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ORIGINAL ARTICLE

Occupational health hazards, health conditions and safety measures among sanitation workers in Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Objectives: To assess the prevalence of occupational injuries and diseases among sanitation workers in Pakistan, and to evaluate their attitudes toward occupational health hazards and practices regarding the use of personal protective equipment (PPE).

Methods: This cross-sectional study was conducted from July to December 2021 among 502 permanently employed sanitation workers from five districts of Khyber Pakhtunkhwa (KP), Pakistan. Data were collected using a self-constructed, piloted questionnaire covering sociodemographics, occupational health problems, attitudes, and PPE use. Analysis was performed using SPSS version 22, with Chi-square tests applied for associations.

Results: The mean age of participants was 35.7±7.9 years; most were male (97%), married (88.6%), and had education below secondary school. Reported communicable diseases included dengue (50%) typhoid (14.4%), and hepatitis C (5.4%). Hospital admissions were primarily due to eye problems (17.5%) accidental injuries/falls (14.0%) and skin diseases (11.3%) with burns allergies, and sharps injuries also noted. Only 23.1% of sanitation workers reporte consistent use of PPE and 14.7% had witnessed a co-worker's death during duty. The majority (77%) bore healthcare expenses out-of-pocket. Significant associations were observed between work experience and frequency of occupational diseases/injuries (p=0.005).

Conclusion: Sanitation workers in KP are exposed to multiple occupational health hazards, compounded by low literacy, poor awareness, and inadequate use of PPE. Lack of structured health coverage and financial protection further exacerbate their vulnerability. Implementation of occupational safety policies, provision of PPE, and comprehensive health and safety training are urgently needed to safeguard this marginalized workforce.

Keywords: Occupational Health (MeSH); Safety (MeSH); Hazards (MeSH); Sanitary worker (Non-MeSH); Wounds and Injuries (MeSH); Injuries (MeSH); Health conditions (Non-MeSH); Health (MeSH); Sanitation workers (Non-MeSH); Personal Protective Equipment (MeSH).

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INTRODUCTION

Occupational health is a multidisciplinary field aimed at ensuring the highest standards of health, safety, and well-being for workers in their workplaces. Occupational diseases and injuries contribute substantially to the global disease burden adversely affecting workers' health reducing productivity, undermining economic growth and destabilizing social systems.[1]

Globally more than 2.9 billion workers are at risk of diverse occupational hazards, including physical, mechanical, chemical, biological, and psychosocial exposures. According to the World Health Organization (WHO) and the International Labour Organization (ILO), occupational injuries account for 140,000 to 355,000 deaths annually.[2] Among the most marginalized groups are sanitation workers who face multiple hazardous exposures such as chemicals endotoxins, and bioaerosols, placing them at risk of respiratory problems and chronic lung diseases.[3]

According to the World Health Organization (WHO), sanitation work encompasses tasks such as emptying toilets, pits, and septic tanks; entering manholes and sewers for repairs or unblocking; transporting faecal waste; operating treatment plants; and cleaning public toilets or areas around homes and businesses.[4] These workers operate in highly hazardous environments, often entering confined spaces and facing exposure to dangerous agents that can be fatal. Alarmingly sanitation workers experience casualty rates twice as high as police officers and nearly seven times higher than firefighters.[5]

Rapid urbanization has resulted in expanding populations and increasing sanitation challenges including excessive garbage dirty roads and blocked drains. Sanitation workers are particularly vulnerable to cuts, bruises, and needlestick injuries in the course of their duties. These occupational exposures contribute to a wide range of health problems such as dermatological, gastrointestinal respiratory, musculoskeletal and orthopaedic conditions.[6] Poor waste segregation and inadequate sanitary infrastructure further exacerbate the problem, leading to indiscriminate disposal of garbage on streets and exposing workers to dirt, infections, chemicals, sharp objects, and animal excreta. Disease transmission occurs through two main pathways: environmental exposure (waterborne, airborne, and direct contact) and specific contact pathways involving pathogens such as hepatitis B virus human immunodeficiency virus an clostridium tetani.[7] Sanitation workers

are at disproportionately high risk of gastrointestinal illness due to exposure to contaminated water, experiencing on average at least one episode of gastroenteritis per person annually. The gastrointestinal disease burden among those exposed to wastewater is estimated to be 2.8 times higher than the diarrheal disease burden in the general population of Vietnam.[8] Furthermore, evidence shows that sanitation workers have significantly higher odds of hepatitis A infection with a pooled estimate of 2.09 (95% Predicted Interval: 1.39–3.00).[9]

In Pakistan, little research has explored the occupational health and safety of sanitation workers. A tragic incident in Sargodha, where two workers were asphyxiated while cleaning a sewage line, highlights the urgency of this issue.[10] Addressing the global burden of occupational hazards among this vulnerable group requires mapping their working conditions and conducting targeted research, particularly in developing countries like Pakistan. This study aimed to determine the prevalence of occupational injuries and diseases among sanitation workers and to evaluate their attitudes and practices regarding occupational health hazards and the use of personal protective equipment (PPE).

METHODS

Study design and setting: Shifa Tameer-e-Millat University, in collaboration with the Integrated Regional Support Programme (IRSP), conducted a cross-sectional survey among sanitation workers. A self-constructed, mixed-format questionnaire was administered to 502 permanently employed workers from five districts of Khyber Pakhtunkhwa (Peshawar, Mardan, Swat, Swabi, and Abbottabad) (Figure 1). Data collection was carried out over a six-month period, from July to December 2021.

Sample size and technique: Using WHO sample size calculator with confidence level 95%, anticipated population proportion 50, absolute precision 4%, our sample size was calculated 462 (round off 500). Non-probability convenient sampling technique was used to collect data from 502 sanitation workers.

Data collection tool and procedure: Data were collected by trained IRSP staff from five districts of KP after obtaining informed consent. The self-constructed questionnaire was developed through an extensive literature review and expert input. It was piloted with 10 participants, whose feedback guided revisions to improve clarity, logical flow, content relevance, and completion time resulting in a refined and validated instrument for the main study.

Initially designed in English it was translated into Urdu and back-translated to ensure linguistic and conceptual equivalence. Data collectors received proper training to standardize procedures and minimize errors or missing information. The final questionnaire included sections on sociodemographic characteristics, attitudes and practices occupational injuries and diseases and use of PPE, with the Urdu version administered to participants.

Statistical analysis: Data were analyzed using SPSS version 22. Means and standard deviations were calculated for quantitative variables while frequencies and percentages were reported for qualitative variables. Associations were tested using the Chi-square test, with a p-value <0.05 considered statistically significant.

Figure 1: Map of KP, Pakistan showing 5 districts from where data was collected

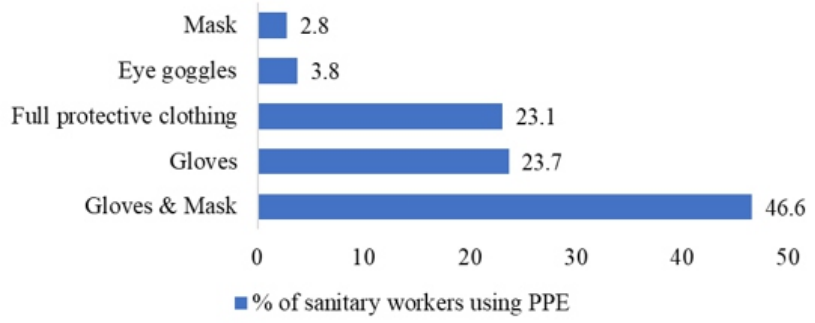

Figure 2: Use of PPE among sanitation workers

Ethical considerations: Ethical approval was obtained from the Institutional Review Board and Ethical Committee (IRB&EC) of Shifa Tameer-e-Millat University, Islamabad (letter #010-830-2020, dated February 22, 2020). Written informed consent was obtained from all participants prior to data collection.

RESULTS

The mean age of participants was 35.7±7.9 years; most had education below secondary school, and all were employed full-time. The majority (85%) were from Mardan and Peshawar. Sociodemographic characteristics are summarized in Table I.

Occupational health attitude and practices: Table II summarizes the occupational health attitudes and practices of sanitation workers. Most participants (96.7%) did not report work-related stress due to low salaries (p=0.009) and 93% were granted paid sick leave. While 52.8% expressed willingness to continue their jobs, a significant proportion of workers (n=234; 46.6%) aged 31–40 years indicated a preference to change their occupation (p=0.008).

Occupational injuries/Illnesses: Sanitation workers reported hospital admissions primarily for eye problems (17.5%) accidental injuries or falls (14.0%) and skin diseases (11.3%), with smaller proportions affected by burns (4.9%), allergies (4.0%), sharps-related cuts (4.1%) cold-related conditions (2.2%) asthma (1.5%), heat stroke (1.5%) chemical injuries (0.8%), and gas inhalation (0.4%); other causes accounted for 37.8%. Reported communicable diseases included dengue (50%), typhoid (14.4%), and hepatitis C (5.4%), along with malaria, cholera abdominal pain hepatitis B and tuberculosis.

A significant association was found between work experience and the frequency of occupational injuries or diseases (p=0.005), as shown in Table III. However, no significant difference was observed between work experience and hospitalization rates due to occupational health issues. Despite these risks, most workers (n=460; 91.6%) reported being healthy and not receiving any treatment, likely reflecting limited health awareness. Fewer than 1% were on medication for tuberculosis, diabetes, heart disease, hepatitis or thyroid disorders while 3% and 2% reported treatment for chest infections and hypertension, respectively.

Table I: Sociodemographic characteristics of sanitation workers (n=502)

Characteristics		Frequency (%)
Age (years)	<20	3 (0.6)
	20-30	147 (29.3)
	>30-40	234 (46.6)
	>40-50	84 (16.7)
	>50	34 (6.8)
Gender	Male	487 (97)
	Female	15 (3)
Marital Status	Single	57 (11.4)
	Married	445 (88.6)
Residential Area	Abbottabad	15 (3)
	Mardan	188 (37.5)
	Peshawar	240 (47.7)
	Swabi	18 (3.6)
	Swat	41 (8.2)
Work Experience (years)	<10	324 (64.5)
	10-20	133 (26.5)
	>20	45 (9)
Monthly Income (PKR)	<20,000	178 (35.5)
	20,000-30,000	269 (53.5)
	31,000-40,000	49 (9.8)
	>40,000	6 (1.2)

n: Frequency

Use of personal protective equipment: Figure 2 illustrates the provision and utilization of PPE among sanitation workers. Almost 47% of the sanitation workers used masks with or without gloves. Despite the context of the COVID-19 pandemic, overall PPE usage remained low at 23.1%, with no statistically significant association observed (p=0.069). Notably, the incidence of work-related illnesses or injuries among participants was minimal.

DISCUSSION

This study was carried out with the aim to identify the attitude and practices regarding occupational health hazards and safety among sanitation workers, along with the prevalence of different occupational health injuries and diseases. Results of our study showed that workers are prone to several occupational health hazards, and no proper measures were being followed regarding occupational safety. Most of the sanitation workers were male and it was in synchronous with other studies, which also had either no or less number of female sanitation workers.[11] The large number of males in this study might be due to cultural norms and the fact that usually males are the breadwinners of their families in KP. Regarding their level of education, in our

Table II: Occupational health attitude and practices of sanitation workers

Occupational Health Attitude and practices		Frequency (%)
How many hours per week do you work?	Less than 36	218 (43.4)
	37-48	276 (55)
	49-60	7 (1.4)
	More than 60	1 (0.2)
How many Holidays/ leaves do you avail per year?	Less than 10	125 (24.9))
	11-20	289 (57.5)
	21-30	41 (8.2)
	More than 30	47 (9.4)
Why are you doing this work?	I like it	80 (15.9)
	I have no other option	370 (73.7)
	My parents/family want me to do it	24 (4.8)
	My parents were also doing same work	28 (5.6)
Have you ever witnessed death of a co-workers while performing his/her duty?	Yes	74 (14.7)
	No	428 (85.3)
How many times have you encountered any disease / illness /injury while doing your work?	Once a month	18 (3.6)
	Once during the last 3 months	7 (1.4)
	Once during the last year	21 (4.2)
	Once during this job	36 (7.2)
	Never	420 (83.6)
Who covers the healthcare expenses?	Self	385 (76.7)
	Government	116 (23.1)
	Employer	1 (0.2)

study all the participants were below secondary compared to a study from Assiut city, where 70.2% were illiterate.[12] Although literacy rate in Pakistan is low, our study participants were not illiterate, which may be due to eligibility criteria for getting full time employment.

Most of the participants (76%) of our study were from younger age groups 20-40 years compared to another study conducted on the morbidity profile of street sweepers (age group 30-50 years old). [13]

The monthly income of sanitation workers in our study was higher than that reported in Ethiopia, though differences in socioeconomic context and inflation rates must be considered.[14]

Most participants (64.5%) had less than 10 years of work experience, contrasting with a study in which the majority had over 10 years of experience.[15] No health insurance or financial coverage was available to the sanitation workers, and more than 75% of workers reported taking only 10-20 days off annually, well below the 28 days of leave mandated under Pakistan's labour laws, which include 14 days of paid annual leave and approximately 14 public holidays. Similar findings have been reported from Nepal, where sanitation workers often rely on home remedies, seek medical care only if symptoms persist and are granted sick leave only in emergencies, with minor injuries typically left untreated.[16] Most occupational injuries and diseases acquired by the participants were due to accidental falls and skin diseases, while less than 5% reported pulmonary issues.[17] A study from India also described that injuries and chest pain were the most commonly reported illnesses. In a study from Iran, physical and psychological workload was 39% and 36.5% respectively. In the same study, musculoskeletal disorders were reported in 92.5% of waste collectors at least in one part of body during the last one year.[18] Two other studies reported that the most common illnesses are respiratory problems (15% and 50.7% respectively) besides other health problems.[8,19] The frequency of skin diseases in our study is (11.3%), burns (4.9%), allergies (4.0%), while similar high frequency was found in a study done in China on occupational skin diseases among sanitation workers.[7] Another study done in India also reported numerous health problems such as gastrointestinal diseases, skin issues, orthopaedic problems and respiratory diseases among 70% of sanitation workers.[14] Other health problems include a significantly higher risk of developing musculoskeletal disorders among street sweepers in a study done by Lin WY, et al.[20]

Majority of the participants, in our study were provided with some form of personal protective gear but only 23.7% used gloves, 2.8% masks, 3.8% eye goggles, 46.6% used both masks and gloves and only 23.1% sanitation workers used full PPE. This is consistent with another study from Egypt which reported use of safety boots 42.9%, gloves 24.3% full PPE 7.1%.[21]

The low use of PPE may be attributed to lack of awareness regarding its benefits and the habit of working without protective equipment. This finding is consistent with a study in Ethiopia, where although 70.4% of respondents reported having PPE such as masks, gloves, aprons and boots, only 3.7% had full PPE.[22] Similarly, Eneyew B, et al., reported that 59.5% of street sweepers and 58.3% of door-to-door waste collectors used masks, while 65.5% and 81.0% respectively used gloves.[23] Another study from Addis Ababa demonstrated that the odds of injury were 2.62 times higher among workers not using PPE compared to those who did.[24]

Table III: Association between Occupational diseases/injuries and work experience

Occupational Health diseases/injuries		Work Experience			p-value
		Less than 10 years n (%)	10-20 years n (%)	More than 20 years n (%)	
Number of times any disease / illness /injury has been encountered while doing work	Never	281 (55.98)	80 (15.94)	35 (6.97)	0.005
	Once a month	13 (2.59)	1 (0.20)	1 (0.20)	
	Once during the last 3 months	4 (0.80)	3 (0.60)	0 (0)	
	Once during the last year	9 (1.79)	7 (1.39)	4 (1.39)	
	Once during this job	15 (2.99)	15 (2.99)	5 (1)	
	NA*	7 (1.39)	14 (2.79)	8 (1.59)	
Length of hospitalization for occupational disease / illness/ injury	Less than 3 days	118 (23.51)	20 (3.98)	5 (1)	0.001
	4 -7 days	21 (4.18)	16 (3.19)	7 (1.39)	
	>7 –14 days	3 (0.60)	3 (0.60)	1 (0.20)	
	>14 days-Up to a month	1 (0.20)	1 (0.20)	0 (0)	
	NA	193 (38.45)	66 (13.15)	32 (6.37)	
Number of times admitted to the hospital	Once	107 (21.31)	24 (4.78)	3 (0.60)	0.013
	Twice	44 (8.76)	15 (2.99)	6 (1.20)	
	Thrice	5 (1)	4 (0.80)	2 (0.40)	
	More than 3 times	2 (0.40)	0 (0)	1 (0.20)	
	NA	100 (19.92)	143 (28.49)	46 (9.16)	
Known diseases / illnesses	High blood pressure	3 (0.60)	6 (1.20)	2 (0.40)	0.002
	Chest Infections	7 (1.39)	1 (0.20)	0 (0)	
	Orthopaedic	0 (0)	1 (0.20)	0 (0)	
	Diabetes	1 (0.20)	2 (0.40)	1 (0.20)	
	Heart problems	4 (0.80)	5 (1)	0 (0)	
	Tuberculosis	2 (0.40)	0 (0)	0 (0)	
	Thyroid problems	0 (0)	2 (0.40)	0 (0)	
	Nutritional deficiencies	1 (0.20)	3 (0.60)	0 (0)	
	NA	318 (63.35)	86 (17.13)	42 (8.37)	

*NA: Not Available

Limitations of the study

In this study, 85% of the data were collected from Mardan and Peshawar, with the remaining 15% from other districts, based on participant availability. Although the distribution was uneven, sanitation workers generally face similar working conditions across the region, which minimizes the impact of this variation on the validity of the findings. A key limitation, however is the use of non-probability convenience sampling, which may introduce sampling bias and limit the generalizability of the results.

CONCLUSION

Sanitation workers in Khyber Pakhtunkhwa province of Pakistan face multiple occupational health hazards, exacerbated by low literacy, poor awareness and limited use of PPE. The lack of health coverage financial protection, and adequate workplace safeguards further heightens their vulnerability. To address these gaps, there is an urgent need for targeted training programs on occupational safety, including proper use of PPE and basic first aid, alongside regular medical examinations. Government policies must ensure health coverage, entitlement to paid leave, and strict enforcement of occupational safety regulations, so that sanitation workers can exercise their fundamental right to a safe and healthy work environment.

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AUTHORS' CONTRIBUTION

The Following authors have made substantial contributions to the manuscript as under:

UKK: Conception and study design, acquisition of data, critical review, approval of the final version to be published

FS: Conception and study design, critical review, approval of the final version to be published

SNS & QA: Acquisition of data, drafting the manuscript, critical review, approval of the final version to be published

HR: Analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

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