

KNOWLEDGE, ATTITUDE, AND PRACTICE ABOUT HAND HYGIENE AMONG MEDICAL STUDENTS

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ABSTRACT

Objective: To evaluate knowledge, attitude, and practices (KAP) of hand hygiene (HH) among medical students.

Material and methods: This descriptive cross-sectional study included 189 students enrolled in two medical colleges in Swat. We used the WHO healthcare worker questionnaire, which includes 25 multiple-choice and “yes” or “no” questions, to assess knowledge. We used two separate self-structured questionnaires with 10 and 6 questions, respectively, to assess attitudes and practices. We entered data from the completed questionnaires into a computerized database for analysis. In the descriptive analyses, we reported continuous variables as medians and categorical variables as frequencies and proportions.

Results: Among medical students, HH knowledge was moderate: 135 out of 189 (71.4%), and only 26 out of 189 (13.7%) had good knowledge. Regarding HH, most students had negative attitudes. Only 15 out of 189 (8%) had good attitudes. Most students had poor HH practices. Only 18 out of 189 (9.5%) had good HH practices.

Conclusion: In our study, most medical students had only moderate knowledge of HH, but their attitudes and actual practices were often poor. Improving their understanding and habits is crucial for preventing hospital infections and reducing healthcare costs. To achieve this, we need comprehensive plans that align with WHO and CDC guidelines. Teachers should teach students about the importance of HH and its effects on patients and on themselves. Clinical instructors should monitor students' HH practices during rotations to encourage better habits.

Keywords: Knowledge, attitude, practices, hand hygiene, KAP, Medical students.

This article may be cited as: khan AA, syed R, Ubaidullah, Iqbal B. Knowledge, Attitude, And Practice About Hand Hygiene Among Medical Students. J Med Sci 2026 July - September;34(3):66-71

INTRODUCTION

Hand hygiene (HH) is the most effective and economical measure to prevent pathogen transmission and reduce healthcare-associated infections (HAIs).¹ HAIs remain a major global health challenge, contributing to increased morbidity and mortality, prolonged hospital stays, and rising healthcare costs.² Evidence indicates that proper adherence to HH practices can reduce HAIs by up to 50%, underscoring its critical role in patient safety and infection control.

HH includes practices such as handwashing with soap and water and using alcohol-based hand rubs (ABHR).³ The World Health Organization (WHO) has es-

tablished standardized guidelines, including the “My Five Moments for Hand Hygiene,” to promote effective HH at key points during patient care.² ABHR is widely recommended for its rapid action, broad antimicrobial spectrum, and ease of use in clinical settings.

Despite well-established guidelines, HH compliance among healthcare workers remains suboptimal worldwide.⁴ Factors such as inadequate knowledge, negative attitudes, time constraints, and lack of institutional support contribute to poor adherence.⁵ Medical students are a critical group in this context, as they are actively involved in patient care during clinical training and are in a formative phase for developing lifelong professional behaviors. Inadequate HH practices at this stage may persist into future clinical practice, increasing the risk of infection transmission.

Previous studies assessing knowledge, attitudes, and practices (KAP) regarding HH among medical students have reported mixed findings. While knowledge levels are often moderate, attitudes and actual practices tend to be inadequate.⁶⁻⁸ Additionally, studies have shown

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Date Received: 13/07/2024

Date Revised: 29/04/2026

Date Accepted: 11/09/2026

that medical students may show lower compliance than nursing students, suggesting gaps in training and reinforcement.^{6,9} In low- and middle-income countries, including Pakistan, challenges such as limited resources, inadequate training, and poor awareness of HH guidelines further hinder compliance.^{10, 11} However, recent data on HH-related KAP among medical students in Khyber Pakhtunkhwa remain limited. Therefore, this study aims to assess knowledge, attitudes, and practices regarding HH among medical students in Swat, Pakistan, and to identify gaps that may inform targeted educational interventions.

MATERIAL AND METHODS

This research used a quantitative, descriptive cross-sectional design. The study was conducted at two medical colleges in Swat: Saidu Medical College, a public institution, and Swat Medical College, a private institution. Data collection took place over two months. The sample size was determined using the WHO sample size calculator, based on the targeted precision and population size. We used stratified random sampling to select participants, with year of study as the stratification variable. This approach ensured proportional representation across academic levels (third, fourth, and final year) and controlled for potential confounders related to differences in clinical exposure and HH training between year groups. The inclusion criteria included students from the third, fourth, and final years of both medical colleges, while first- and second-year students were excluded because they have limited clinical exposure and would not yet have formal HH training in clinical settings.

The study used a self-administered questionnaire with four parts: demographic information and an assessment of KAP related to HH among medical students. The WHO's healthcare worker questionnaire, which has 25 multiple-choice and "yes" or "no" questions, was used to assess knowledge. Attitudes and practices were evaluated using two self-structured questionnaires with 10 and 6 questions, respectively. On a scale of 1 to 7, with strongly agreeing to strongly disagreeing, respondents rated their answers. Maximum scores were 10 for attitudes and 6 for practices. Scores were assigned based on correctness, with 0 for negative attitudes or poor practices and 1 point for each correct response indicating positive attitudes or good practices. A score of more than 75% was considered good, a score of between 50% and 74% was considered intermediate, and a score of less than 50% was considered poor.

The data were collected using Google Forms. The questionnaire was initially pilot-tested for reliability with fifteen randomly selected participating students. Based on the pilot test findings, the questionnaire was revised to improve its reliability and validity. Participants were asked to sign an attached online consent form before proceeding to complete the questionnaire. The researchers sent a link

to the questionnaire to students at both medical colleges.

The researchers entered data from the completed questionnaires into a computerized database for analysis. In the descriptive analyses, continuous variables were reported as medians, and categorical variables as frequencies and proportions. We compared the percentage of correct answers between third- and final-year students using the Z test. Statistical significance was defined as a P value <0.05.

RESULTS

A total of 189 students participated in the study. Most participants were male (79.9%; n=151), while the remaining 20.1% (n=38) were female. Students had a median age of 23.3±2.1 years. Students from each of the three classes (third, fourth, and final year) were 63 (33.3%). Students from Saidu Medical College accounted for 62.4% (n=118), and those from Swat Medical College accounted for 37.6% (n=71). About 3/5 of participants (59.8%; n=113) reported receiving formal training in HH in the last three years, and 30.7% (n=58) routinely used alcohol-based hand rubbing for HH.

KNOWLEDGE OF HH: Among the majority of medical students, HH knowledge was moderate (135 out of 189), and only 26 out of 189 had good knowledge. A comparison between third- and final-year students shows that final-year students had significantly better knowledge than third-year students (p=0.034). Table 2 displays the percentages of students who answered each question correctly regarding their knowledge of HH.

ATTITUDES TO HH: Regarding HH, most students had negative attitudes. Only 15 out of 189 students had good attitudes. Table 3 shows the percentages of students who correctly answered each question about their attitudes toward HH.

PRACTICES OF HH: Regarding HH, most students have poor practices. Only 18 of 189 students have good HH practices. Table 4 shows the percentages of students who correctly answered each specific question about HH practices.

Table No 1: Demographic data of the students

VARIABLE	N (%)
Age (Years) (Mean ± SD)	23.3±2.1
Gender	
Male	151 (79.9)
Female	38 (20.1)
Year of study	
Third	63 (33.3)
Fourth	63 (33.3)
Final	63 (33.3)

Table No 2: Knowledge of HH among medical students

S.NO	QUESTIONS(ANSWER)	Total %(n)	THIRD YEAR(n=63)	FINAL YEAR(n=63)	P-VALUE
1	Which of the following is the primary method by which potentially dangerous germs are transferred between patients? (health care workers hands when not cleaned)	48.7% (92)	28.5% (18)	65.1% (41)	*0.002
2	Which is the most common source of the germs causing diseases linked to health-care? (germs already present on or within the patient)	68.8% (130)	55.5% (35)	82.5% (52)	*0.03
3	Which of the following practices for HH keeps healthcare workers safe from germs?				
4	Following patient contact (yes)	82.5%(156)	71.4%(45)	85.7%(54)	NS
5	As soon as there's a chance of bodily fluid exposure (yes)	77.7%(147)	66.6%(42)	84.1%(53)	*0.04
6	Right before an aseptic or clean process (no)	36.5%(69)	25.4%(16)	46%(29)	*0.02
7	Upon exposure to a patient's immediate environment (yes)	64.02%(121)	58.7%(37)	65%(41)	NS
8	Which of the following practices for hand cleanliness shields the patient from germs?				
9	Prior to making contact with a patient (yes)	80.4%(152)	57.1%(36)	87.3%(55)	*0.02
10	As soon as there's a chance of bodily fluid exposure (yes)	69.8%(132)	66.6%(42)	74.6%(47)	NS
11	Upon exposure to a patient's immediate environment (no)	47.1%(89)	42.9%(27)	49.2%(31)	NS
12	Right before an aseptic or clean process (yes)	83.5%(158)	82.5%(52)	85.7%(54)	NS
13	Which of the following claims about hand washing with soap and water and using an alcohol-based hand rub is true?				
14	When cleaning your hands, hand rubbing is faster than hand washing (true)	59.7%(113)	52.4%(33)	69.8%(44)	NS
15	Dry skin is more often caused by hand rubbing than by hand washing (false)	44.9%(85)	22.2%(14)	66.6%(42)	**0.0001
16	Hand rubbing works better than hand washing to get rid of germs (false)	50.2%(95)	44.4%(28)	52.4%(33)	NS
17	It is recommended to wash and rub your hands in sequence (false)	41.8%(79)	25.4%(16)	57.1%(36)	**0.0005
18	How long does it take an alcohol-based hand rub to effectively eradicate the majority of germs on your hands? (20 seconds)	69.3%(131)	54%(34)	80.1%(51)	*0.03
19	Which type of HH method is required in the following situations?				
20	Prior to palpating the abdomen (rubbing)	58.2%(110)	49.2%(31)	55.5%(35)	NS
21	Prior to administering an injection (rubbing)	53.4%(101)	39.7%(25)	61.9%(39)	*0.02
22	After emptying a bed pan (washing)	46%(87)	31.7%(20)	54%(34)	*0.02
23	After removing examination gloves (rubbing/washing)	50.2%(95)	47.6%(30)	52.4%(33)	NS
24	After making a patient's bed (rubbing)	43.3%(82)	38.1%(24)	47.6%(30)	*0.03
25	After visible exposure to blood (washing)	55.5%(105)	52.4%(33)	58.7%(37)	NS
26	Which of the following, given the higher chance of dangerous germs colonizing hands, should be avoided?				
27	Putting on jewelry (yes)	56.6%(107)	46%(29)	65%(41)	*0.03
28	Damaged skin (yes)	51.8%(98)	42.9%(27)	61.9%(39)	*0.01
29	synthetic fingernails (yes)	49.2%(93)	47.6%(30)	54%(34)	NS
30	Regular use of a hand cream (no)	38.1%(72)	27%(17)	49.2%(31)	*0.02

*p<0.05 (Significant), **p<0.001 (highly significant), NS (Not significant)

Table No 3: Attitudes to HH among medical students

S.NO	STATEMENT	% (n)
1	I always use the proper HH techniques.	35.4%(67)
2	My knowledge of HH is adequate.	29.6%(56)
3	There are moments when I have more vital tasks than washing my hands.	46.6%(88)
4	Hygiene can occasionally be more challenging due to emergencies and other commitments.	38%(72)
5	HH is less necessary when wearing gloves.	41.3%(78)
6	When people forget to wash their hands, I get irritated.	57.1%(108)
7	I'm hesitant to urge people to wash their hands.	64%(121)
8	HH has not been adequately taught to newly qualified employees during their training.	47%(89)
9	If I neglect my HH, I feel bad.	31.2%(59)
10	Following HH guidelines is simple in the existing arrangement.	37.6%(71)

Table No 4: Practices of HH among medical students

S.NO	STATEMENT	% (n)
1	There are times when I miss out HH simply because I forget it	33.8%(64)
2	Keeping my hands clean is crucial to my job.	28%(53)
3	It is challenging for me to practice HH as often as is required because of how frequently it is required.	32.8%(62)
4	My HH has been positively impacted by the infection prevention team.	41.3%(78)
5	Noticeboards for infection prevention encourage me to wash my hands.	46%(87)
6	Time constraints make it challenging for me to attend HH courses.	35.4%(67)

DISCUSSION

This study offers a comprehensive evaluation of knowledge, attitudes, and practices (KAP) related to hand hygiene (HH) among medical students in Swat, Pakistan, and highlights a critical gap between knowledge and behavior. Although most students demonstrated moderate knowledge, their attitudes and practices were largely sub-optimal, underscoring the need for targeted educational and behavioral interventions.

In this study, 71.4% of students had moderate knowledge, while only 13.7% demonstrated good knowledge. These findings align with previous studies among medical undergraduates, which report that although baseline knowledge is often acceptable, it is rarely optimal.¹²⁻¹⁴ The significantly better knowledge among final-year students compared with third-year students likely reflects greater clinical exposure and cumulative learning. However, persistent deficiencies in key areas, such as appropriate HH indications and techniques, suggest that current teaching strategies are insufficient to reinforce infection control principles. Similar gaps in essential HH knowledge have been reported in studies from India and the Middle East.^{13,15}

Despite moderate knowledge, attitudes toward HH were notably poor, with only 8% of participants demonstrating a positive attitude. Many students perceived HH as less important during complicated clinical situations, and misconceptions, such as reduced necessity when gloves are used, were common. These findings align with

previous research identifying negative attitudes and low perceived importance as major barriers to HH compliance.^{16, 17} Attitudinal deficits may stem from inadequate emphasis on infection prevention in undergraduate curricula, lack of accountability, and insufficient role modeling by senior clinicians. Studies show that mentors' behavior significantly influences students' adherence to infection control practices.¹⁸

The most concerning finding is the low level of HH practices, with only 9.5% of students demonstrating good practice. This is considerably lower than reported in some international settings, where higher compliance has been observed.^{13,19} The discrepancy between knowledge and practice reflects a well-recognized phenomenon in health-care, in which knowledge alone does not necessarily translate into behavior change. Multiple barriers, including time constraints, high workloads, forgetfulness, and limited access to HH resources, have been identified as contributing factors.^{20, 21} In our study, only 30.7% of students reported routine use of alcohol-based hand rubs (ABHR), indicating underutilization of a key WHO-recommended intervention.

The finding that only 59.8% of students had received formal HH training further underscores gaps in the current medical education system. Evidence suggests that structured educational interventions, such as simulation-based training, workshops, and repeated reinforcement, can significantly improve both knowledge and compliance.^{22, 23} For example, interventional studies have demonstrated sustained improvements in HH ad-

herence following targeted training programs and regular feedback.²³ Therefore, integrating these approaches into undergraduate curricula is essential to ensure long-term behavioral change.

In the Pakistani context, these findings are particularly concerning. Previous studies among healthcare workers have reported low HH compliance, limited awareness of WHO guidelines, and infrastructure barriers, including inadequate availability of sinks, soap, and ABHR.^{10, 11} These challenges are often more pronounced in resource-limited settings, including regions such as Khyber Pakhtunkhwa, where institutional support for infection control may be inconsistent. Variability in HH policy enforcement also contributes to poor adherence.

Another important observation is the gap between self-perceived competence and actual behavior. A relatively small proportion of students considered their HH knowledge adequate, and even fewer consistently followed recommended practices. This suggests a lack of confidence and underscores the importance of practical, hands-on training alongside theoretical instruction. Behavioral factors such as motivation, peer influence, and institutional culture also play a crucial role. Interventions that incorporate peer-led education, visual reminders, and routine audits have shown promising results in improving compliance.²⁴

This study has significant implications for medical education and healthcare policy. A multifaceted approach is needed to improve HH compliance among medical students. This approach should include integrating HH into competency-based curricula, providing rigorous supervision during clinical rotations, ensuring ABHR availability at the point of care, and fostering a culture that prioritizes patient safety. Regular monitoring, feedback, and accountability mechanisms are also essential to sustain improvements.

This study has several limitations. Its cross-sectional design limits the ability to assess causal relationships or changes over time. Additionally, reliance on self-reported data may introduce reporting bias, with participants potentially overestimating their compliance. The study was also limited to two medical colleges in a single region, which may affect generalizability.

CONCLUSION

In our study, most medical students had only moderate knowledge of HH, but their attitudes and actual practices were often poor. Improving their understanding and habits is crucial for preventing hospital infections and reducing healthcare costs. To achieve this, we need comprehensive plans that follow WHO and CDC guidelines. Teachers should teach students about the importance of HH and its effects on patients and on themselves. Clinical instructors should monitor students' HH practices during

rotations to encourage better habits.

ACKNOWLEDGEMENT

We acknowledge students from both medical colleges for participating in the study.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
khan AA	✓	✓	✗	✗	✓	✗
syed R	✓	✗	✓	✓	✓	✗
Ubaidullah	✓	✓	✗	✗	✗	✓
Iqbal B	✓	✗	✓	✓	✓	✗

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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Saidu Medical College, Swat. Vide No. 59-ERB/024).

Dated: 01 04 2024



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