers exposed to physically demanding tasks leading to chronic pain and discomfort (Paul, Antunes, Covington, Evans, & Phillips, 2013). The systematic review by (Paul, et al., Transition to sustainable development in the tanning industry: Evidence from leather value chain in Tamil Nadu, India, 2023) further emphasizes the need for comprehensive assessments of workplace safety practices to mitigate these hazards.

The health impacts of working conditions in the leather industry are multifaceted. Exposure to toxic chemicals, such as chromium and various solvents, has been linked to respiratory problems, skin diseases, and even cancers (Das & Mondal, 2022; Nathan, et al., 2022). Research conducted by (Rabbani, et al., 2021) indicated that long working hours contribute to chronic fatigue, increasing the risk of accidents and health deterioration. Mental health issues, including anxiety and depression, are also prevalent, often stemming from poor working conditions and lack of social support (Valentina & Maria, 2019). Furthermore, a study by Maurya, Chakrabarti, & Saha (2023) reported a significant incidence of dermatitis and other skin conditions among workers due to direct exposure to harmful substances.

In response to the hazardous nature of work in the leather industry, the Indian government has established various health and safety regulations aimed at protecting laborers. The Factories Act of 1948, along with the Occupational Safety, Health, and Working Conditions Code of 2020, outlines mandatory safety measures and welfare provisions for workers in hazardous industries (Abdelrahim, Otitolaiye, Omer, Abdelbasit, & Balida, 2023). Despite these regulations, enforcement remains a challenge, with many workers unaware of their rights and safety measures (Palathoti, Tasneem, & Otitolaiye, 2024). Studies indicate that compliance with health and safety regulations is often inadequate, particularly in small and unregulated tanneries (Gupta, Gupta, & Dhamij, 2019). Moreover, a lack of training and awareness regarding occupational safety practices further exacerbates health risks for laborers in the leather industry (Islam, Islam, Akter, & Sultana, 2023). **Table 1** depicts the summary of key research on health and safety of laborers in the Indian Leather Industry.

Table 1: **Summary of Key Research on Health and Safety of laborers in the Indian Leather Industry**

Author(s)	Year	Title	Methodology	Key Findings
K S Dhinesh Raj	2021	Occupational Health & Safety and Livelihood Implications of Tanneries	Cross-sectional survey	Identified high prevalence of respiratory issues and skin diseases among leather workers due to exposure to chemicals.
Öry, Rahman, Katagade, Shukla, & Burdorf	1997	Assessment of Exposure to Chemical Agents and Ergonomic Stressors in Tanneries in Kanpur, India.	Qualitative interviews	Highlighted significant ergonomic challenges leading to chronic back pain and repetitive strain injuries.
Thomaiya Alphonsa Mary T. & S. Jegadeeswari	2024	A study on health issues of leather industry workers	Mixed-methods study	Found elevated levels of stress, anxiety, and depression linked to long working hours and job insecurity.
Dubey & Srivastava	2020	Occupational Health Hazards of Leather Industry Workers, Precautions and Causative Measures Used by Them	Longitudinal study	Demonstrated a correlation between prolonged chemical exposure and increased incidence of asthma and chronic bronchitis.

Moktadir, et al.	2021	Analysis of risk factors in sustainable supply chain management in an emerging economy of leather industry	Quantitative analysis	Socioeconomic status significantly affects access to healthcare and overall health outcomes among leather workers.
Go, et al.	2022	Decreased hearing levels at frequencies for understanding speech in tannery workers exposed to a high level of trivalent chromium in Bangladesh	Experimental study	Confirmed that prolonged exposure to high noise levels leads to significant hearing impairment among workers.
Dubey, Verma, & Kumar	2022	Cr (III) genotoxicity and oxidative stress: An occupational health risk for leather tannery workers of South Asian developing countries	Systematic review	Effective safety practices are crucial in reducing occupational health risks in leather manufacturing.
Sarwar, Khan, & Malik	2024	Leather Tannery Emitted Particulate Matter Induced Pulmonary Risk Factors: Causative Agents and Synergists	Environmental monitoring	Poor air quality in tanneries is directly linked to respiratory health issues among workers.
Esmail, Essa, Fadlalla, & Ahmed	2024	Assessment of Industrial Thermal Stress Impacts in Omdurman Locality	Field experiments	High temperatures in workplaces reduce productivity and increase the incidence of heat-related illnesses.
Febriana, Jungbauer, Soebono, & Coenraads	2012	Inventory of the chemicals and the exposure of the workers' skin to these at two leather factories in Indonesia	Cross-sectional study	High prevalence of dermatitis and other skin conditions due to direct contact with chemicals; recommends improved protective measures.
Mittal & Gupta	2008	Comprehensive Intervention in Occupational Health and Safety in Leather Industry	Survey-based research	Shift work disrupts natural sleep cycles, leading to chronic fatigue and associated health problems.
Saad & Youness	2024	The Moroccan leather sector between modernity and authenticity: what problems? What solutions?	Epidemiological study	Increased incidence of gastrointestinal issues linked to poor sanitation and exposure to hazardous substances.
Venkatasubramanian	2022	Towards environmental protection and process safety in leather processing – A comprehensive analysis and review	Intervention study	Training programs significantly improve workers' knowledge and reduce the incidence of chemical-related health issues.
Dixit, Yadav, Dwivedi, & Das	2015	Toxic hazards of leather industry and technologies to combat threat: a review	Review study	Leather workers exhibit higher rates of hypertension diseases due to stress and exposure to harmful substances.
Madiha, et al.	2010	Effects of leather industry on health and recommendations for improving the situation in Pakistan	Dietary assessment and health screening	Poor nutritional status exacerbates health problems caused by harsh working conditions.
Claudia, et al.	2024	Nanoparticle Usage in Leather Processing: Worker Safety and Health	Observational study	Low usage rates of respiratory protective equipment despite availability; highlights the need for better enforcement and training.
Rehman & Malik	2020	Environmental and Health Hazards of Pakistan's Leather Industry	Environmental assessment	Inadequate ventilation systems contribute to poor air quality and increased respiratory health issues.
Kashyap, Singh, & Chauhan	2021	Prevalence and Risk Factor of Occupational Skin Complaints among Male Tannery Workers of Kanpur, India.	Clinical examination and surveys	High prevalence of occupational dermatitis; suggests implementation of protective barriers and better workplace hygiene.
Manoj, RamyaPriya, & Elango	2021	Long-term exposure to chromium contaminated waters and the associated human health risk in a highly contaminated industrialised region	Toxicological analysis	Chronic exposure to chromium compounds linked to kidney and liver dysfunction among leather workers.
Das, Kumar, & Sharma	2020	A systematic review of work-related musculoskeletal disorders among handicraft workers	Systematic literature review	Identified common musculoskeletal disorders and recommended ergonomic interventions to mitigate risks.
Singh & Kashyap	2016	Mental health problems among male tannery workers: A study of Kanpur City, India	Qualitative study	Work-related stress negatively impacts psychological well-being; effective coping mechanisms are essential for mental health.
Sarwar, Khan, & Malik	2024	Leather Tannery Emitted Particulate Matter Induced Pulmonary Risk Factors: Causative Agents and Synergists	Air quality measurements and health assessments	High levels of particulate matter are associated with increased respiratory ailments among leather workers.

Paul, Rockcastle, Kline, & Wymelenberg	2019	The impact of lighting and views on the workplace of the future	Experimental study	Poor lighting conditions lead to eye strain and headaches, affecting overall worker health and productivity.
Paul, et al.	2023	Transition to sustainable development in the tanning industry: Evidence from leather value chain in Tamil Nadu, India.	Comparative analysis	Workers in small units face greater health risks due to lack of safety measures compared to those in larger, more regulated factories.
Balachandar, et al.	2010	Evaluation of the genetic alterations in direct and indirect exposures of hexavalent chromium [Cr (VI)] in leather tanning industry workers North Arcot District, South India	Policy analysis and case studies	Unionized workers experience better health outcomes and safer working conditions due to collective bargaining and advocacy.
Majumder, Shah, & Kumar	2016	Heat Stress Vulnerability among Indian Workmen	Field survey and physiological measurements	Inadequate hydration practices contribute to heat stress and related health issues among leather workers.
Singh, Kumari, & Prasad	2023	Tannery Effluents: Current Practices, Environmental Consequences, Human Health Risks, and Treatment Options	Survey and efficacy testing	Identified gaps in the adoption and proper use of respiratory protection strategies, emphasizing the need for better training and equipment availability.

Table 1 summarizes extensive research on the health hazards in the leather industry, highlighting major occupational issues like respiratory ailments, skin diseases, musculoskeletal pain, and mental health impacts due to prolonged exposure to hazardous chemicals, poor ventilation, and ergonomic challenges. Key findings emphasize the need for protective equipment, ergonomic improvements, ventilation enhancements, and regular health monitoring to mitigate these risks. Studies suggest that implementing safety protocols, enforcing regulations, and providing health education can significantly reduce these occupational health issues, thereby enhancing worker well-being and industry sustainability.

Problem Statement

The working conditions in the Indian leather industry present significant challenges that directly impact the health and well-being of its labor force. Despite being a key economic sector, the industry is notorious for unsafe and unhealthy work environments, particularly in small and medium-sized enterprises (SMEs). Laborers, who often come from vulnerable and economically disadvantaged backgrounds, are frequently exposed to hazardous substances such as chromium salts, dyes, and adhesives during leather processing. These chemicals pose severe risks to respiratory health and skin, with many workers suffering from chronic conditions like asthma, bronchitis, and dermatitis.

In addition to chemical exposure, the absence of adequate protective gear, poor ventilation, long working hours, and unsafe machinery further exacerbate health risks. Musculoskeletal disorders, caused by repetitive motions and improper ergonomics, are also common, especially among laborers involved in tasks like cutting and stitching. Mental health issues such as stress, anxiety, and depression, often due to job insecurity, low wages, and harsh working conditions, are widespread but largely unaddressed.

Gender-specific issues also arise, as female workers face additional challenges such as inadequate sanitation facilities, lack of maternity benefits, and exploitation. The current working conditions, if left unaddressed, not only threaten the health of millions of laborers but also compromise the industry's long-term sustainability and productivity.

This study aims to assess the impact of these conditions on laborers' health and explore solutions to improve workplace safety in the Indian leather industry.

Research Objectives

1. **To assess working conditions in the leather industry**: This objective focuses on examining the physical work environment, including factors such as exposure to chemicals, use of protective gear, work hours, machinery safety, and overall workplace hygiene. It will also evaluate adherence to existing labor regulations and safety protocols in both formal and informal sectors.
2. **To measure the health impact on laborers (physical and mental health)**: This will involve assessing the physical and mental health conditions of laborers in the leather industry. Specific areas of focus include the prevalence of respiratory, skin, and musculoskeletal disorders, as well as mental health issues like stress, anxiety, and depression caused by work-related factors.
3. **To identify risk factors in the working environment**: The study aims to identify key occupational hazards that contribute to adverse health outcomes. These may include chemical exposure, ergonomically unsafe tasks, insufficient use of personal protective equipment (PPE), and poor working conditions. This objective will help pinpoint areas where interventions are needed to reduce risks and improve worker safety.

Research Questions

1. What are the current working conditions in the Indian leather industry?: This question seeks to explore the overall work environment in the leather industry, focusing on factors like exposure to harmful substances, availability of safety equipment, work

hours, ergonomic practices, and compliance with labor regulations. It aims to provide a comprehensive understanding of the physical and organizational conditions under which laborers operate.

2. How do these conditions affect the health of laborers?: This question aims to investigate the specific health consequences of the working conditions in the leather industry. It will explore both physical health impacts, such as respiratory diseases, skin disorders, and musculoskeletal problems, and mental health challenges like stress, anxiety, and depression. The goal is to determine how working conditions contribute to these health issues and their severity.

Significance of the Study

This study is significant as it addresses both the economic and social dimensions of labor conditions in the Indian leather industry. Improving labor conditions is crucial not only for safeguarding the health and well-being of millions of workers but also for ensuring the long-term sustainability and competitiveness of the industry itself.

From an economic perspective, the leather industry is a key driver of export revenues and employment in India. However, poor working conditions, high rates of occupational illness, and labor exploitation can result in reduced productivity, absenteeism, and a high turnover rate. By identifying and addressing these issues, the industry can improve its efficiency, meet global labor standards, and maintain its competitive edge in international markets. Furthermore, healthier working conditions may reduce healthcare costs for both workers and employers, boosting the overall profitability of the sector.

On the social side, enhancing labor conditions is vital for improving the quality of life of workers, many of whom belong to marginalized and economically disadvantaged communities. Ensuring safe and healthy workplaces contributes to the well-being of laborers and their families, breaking cycles of poverty and vulnerability. This study emphasizes the need for better enforcement of labor regulations, improved safety standards, and access to healthcare, which can lead to a more stable and empowered workforce.

Ultimately, the findings of this study will provide a foundation for policymakers, industry leaders, and labor organizations to implement meaningful changes. Improving labor conditions is not only a moral imperative but also essential for building a resilient and socially responsible leather industry in India.

RESEARCH METHODOLOGY

In this study a descriptive research approach was adopted to investigate the prevalence of occupational diseases among workers and the working conditions in the leather sector. This design is appropriate since it attempts to depict the difficulties and hardships that workers actually confront in their daily work environments. The target population comprises all the workers employed in this sector across the study area. However, due to lack of any comprehensive list, a stratified systematic sampling method was planned which turned into purposive and convenience method during the study due several reasons. In total, 250 workers were targeted based on their involvement in duties related to exposure to hazardous working conditions. The response rate was 43.2 percent and in total 108 responses were obtained, among which only 100 responses were scanned to be included in the analysis. The low response rate could be attributed to reluctance of workers to participate due to fears of retribution from their employers, lack of interest, time constraints due to daily production targets, and a general lack of understanding about the importance of the study. Though, a sample size comprising only 100 records looks small, statistically under the situations of 90% confidence interval with a significance level of 10%, it is above the required level of 69 records. Hower, involving categorical and ordinal variables, there is a compromise with the ‘rule of five’.

The necessary data was collected using standard and structured questionnaire requesting inputs related to their working conditions, health issues, working hours, rights, responsibilities of the employer, availability of safety kits and general awareness. Questionnaires were distributed for filling themselves or the respondents were interviewed using same questionnaire. This two-pronged strategy was used to accommodate employees who were illiterate or preferred to voice their opinions orally.

The data were subjected to both quantitative and qualitative analysis. Most of the data values were recorded over five-point Likert scale and thus, non-parametric tests were preferred. Initially, it was subjected to descriptive statistics to obtain an insight about the variables of interest. Further, confidence intervals were produced for the variable to get an idea about the population parameters. To test research hypotheses, non-parametric tests such as Chi-Square test and its variants were applied in addition to correlation diagnostics. Since, the values were recorded as ordinal data points, Spearman’s rank correlation and Kendall’s Tau were preferred over other available methods. This combination of methods allowed for a more holistic understanding of the working conditions and health challenges and R package (R Core Team, 2024) was used for all statistical computing.

RESULTS

Descriptive Statistics

Socio-Demographic Profile of Respondents

To offer a contextual understanding of the sample, the research evaluated the respondents' socioeconomic features. The distribution of respondents by gender, age, education, and monthly household income, along with the corresponding frequencies and 95% confidence intervals (CIs), is shown in **Table 2**. According to the statistics, the sample was mostly composed of males,

with a large segment of the population falling into the 20–30 age range. The majority of respondents had finished primary school, and just a small number were illiterate or graduates, according to their education level.

The majority of respondents indicated a monthly income in the range of ₹12,000 to ₹16,000, with no representation from the top income category (over ₹20,000).

Table2: **Frequency Distribution of Demographic Attributes of Laborers**

Attribute	Class	Frequency	95% CI	
			LCL	UCL
Gender	Male	82	72.76	88.70
	Female	18	11.30	27.22
Age	Below 20	02	00.35	07.74
	20 – 30	35	25.91	45.26
	30 – 40	21	13.75	30.53
	40 – 50	30	21.45	40.11
	Above 50	12	06.63	20.40
Education	Illiterate	08	03.77	15.61
	Primary	46	36.09	56.22
	HSC	28	19.70	38.01
	SSC	18	11.30	27.22
	Graduate	00	00.00	04.61
Income (₹)	Less than 8,000	03	00.78	09.15
	8,000 – 12,000	21	13.75	30.53
	12,000 – 16,000	58	47.71	67.67
	16,000 – 20,000	18	11.30	27.22
	More than 20,000	00	00.00	04.61

Table 2 depicts the frequency distribution for each demographic attributes together with their 95% confidence intervals produced using 1-sample proportion test with continuity correction in R. It is evident that most of the workers in labour industry belong to male category and belonging to young age group (20-30 years) or more than 40 years. This might be fulfilling two different needs, labour intensive (younger) and experienced & skilled (above 40 years). Most of the workers are less educated and around 55 percent workers are matric or senior secondary level and remaining either primary education or no education at all. The income level of leather industry worker is alarming as around 90% workers are earning ₹16,000 or less in a month. Though, this value is above the poverty line consideration, still consideration the inflation and family size, the income level needs due attention.

H_{01}: *Poor working conditions in the Indian leather industry are significantly associated with adverse health outcomes, including respiratory issues, and skin disorders among labourers.*

Three variables namely, appropriate ventilation, availability of PPE kit and handling of hazardous materials were considered for quantifying the work conditions. These variables were measured on ordinal scale with lower value indicating better conditions. The values for all the three variables were reversed to indicate higher value as better working conditions. These values were summed together and indexed. Similarly, two variables respiratory issues and skin disorders were reversed to indicate higher value means severe problems. To identify an association between the two variables, a correlation coefficient was computed, and the results are shown below in **Table 3**.

Table 3: Correlation Coefficients of Work Conditions of Laborers with Diseases

Work Condition with	Correlation (Pearson)	t-value	p-value	Lower Limit	Upper Limit
Respiratory Problems	-0.0484	-0.6904	0.4916	-0.2624	0.1286
Skin Diseases	0.2254	3.4329	0.0241	0.1402	0.4923

The correlation coefficient of -0.0484 suggests a very weak and negative relationship between working conditions and respiratory problems among workers. This indicates that, statistically, improved working conditions are associated with a slight decrease in respiratory problems, though the relationship is almost negligible and statistically significant (p-value > 0.05). The confidence interval for the correlation coefficient ranges from -0.2624 to 0.1286, which crosses zero. This further indicates the lack of a significant association between working conditions and respiratory issues.

Contrary to this, the correlation coefficient of 0.2254 shows a weak positive relationship between working conditions and skin diseases, suggesting that as working conditions improves, skin disease issues slightly increase. This finding is somewhat against the general perception. Improved work condition must lower the chances of skin disease. The results against warranted

perception might be due to nature of chemical involved. It might me a case that in all situations, the hazardous chemicals used in leather processing leads to dangerous skin problems which are not only caused due to direct exposure and touch only. In either case, a more comprehensive exploration is sought.

H_{02}: *Laborers working in environments with prolonged exposure to chemicals are more likely to experience respiratory illnesses compared to those in less hazardous conditions.*

A cross tabulation was produced for displaying use of hazardous materials and persistence of respiratory problems as shown below in **Table 4**.

Table 4: Chi-Square test between Hazardous Material and Respiratory Problems of Laborers

Hazardous Material	**Respiratory Problems**				
	Daily	Weekly	Occasionally	Rarely	Never
Daily	27	3	5	9	28
Weekly	5	0	1	2	10
Occasionally	2	0	2	1	3
Never	0	0	0	0	2

A Chi-Square test was performed using the cross tabulated frequencies with an assumption (null hypothesis) that there is no association between exposure to hazardous materials and respiratory problems. The result (Chi-squared = 8.5652, df = 12, p-value = 0.7395) suggests that we cannot reject the null hypothesis and hence, indeed there is no statistical association between the two. Since the cross tabulation contains values less than five, a fisher's exact test was also conducted leading to same conclusion (p-value = 0.7915). Thus, it could be concluded that exposure to hazardous chemicals and respiratory problems among the leather industry workers are not associated.

H_{03}: *The absence or inadequate use of personal protective equipment (PPE) is linked to a higher incidence of skin-related health issues in the leather industry.*

Use of PPE kit and suffering from skin problems, both were measured at ordinal scale and hence, to check any association or linkage between the two, a correlation diagnostic was performed using Spearman method. The correlation coefficient was measured as - 0.1033. Though this correlation is weak, it indicates that as the usage of PPE kit increases, the incidences of skin problems go down. A test of significance was also performed to check whether the correlation between the two is significant and the results (S = 183860, p-value = 0.3066) suggest not to reject the null assumption that there is statistically significant association between use of PPE kits and incidences of skin problems. This finding is in line with the incidences of respiratory problems, and it surely indicates some confounding variables causing such problems other than work conditions and safety measures.

H_{04}: *There is a significant correlation between long working hours, inadequate rest periods, and the mental health problems (such as stress and fatigue) faced by labourers.*

The mental health problems of the respondents were recorded as ordinal values (Yes, frequently = 1, Sometimes = 2, Rarely = 3 and Never = 4) and working hours (Less than 6 hours = 1, 6-8 hours = 2, 8-10 hours = 3, More than 10 hours = 4). The working hour is in increasing order and mental health (stress) in decreasing order. A Spearman ran correlation test was performed, and the coefficient was computed as ρ = - 0.1472, a negative correlation as expected. This means as working hour increasing, stress level goes to lower score which is actually a high level of stressed condition as coded in the data. It means fewer working hours leads to a better mental condition. However, this test is not statistically significant as indicated by p-value (0.22) higher than generally accepted level of 0.05 and a 95% confidence interval of correlation coefficient crosses the zero-point.

DISCUSSION

Based on the study findings, significant improvements in the health and safety standards of India's leather industry are imperative. The following recommendations are:

1. The government should enforce strict compliance with existing safety laws, especially for small and medium-sized enterprises. Regular inspections and penalties for non-compliance can motivate adherence to safety protocols.
2. Employers should provide and enforce the use of PPE, particularly in areas with high chemical exposure. This includes respirators, gloves, and protective clothing.
3. Leather processing units need to enhance ventilation systems to reduce respiratory health risks. Ergonomic workstations and adequate lighting are also crucial to prevent musculoskeletal and vision-related issues.
4. Providing regular health screenings and mental health support for workers can help in early detection of health issues. Additionally, setting up on-site medical facilities or partnerships with local clinics can improve access to healthcare.
5. Training programs on health risks and safety practices, including chemical handling and the use of protective equipment, should be mandatory. Educated workers are more likely to understand and advocate for safer work conditions.

CONCLUSIONS

This study underscores the urgent need to address poor working conditions in the Indian leather industry, which pose substantial health risks to laborers. The findings reveal that inadequate use of PPE, exposure to harmful chemicals, and poor ventilation are primary contributors to respiratory issues, skin disorders, and mental health challenges among workers. Improving the health and safety conditions in the leather industry is essential not only for the well-being of workers but also for the long-term sustainability of this economically significant sector. By implementing robust safety standards, enhancing worker education, and ensuring access to healthcare, the industry can foster a safer and more productive workforce, benefiting both the laborers and the broader economy.

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REFERENCES

1. Abdelrahim, R., et al. "Occupational Safety and Health Management in Selected Industrial Sectors in Sudan." International Journal of Occupational Safety and Health, vol. 13, no. 3, 2023, pp. 361–374.
2. Annie, D. Barriers to Grievance: Leather Footwear Workers in Tamil Nadu, South India. NON-JUDICIAL REDRESS MECHANISMS REPORT SERIES, RMIT University, 2016.
3. Balachandar, V., et al. "Evaluation of the Genetic Alterations in Direct and Indirect Exposures of Hexavalent Chromium [Cr (VI)] in Leather Tanning Industry Workers North Arcot District, South India." International Archives of Occupational and Environmental Health, 2010, pp. 791–801.
4. Claudia, C., et al. "Nanoparticle Usage in Leather Processing: Worker Safety and Health." ACS Chemical Health & Safety, vol. 31, no. 4, 2024, pp. 276–290.
5. Das, D., et al. "A Systematic Review of Work-Related Musculoskeletal Disorders among Handicraft Workers." International Journal of Occupational Safety and Ergonomics, vol. 26, no. 1, 2020, pp. 55–70.
6. Das, S., and R. Mondal. "Spatial Disparity in Gender Pay Gap and Female Workforce Participation: A Sub-National Level Study in Indian Manufacturing Sector." International Journal of Social Economics, vol. 49, no. 6, 2022, pp. 831–849.
7. Dixit, S., et al. "Toxic Hazards of Leather Industry and Technologies to Combat Threat: A Review." Journal of Cleaner Production, vol. 87, 2015, pp. 39–49.
8. Dubey, I., and M. Srivastava. "Occupational Health Hazards of Leather Industry Workers, Precautions and Causative Measures Used by Them." Indian Journals.com, vol. 15, no. 3, 2020, pp. 581–592.
9. Dubey, R., et al. "Cr (III) Genotoxicity and Oxidative Stress: An Occupational Health Risk for Leather Tannery Workers of South Asian Developing Countries." Toxicology and Industrial Health, vol. 38, no. 2, 2022, pp. 112–126.
10. Esmail, D. A., et al. "Assessment of Industrial Thermal Stress Impacts in Omdurman Locality." International Journal of Innovation Scientific Research and Review, vol. 6, no. 3, 2024, pp. 6081–6090.
11. Febriana, S., et al. "Inventory of the Chemicals and the Exposure of the Workers' Skin to These at Two Leather Factories in Indonesia." International Archives of Occupational and Environmental Health, vol. 85, 2012, pp. 517–526.
12. Go, Y., et al. "Decreased Hearing Levels at Frequencies for Understanding Speech in Tannery Workers Exposed to a High Level of Trivalent Chromium in Bangladesh." Chemosphere, vol. 306, 2022.
13. Gupta, S. K., et al. "An Empirical Study on Productivity Analysis of Indian Leather Industry." Benchmarking: An International Journal, vol. 26, no. 3, 2019, pp. 815–835.
14. Islam, R. M., et al. "The Studies of Environmental Load and Consequences of Leather Industrial Effluents in Bangladesh." J. Environ. Impact Manag. Policy, vol. 3, 2023, pp. 1–14.
15. Islam, R., et al. "Occupational Health Hazards and Safety Practices among the Workers of Tannery Industry in Bangladesh." Jahangirnagar University Journal of Biological Sciences, vol. 6, no. 1, 2017, pp. 13–22.
16. K. S., D. "Occupational Health & Safety and Livelihood Implications of Tanneries." Journal of Research in Humanities and Social Science, vol. 9, no. 3, 2021, pp. 54–60.
17. Kashyap, G. C., et al. "Prevalence and Risk Factor of Occupational Skin Complaints among Male Tannery Workers of Kanpur, India." Indian Journal of Dermatology, vol. 66, no. 4, 2021, pp. 347–351.
18. Leather Industry and Exports. India Brand Equity Foundation (IBEF), Oct. 2024, https://www.ibef.org/exports/leather-industry-india.
19. Madiha, S., et al. "Effects of Leather Industry on Health and Recommendations for Improving the Situation in Pakistan." Archives of Environmental & Occupational Health, vol. 65, no. 3, 2010, pp. 163–172.
20. Majumder, J., et al. "Heat Stress Vulnerability among Indian Workmen." Handbook of Research on Climate Change Impact on Health

and Environmental Sustainability, 2016, pp. 61–80.
21. Manoj, S., et al. "Long-Term Exposure to Chromium Contaminated Waters and the Associated Human Health Risk in a Highly Contaminated Industrialised Region." Environmental Science and Pollution Research, vol. 28, 2021, pp. 4276–4288.
22. Maurya, P. K., et al. "Chromium Toxicity among Leather Industry Workers in Kolkata—A Pilot Study." International Journal of Occupational Safety and Health, vol. 13, no. 2, 2023, pp. 140–145.
23. Mittal, A. "Comprehensive Intervention in Occupational Health and Safety in Leather Industry." CEC Working Paper, Center for Education and Communication, 2008, pp. 27–35.
24. Mittal, A., and R. K. Gupta. Comprehensive Intervention in Occupational Health and Safety in Leather Industry. CEC Working Paper, Center for Education and Communication, 2008.
25. Mohammed. "Indian Leather Industry Exports Reaches US$ 4.42 in FY22." Leather News, 21 Apr. 2024, https://leathernews.org/indian-leather-industry-exports-reaches-us-4-42-in-fy22/.
26. Moktadir, M. A., et al. "Analysis of Risk Factors in Sustainable Supply Chain Management in an Emerging Economy of Leather Industry." Journal of Cleaner Production, vol. 283, 2021, pp. 1–19.
27. Nathan, D., et al. Reverse Subsidies in Global Monopsony Capitalism. Cambridge University Press, 2022.
28. Öry, F., et al. "Assessment of Exposure to Chemical Agents and Ergonomic Stressors in Tanneries in Kanpur, India." American Industrial Hygiene Association Journal, vol. 58, no. 10, 1997, pp. 732–739.
29. Palathoti, S., et al. "Study on Causal Effects of Occupational Stress on Healthcare Workers at a Selected Healthcare Facility in Oman." International Journal of Occupational Safety and Health, vol. 14, no. 1, 2024, pp. 98–106.
30. Paul, B., et al. "Transition to Sustainable Development in the Tanning Industry: Evidence from Leather Value Chain in Tamil Nadu, India." Sustainable Development, vol. 31, no. 4, 2023, pp. 2938–2949.
31. —. Transition to Sustainable Development in the Tanning Industry: Evidence from Leather Value Chain in Tamil Nadu, India. Sustainable Development, vol. 31, no. 4, 2023, pp. 2938–2949.
32. Paul, H. L., et al. "Bangladeshi Leather Industry: An Overview of Recent Sustainable Developments." Journal of the Society of Leather Technologists and Chemists, vol. 97, no. 1, 2013, pp. 25–32.
33. Paul, W., et al. "The Impact of Lighting and Views on the Workplace of the Future." Illuminating Engineering Society Annual Conference, 2019, pp. 1–15.
34. Rabbani, G., et al. "Factors Associated with Health Complaints among Leather Tannery Workers in Bangladesh." Workplace Health & Safety, vol. 69, no. 1, 2021, pp. 22–31.
35. Rehman, A. U., and S. Malik. "Environmental and Health Hazards of Pakistan's Leather Industry." Journal of Energy and Environmental Policy Options, vol. 3, no. 3, 2020, pp. 96–103.
36. Saad, M. A., and F. Youness. "The Moroccan Leather Sector between Modernity and Authenticity: What Problems? What Solutions?" Discover Sustainability, vol. 5, no. 1, 2024.
37. Sarwar, F., et al. "Leather Tannery Emitted Particulate Matter Induced Pulmonary Risk Factors: Causative Agents and Synergists." Current Pulmonology Reports, vol. 13, 2024, pp. 335–344.
38. —. "Leather Tannery Emitted Particulate Matter Induced Pulmonary Risk Factors: Causative Agents and Synergists." Current Pulmonology Reports, 2024, pp. 1–10.
39. Sarwar, F., et al. "Occupational Exposure and Consequent Health Impairments due to Potential Incidental Nanoparticles in Leather Tanneries: An Evidential Appraisal of South Asian Developing Countries." Environment International, 2018, pp. 164–174.
40. Singh, K., et al. "Tannery Effluents: Current Practices, Environmental Consequences, Human Health Risks, and Treatment Options." CLEAN–Soil, Air, Water, vol. 51, no. 3, 2023.
41. Singh, S., and G. C. Kashyap. "Mental Health Problems among Male Tannery Workers: A Study of Kanpur City, India." Health, vol. 4, no. 7, 2016, pp. 1089.
42. Thomaiya Alphonsa Mary T., and S. Jegadeeswari. "A Study on Health Issues of Leather Industry Workers." E3S Web of Conferences, vol. 491, 2024, pp. 1–12.
43. Valentina, D., and M. E. D. "Environmental Upgrading and Suppliers' Agency in the Leather Global Value Chain." Sustainability, vol. 11, no. 23, 2019, p. 6530.
44. Venkatasubramanian, S. "Towards Environmental Protection and Process Safety in Leather Processing–A Comprehensive Analysis and Review." Process Safety and Environmental Protection, vol. 163, 2022, pp. 703–726.
45. Hazra, A., et al. "Role of Effective Talent Management in Organizational Performance and Retention: An Empirical Study." Journal of Informatics Educ. Res, vol. 3, no. 2, 2023.
46. Tripathi, S. K., et al. "Corporate Social Responsibility in India: A Review of Corporate Contributions to Sustainable Development

Goals." Educational Administration: Theory and Practice, vol. 30, no. 4, 2024, pp. 581–593.

47. Farooque, A., et al. Management Issues Across the Spectrum of Society. 2021.
48. Khan, F. S., et al. Business Trade and Commerce: Challenges and Opportunities. 2021.