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PREVALENCE OF RESPIRATORY AND MUSCULOSKELETAL SYMPTOMS IN BRICK KILN WORKERS AND ITS IMPACT ON THE QUALITY OF LIFE

Original Research (ID: 1693)

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ABSTRACT

Background: Brick kiln workers are exposed to dust, smoke, heat, chemical fumes and repetitive physical workload, which may increase their risk of respiratory and musculoskeletal problems. These workers often perform prolonged manual tasks such as moulding, carrying and baking bricks in poorly controlled occupational environments. Such exposures may affect physical functioning, daily activity and overall well-being. Assessing these symptoms and their relationship with quality of life is important for planning preventive occupational health measures.

Objective: To determine the prevalence of respiratory and musculoskeletal symptoms among brick kiln workers and assess their association with quality of life.

Methods: This cross-sectional study was conducted on 100 brick kiln workers selected through convenience sampling. Workers involved in moulding, carrying and baking were included according to predefined selection criteria. Written informed consent was obtained from all participants. Respiratory symptoms were assessed using the American Thoracic Society Division of Lung Disease 78-A questionnaire, musculoskeletal symptoms were evaluated through the Modified Nordic Musculoskeletal Questionnaire, and quality of life was measured using the 36-Item Short Form Health Survey. Data were analyzed using SPSS version 20. Descriptive statistics were calculated, and chi-square analysis was applied to determine associations between symptoms and quality-of-life domains.

Results: Among the participants, 85% were male and 15% were female. Most workers performed moulding work (60%), followed by carrying (20%) and baking (20%). A total of 64% worked more than 7 hours daily, and 29% were current smokers. Shoulder symptoms were the most frequent musculoskeletal complaint (21.4%), followed by lower back pain (20.1%), knee symptoms (11.7%), upper back symptoms (11.0%), and neck and wrist symptoms (10.4% each). Respiratory complaints included chest cold or chest illness (31%), frequent cough (27%), frequent phlegm (15%), chronic bronchitis (6%), chronic cough (5%), frequent wheezing (5%) and chronic wheezing (5%). Breathlessness was reported as grade I in 2%, grade II in 7%, grade III in 3% and grade IV in 3%. Musculoskeletal symptoms, particularly in the neck, shoulder, wrist, knee and ankle regions, showed significant associations with several SF-36 domains. Respiratory symptoms, especially wheezing and dyspnea, were also significantly associated with poorer quality-of-life domains.

Conclusion: Brick kiln workers showed a considerable burden of respiratory and musculoskeletal symptoms, which were associated with reduced quality of life. The findings highlight the need for workplace safety measures, early screening, protective equipment and ergonomic interventions in brick kiln settings.

Keywords: Air Pollutants, Occupational; Cough; Dyspnea; Musculoskeletal Pain; Occupational Diseases; Quality of Life; Respiratory Tract Diseases.

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INTRODUCTION

Brick kiln work remains an important yet under-recognized occupational health concern in Pakistan. The country is among the major brick-producing nations, with the industry reported to produce more than 60 billion bricks annually through approximately eighteen thousand brick kilns (1). Despite its economic contribution, brick production is largely labor-intensive and commonly operates in environments where workers are exposed to dust, smoke, heat, heavy physical workload and limited access to occupational health services. The process of brick making begins with clay extraction and soil moulding, followed by sun drying, kiln firing and transportation of finished bricks, each stage requiring repetitive manual effort and prolonged exposure to environmental hazards (2). Coal is commonly used as the main fuel in brick kilns, and its combustion releases particulate matter, carbon monoxide, nitrogen oxides, sulphur dioxide and several toxic metals into the surrounding air (3, 4). These pollutants may affect respiratory health depending on their concentration, duration of exposure and ability to penetrate the respiratory tract. The depth of penetration of gases is influenced by their water solubility; highly soluble gases such as sulphur dioxide usually irritate the upper airways at lower concentrations but may reach deeper lung tissues at higher doses, whereas less soluble gases such as nitrogen dioxide can penetrate more deeply and reach the alveoli (5). Continuous exposure to such pollutants may contribute to cough, breathlessness, wheezing, chest tightness and reduced exercise tolerance, particularly among workers who have prolonged occupational exposure or a history of smoking.

In addition to respiratory problems, brick kiln workers are also vulnerable to musculoskeletal symptoms because of the physically demanding nature of their work. Occupational musculoskeletal disorders are more common in developing countries where poor working conditions, low wages, long working hours and limited medical support often coexist. Pain and discomfort may be influenced by the intensity, duration and frequency of work, along with awkward postures such as prolonged standing, kneeling, squatting, bending and twisting of the back (6). Brick workers frequently perform repeated trunk flexion and rotation while lifting, moulding, carrying and stacking bricks, which can overload the spinal and limb muscles and may lead to fatigue of trunk extensors, lower back pain and other regional musculoskeletal complaints (7). Smoking may further worsen respiratory and functional limitations in this occupational group. Reduced exercise capacity has been observed even after short-term smoking exposure, while chronic smoking may contribute to skeletal muscle changes associated with the development of chronic obstructive pulmonary disease symptoms. Previous evidence has shown that smokers may have a reduced cross-sectional area of smaller quadriceps muscle fibers, reflecting possible peripheral muscle involvement in addition to respiratory compromise (8). For occupational health assessment, smoking status is commonly categorized as never-smokers and ever-smokers, with ever-smokers including both current and former smokers. A former smoker is generally defined as a person who smoked for at least one year but has not smoked during the preceding year (9).

Although respiratory and musculoskeletal symptoms have been studied separately in different occupational groups, limited local evidence is available regarding their combined burden among brick kiln workers and how these symptoms influence quality of life. This gap is important because the health of brick kiln workers is not only affected by workplace exposures but also by social and economic vulnerability, delayed healthcare seeking and lack of routine screening. Understanding the prevalence of these symptoms and their relationship with quality of life may help identify the true occupational burden and support preventive strategies, early rehabilitation and workplace health interventions. Therefore, the present study was designed to determine the prevalence of respiratory and musculoskeletal symptoms among brick kiln workers and to assess their impact on quality of life. It was hypothesized that brick kiln workers with respiratory and musculoskeletal symptoms would have poorer quality of life compared with those without such symptoms.

METHODS

This cross-sectional study was conducted at The University of Faisalabad, Faisalabad, from 20 August to 12 December 2024. Brick kiln workers were recruited through a convenience sampling technique. A total of 120 workers were initially screened, of whom 100 fulfilled the eligibility criteria and were included in the final analysis. Before data collection, ethical approval was obtained from the Institutional Review Board of The University of Faisalabad under reference number TUF/IRB/406/24. All eligible participants were informed about the purpose, procedure, voluntary nature and confidentiality of the study, and written informed consent was obtained prior to their participation. The study included male and female brick kiln workers aged 18 to 35 years who had been working in brick kilns for at least one year. Both smokers and non-smokers were considered eligible in order to assess respiratory and musculoskeletal symptoms across different smoking statuses. Participants were excluded if they refused to participate, had an active infection, recent wound, history of surgery within the previous three months, diagnosed neurological disorder, diagnosed orthopaedic, cardiac or respiratory condition, psychological instability, pregnancy, or were taking medication for any specific medical condition.

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Data were collected using structured and validated assessment tools. Respiratory symptoms were assessed through the American Thoracic Society Division of Lung Disease 78-A questionnaire. Musculoskeletal symptoms were evaluated using the Modified Nordic Musculoskeletal Questionnaire, which identifies symptoms in different body regions related to occupational exposure. Quality of life was measured using the 36-Item Short Form Health Survey, a widely used instrument for assessing physical and mental health-related quality of life. Demographic and occupational information, including age, gender, smoking status and duration of work, was also recorded to describe the study population and support interpretation of the findings. The collected data were entered and analyzed using Statistical Package for Social Sciences version 20. Descriptive statistics were used to summarize demographic characteristics, respiratory symptoms, musculoskeletal symptoms and quality-of-life scores. Frequencies and percentages were reported for categorical variables, while mean and standard deviation were used for continuous variables where appropriate. The chi-square test was applied to determine the association between respiratory symptoms, musculoskeletal symptoms and quality-of-life categories. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 100 brick kiln workers were included in the final analysis. Most participants were male, comprising 85% of the sample, while females represented 15%. Regarding working duration, 64% of the workers reported working for more than 7 hours per day, whereas 36% worked for less than 7 hours per day. In relation to smoking status, 29% were current smokers and 71% were never-smokers, while no participant was reported as a former smoker. The most common work category was moulding, reported by 60% of participants, followed by carriers and bakers, each representing 20% of the sample. Most participants had a normal body mass index, observed in 70%, while 16% were overweight and 6% were classified as obese class I. Thinness was less frequent, with severe thinness in 3%, moderate thinness in 2% and mild thinness in 3%. Most workers were uneducated, accounting for 83% of the sample, while 17% were educated. Respiratory symptoms were reported with varying frequency among the workers. The most common respiratory complaint was chest cold or chest illness, which was present in 31% of participants. Frequent cough was reported by 27%, while chronic cough was present in 5%. Frequent phlegm was reported by 15%, whereas chronic phlegm was present in 3%. Wheezing was reported less frequently, with frequent wheezing and chronic wheezing each present in 5% of participants. Breathlessness was also reported across different grades, with grade I in 2%, grade II in 7%, grade III in 3% and grade IV in 3%. Chronic bronchitis was present in 6% of the workers, while 4% reported a history of past respiratory illness.

Musculoskeletal symptoms were reported in multiple body regions. During the previous 12 months, shoulder symptoms were the most commonly reported complaint, present in 21.40% of participants, followed by lower back symptoms in 20.10%, knee symptoms in 11.70%, upper back symptoms in 11.00%, neck and wrist symptoms each in 10.40%, ankle symptoms in 7.80%, elbow symptoms in 6.50% and hip symptoms in 0.60%. Symptoms that prevented normal work were most frequently reported in the shoulder region at 19.60%, followed by lower back at 14.70%, upper back at 13.70%, knee at 12.70%, neck and wrist each at 10.80%, ankle at 9.80%, elbow at 6.90% and hip at 1.00%. During the previous 7 days, shoulder symptoms remained the most frequent complaint, reported by 20.40% of participants, followed by lower back symptoms in 18.50%. Wrist and knee symptoms were each reported by 12.00%, while upper back and ankle symptoms were each reported by 10.20%. Neck symptoms were present in 9.30%, elbow symptoms in 6.50% and hip symptoms in 0.90%. Among participants who reported an injured or hurt body region, the knee was the most frequently affected site at 33.30%, followed by the shoulder, elbow and wrist, each at 16.70%. Upper back and hip complaints were each reported by 8.30%, while neck, lower back and ankle were not reported in this category.

The duration of musculoskeletal symptoms also varied by body region. Symptoms lasting 1–7 days were most commonly reported in the shoulder region at 29.00%, followed by lower back at 19.40%, neck and wrist each at 12.90%, knee at 9.70%, elbow and upper back each at 6.50%, ankle at 3.20% and hip at 0%. Symptoms lasting 8–30 days were most frequently reported in the lower back at 29.00%, followed by upper back at 22.60%, shoulder and knee each at 12.90%, neck at 9.70%, elbow, wrist, hip and ankle each at 3.20%. Symptoms lasting more than 30 days were most commonly reported in the shoulder and lower back regions, each at 21.70%, followed by upper back at 17.40%, elbow at 13.00%, wrist and knee each at 8.70%, ankle at 8.70%, while neck and hip were reported as 0%. Daily symptoms were reported most frequently in the shoulder region at 20.00%, followed by lower back at 17.30%, wrist at 13.30%, neck and knee each at 12.00%, ankle at 10.70%, upper back at 8.00%, elbow at 5.30% and hip at 1.30%. Doctor visits due to musculoskeletal symptoms were most commonly reported for shoulder complaints at 19.50%, followed by lower back at 17.70%, wrist and upper back each at 12.40%, knee at 11.50%, neck at 10.60%, ankle at 8.80%, elbow at 5.30% and hip at 1.80%. The association between musculoskeletal symptoms and SF-36 domains showed statistically significant findings in several body regions. Neck symptoms were significantly associated with physical functioning ($p=0.003$), role functioning due to physical health ($p=0.010$), role functioning due to emotional health ($p=0.003$), social functioning ($p=0.021$), pain ($p=0.010$) and general health ($p=0.018$). Shoulder symptoms were significantly associated with physical functioning ($p=0.008$), role functioning due to physical health ($p=0.004$), role functioning due to emotional health ($p=0.001$), energy/fatigue ($p=0.006$), emotional well-being ($p=0.028$), social functioning ($p=0.035$) and pain ($p=0.010$). Wrist symptoms were significantly associated with physical functioning ($p=0.005$), role functioning due to physical health ($p=0.007$), role functioning due to emotional health ($p=0.036$), social functioning ($p=0.016$) and pain ($p<0.001$). Upper back

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symptoms were significantly associated only with pain (p=0.030). Knee symptoms were significantly associated with physical functioning (p=0.031), energy/fatigue (p=0.008), pain (p=0.040) and general health (p=0.018). Ankle symptoms were significantly associated with physical functioning (p<0.001), social functioning (p<0.001), pain (p=0.002) and general health (p=0.022). No statistically significant association was observed between elbow, lower back or hip symptoms and the SF-36 domains based on the provided p-values.

Respiratory symptoms also showed significant associations with selected SF-36 domains. Cough was significantly associated with social functioning (p=0.004) and general health (p=0.004). Phlegm was significantly associated with emotional well-being (p=0.016), social functioning (p=0.038) and general health (p=0.004). Wheezing showed significant associations with physical functioning (p<0.001), role functioning due to physical health (p<0.001), role functioning due to emotional health (p<0.001), energy/fatigue (p=0.015), social functioning (p=0.028), pain (p<0.001) and general health (p=0.008). Dyspnea was significantly associated with energy/fatigue (p<0.001), emotional well-being (p=0.004), pain (p=0.003) and general health (p<0.001). Several musculoskeletal regions showed statistically significant associations with different SF-36 domains, particularly neck, shoulder, wrist, knee and ankle symptoms. Shoulder pain was one of the most consistently associated complaints, showing significant relationships with physical functioning, role limitation due to physical health, role limitation due to emotional health, energy, emotional well-being, social functioning and pain. Neck and wrist symptoms were also significantly associated with multiple functional and quality-of-life domains. Although lower back pain was among the most frequently reported musculoskeletal complaints, it did not show a statistically significant association with the SF-36 domains in the provided analysis. Among respiratory symptoms, cough and phlegm were significantly associated mainly with social functioning and general health, while wheezing showed significant associations with most SF-36 domains, including physical functioning, role functioning, energy, social functioning, pain and general health. Dyspnea was significantly associated with energy, emotional well-being, pain and general health.

Table 1: Demographic Data

Variables		Frequency%
Gender of the participant	Female	15
	Male	85
Working hours	more than 7 hours	64
	less than 7 hours	36
Smoking status	current smoker	29
	never smoker	71
	former smoker	0
Type of work	Moulder	60
	Carrier	20
	Baker	20
Body mass index	Severe Thinness	3
	Moderate Thinness	2
	Mild Thinness	3
	Normal	70
	Overweight	16
	Obese Class I	6
	Obese Class II	0.0
	Obese Class III	0.0
Education	Educated	17
	Uneducated	83

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Table 2: Respiratory Symptoms:

Respiratory Symptoms		Frequency%
Cough	Frequent cough	27.0
	Chronic cough	5.0
Phlegm	Frequent phlegm	15.0
	Chronic phlegm	3.0
Wheezing	Frequent wheezing	5.0
	Chronic wheezing	5.0
Chest cold and chest illness	Yes	31.0
Breathlessness	Grade I	2.0
	Grade II	7.0
	Grade III	3.0
	Grade IV	3.0
Chronic bronchitis	Yes	6.0
Past illness	Yes	4.0

Table 3: Trouble in different regions from last 12 months to every day

	Neck	Shoulder	Elbow	Wrist	Upper back	Lower back	Hip	Knee	Ankle
Last 12 month	10.40%	21.40%	6.50%	10.40%	11.00%	20.10%	0.60%	11.70%	7.80%
Prevented from work	10.80%	19.60%	6.90%	10.80%	13.70%	14.70%	1.00%	12.70%	9.80%
Last 7 days	9.30%	20.40%	6.50%	12.00%	10.20%	18.50%	0.90%	12.00%	10.20%
Hurt body part	0%	16.70%	16.70%	16.70%	8.30%	0%	8.30%	33.30%	0%
Total time 1-7 days	12.90%	29.00%	6.50%	12.90%	6.50%	19.40%	0%	9.70%	3.20%
8-30 days	9.70%	12.90%	3.20%	3.20%	22.60%	29.00%	3.20%	12.90%	3.20%
More than 30 days	0%	21.70%	13%	8.70%	17.40%	21.70%	0%	8.70%	8.70%
Every day	12.00%	20.00%	5.30%	13.30%	8.00%	17.30%	1.30%	12.00%	10.70%
Visit to doctor	10.6%	19.5%	5.3%	12.4%	12.4%	17.7%	1.8%	11.5%	8.8%

Table 4: Influence of musculoskeletal and respiratory symptoms on Quality of Life (SF-36)

	PF	RFP	RFE	Energy	EWB	SF	Pain	GH
Neck	0.003	0.01	0.003	0.057	0.323	0.021	0.01	0.018
Shoulder	0.008	0.004	0.001	0.006	0.028	0.035	0.01	0.085
Elbow	0.585	0.414	0.56	0.98	0.984	0.639	0.19	0.217
Wrist	0.005	0.007	0.036	0.198	0.075	0.016	0	0.351
Upper back	0.245	0.4	0.094	0.578	.0.671	0.355	0.03	0.152

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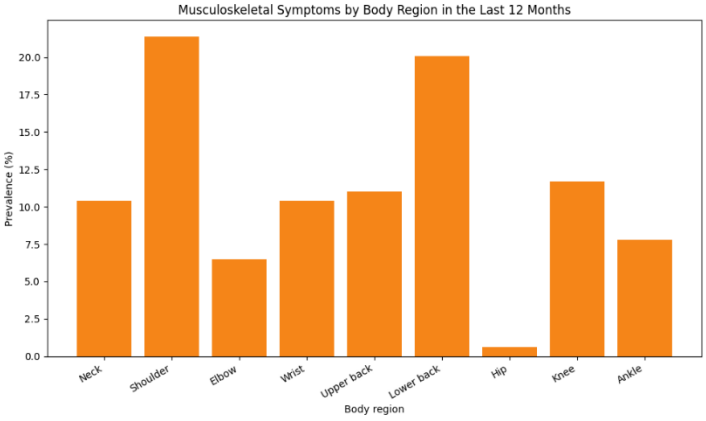
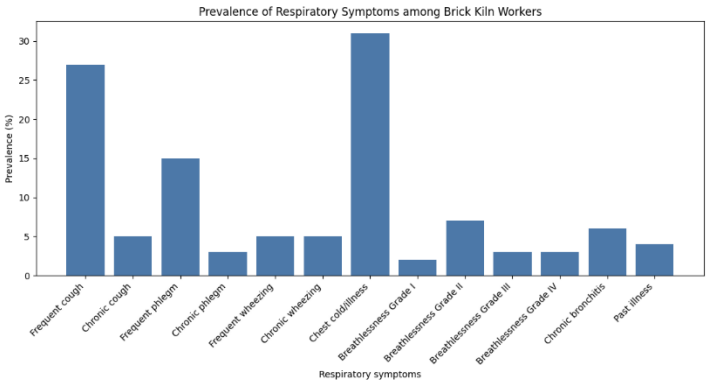
Lower back	0.192	0.423	0.277	0.924	0.363	0.316	0.17	0.741
Hip	1	0.991	0.987	0.828	0.963	0.981	1	0.838
Knee	0.031	0.794	0.766	0.008	0.1	0.61	0.04	0.018
Ankle	0	0.067	0.602	0.59	0.564	0	0.002	0.022
Cough	0.398	0.38	0.576	0.724	0.116	0.004	0.38	0.004
Phlegm	0.86	0.78	0.735	0.863	0.016	0.038	0.11	0.004
Wheeze	0	0	0	0.015	0.792	0.028	0	0.008
Dyspnea	0.673	0.16	0.521	0	0.004	0.308	0.003	0

*PH= Physical Functioning; RFP= Role functioning/ physical; RFE=Role of Functioning/Emotional; EWB=Emotional well-being; SF= Social Functioning





DISCUSSION

The present study assessed the prevalence of respiratory and musculoskeletal symptoms among brick kiln workers and examined their association with quality of life. The findings showed that respiratory complaints were common in this occupational group, with chest cold or chest illness, frequent cough and phlegm being the most frequently reported symptoms. Musculoskeletal symptoms were also evident, particularly in the shoulder and lower back regions. These findings suggested that brick kiln workers experienced a combined burden of respiratory and physical health problems, which may be linked to prolonged exposure to dust, smoke, heat, repetitive manual work and physically demanding postures during brick production (10-12). The respiratory findings of the present study were consistent with previous occupational health research conducted among brick kiln workers. A cross-sectional study conducted in India among women working in the brick kiln industry reported a high frequency of respiratory complaints, supporting the observation that kiln-related exposure may contribute to respiratory morbidity (10). Similarly, another study investigating respiratory ailments among brick kiln laborers reported that age, nature of work and smoking status played a significant role in the development of respiratory symptoms (11). The present study also included both smokers and non-smokers, and although smoking-wise comparison was not available in the provided analysis, the presence of respiratory symptoms among workers remained an important finding. This supported the possibility that occupational exposure itself may contribute to respiratory complaints, particularly where workers remain exposed to airborne pollutants for long working hours (13,14).

The findings were also comparable with a prevalence study conducted among brick kiln workers in the Jammu region, where a considerable burden of respiratory disorders was reported among workers, along with a significant relationship between respiratory complaints and gender (12). In the present study, males formed the majority of the sample, which reflected the labor pattern commonly seen in physically demanding kiln work. However, gender-based comparison of respiratory symptoms was not provided, limiting the ability to determine whether male and female workers were affected differently. Despite this limitation, the observed frequency of cough, phlegm, wheezing, breathlessness and chronic bronchitis highlighted the need for routine respiratory screening and preventive workplace measures in brick kiln settings (15-17). Musculoskeletal symptoms were another important finding of the present study. Shoulder pain was the most commonly reported regional complaint, followed by lower back pain. This pattern appeared biologically plausible because

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brick kiln tasks commonly involve repetitive lifting, carrying, bending, squatting, twisting and prolonged standing. Similar occupational patterns have been reported in other worker populations exposed to physically demanding environments. A previous study among greenhouse workers found evidence of both work-related musculoskeletal and respiratory diseases in nearly half of the workers, indicating that combined respiratory and musculoskeletal morbidity may occur in occupations involving environmental exposure and sustained physical workload (13). The present findings supported this occupational health concern in brick kiln workers, where respiratory exposure and biomechanical stress may coexist (18).

Comparison with workers from other industries further supported the relevance of these findings. A study conducted among cement factory workers reported respiratory health risks in 13.2% of workers, with shortness of breath being the dominant complaint among those affected, while musculoskeletal health risks were reported in 22.2% of workers and neck-related symptoms were common (14). In contrast, the present study showed frequent cough as a leading respiratory symptom and shoulder pain as the most common musculoskeletal complaint. This difference may be related to variation in workplace tasks, exposure patterns, body mechanics, use of protective equipment and duration of work. Brick kiln workers often perform more manual handling and repetitive upper limb activity, which may explain the greater shoulder involvement observed in the present study (19-21). The association of symptoms with quality-of-life domains further emphasized the practical relevance of the findings. Neck, shoulder, wrist, knee and ankle symptoms were significantly associated with several SF-36 domains, particularly physical functioning, role limitations, pain, social functioning and general health. Shoulder symptoms showed the most consistent association across multiple quality-of-life domains, suggesting that upper limb pain may interfere with both work performance and daily functioning. Among respiratory symptoms, cough and phlegm were associated mainly with social functioning and general health, while wheezing and dyspnea showed broader associations with physical functioning, energy, emotional well-being, pain and general health. These findings indicated that respiratory and musculoskeletal symptoms were not isolated complaints but were linked with perceived health status and functional well-being (22,23).

The findings were also in line with evidence showing that occupational workload can contribute to persistent musculoskeletal pain and work limitation. A previous study assessing work demands reported that a notable proportion of workers experienced musculoskeletal pain during the previous 12 months, and such work-related pain contributed to reduced work capacity and job discontinuation in some workers (15). The present study similarly found that musculoskeletal symptoms were reported across several body regions and, in some workers, prevented usual work activity. This highlighted the need to consider both symptom prevalence and functional consequences when evaluating occupational health in brick kiln workers (24). The strength of the present study was that it assessed both respiratory and musculoskeletal symptoms in the same occupational group and linked these symptoms with multiple domains of quality of life. The use of standardized questionnaires, including the American Thoracic Society Division of Lung Disease 78-A questionnaire, the Modified Nordic Musculoskeletal Questionnaire and the SF-36 Health Survey, strengthened the consistency of symptom assessment. The study also included workers with different job roles, including moulders, carriers and bakers, which provided a broader view of health complaints within the brick kiln work environment (16-18).

However, certain limitations should be considered while interpreting the findings. The study used a cross-sectional design, so causal relationships between occupational exposure, symptoms and quality of life could not be established. The convenience sampling technique and relatively small sample size limited the generalizability of the findings. The age range was restricted to 18–35 years, which may have excluded older workers who could have longer exposure duration and a greater burden of chronic symptoms. The study also excluded participants with diagnosed respiratory, cardiac, orthopaedic and neurological conditions, which may have reduced the measured prevalence of occupational disease. In addition, quality-of-life results were presented mainly through associations with SF-36 domains, but mean SF-36 scores were not provided. Smoking-wise, gender-wise, work-type-wise and working-hour-wise comparisons were also not available, although these variables may influence respiratory and musculoskeletal outcomes (19-21). Overall, the present study added useful local evidence regarding the health burden faced by brick kiln workers. The findings suggested that respiratory complaints and musculoskeletal symptoms were common and were associated with several quality-of-life domains. Future studies should include larger and more diverse samples, older age groups, objective respiratory assessment such as spirometry, detailed exposure measurement, ergonomic evaluation and multivariable analysis to adjust for smoking, work duration, job category and body mass index. Longitudinal studies would also help clarify whether prolonged exposure to brick kiln work contributes to progressive respiratory impairment, persistent musculoskeletal pain and deterioration in quality of life over time.

CONCLUSION

The study concluded that brick kiln workers experienced a noticeable burden of respiratory and musculoskeletal symptoms, which was associated with poorer quality of life. Continuous exposure to dust, smoke and hazardous emissions, along with prolonged working hours and physically demanding tasks, appeared to contribute to these health problems. The findings highlight the need for workplace safety measures, routine health screening, protective equipment, ergonomic improvements and early rehabilitation support to reduce occupational health risks and improve the well-being of brick kiln workers.

AUTHOR CONTRIBUTION

Author	Contribution
Fatima Farrukh	Substantial contribution to study design, analysis, acquisition of Data, Manuscript Writing, Has given Final Approval of the version to be published
Walna Ali	Substantial contribution to study design, collection of Data, Manuscript Writing, Has given Final Approval of the version to be published
Maryam Safdar	Substantial contribution to data analysis, write up proof reading, Has given Final Approval of the version to be published
Malaika Khaliq	Substantial contribution to collection of data and interpretation of data, Has given Final Approval of the version to be published
Aiza Nasir	Substantial Contribution to study design and Data Analysis, Has given Final Approval of the version to be published

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