

# Knowledge, Attitude and Practice Study About Hand Hygiene Among Medical Students at University of Cyberjaya, Malaysia

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## ABSTRACT

**Background:** Hand Hygiene is one of the preventive measures to reduce the health care-associated infection. Medical students spend significant time in hospital during their clinical training thus they are required to have good awareness and compliance towards hand hygiene.

**Aim:** To assess the level of knowledge, attitude and practice on hand hygiene among medical students.

**Materials & Methods:** An online cross-sectional study was conducted on 290 medical students who were selected through convenience sampling. The scores obtained were categorized into good, moderate and poor. Data analysis was done using Jeffreys' Amazing Statistics Program.

**Result:** The study showed that 58.6% of respondents have moderate knowledge towards hand hygiene, 69.3% of respondents have a good attitude towards hand hygiene and 41.4% of respondents have moderate practice towards hand hygiene.

**Conclusion:** Educational interventions can be implemented to resolve the lack of knowledge and practice of hand hygiene among medical students.

**Keywords:** KAP, Hand Hygiene, Medical Students, Malaysia

## INTRODUCTION

Hand Hygiene (HH) is a general term that applies to either handwashing, antiseptic hand wash, antiseptic hand rub, or surgical

hand antisepsis.<sup>[1]</sup> Meanwhile, Health care-associated infection (HCAI) are infections that are acquired whether within 48 hours of hospital admission or within 30 days after receiving health care.<sup>[2]</sup>

HCAIs are a major source of morbidity and mortality and are the second leading cause of death worldwide <sup>[3]</sup> with HH being an important countermeasure for reducing HCAI.<sup>[4]</sup> It only takes about 20 seconds to maintain proper HH and these 20 seconds can make a huge difference in the risk of transmitting infections. <sup>[5]</sup> Yet, Healthcare professionals' compliance on HH is poor, and most attempts to increase it have been unsuccessful.<sup>[6]</sup>

HCAI is common in Malaysia with the prevalence rate of 6.1%.<sup>[7]</sup> To add on, the Centers for Disease Control and Prevention (CDC) also stated that approximately 1 in 31 hospital patients experience HCAI on any given day.<sup>[8]</sup> The pathogens that can cause these illnesses have also developed multi-drug resistance organisms (MDRO) worldwide.<sup>[9]</sup> Evidently, HH remains a universal strategy for preventing transmission of MDRO.<sup>[10]</sup>

Medical students are also involved in the healthcare system and spend a significant amount of time in the hospitals. During their clinical training, they are exposed to many harmful microorganisms in the hospital wards, which are most likely to be contaminated. These students have the

potential to transmit HCAs to both patients and healthcare worker.<sup>[11]</sup>

By conducting this research, we hope not only to enhance the knowledge about HH but to also raise awareness on the attitude and the practice of it.

## MATERIALS AND METHODS

This cross-sectional study was conducted among medical students studying Bachelor of Medicine and Bachelor of Surgery (MBBS) at University of Cyberjaya (UOC) from Year 1 to Year 5 and aged at least 18 years old. The respondents were selected through convenience sampling.

Data was collected through an online survey which was distributed on several social media platforms. The questionnaire was an adaptation of two validated sources [12-13] that consist of four sections which were sociodemographic characteristics, knowledge on HH, attitude on HH and practice on HH. Correct knowledge, positive attitude and positive practice were awarded with 1 point each. The maximum points obtainable for Knowledge, Attitude and Practice (KAP) are 20, 8, and 9 respectively. The points obtained would be classified into three categories: >75% is

considered good, 50-74% is considered moderate, and <50% is considered poor. Statistical tests that were used include the chi-square test and logistic regression to determine the association between years of study with HH and evaluate the differences between gender with HH.

## RESULT

A total of 290 respondents participated in this study with a response rate of 86.8%.

Table 1: KAP status of HH among respondents

	Frequency, n	Percentage, %
<b>Knowledge Status</b>		
Good	118	40.7
Moderate	170	58.6
Poor	2	0.7
<b>Attitude Status</b>		
Good	201	69.3
Moderate	53	18.3
Poor	36	12.4
<b>Practice Status</b>		
Good	99	34.1
Moderate	120	41.4
Poor	71	24.5

Table 1 shows that majority of the respondents has achieved moderate status on knowledge of HH (58.6%), good attitude towards HH (69.3%) and moderate practice towards HH (41.4%).

Table 2: Knowledge of HH among respondents according to year of study

No.	Question	Year	Correct, n (%)	Incorrect, n (%)	P-value
1	Health-care workers' hand when not clean is the main route of cross-transmission of potentially harmful germs between patients in health-care workers	1	56 (100.0%)	0 (0.0%)	0.461
		2	60 (100.0%)	0 (0.0%)	
		3	77 (100.0%)	0 (0.0%)	
		4	62 (98.4%)	1 (1.6%)	
		5	34 (100.0%)	0 (0.0%)	
2	Germs already present on or within the patient is the most frequent source of germs responsible for healthcare-associated infections	1	54 (96.4%)	2 (3.6%)	0.226
		2	57 (95.0%)	3 (5.0%)	
		3	72 (93.5%)	5 (6.5%)	
		4	55 (87.3%)	8 (12.7%)	
		5	33 (93.4%)	1 (6.6%)	
For the following statements on hand rub and hand wash					
3	Hand rubbing causes skin dryness more than hand washing	1	18 (32.1%)	38 (67.9%)	0.068
		2	10 (16.7%)	50 (83.3%)	
		3	21 (27.3%)	56 (72.7%)	
		4	14 (22.2%)	49 (77.8%)	
		5	3 (8.8%)	31 (91.2%)	
4	Hand rubbing is more effective against germs than hand washing	1	37 (66.1%)	19 (33.9%)	0.008
		2	41 (68.3%)	19 (31.7%)	
		3	46 (59.7%)	31 (40.3%)	
		4	40 (63.5%)	23 (36.5%)	
		5	11 (32.4%)	23 (67.6%)	
5	Hand washing and hand rubbing are recommended to be performed in sequence	1	10 (17.9%)	46 (82.1%)	0.072
		2	12 (20.0%)	48 (80.0%)	
		3	25 (32.5%)	52 (67.5%)	
		4	22 (34.9%)	41 (65.1%)	
		5	6 (17.6%)	28 (82.4%)	

6	The minimal time needed for alcohol-based hand rub to kill most germs on your hands is 20 seconds	1	45 (80.4%)	11 (19.6%)	0.244
		2	48 (80.0%)	12 (20.0%)	
		3	57 (74.0%)	20 (26.0%)	
		4	56 (88.9%)	7 (11.1%)	
		5	29 (85.3%)	5 (14.7%)	
<b>Regarding the preference of hand hygiene method</b>					
7	Hand rubbing is better than hand washing before palpation of the abdomen	1	37 (66.1%)	19 (33.9%)	0.773
		2	45 (75.0%)	15 (25.0%)	
		3	55 (71.4%)	22 (28.6%)	
		4	47 (74.6%)	16 (25.4%)	
		5	26 (76.5%)	8 (23.5%)	
8	Hand rubbing is better than hand washing before giving an injection	1	37 (66.1%)	19 (33.9%)	0.417
		2	36 (60.0%)	24 (40.0%)	
		3	48 (62.3%)	29 (37.7%)	
		4	45 (71.4%)	18 (28.6%)	
		5	26 (76.5%)	8 (23.5%)	
9	Hand washing is better than hand rubbing after visible exposure to blood	1	48 (85.7%)	8 (14.3%)	0.065
		2	46 (76.7%)	14 (23.3%)	
		3	70 (90.9%)	7 (9.1%)	
		4	58 (92.1%)	5 (7.9%)	
		5	31 (91.2%)	3 (8.8%)	
<b>Which of the following hand hygiene actions prevents transmission of germs to the patient?</b>					
10	Before touching a patient	1	53 (94.6%)	3 (5.4%)	0.080
		2	58 (96.7%)	2 (3.3%)	
		3	77 (100.0%)	0 (0.0%)	
		4	63 (100.0%)	0 (0.0%)	
		5	34 (100.0%)	0 (0.0%)	
11	Immediately after risk of body fluid exposure	1	53 (94.6%)	3 (5.4%)	0.354
		2	58 (96.7%)	2 (3.3%)	
		3	69 (89.6%)	8 (10.4%)	
		4	61 (96.8%)	2 (3.2%)	
		5	32 (94.1%)	2 (5.9%)	
12	After exposure to immediate surroundings of a patient	1	7 (12.5%)	49 (87.5%)	0.192
		2	6 (10.0%)	54 (90.0%)	
		3	8 (10.4%)	69 (89.6%)	
		4	3 (4.8%)	60 (95.2%)	
		5	0 (0.0%)	34 (100.0%)	
13	Immediately before a clean/aseptic procedure	1	51 (91.1%)	5 (8.9%)	0.122
		2	58 (96.7%)	2 (3.3%)	
		3	75 (97.4%)	2 (2.6%)	
		4	63 (100.0%)	0 (0.0%)	
		5	32 (94.1%)	2 (5.9%)	
<b>Which of the following hand hygiene actions prevents transmission of germs to the health care worker?</b>					
14	Before touching a patient	1	51 (91.1%)	5 (8.9%)	0.454
		2	52 (86.7%)	8 (13.3%)	
		3	72 (93.5%)	5 (6.5%)	
		4	58 (92.1%)	5 (7.9%)	
		5	33 (97.1%)	1 (2.9%)	
15	Immediately after risk of body fluid exposure	1	54 (96.4%)	2 (3.6%)	0.637
		2	59 (98.3%)	1 (1.7%)	
		3	73 (98.4%)	4 (5.2%)	
		4	62 (98.4%)	1 (1.6%)	
		5	32 (94.1%)	2 (5.9%)	
16	After exposure to immediate surroundings of a patient	1	3 (5.4%)	53 (94.6%)	0.715
		2	2 (3.3%)	58 (96.7%)	
		3	2 (2.6%)	75 (97.4%)	
		4	2 (3.2%)	61 (96.8%)	
		5	0 (0.0%)	34 (100.0%)	
17	Immediately before a clean/aseptic procedure	1	48 (85.7%)	8 (14.3%)	0.351
		2	54 (90.0%)	6 (10.0%)	
		3	73 (94.8%)	4 (5.2%)	
		4	59 (93.7%)	4 (6.3%)	
		5	32 (94.1%)	2 (5.9%)	
<b>Regarding likelihood of colonization of hands with harmful germs</b>					
18	Wearing jewellery should be avoided because it is associated with an increased likelihood of colonization of hands with harmful germs	1	52 (92.9%)	4 (7.1%)	0.120
		2	53 (88.3%)	7 (11.7%)	
		3	66 (85.7%)	11 (14.3%)	
		4	59 (93.7%)	4 (6.3%)	
		5	34 (100.0%)	0 (0.0%)	
19	Artificial fingernails should be avoided because it is associated with an increased likelihood of colonization of hands with harmful germs	1	54 (96.4%)	2 (3.6%)	0.472
		2	57 (95.0%)	3 (5.0%)	

		3	71 (92.2%)	6 (7.8%)	
		4	62 (98.4%)	1 (1.6%)	
		5	33 (97.1%)	1 (2.9%)	
20	Regular use of a hand cream should be avoided because it is associated with an increased likelihood of colonization of hands with harmful germs	1	25 (44.6%)	31 (55.4%)	0.003
		2	26 (43.3%)	34 (56.7%)	
		3	41 (53.2%)	36 (46.8%)	
		4	36 (57.1%)	27 (42.9%)	
		5	6 (17.6%)	28 (82.4%)	

Table 2 shows that the year 2 students have the most correct knowledge on ‘hand rubbing is more effective against germs than hand washing’ with a percentage of 68.3% (p=0.008). About 57.1% of year 4 students

have the correct knowledge on ‘regular use of a hand cream should be avoided because it is associated with an increased likelihood of colonization of hands with harmful germs’ (p=0.003).

Table 3: Attitude towards HH among respondents according to year of study

No.	Question	Year	Yes, n (%)	No, n (%)	P-value
1	I adhere to correct hand hygiene practices at all times by WHO and CDC guidelines for hand hygiene	1	50 (89.3%)	6 (10.7%)	<0.001
		2	53 (88.3%)	7 (11.7%)	
		3	63 (81.8%)	14 (18.2%)	
		4	60 (95.2%)	3 (4.8%)	
		5	15 (44.1%)	19 (55.9%)	
2	I lack proper hand hygiene practices because no living examples (that is, healthcare providers) are performing them as well	1	14 (25.0%)	42 (75.0%)	<.001
		2	16 (26.7%)	44 (73.3%)	
		3	16 (20.8%)	61 (79.2%)	
		4	10 (15.9%)	53 (84.1%)	
		5	23 (67.6%)	11 (32.4%)	
3	Sometimes I have more important things to do than hand hygiene	1	17 (30.4%)	39 (69.6%)	<0.001
		2	25 (41.7%)	35 (58.3%)	
		3	15 (19.5%)	62 (80.5%)	
		4	13 (20.6%)	50 (79.4%)	
		5	24 (70.6%)	10 (29.4%)	
4	Wearing gloves reduces the need for hand hygiene	1	19 (33.9%)	37 (66.1%)	<0.001
		2	27 (45.0%)	33 (55.0%)	
		3	16 (20.8%)	61 (79.2%)	
		4	16 (25.4%)	47 (74.6%)	
		5	23 (67.6%)	11 (32.4%)	
5	I feel frustrated when others omit hand hygiene	1	46 (82.1%)	10 (17.9%)	0.301
		2	49 (81.7%)	11 (18.3%)	
		3	59 (76.6%)	18 (23.4%)	
		4	51 (81.0%)	12 (19.0%)	
		5	32 (94.1%)	2 (5.9%)	
6	I am reluctant to ask others to engage in hand hygiene	1	19 (33.9%)	37 (66.1%)	<0.001
		2	33 (55.0%)	27 (45.0%)	
		3	16 (20.8%)	61 (79.2%)	
		4	12 (19.0%)	51 (81.0%)	
		5	22 (64.7%)	12 (35.3%)	
7	I feel guilty if I omit hand hygiene	1	51 (91.1%)	5 (8.9%)	0.113
		2	48 (80.0%)	12 (20.0%)	
		3	61 (79.2%)	16 (20.8%)	
		4	57 (90.5%)	6 (9.5%)	
		5	31 (91.2%)	3 (8.8%)	
8	I only practice hand hygiene in the presence of other health workers	1	4 (7.1%)	52 (92.9%)	<0.001
		2	7 (11.7%)	53 (88.3%)	
		3	9 (11.7%)	68 (88.3%)	
		4	6 (9.5%)	57 (90.5%)	
		5	17 (50.0%)	17 (50.0%)	

Table 3 indicates that 95.2% students in year 4 ‘adhere to correct HH practices at all times by WHO and CDC guidelines for hand hygiene’ (p<0.001). Meanwhile, 67.6% of the year 5 students ‘lack proper hand hygiene practices because no living

examples are performing them as well’ (p<0.001). Around 70.6% of the year 5 students ‘sometimes have more important things to do rather than hand hygiene’, (p<0.001). About 67.6% of students from year 5 thinks that ‘wearing gloves reduces

the need for hand hygiene' ( $p < 0.001$ ). A significant percentage of students from year 5 (64.7%) are 'reluctant to ask others to engage in HH' ( $p < 0.001$ ). Lastly, half of

year 5 students (50%) 'only practice HH in the presence of other health workers' ( $p < 0.001$ ).

**Table 4: Practice of HH among respondents according to year of study**

No.	Question	Year	Yes, n (%)	No, n (%)	P-value
1	Sometimes I miss out hand hygiene simply because I forget it	1	33 (58.9%)	23 (41.1%)	0.138
		2	37 (61.7%)	23 (38.3%)	
		3	37 (48.1%)	40 (51.9%)	
		4	35 (55.6%)	28 (44.4%)	
		5	25 (73.5%)	9 (26.5%)	
2	I follow the steps of hand washing thoroughly	1	37 (66.1%)	19 (33.9%)	0.110
		2	31 (51.7%)	29 (48.3%)	
		3	42 (54.5%)	35 (45.5%)	
		4	44 (69.8%)	19 (30.2%)	
		5	24 (70.6%)	10 (29.4%)	
3	It is difficult for me to attend hand hygiene courses due to time pressure	1	27 (48.2%)	29 (51.8%)	0.002
		2	27 (45.0%)	33 (55.0%)	
		3	32 (41.6%)	45 (58.4%)	
		4	18 (28.6%)	45 (71.4%)	
		5	24 (70.6%)	10 (29.4%)	
4	The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary	1	25 (44.6%)	31 (55.4%)	0.004
		2	29 (48.3%)	31 (51.7%)	
		3	30 (39.0%)	47 (61.0%)	
		4	25 (39.7%)	38 (60.3%)	
		5	26 (76.5%)	8 (23.5%)	
5	I use hands as an aid to wipe the dust around me	1	21 (37.5%)	35 (62.5%)	0.002
		2	29 (48.3%)	31 (51.7%)	
		3	33 (42.9%)	44 (57.1%)	
		4	31 (49.2%)	32 (50.8%)	
		5	27 (79.4%)	7 (20.6%)	
6	I use handkerchief to wipe sweat and sneeze	1	39 (69.6%)	17 (30.4%)	0.075
		2	42 (70.0%)	18 (30.0%)	
		3	45 (58.4%)	32 (41.6%)	
		4	40 (63.5%)	23 (36.5%)	
		5	29 (85.3%)	5 (14.7%)	
7	I wash my hands before and after food intake	1	53 (94.6%)	3 (5.4%)	0.160
		2	57 (95.0%)	3 (5.0%)	
		3	76 (98.7%)	1 (1.3%)	
		4	63 (100.0%)	0 (0.0%)	
		5	34 (100.0%)	0 (0.0%)	
8	I own a separate paper hand towel	1	39 (69.6%)	17 (30.4%)	0.014
		2	35 (58.3%)	25 (41.7%)	
		3	39 (50.6%)	38 (49.4%)	
		4	32 (50.8%)	31 (49.2%)	
		5	27 (79.4%)	7 (20.6%)	
9	I use the common soaps or sanitizers provided in canteen and common toilets	1	47 (83.9%)	9 (16.1%)	0.374
		2	52 (86.7%)	8 (13.3%)	
		3	67 (87.0%)	10 (13.0%)	
		4	59 (93.7%)	4 (6.3%)	
		5	32 (94.1%)	2 (5.9%)	

Table 4 states that year 5 found it 'difficult to attend hand hygiene courses due to time pressure' (70.6%) ( $p = 0.002$ ). Roughly 76.5% of the year 5 students also states that 'the frequency of hand hygiene required makes it difficult for them to carry it out as

often as necessary' ( $p = 0.004$ ). About 79.4% students from year 5 'use hands as an aid to wipe the dust around them' ( $p = 0.002$ ). Majority of the year 5 students (79.4%) 'own a separate paper hand towel' ( $p = 0.014$ ).

**Table 5: Gender differences among medical students in KAP of HH**

Parameter	Frequency		OR (95% CI)	P-Value
	Male, n (%)	Female n (%)		
Hand rubbing is more effective against germs than hand washing				
Correct	42 (43.3%)	133 (68.9.0%)	0.34 (-1.57 - -0.561)	<0.001
Incorrect	55 (56.7%)	60 (31.1%)		
Regular use of a hand cream should be avoided because it is associated with an increased likelihood of colonization of hands with harmful germs				
Correct	34 (35.1%)	100 (51.8%)	0.50 (-1.19 - -0.19)	0.007
Incorrect	63 (64.9%)	93 (48.2%)		
I adhere to correct hand hygiene practices at all times by WHO and CDC guidelines for hand hygiene				
Yes	68 (70.1%)	173 (89.6%)	0.27 (-1.94 - -0.67)	<0.001
No	29 (29.9%)	20 (10.4%)		
I lack proper hand hygiene practices because no living examples (that is, healthcare providers) are performing them as well				
Yes	36 (37.1%)	43 (22.3%)	2.06 (0.19 – 1.26)	0.007
No	61 (62.9%)	150 (77.7%)		
Sometimes I have more important things to do than hand hygiene				
Yes	41 (42.3%)	53 (27.5%)	1.93 (0.15 – 1.17)	0.011
No	56 (57.7%)	140 (62.5%)		
Wearing gloves reduces the need for hand hygiene				
Yes	41 (42.3%)	60 (31.1%)	1.62 (-0.02 – 0.99)	0.059
No	56 (57.7%)	133 (38.9%)		
I am reluctant to ask others to engage in hand hygiene				
Yes	46 (47.4%)	56 (29.0%)	2.21 (0.29 – 1.30)	0.002
No	51 (52.6%)	137 (71.0%)		
I only practice hand hygiene in the presence of other health workers.				
Yes	28 (28.9%)	15 (7.8%)	4.82 (0.89 – 2.26)	<0.001
No	69 (71.1%)	178 (92.2%)		
It is difficult for me to attend hand hygiene courses due to time pressure				
Yes	47 (48.5%)	81 (42.0)	1.30 (-0.23 – 0.75)	0.294
No	50 (51.5%)	112 (58.0)		
The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary				
Yes	56 (57.7%)	79 (40.9%)	1.97 (0.18 – 1.17)	0.007
No	41 (42.3%)	114 (59.1%)		
I use hands as an aid to wipe the dust around me				
Yes	63 (65.0%)	78 (40.4%)	2.73 (0.50 – 1.51)	<0.001
No	34 (35.0%)	115 (59.6%)		
I own a separate paper hand towel				
Yes	50 (51.5%)	122 (63.2%)	0.62 (-0.97 – 0.02)	0.056
No	47 (48.5%)	71 (36.8%)		

Table 5 shows that less males answered correctly (43.3%) “Hand rubbing is more effective against germs than hand washing” compared to females (68.9%) (p<0.001) (OR=0.34). Lesser percentage of males (35.1%) answered correctly with regards to the use of hand cream in HH as compared to females (51.8%) (p=0.007) (OR=0.50). Fewer males (70.1%) always adhere to correct HH practices according to the guidelines compared to females (89.6%) (p<0.001) (OR=0.27). Greater percentage of males (37.1%) agreed that they lack proper HH practices due to no living examples compared to females (22.3%) (p=0.007) (OR=2.06). Higher percentage of males said that they have more important things to do than HH (42.3%) compared to females (31.3%) (p=0.011) (OR=1.93). Greater percentage of males (57.7%) stated that

“wearing gloves does not reduce the need for HH” compared to females (38.9%) (p=0.059) (OR=1.62). Males are more “reluctant to ask others to engage in HH” (47.4%) compared to females (29.0%) (p=0.002) (OR=2.21). Males (28.9%) agreed that they only practice HH in the presence of other healthcare workers compared to females (7.8%) (p<0.001). (OR=4.82). More males (57.7%) stated yes to “the frequency of HH required makes it difficult for me to carry it out as often as necessary” compared to females (40.9%) (p=0.007) (OR=1.97). “I use hands as an aid to wipe dust around me”, greater percentage of males said yes (65.0%) compared to females (40.4%) (p<0.001) (OR=2.73).



## DISCUSSION

Our results have revealed that 40.7% of medical students had good knowledge, 69.3% had good attitude and 34.1% had good practice towards HH. Our findings of good attitude towards HH were better but lacking in terms of good knowledge and practice than the similar study done in Malaysia.<sup>[14]</sup> Despite being our respondents had undergone formal education on HH, this shows that basic health education does not always achieve the expected level in the HH compliance as necessary for the clinical practice. This is because majority of them either did not follow or forgot to follow protocols in practice.<sup>[15]</sup> HH training sessions may need to be conducted more frequently for medical students with continuous monitoring and performance feedback to encourage them to follow correct HH practices.<sup>[13]</sup> Additionally, it has also been observed that the practice to HH increases with consistent training.

Majority of the participants achieved moderate knowledge in terms of HH which was consistent to a previous study.<sup>[16]</sup> The students were able to comprehend that hand rubbing was more effective against germs compared to hand washing. The effectiveness of hand rubbing was further proven when the median percentage reduction in the bacterial contamination was significantly higher when compared to the effectiveness of hand washing.<sup>[17]</sup>

Similarly, the lack of proper HH practice observed in UOC medical students were agreeing with the results of another study.<sup>[18]</sup> The results of poor attitude towards HH were caused by lack of living examples such as healthcare professionals performing HH practices during their clinical attachments to hospitals. Based on these findings, we can conclude that healthcare professionals' role is very crucial to influence good attitudes toward HH among medical students as lack of role models for HH could be considered as a possible barrier to apply correct HH measures.<sup>[19]</sup> Hence, healthcare professionals must display accurate HH

practice and encourage students to follow effectively.

Furthermore, the practice of HH result was congruent with another study<sup>[20]</sup> where the majority of participants had only achieved moderate HH practice. The practice of HH habits can be affected by the amount of knowledge one has regarding HH.<sup>[13]</sup> This can be seen in a study which reported that nursing students who had a significantly better knowledge of HH compared to the medical students, also had better practice of HH.<sup>[13]</sup> We can see a similar pattern here with medical students at UOC who scored moderately with both knowledge and practice. Therefore, including more HH courses in their syllabus is important to improve the practice of HH among the medical students at UOC.

Generally, in all three domains, the pre-clinical year students (Year 1 & Year 2) had better KAP when compared to the clinical year students (Year 3 to Year 5). Our finding is inconsistent to a similar study conducted which reported that as they advanced their medical schooling, they inclined towards greater KAP.<sup>[12]</sup> Our findings are due to our respondents being taught on HH when they were only in pre-clinical years. As they advance to clinical years, those students do not receive enough education on how to apply proper HH in practice.<sup>[21]</sup> To add on, more of the year 5 students reported that it was difficult to practice HH due to time pressure and they had more important things to do than HH. This is due to their heavy workload and obstacles to perform HH such as overcrowded wards.<sup>[22]</sup> Another study reported that HH compliance declined among physicians as they reached higher levels in the medical hierarchy.<sup>[22]</sup> The lack of proper HH performed by the healthcare workers could lead to the poor attitude observed among clinical year students.

In relation to gender, female had better KAP when compared to male. Female respondents having better knowledge on HH than males were consistent with a study done in Hong Kong.<sup>[24]</sup> It is unclear why

such difference exists, since information about it is lacking to support this claim. Albeit, there were several studies that revealed no difference in knowledge otherwise.<sup>[25-26]</sup> Moreover, female participants having better attitude towards HH was also consistent with a similar study.<sup>[25]</sup> Past studies have proven the importance of positive attitude towards HH.<sup>[27]</sup> Whereby, positive attitude towards HH after patient contact were independently associated with good observed HH performance.<sup>[28]</sup> This equates to female students having better HH practice - similar finding was observed in International Medical University, Malaysia.<sup>[29]</sup> Higher compliance among females is linked to their inclination to practice socially acceptable behaviours.<sup>[27]</sup> Females feel a greater need for acceptance within a group and are therefore more likely to wash their hands.<sup>[30]</sup> The need for gender-specific educational intervention on HH is highlighted to tackle these gender differences.

## CONCLUSION

Overall, the students' attitudes towards HH were good but their knowledge and practice were only moderate. This suggests that there is a need for greater emphasis on improving knowledge and practice related to HH among medical students through targeted educational interventions. Interventions could be tailored to address the unique needs of different groups of medical students, such as those in pre-clinical versus clinical years or those with different levels of prior knowledge. By implementing targeted educational interventions, medical schools can help to ensure that their students are well-prepared to protect themselves and their patients from healthcare-associated infections.

Additionally, this study highlights the need for further research on the gender differences in HH practices, as few studies have been conducted in this area. Future studies could investigate whether there are differences in KAP of HH between male and female medical students, and explore

potential underlying reasons for any observed differences. This could lead to more effective and targeted interventions to improve HH practices among both male and female medical students, ultimately leading to better patient outcomes and decreased healthcare-associated infections.

## Declaration by Authors

**Ethical Approval:** Approved

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