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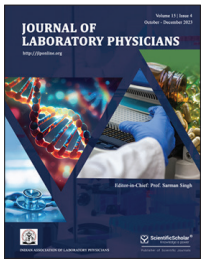

Original Article

A novel study to assess knowledge, attitude, and practices of housekeeping and sanitation workers for infection control in clinical service laboratories of a tertiary care hospital

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ABSTRACT

Objectives: This study aimed to assess the knowledge, attitudes, and practices (KAP) of health and sanitation workers (HSWs) regarding safe housekeeping and sanitary practices.

Materials and Methods: A cross-sectional study was conducted from August to October 2024 among 237 HSWs at a tertiary care hospital in Eastern India. A validated KAP questionnaire was used to assess knowledge (20 items), attitude (eight items), and practices (three items) related to hospital housekeeping and sanitation practices.

Statistical analysis: Descriptive statistics were used to summarize the participant characteristics and KAP scores. Cluster analysis identified KAP groups, while Pearson's correlation was used to examine the relationships between KAP components. Multiple regression analysis was performed to identify the predictors of KAP scores.

Results: The majority of HSWs demonstrated good KAP scores (69.2%). The mean KAP scores were 17.65 ± 2.58, 32.97 ± 2.75, and 18.16 ± 2.12, respectively. Workers in academic/residential areas had significantly higher KAP scores ($P < .001$). Pearson's correlation analysis revealed a significant positive relationship between attitude and practice ($r = 0.387$, $P = .001$) in the Intermediate KAP group. Attitude ($\beta = 0.586$, $P < .001$) and practice ($\beta = 0.182$, $P = .001$) were significant predictors of overall KAP scores.

Conclusions: This is the first study to systematically assess the KAP of HSWs in a hospital setting in India. Improving attitudes and addressing practical barriers to safe practices can enhance hospital infection control and patient safety.

Keywords: Aerosols, Attitude, Biomedical waste, Housekeeping, Immunization, Infection control, Knowledge, Practices, Sanitation workers

INTRODUCTION

Housekeeping and sanitation workers (HSWs) play a key role in maintaining cleanliness and preventing infections in healthcare environments including hospitals, offices, industries, municipalities, and clinical laboratory services. Their responsibilities in clinical settings are crucial for infection control and prevention of nosocomial infections, which pose risks to patients, healthcare workers, and the public.[1] Despite their important roles, HSWs often face significant occupational hazards and lack proper recognition of their work.

Although HSWs face unique occupational risks, they form part of a broader healthcare workforce that requires protection. Several studies have examined occupational health and safety for various healthcare workers, including HSWs, during recent epidemics and pandemics, such as COVID-19, Ebola, and severe acute respiratory syndrome (SARS).[2,3] Studies have shown that healthcare workers across different specialties face varying levels of occupational risks. For example, surgical staff have higher odds of sharps injuries, support personnel face increased risks when working overtime, and laboratory workers have significantly higher odds of occupational injury compared to other healthcare workers.[4-6] During the 2020 COVID-19 pandemic period, cleaning staff experienced a high rate of needle stick injuries (33.64%), second only to nurses (50.24%), highlighting the significant occupational risks faced by HSWs.[7] Systematic reviews have shown that HSWs, such as other healthcare workers, are at risk of occupational injuries, musculoskeletal disorders, and infectious diseases such as hepatitis and tuberculosis due to their daily exposure to healthcare waste.[8,9] Moreover, the lack of recognition and support for their work has been linked to mental health challenges including depression.[10,11]

Despite their important role, the activities are often overlooked in patient care areas. They face considerable challenges in their work environments, including potential exposure to hazardous materials due to inadequate training and resources.[12] In India, housekeeping work is generally perceived as a low-status job, often associated with stigma and discrimination due to its perceived unskilled nature.[13] This societal attitude, combined with the inherent risks of work, puts HSWs in a vulnerable position.

Given the critical nature of their responsibilities, it is essential that HSWs possess adequate knowledge, positive attitudes, and safe practices regarding housekeeping and sanitation in hospitals. Despite their important role in infection control, few studies have focused on assessing the knowledge, attitude, and practices (KAP) of HSWs in healthcare settings, particularly in low- and middle-income countries, such as India.[14]

This study aimed to examine an important but understudied group of healthcare workers by assessing the KAP of HSWs regarding safe housekeeping and sanitary practices in a tertiary care hospital in Eastern India. By identifying gaps in the KAP, this study seeks to provide insights that can inform the development of training programs and policy interventions to improve the safety and efficacy of hospital housekeeping services.

MATERIALS AND METHODS

Study design and setting

This cross-sectional study was conducted at a tertiary care hospital in Eastern India from August to October 2024. The center is a central government-run institute that provides multispecialty healthcare services.

Participants

The target population consisted of HSWs employed at the hospital through outsourcing agencies. The inclusion criteria required participants to have worked at the hospital for at least 6 months and possess basic literacy (ability to read and write in English, Hindi, or Bengali). Workers who were unavailable during the study period or declined to participate were excluded from the study.

Sample size

The sample size was calculated using the formula: $n = Z^2 P (1-P)/d^2$, where P represents the proportion of HSWs having adequate knowledge about handling healthcare waste, which was estimated at 74.4% based on a previous study,[15] and d is the margin of error set at 6%. At the 95% confidence interval, the required sample size was 207. Considering a 10% non-response rate, the final sample size was adjusted to 230 participants.

Questionnaire development

A KAP questionnaire was specifically developed for this study, following a rigorous process of literature review, expert validation, and pilot testing.[16] The questionnaire was designed to assess three key areas related to safe housekeeping and sanitation practices in hospitals: knowledge (20 items), attitude (eight items), and practices (three items) [Supplementary Table 1]. Each question was reviewed by a panel of four internal and external experts for clarity, relevance, and necessity. A content validity index threshold of 0.70 was set, and items not meeting this criterion were excluded from the study. The questionnaire was developed in English and later translated into Hindi and Bengali following a forward-backward translation process [Supplementary Tables 2 and 3, respectively]. The final questionnaire was pilot-tested on 10 HSWs to ensure clarity and usability. None of the items were revised based on a pilot study. During the data collection process, the participants were given a questionnaire in their preferred language. The exact percentages of questionnaires used in each language were not tracked.

Data collection

The data were collected using self-administered questionnaires. A total of 237 participants were recruited through purposive sampling. The study team established rapport with the HSWs and explained the purpose of the study, ensuring that the participants understood the

confidentiality of their responses. Written informed consent was obtained from all the participants. Participants were provided with a detailed information sheet and instructions on how to complete the questionnaires. The data collection process took approximately 20–25 min per participant.

Variables

The primary outcomes of interest were the KAP of HSWs regarding safe housekeeping and sanitary practices in hospitals.

KAP score determination

Knowledge was assessed using 20 items, which included 14 dichotomous (yes/no/do not know) questions and six multiple-choice questions. Each correct response received a score of "1" and incorrect responses a score of "0." The total knowledge score ranges from 0 to 20, with higher scores indicating better knowledge.

Attitude was measured through eight items using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The attitude score was calculated by summing the responses to the eight items, yielding a total score ranging from 8 to 40, with higher scores reflecting a more positive attitude toward safe housekeeping and sanitary practices.

Practices were self-reported by HSWs using a structured practice tool (three items) on a 5-point Likert scale (1 = never, 5 = always), with a total possible practice score ranging from 3 to 15. Higher scores indicated better adherence to safe housekeeping practices. The overall KAP score was calculated by summing the individual scores for knowledge, attitudes, and practices, with a potential range of 11–75.

In addition to the KAP scores, the authors also collected sociodemographic data, including age, gender, education, and work area. These variables were treated as independent variables and analyzed to explore their association with the KAP scores. The internal consistency and reliability of the KAP questionnaire were evaluated using Cronbach's alpha. The overall reliability was acceptable, with a Cronbach's alpha of 0.82 for the knowledge domain, 0.76 for attitude, and 0.73 for practices, indicating good internal consistency across all subscales.

Statistical analysis

Data were analyzed using IBM Statistical Package for the Social Sciences Statistics for Windows, Version 26.0 (IBM Corp., Armonk, N.Y.). Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the participant characteristics and KAP scores. Internal consistency of the KAP scale was measured using Cronbach's alpha (α). A two-step cluster analysis was performed to classify participants based on their KAP scores, with log-likelihood distance and Schwarz's Bayesian Information Criterion used to determine the number of clusters. Differences between clusters were analyzed using the Chi-square test for categorical variables and the independent *t*-test for continuous variables. Pearson's correlation (r) was used to examine the relationships between KAP components, and multiple linear regressions were performed to identify the predictors of KAP scores. Statistical significance was set at $P < 0.05$.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC-2024/254). All participants were informed of the study objectives, their rights as participants, and the confidentiality and anonymity of their data. Written informed consent was obtained from each participant before data collection. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (1975, revised in 2013).

RESULTS

Participant characteristics

A total of 237 HSWs participated in the study. Demographic characteristics are summarized in Table 1. The mean age of the participants was 33.44 ± 6.76 years, with the majority being male (72.6%) and married (65.8%). Workers were distributed across various areas of the hospital, including outpatient department (OPD) (42.2%), inpatient department (IPD) (15.6%), academic/residential areas (37.1%), and support services (5.1%).

KAP scores

A two-step cluster analysis was used to segment the participants into three clusters. Silhouette's measure of cohesion and separation was fair. Cluster 1 (n = 164; 69.2%) with higher mean scores was labeled as the good KAP group. Cluster 2 (n = 67; 28.3%) demonstrated moderate KAP scores, and Cluster 3 (n = 6; 2.5%) had the lowest mean scores, thus identified as the poor KAP group. However, due to the small size of Cluster 3, Clusters 2 and 3 were combined into one group, now referred to as the Intermediate KAP group.

The mean knowledge, mean attitude, and mean practice scores were 17.65 ± 2.58, 32.97 ± 2.75, and 18.16 ± 2.12, respectively [Table 2]. Participants in the good KAP group had significantly higher scores across all three domains, knowledge (18.27 ± 1.28), attitude (34.30 ± 1.14), and practices (18.91 ± 1.27), compared to those in the intermediate KAP group (n = 73, 30.8%) ($P < 0.001$ for all). Notably, a significant difference in KAP scores was observed

Table 1: Demographic profile of the housekeeping and sanitation workers (*n*=237).

Variable	Total (*n*=237)	Good KAP (*n*=164; 69.2%)	Intermediate KAP (*n*=73; 30.8%)	Chi-square value	*P*-value
	Frequency (%)	Frequency (%)	Frequency (%)		
Age					
Mean±SD	33.44±6.76	33.75±6.84	32.72±6.58	1.077	.283[c]
Gender					
Male	172 (72.6)	122 (70.9)	50 (29.1)	0.883	.347[b]
Female	65 (27.4)	42 (64.6)	23 (35.4)		
Marital status					
Unmarried	81 (34.2)	56 (69.1)	25 (30.9)	0.000	>.99[b]
Married	156 (65.8)	108 (69.2)	48 (30.8)		
Education					
Primary or less	11 (4.6)	8 (72.7)	3 (27.3)	0.443	.931[a]
Up to middle	28 (11.8)	18 (64.3)	10 (35.7)		
Secondary	150 (63.3)	104 (69.3)	46 (30.7)		
Graduation and above	48 (20.3)	34 (70.8)	14 (29.2)		
Area of work					
Outpatient department	100 (42.2)	58 (58.0)	42 (42.0)	18.612	<.001[a]
In-patient department	37 (15.6)	25 (67.6)	12 (32.4)		
Academic/residential	88 (37.1)	75 (85.2)	13 (14.8)		
Support	12 (5.1)	6 (50.0)	6 (50.0)		
TT injection					
Yes	158 (66.7)	106 (67.1)	52 (32.9)	0.990	.372[b]
No	79 (33.3)	58 (73.4)	21 (26.6)		
Hepatitis B vaccine					
Yes	86 (36.3)	62 (72.1)	24 (27.9)	0.607	.738[c]
No	110 (46.4)	75 (68.2)	35 (31.8)		
Partially	41 (17.3)	27 (65.9)	14 (34.1)		

[a]Chi-square test, [b]Fisher's exact test, [c]Independent sample t-test. KAP: Knowledge attitude and practices, TT: Tetanus toxoid, SD: Standard deviation

Table 2: Classification of knowledge, attitude, and practices of housekeeping workers into clusters.

Variable	Total	Good KAP (*n*=164; 69.2%)	Intermediate KAP (*n*=73; 30.8%)	*P*-value
Knowledge	17.65±2.58	18.27±1.28	16.26±3.90	<.001
Attitude	32.97±2.75	34.30±1.14	29.99±2.98	<.001
Practices	18.16±2.12	18.91±1.27	16.47±2.62	<.001

Independent sample *t*-test. KAP: Knowledge attitude and practices

based on the area of work, with those in academic/residential areas being more likely to have higher KAP scores ($P < .001$) [Table 1].

Correlation between KAPs

Pearson's correlation analysis showed varying relationships between KAPs across the different KAP groups. In the Good KAP group, a weak but statistically significant negative correlation was found between knowledge and practices ($r = -0.317$, $P < .001$), while the intermediate KAP group showed a moderate positive correlation between knowledge and attitude ($r = 0.372$, $P < .001$) and between attitude and practices ($r = 0.387$, $P = .001$), but no significant relationship between knowledge and practices ($P = .479$) [Table 3].

Factors influencing KAP scores

Only the statistically significant variables were incorporated into the multiple linear regression analysis to assess the

factors influencing the KAP groups. With the KAP group as the dependent variable and area of work and KAP as independent variables, an entry method with a significance level of 0.05 was used. Multiple linear regression analysis identified attitudes and practices as significant predictors of overall KAP scores [Table 4]. Attitude had the strongest positive influence (β = 0.586, $P < .001$), followed by practice (β = 0.182, $P = .001$). Knowledge and work area were not significant predictors of the model. The adjusted R^2 value for the model was 0.540, indicating that approximately 54.0% of the variance in KAP scores was explained by attitudes and practices.

DISCUSSION

This study assessed the KAP of HSWs in a tertiary care hospital in India, focusing on safe housekeeping and sanitary practices. The major findings of this study revealed that approximately two-thirds of the HSWs demonstrated good KAP regarding safe housekeeping and sanitary practices in the hospital. The study also found that workers' attitudes were a strong predictor of their KAP score. In addition, those employed in clinical areas had significantly better KAP scores than those working in non-clinical areas.

Table 3: Pearson's correlation of housekeeping workers' knowledge, attitudes, and practices scores by cluster.

	Knowledge	Attitude	Practices
Good KAP group			
Knowledge	1.000	0.051 *P*=.514	−0.317** *P*≤.001
Attitude	0.051 *P*=.514	1.000	0.225** *P*=.004
Intermediate KAP group			
Knowledge	1.000	0.372** *P*≤.001	0.084 *P*=.479
Attitude	0.372** *P*=.001	1.000	0.387** *P*=.001

**Statistically significant where *P*<.001 and two-tailed. KAP: Knowledge attitude and practices

Table 4: Multiple linear regression analysis of the factors influencing KAP clusters.

	B	Standard error	*β*	*t*-value	*P*-value
Constant	5.470	0.252	-	21.730	<.001
Area of work	0.016	0.022	0.035	0.758	.449
Knowledge	0.009	0.009	0.053	1.039	.300
Attitude	0.098	0.010	0.586	9.517	<.001
Practice	0.040	0.012	0.182	3.381	.001

B: Unstandardized coefficient, β: Standardized coefficient, KAP: Knowledge, attitudes, and practices

The findings of this study have important implications for infection control practices, particularly in clinical laboratories where the proper disposal of biomedical waste and infectious materials is critical. The study highlights that more than two-thirds of the workers demonstrated good KAP scores and exhibited significantly higher scores across all three domains compared to those in the intermediate group. These findings align with existing literature, suggesting that well-informed and trained workers are more likely to engage in safe and effective housekeeping practices in healthcare settings.[17] In contrast, a recent Tanzanian study demonstrated that the majority of the HSWs had poor knowledge and practices regarding handling healthcare waste.[15]

Compared to studies on nurses and physicians, HSWs in this study demonstrated higher overall knowledge scores regarding infection control practices, averaging 88.25% (17.65/20) compared to the typical 40–90% range for nurses.[18] However, Mathur *et al.* (2011) specifically noted that "doctors, nurses, and laboratory technicians have better knowledge than sanitary staff regarding biomedical waste management,"[19] highlighting the need for more comprehensive HSW-specific training programs. The attitude scores of the HSWs (4.12/5) were comparable to those reported for other healthcare workers.[20,21] Suggesting that HSWs recognize the importance of infection control, despite limited knowledge. Notably, HSW's self-reported practice scores (18.16/20 or 90.8%) were higher than those typically reported for other healthcare worker groups, such as doctors (45%) or nurses (52%) in hand hygiene compliance.[22] While these high self-reported practice scores are encouraging, direct observational studies are necessary to confirm their accuracy.

Analysis of the individual KAP items revealed mixed results. While participants demonstrated good knowledge of fundamental practices such as hand hygiene (97.5%) and cleaning solution preparation (96.2%), significant gaps were identified in areas such as chemical substance disposal (26%) and specific practices, such as the two-bucket mopping system (80.3%). Attitudes toward safe housekeeping practices were generally positive, with 88% acknowledging their role and 95% valuing the training. However, only 3.7% felt that they had adequate knowledge of safe housekeeping goals and objectives, and 95% reported not receiving regular updates. Self-reported practices showed moderate adherence to guidelines, with 53% of participants always following the recommended practices.

A significant difference in KAP scores was observed based on the workers' area of assignment, with those employed in academic/residential areas and IPD displaying higher KAP scores than those in OPD and support services. This difference may be partially attributed to the more stringent infection control protocols and frequent training provided in clinical settings. Many workers periodically rotate across different hospital areas, potentially exposing them to diverse levels of

infection control practices. These findings underscore the need for comprehensive and standardized training programs that include all staff regardless of their area of work.

The correlation analysis revealed several interesting patterns. In the good KAP group, a weak negative correlation was observed between knowledge and practice. This suggests that, while HSWs may possess adequate knowledge, translating that knowledge into consistent practices may be a challenge. In contrast, a moderate positive correlation between knowledge and attitude in the intermediate KAP group indicates that workers with a better understanding of housekeeping protocols tend to have a more positive attitude toward implementing safe practices.

These results point to the complexity of changing behavior, where knowledge alone is not always sufficient to ensure proper practices. The significant positive relationship between attitudes and practices across both groups suggests that improving workers' attitudes toward their roles may be a critical factor in enhancing their adherence to safety protocols. This is consistent with other studies that have demonstrated the importance of attitude in driving behavior change in healthcare workers.[23,24]

Multiple linear regression analysis identified attitudes and practices as significant predictors of overall KAP scores, with attitude having the strongest influence. This finding suggests that interventions aimed at improving the attitude and approach of HSWs toward their duties could lead to better compliance with safety practices. Interestingly, knowledge and area of work were not significant predictors of KAP scores, despite previous research suggesting that knowledge plays a crucial role in behavior change.[25] This discrepancy could be due to the fact that while workers may be aware of safety protocols, structural or environmental barriers, such as lack of access to personal protective equipment (PPE) or high workloads, may impede the implementation of these practices.[26]

Implications for practice

The findings of this study have significant implications for infection prevention and control (IPC) practices in hospitals, particularly highlighting the need for ongoing training programs tailored to the specific challenges faced by HSWs in different hospital areas. Training should focus not only on knowledge acquisition but also on fostering positive attitudes toward safety. Interventions must address practical barriers, such as the availability of PPE and sufficient staffing, while managers should create environments in which HSWs feel valued and motivated to adhere to safety protocols. This study also supports the need for policy decisions aimed at reinforcing continued medical education and awareness of HSWs, including regular recognition and rewards to boost morale. As most HSWs are employed through outsourced contracts, the findings suggest that policymakers should require third-party agencies to arrange periodic training courses to build HSW capacity, which could be crucial in responding to future pandemics.

Strengths and limitations

One of the strengths of this study is its use of a 1st-time developed and validated KAP questionnaire, which ensured reliable and consistent measurement of key outcomes. The inclusion of workers from various hospital departments provided a comprehensive view of the KAP across different areas of the hospital. However, the study was limited by its cross-sectional design, which prevents the determination of causal relationships. In addition, the self-reported nature of the KAP questionnaire may have introduced a social desirability bias, where participants overreported positive practices. Future studies could use direct observation of practices to triangulate the data and provide a more accurate assessment of worker adherence to safety protocols.

Recommendations for future research

Further research is needed to explore the barriers to translating knowledge into practice among HSWs, particularly in low-resource settings, where access to adequate training and protective equipment may be limited. Longitudinal studies could also help to identify changes in KAP over time and evaluate the long-term impact of training programs. Investigating the role of organizational support, worker empowerment, and resource availability in shaping KAP would provide valuable insights for designing more effective interventions.

CONCLUSIONS

This pioneering study in India to systematically assess the KAP of HSWs in a tertiary care setting revealed that a significant proportion, particularly those working in clinical areas, possess good KAP. Attitude emerged as the strongest predictor of safe practices, emphasizing the importance of fostering a positive work environment. These findings also emphasize the critical role of waste management in IPC protocols. By addressing these factors, hospitals can enhance their infection control measures and improve patient safety. This novel study provides a foundation for future interventions aimed at improving the working conditions and effectiveness of HSWs in healthcare settings across India, with a focus on integrating waste management into infection prevention and control strategies.

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