

Original Research Article

Occupational health hazards, knowledge and preventive practices among manual scavengers in Kanpur, Uttar Pradesh: a cross-sectional study

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Received: 19 September 2026

Accepted: 13 October 2026

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ABSTRACT

Background: Manual scavenging continues to expose workers to serious chemical, physical, and biological hazards despite legal restrictions in India. These risks are intensified by poor protective practices and limited occupational health support. Aim was to assess occupational health hazards, knowledge, and preventive practices among manual scavengers and to examine their association with selected demographic variables.

Methods: A descriptive cross-sectional study was conducted among 100 manual scavengers in Kanpur using purposive sampling. Data were collected through a structured interview schedule including self-reported occupational health hazards assessment, knowledge, and preventive practices. Data were analysed using descriptive statistics, Pearson's correlation, and chi-square test.

Results: Chemical, physical, and biological hazards were commonly reported. Moderate knowledge was found in 61% of participants with mean knowledge score of 15.1 ± 3.21 , while poor preventive practices were observed in 49%. Biological hazards showed a significant negative correlation with knowledge ($r = -0.201$, $p = 0.044$) while knowledge and preventive practices were significantly associated with age, education, type of work, work experience, family size, and gender.

Conclusions: Manual scavengers in Kanpur experience substantial occupational risk with inadequate preventive practices. Targeted occupational health education, provision of protective equipment, and policy-level support are urgently needed.

Keywords: Knowledge, Manual scavengers, Occupational health hazards, Preventive practices, Sewer workers

INTRODUCTION

Manual scavenging is widely recognized as one of the most hazardous, degrading, and socially marginalized occupations worldwide.¹ In India, manual scavenging has been a persistent issue for many years. Although this practice was officially prohibited in India in 1993, it still exists in various parts of the country. According to the International Labour Organization manual scavenging includes three activities in India: (a) removal of human excreta from public streets and dry latrines, (b) cleaning septic tanks, (c) cleaning gutters and sewers. Although prohibited in India since 1993, the practice persists in

many regions due to poverty, social exclusion, limited alternative employment opportunities and weak enforcement of laws.²

According to the Socio-Economic and Caste Census (SECC) 2011, approximately 180,657 households in India depended on manual scavenging as their primary source of livelihood. Among the states, Maharashtra reported the highest number of manual scavenger households (63,713), followed by Madhya Pradesh, Uttar Pradesh, Tripura, and Karnataka.³ In India, the type of work related to cleanliness is connected to caste. Jobs like manual scavenging, drain cleaning, garbage collection,

and road sweeping are seen as low and they are usually assigned to Dalits, the lowest group. Around 40 to 60% of Dalit household estimated in 2019 are involved in sanitation worker.⁴ The working condition of the sanitary workers have remained virtually unchanged over a century, with many workers using only basic tools such as stick broom and tin plate to remove waste, often carrying it in baskets on their heads.⁵

Occupational exposure among manual scavengers encompasses physical, biological, chemical, and psychosocial hazards. Physical hazards include repetitive heavy lifting, awkward postures, prolonged squatting, slips, falls, musculoskeletal injuries, and accidental trauma during sewer or septic tank cleaning. Biological exposure results from direct contact with human excreta containing pathogenic bacteria, viruses, fungi, and parasites, predisposing workers to gastrointestinal infections, dermatological disorders, hepatitis, leptospirosis, and tuberculosis. The chemical risks are caused by inhalation of toxic gases like hydrogen sulfide, methane, ammonia, and carbon monoxide produced in the narrow sewer spaces and cause acute poisoning, chronic respiratory illnesses, unconsciousness and death as a result of asphyxiation.⁶⁻⁹

Manual scavengers have a much lower life expectancy as compared to the national average. Many die prematurely due to chronic illness or accidents while working in hazardous environments. The average life expectancy of a sanitation workers is below 50 years, with many men who clean sewage drains and septic tanks dying before the age of 40 years.¹⁰ An analysis of data between 2017-18, by National commission for safai karamcharis, revealed that the average age at the time of death was just 32 years.¹¹ The cause of death is predominantly occupational like asphyxiation in a septic tank, drowning in sewage, tuberculosis, cholera, meningitis and various cancers.¹²

The occupational health burden among manual scavengers is compounded by inadequate use of personal protective equipment, lack of safety training, and poor awareness of occupational health hazards, thereby increasing vulnerability to long-term health problems.⁵ Therefore, the present study was undertaken to assess occupational health hazards, knowledge, and preventive practices among manual scavengers in Kanpur and to determine the relationship between these variables and selected demographic factors.

METHODS

Study design and setting

A descriptive cross-sectional design was used to assess occupational health hazards, knowledge, and preventive practices among manual scavengers working in Kanpur, Uttar Pradesh. This design was considered appropriate because it enabled systematic assessment of existing occupational health conditions and preventive behaviors

among manual scavengers without manipulating any variables. The study was conducted in Kanpur, Uttar Pradesh, India. Kanpur is the one of the largest industrial and urban centers in northern India and employs a considerable number of manual scavengers involved in sewer cleaning, septic tank cleaning, public toilet cleaning, and related sanitation work. Since manual scavengers were still performing their manual sanitation tasks in the town, though they had been banned by the law, Kanpur was deemed the right location to explore the occupational health risks of manual scavengers.

Study population

The sample population was that of manual scavengers who were involved in sanitation related jobs in Kanpur Municipal Corporation and related sanitation services. The population available was the manual scavengers who were in their work places at the time of data collection and met the eligibility criteria.

Sample size

There were 100 manual scavengers who were involved in the study.

The single population proportion formula was used to estimate the sample size:

$$n = \frac{Z^2 P(1 - P)}{e^2}$$

where:

Z=1.96 at 95% confidence interval

P=63.7%, according to a past study which showed occupational health issues among municipal solid waste handlers.

e=10% allowable error

The estimated sample size 89 was considered to be rounded to 100 subjects to make it easy to gather all the data and perform statistical procedures.

Sampling technique

The non-probability purposive sampling method was observed to recruit the participants. This approach facilitated inclusion of workers who had direct experience of doing manual scavenging duty and had occupational exposure. The subjects were chosen according to their availability and readiness to take part, as well as the inclusion and exclusion criteria applied by the researchers. As the research was based on an occupation with limited reach, purposive sampling proved to be a viable method to get the proper respondents.

Inclusion criteria

Participants who: had been engaged in manual scavenging or sanitation work for at least six months; were aged 18 years or above; were available during the data collection period; and voluntarily agreed to participate by providing written informed consent.

Exclusion criteria

Participants who: declined to participate; were seriously ill during data collection; or were unavailable despite repeated visits.

Data collection tools

The structured interviewer administered questionnaire was used to gather data based on an extensive examination of published literature. The tool was reviewed by experts from nursing, medicine, and social sciences to ensure adequacy, transparency, suitability and relevance. The suggestions from the experts were incorporated before final use. The instrument consisted of four sections.

Section I: sociodemographic characteristics

Information regarding age, gender, religion, educational status, type of sanitation work, work experience, family size, generation of family involved in sanitation work, and daily working hours in manual scavenging was collected.

Section II: occupational health hazard assessment

Occupational health hazards were assessed using a self-reported occupational health assessment proforma comprising 17 items distributed into three domains: chemical hazards (5 items), physical hazards (5 items), biological hazards (7 items).

Participants reported whether each health problem was: present at the time of interview (2), experienced during the previous six months (1), never experienced (0). Each response was scored according to predetermined criteria, and cumulative scores were categorized as: no hazard (0), insignificant hazard (1-30%), significant hazard (30-60%), major hazard (>60%)

Section III: knowledge questionnaire

Knowledge regarding occupational health prevention was assessed using a 25-item structured multiple-choice questionnaire covering: musculoskeletal disorders, respiratory problems, skin diseases, gastrointestinal illnesses, and general occupational safety measures.

Each correct response was awarded one mark, while incorrect responses received zero marks. Total knowledge scores ranged from 0 to 25.

Section IV: preventive practice questionnaire

Preventive practices were assessed using a 7-item Likert type questions addressing use of personal protective equipment (PPE) and hygiene. Each item was scored on a three-point scale. Practice score was categorized as: poor, moderate and good practice.

Data collection procedure

Administrative permission was sought in the Municipal Corporation and Jal Kal Department, Kanpur before its commencement. The period of data gathering was 14 October 2024 to 30 November 2024. The interviews were held between 10:00 am and 3:00 pm and the average time of the interview was 20 minutes.

The eligibles were approached one-on-one in their workplaces. The aims of the study were clarified using their local language and informed consent in writing was obtained prior to taking part in the study.

The structured questionnaire was used to carry out face-to-face interviews. The data entered was verified to the completed questionnaires on a daily basis as far as completeness and consistency were concerned. The responses were recorded in a systematic fashion and inputted into a master sheet to be analyzed.

Ethical consideration

The Institutional Ethics Committee of the College of Nursing gave its ethical approval (approval number-637/CN/2024, dated 27 June 2024). Data collection was done following administrative permission, granted by JalKal Vibhag and the Municipal Corporation of Kanpur.

Participation was entirely voluntary. A written informed consent was obtained from every participant after explaining the purpose of the study, confidentiality measures, and the voluntary nature of participation. The participants were informed that they could withdraw from the study at any stage without any adverse consequences. Confidentiality and anonymity were maintained throughout the study by assigning unique identification codes and securely storing study records.

RESULTS

Demographic profile

A total of 100 manual scavengers participated in the study. The majority of participants were 34 years or older (53%), followed by those aged 29-33 years (18%). Most respondents were male (94%) and Hindu (94%). Nearly half (47%) had completed primary education, whereas 43% had no formal education. Sewer and gutter cleaning constituted the predominant occupation (67%), followed by sweeping (17%) and septic tank cleaning (13%). Nearly half had up to 5 years of work experience, and

74% were first-generation workers in the occupation. All participants reported working for 8 hours per day (Table 1).

Table 1: Sociodemographic characteristics of study participants (n=100).

Characteristics	Category	N (%)
Age (years)	18-23	14 (14)
	24-28	15 (15)
	29-33	18 (18)
	≥34	53 (53)
Gender	Male	94 (94)
	Female	6 (6)
Religion	Hindu	94 (94)
	Muslim	5 (5)
	Christian	1 (1)
Educational status	No formal education	43 (43)
	Primary school	47 (47)
	Middle school	8 (8)
	High school	2 (2)
Type of work	Sewer/gutter cleaning	67 (67)
	Sweeping	17 (17)
	Septic tank cleaning	13 (13)
	Cleaning human excreta from streets	3 (3)
Work experience	≤5 years	48 (48)
	5-10 years	14 (14)
	11-15 years	26 (26)
	16-20 years	12 (12)
No. of family members	1-2	4 (4)
	3-4	42 (42)
	5-6	42 (42)
	7-8	12 (12)
Generation involved	First generation	74 (74)
	Second generation	25 (25)
	Third generation	1 (1)

Table 2: Distribution of occupational health hazards among manual scavengers.

Hazard category	No hazard N (%)	Insignificant N (%)	Significant N (%)	Major hazard N (%)
Chemical hazards	32 (32.0)	25 (25.0)	23 (23.0)	20 (20.0)
Physical hazards	13 (13.0)	31 (31.0)	41 (41.0)	15 (15.0)
Biological hazards	21 (21.0)	35 (35.0)	29 (29.0)	14 (14.0)

Biological health problems

Cut wounds were the most common biological hazard-related condition, affecting 59% of participants either currently or during the previous six months. Gastrointestinal symptoms were also common, with nearly half reporting abdominal pain, diarrhoea, or vomiting. Dermatological conditions including skin rashes and allergies were frequently observed among manual scavengers (Table 3).

Occupational health hazards

Overall occupational health hazards

The findings showed substantial exposure to occupational health hazards. Physical hazards constituted the most frequently reported occupational risk. Overall, 41% of participants experienced significant physical hazards, compared with 29% who experienced significant biological hazards and 23% who experienced significant chemical hazards. Major hazards were reported by 20%, 15%, and 14% of participants for chemical, physical, and biological hazards, respectively (Table 2). The most common occupational exposure was in the form of physical hazards, which underscored the physically challenging essence of manual scavenging.

Chemical health hazards

Respiratory complaints were common among participants. Cough was the most frequently reported symptom, with 64% of workers reporting either current cough or cough during the previous six months.

Half of the participants experienced shortness of breath at some point, while wheezing affected 45%. Approximately one-third experienced nasal irritation or throat infection (Table 3).

Physical health hazards

Bruises, joint pain, lower back pain, wrist pain, and generalized body aches were commonly reported among the workers. Approximately two-thirds had experienced bruises, while more than 60% reported joint pain. Nearly half experienced lower back pain, and 41% reported wrist pain (Table 3).

Knowledge and preventive practices of manual scavengers

Most of the participants had moderate knowledge on prevention of occupational health problems. In particular, 61 percent were in the moderate level of knowledge, 36 percent were good in knowledge and 3 percent were poor in knowledge. The occupational health risk knowledge mean score was 15.1 ± 3.21 , out of the possible maximum score of 25, which indicates that the participants were not

uniformly well informed of occupational health risks and thus a lot more needs to be done in enhancing the knowledge of the participants in relation to occupational

health risks by engaging in well-organized occupational health education programmes.

Table 3: Prevalence of occupational hazards-related health problems among manual scavengers (n=100).

Health problem	Current N (%)	Previous 6 months N (%)	Ever affected (%)	Never affected (%)
Chemical hazards				
Cough	17 (17.0)	47 (47.0)	64.0	36 (36.0)
Shortness of breath	20 (20.0)	30 (30.0)	50.0	50 (50.0)
Wheezing	19 (19.0)	26 (26.0)	45.0	55 (55.0)
Nasal irritation	21 (21.0)	13 (13.0)	34.0	66 (66.0)
Throat infection	18 (18.0)	16 (16.0)	34.0	66 (66.0)
Physical hazards				
Bruises	29 (29.0)	37 (37.0)	66.0	34 (34.0)
Joint pain	30 (30.0)	31 (31.0)	61.0	39 (39.0)
Lower back pain	29 (29.0)	20 (20.0)	49.0	51 (51.0)
Wrist pain	32 (32.0)	9 (9.0)	41.0	59 (59.0)
Body aches	33 (33.0)	13 (13.0)	46.0	54 (54.0)
Biological hazards				
Skin rashes	21 (21.0)	21 (21.0)	42.0	58 (58.0)
Acne	20 (20.0)	16 (16.0)	36.0	64 (64.0)
Skin allergy	17 (17.0)	22 (22.0)	39.0	61 (61.0)
Cut wounds	27 (27.0)	32 (32.0)	59.0	41 (41.0)
Abdominal pain	32 (32.0)	17 (17.0)	49.0	51 (51.0)
Diarrhea	29 (29.0)	15 (15.0)	44.0	56 (56.0)
Vomiting	31 (31.0)	13 (13.0)	44.0	56 (56.0)

Table 4: Knowledge and practices regarding prevention of occupational health problems (n=100).

	Max Score	Mean score	SD	Pearson's 'r'	P value
Knowledge	25	15.1	3.21	0.128	0.206
Practice	14	4.94	4.72		

Preventive practice was weaker than knowledge. Nearly half of the respondents i.e. 49% of the respondents practiced poorly, 34% moderately and only 17% practiced well in preventive practice. The mean practice score was 4.94 ± 4.72 . The standard deviation is rather large which shows a significant difference in the real safety behaviour of the participants (Table 4). Pearson correlation analysis showed that there was a weak positive correlation between knowledge and practice scores ($r=0.128$); although the correlation was not statistically significant ($p=0.206$). These results indicate that the level of knowledge of the participants on the subject of occupational health hazards did not have a significant impact on the reported preventive behaviors by the participants (Table 4).

DISCUSSION

This paper evaluated the occupational health risks, knowledge and prevention practices among the manual scavengers in Kanpur, Uttar Pradesh. These results indicate that the occupational exposure of manual

scavengers to physical, biological and chemical risks is still significant even though laws have banned manual scavenging in India. Despite the fact that most of the participants had moderate occupational health prevention knowledge, preventive practices were still deficient showing the constant gap between occupational health awareness and the adoption of safe occupational behaviours.

Sanitary workers commonly experience musculoskeletal pain, injuries, skin problems, and respiratory complaints due to unsafe working conditions. Studies conducted among sanitation workers revealed that most common issues among sanitary workers were body aches, tiredness and headaches.^{5,12} Similarly, the present study found that manual scavengers were exposed to significant to major physical, biological, and chemical hazards, including body aches, skin infections, wounds, coughing, and shortness of breath. These findings highlight the need for regular health check-ups, proper use of personal protective equipment, and occupational health education to reduce occupational health risks among manual scavengers.¹²

The present study found that manual scavengers had moderate knowledge related to occupational hazards. A study conducted to assess knowledge, attitude and practices on occupational hazards among sanitary workers reported that 58% of sanitary workers had poor knowledge, 39% had average knowledge, and only 3% had excellent knowledge regarding occupational hazards. The findings indicate that the overall level of knowledge among sanitary workers was inadequate, highlighting the need for regular health education and occupational safety training to improve awareness of occupational hazards and preventive measures.¹³ Inadequate awareness, limited training, discomfort while using PPE, and low educational status contributed to unsafe work practices leading to many occupational hazards.¹⁴

Manual scavengers are mainly involved in cleaning of septic tanks, drains and sewer systems and in most cases, they are required to crawl or in some instances, to dive into them. These jobs are often done without proper personal protective gear and they expose the employee to a lot of physical, biological and chemical risks.¹⁵ In the research article, “still cleaning with bare hands”, manual scavengers were still working in the unsafe conditions without having the proper personal protective equipment, which subjected them to various occupational health risks. The report highlights that inadequate safety measures and scarcity of protective measures are augmenting the potential of injuries and work-related illness.¹⁶ The results are also in line with the current study which also noted that there was poor preventive behavior among manual scavengers and there was a need to conduct continuous awareness programmes, skill based training and proper provision and proper use of personal protective equipment to enhance occupational safety.

The level of knowledge and practices of manual scavengers was found to have a positive relationship in the current study but this was statistically insignificant. In one of the studies, they carried out on street cleaners in Sohag City, it was reported that they had different occupational health issues as a result of being exposed to physical, chemical, and biological hazards in their workplace. The investigation observed a statistically significant positive relationship between knowledge and practice, which meant that more knowledgeable workers had the tendency of adhering to the right preventive practices in occupational health. These results show that health education is vital in encouraging healthy working environments and minimizing health hazards at work.¹⁷ The percentage of participants with moderate level of knowledge was fairly high, but the practice of prevention was still low. This inconsistency is an indication that awareness does not necessarily translate to safe behaviour. Inability to translate knowledge to action may be caused by structural constraints which include inadequate protective equipment, financial strain, ineffective supervision and normalization of unsafe work. This interpretation can be supported by the weak association between knowledge and practice in the study.

The cross-sectional design does not allow the determination of causal relationship between occupational hazards, knowledge and preventive practices. Purposive sampling can restrict the applicability of the results to the outside world. The research was carried out at one city; hence, the regional differences in the occupational conditions might not be well-represented.

CONCLUSION

Manual scavengers in Kanpur experience substantial occupational risk with inadequate preventive practices. Targeted occupational health education, provision of protective equipment, and policy-level support are urgently needed.

ACKNOWLEDGEMENTS

The authors are thankful to the Principal, College of Nursing, who gave them permission to carry out the study. The Kanpur Municipal Corporation, and the Jal Kal department also assisted the authors in the administrative support. The manual scavengers gain special appreciation on how they willingly took part in the study and shared their experiences with the challenges that come with their trade.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of the College of Nursing (Approval No. 637/CN/2024, dated 27 June 2024)

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Cite this article as: Patel AK, Batra N. Occupational health hazards, knowledge and preventive practices among manual scavengers in Kanpur, Uttar Pradesh: a cross-sectional study. *Int J Community Med Public Health* 2026;13:6845-51.