KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS 5 MOMENTS FOR HAND HYGIENE AMONG UNDERGRADUATE NURSING STUDENTS AT UNIVERISITI SAINS MALAYSIA

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KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS 5 MOMENTS FOR HAND HYGIENE AMONG UNDERGRADUATE NURSING STUDENTS AT UNIVERSITI SAINS MALAYSIA

by

JULAIKHA BINTI JUMAIN

Dissertation submitted in partial fulfilment of the requirements
for the degree of
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August 2025

CERTIFICATE

This is to certify that the dissertation entitled "KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS 5 MOMENTS FOR HAND HYGIENE AMONG UNDERGRADUATE NURSING STUDENTS AT UNIVERSITI SAINS MALAYSIA" is the bona fide record of research work done by MISS JULAKHA BINTI JUMAIN during the period from October 2024 to June 2025 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfillment for the degree of Bachelor of Nursing (Honours).

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotional purposes.

.....

Julaikha Binti Jumain

Date: 3rd August 2025

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LIST OF ABBREVIATIONS

HH	Hand Hygiene
HAIs	Hospital Acquired Infections
WHO	World Health Organizations
HCWs	Healthcare Workers
HW	Hand Washing
TPB	Theory Planned Behavior
KAP	Knowledge, Attitude, and Practice
PPSK	Pusat Pengajian Sains Kesihatan
HCAIs	Healthcare Acquired Infections
MPSG	Malaysian Patient Safety Goals
USM	Univerisiti Sains Malaysia

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PENGETAHUAN, SIKAP DAN AMALAN TERHADAP LIMA MOMEN UNTUK PENCUCIAN TANGAN DI KALANGAN PELAJAR JURURAWAT DI UNIVERSITI SAINS MALAYSIA

ABSTRAK

Pencucian tangan merupakan aspek penting dalam penjagaan kesihatan bagi mencegah jangkitan, namun tahap pematuhan dalam kalangan pelajar kejururawatan masih menjadi cabaran. Kajian keratan rentas ini menilai tahap pengetahuan, sikap dan amalan terhadap Lima Momen untuk Pencucian Tangan dalam kalangan pelajar kejururawatan di Universiti Sains Malaysia. Seramai 141 orang peserta telah direkrut melalui pensampelan mudah dan data dikumpul menggunakan borang soal selidik yang telah disahkan. Hasil kajian ini menunjukkan 95.7% pelajar mempunyai tahap amalan yang baik, manakala majoriti menunjukkan tahap pengetahuan (72.3%) dan sikap (58.9%) yang sederhana. Korelasi positif yang lemah dan tidak signifikan dilaporkan antara pengetahuan, sikap dan amalan (pengetahuan-sikap: $r = 0.137$, $p = 0.105$; pengetahuan-amalan: $r = 0.129$, $p = 0.127$; sikap-amalan: $r = 0.134$, $p = 0.111$). Selain itu, tiada perbezaan signifikan dalam tahap amalan berdasarkan jantina ($\chi^2 = 1.681$, $p = 0.219$), tahap pendidikan ($\chi^2 = 0.187$, $p = 1.000$) dan tahun pengajian ($\chi^2 = 2.741$, $p = 0.506$). Hasil kajian ini menunjukkan keperluan pendidikan secara berterusan, kempen pencucian tangan yang kerap, penempatan bahan pencuci tangan dan sinki yang mudah diakses, penyeliaan dan latihan praktikal secara berterusan bagi memperkukuhkan pematuhan pencucian tangan.

KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS FIVE MOMENTS FOR HAND HYGIENE AMONG UNDERGRADUATE NURSING STUDENTS AT UNIVERSITI SAINS MALAYSIA

ABSTRACT

Hand hygiene is essential in healthcare to prevent infections, yet compliance among nursing students remains a challenge. This cross-sectional study assessed knowledge, attitude, and practice towards Five Moments for Hand Hygiene among undergraduate nursing students at Universiti Sains Malaysia. A total of 141 participants were recruited via convenience sampling, and data were collected using a self-administered validated questionnaire. Results showed that 95.7% of students had good hand hygiene practice, while most had moderate knowledge (72.3%) and attitude (58.9%). Weak, non-significant positive correlations were found between knowledge, attitude, and practice (knowledge-attitude: $r = 0.137$, $p = 0.105$; knowledge-practice: $r = 0.129$, $p = 0.127$; attitude-practice: $r = 0.134$, $p = 0.111$). Furthermore, no significant differences in practice were observed based on gender ($\chi^2 = 1.681$, $p = 0.219$), education level ($\chi^2 = 0.187$, $p = 1.000$), and year of study ($\chi^2 = 2.741$, $p = 0.506$). These findings emphasize the need for ongoing education, regular hand hygiene campaigns, accessible placement of hand rubs and sinks, continuous supervision and practical training to maintain and enhance hand hygiene compliance.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter consist of background of study, problem statements, research questions, research objectives, research hypothesis, conceptual and operational definition, and significance of study.

1.2 Background of Study

Hand hygiene, achieved via handwashing or disinfection, is a key strategy for preventing healthcare-associated infections (HAIs) (Pittet et al., 2000). Healthcare-assosciated infections (HAIs) remain a significant burden worldwide, despite being largely preventable through basic interventions such as hand hygiene. The World Health Organization (WHO) introduced the “Five Moments for Hand Hygiene” to guide health professionals on when to perform hand hygiene to minimize pathogen transmission (WHO, 2010). Despite its critical role, studies consistently report suboptimal adherence among healthcare providers, including nursing students (Nair et al., 2014 ; Van De Mortel et al., 2012).

Hygienic handwashing involves the use of detergents and antiseptic agents to remove dirt and transient flora, while hand disinfection uses antiseptic solutions such as medicated soap or alcohol-based hand rubs (Pittet, 2001). These practices are essential for reducing microbial transmission in healthcare settings. The "Five Moments" approach marked a significant evolution from the traditional "two moments" model, emphasizing the importance of specific hand hygiene actions before, during, and after patient care to reduce the risk of cross-contamination (Pittet et al., 2010; Varatharajan et al., 2022).

Despite widespread awareness, research continues to reveal gaps in knowledge, attitude, and practice (KAP) regarding hand hygiene among nursing students. Studies from various countries, including India and Greece, have highlighted a disconnect between what students know and what they practice in clinical environments (Nair et al., 2014; van de Mortel et al., 2010). Ayyappan et al. (2021) stress the need for effective training to enhance compliance.

Given the clinical exposure and frontline roles nursing students during training, assessing KAP regarding hand hygiene among nursing students at Universiti Sains Malaysia (USM) is essential to ensuring patient safety. This study aims to identify gaps and improve current training programs, fostering better compliance and professional practice in clinical environments (Ariyarathne et al., 2013; Thakker & Jadhav, 2015).

1.3 Problem Statement

Hand hygiene compliance remains suboptimal worldwide, with WHO data indicating an average compliance rate of about 40% without targeted interventions (WHO, 2023). Even in critical care settings, compliance averages only 60%. Disparities between countries and healthcare settings further emphasize the need to understand underlying behavioural factors.

In Malaysia, the Ministry of Health adopted WHO's "Clean Care is Safer Care" campaign under Malaysian Patient Safety Goals (MPSG), targeting at least 75% compliance (Lum, 2020) . However, compliance reporting is voluntary. In 2018, only a fraction of healthcare facilities submitted data, with compliance rates varying widely. University hospitals reported an average compliance of 85.56%, but primary care and private clinics lacked reporting (Lum, 2020).

At the university level, the degree to which nursing students comply remains unclear, despite their high-risk exposure during training. While they are expected to adhere to infection control practices, gaps persist. Although international studies document this issue, there is limited data on Malaysian nursing students, particularly at USM. This study seeks to address this gap by evaluating the current level of knowledge, attitude, and practice among USM nursing students, thereby guiding targeted improvements in education and compliance.

1.4 Research Questions

The research questions for this study are as follows:

i. What is the level of knowledge of five moments for hand hygiene among undergraduate nursing student at USM?

ii. What is the level of attitude of five moments for hand hygiene among undergraduate nursing students at USM?

iii. What is the level of practice of five moments for hand hygiene among undergraduate nursing students at USM?

iv. Is there any correlation between knowledge, attitude and practice of five moments for hand hygiene among undergraduate nursing students at USM?

v. Is there any association between selected factors (gender, year of study and education status) and practice of five moments for hand hygiene among undergraduate nursing students at USM?

1.5 Research Objectives

1.5.1 General Objective

The general objective of this study was to determine the level of knowledge, attitude and practice towards five moments for hand hygiene among undergraduate nursing students at USM.

1.5.2 Specific Objectives

The specific objectives for this study are as follows:

i. To identify the level of knowledge of five moments for hand hygiene among undergraduate nursing students at USM.

ii. To identify the level of attitude of five moments for hand hygiene among undergraduate nursing students at USM.

iii. To identify the level of practice of five moments for hand hygiene among undergraduate nursing students at USM.

iv. To identify the correlation between knowledge, attitude and practice of five moments for hand hygiene among undergraduate nursing students at USM.

v. To determine the association between selected factors (gender, year of study and education status) and practice of five moments for hand hygiene among undergraduate nursing students at USM.

1.6 Research Hypothesis

Hypothesis 1 (H_0): There is no significant association between knowledge, attitude and practice towards five moments for hand hygiene among undergraduate nursing students at USM.

(H_A): There is a significant association between knowledge, attitude and practice towards five moments for hand hygiene among undergraduate nursing students at USM.

Hypothesis 2 **(H0):** There is no significant association between selected factors (gender, year and education status) and practice towards five moments for hand hygiene among undergraduate nursing students at USM.

(H_A): There is a significant association between selected factors (gender, year of study and education status) and practice towards five moments for hand hygiene among undergraduate nursing students at USM.

1.7 Significance of study

This study is significant because it evaluates the level of knowledge, attitude, and practice in the five moments of hand hygiene among undergraduate nursing students who are future healthcare professionals. The findings will contribute to the evidence base on hand hygiene compliance and provide guidance for educational institutions and nurse educators to enhance training programs. Improved hand hygiene knowledge and behavior will promote safer care environments, reduce healthcare-associated infections, and elevate the quality of clinical practice.

1.8 Definitions of Operational Terms

There operational terms used in this research proposal are shown below:

Table 1.1 Definitions of Operational Terms

Variables	Conceptual Definition	Operational Definition
Hand hygiene	A broad phrase that can refer to handwashing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis (Gerberding et al., 2002)	In this study, hand hygiene refers to actions related to the WHO Five Moments, assessed using scores from the KAP questionnaire in section A, section B and section C.
Five moments for hand hygiene	An approach to prevent the transfer of microorganisms between different patient zones and from critical areas where contamination could result in infection (Salmon et al., 2015).	Adherence to WHO-defined hand hygiene moments as measured through student responses.
Knowledge	Expertise, comprehension, or information about a subject gained through experience or study (Cambridge Dictionary, 2024a)	Assessed via Section B of the questionnaire, reflecting understanding of the Five Moments.
Attitude	Attitude pertains to an individual's assessment of a behaviour, whether it is positive or negative (White et al., 2015).	Assessed via Section C, reflecting the respondent's disposition toward hand hygiene practices.
Practice	Focus on actions over thoughts or concepts (Cambridge Dictionary, 2024b), as carrying out specific procedure(s) in accordance with predetermined standard (Jemal, 2018).	Assessed via Section D, reflecting students' actual hand hygiene behaviors
Undergraduate nursing students	An individual enrolled in an accredited nursing program who is employed by an organization to deliver nursing care but has not yet attained certification as a graduate nurse (Undergraduate Nurse Definition, 2024).	Includes Diploma and Bachelor students studying at USM Health Campus.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter generally review the current literature related to knowledge, attitude and practice towards 5 moments for hand hygiene among undergraduate nursing students at Universiti Sains Malaysia. This chapter will also describe the theoretical and conceptual framework used in this study.

2.2 Five Moments for Hand Hygiene

Hand hygiene plays a vital role in patient safety by preventing healthcare-associated infections (HCAIs). To establish global consistency in hand hygiene practices, the World Health Organization (WHO) developed the Guidelines on Hand Hygiene in Health Care and introduced the "My Five Moments for Hand Hygiene" framework (Salmon et al., 2015). This concept identifies key moments for hand hygiene based on an evidence-based model of microorganism transmission via healthcare workers' (HCWs) hands (Salmon et al., 2015).

A core element of this framework is the division of the healthcare setting into two zones: the patient zone and the healthcare zone, requiring HCWs to adhere to specific hand hygiene practices at designated moments (Salmon et al., 2015). The "My five moments for hand hygiene" concept aims to: 1) promote positive outcome evaluation by linking hand hygiene actions to specific infectious outcomes in patients and HCWs; and 2) increase self-efficacy by providing clear advice on how to integrate hand hygiene into complex care tasks (positive control beliefs) (WHO, 2010).This approach combines several factors that have been linked to faster innovation diffusion, including practicality, compatibility with current perceptions of microbiological risk, simplicity, trialability, and observability (WHO, 2010).

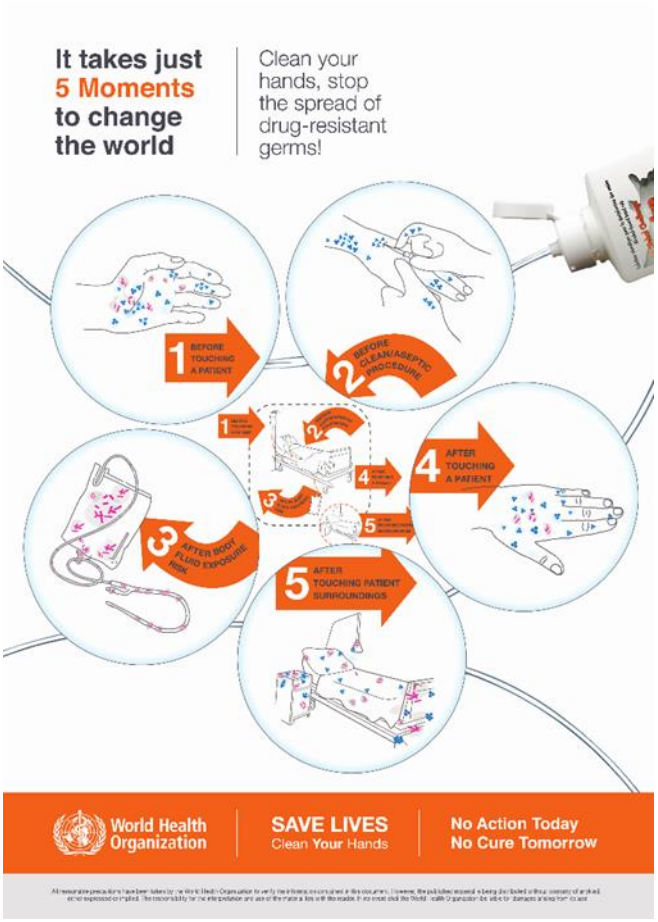

Figure 2.1 Five Moments for Hand Hygiene. Reprinted from (WHO, 2021)

2.2.1 Indications for Hand Hygiene During Patient Care

Hands should be washed with soap and water under the following circumstances: when visibly dirty or contaminated with blood, body fluids, or proteinaceous material, and when exposure to Bacillus anthracis is suspected or confirmed, as alcohol-based agents are ineffective against spores (Mathur, 2011). Handwashing is also necessary after using the restroom, using either non-antimicrobial or antimicrobial soap, and before and after eating (Mathur, 2011).

In clinical settings, when hands are not visibly soiled, an alcohol-based hand rub should be routinely used (Mathur, 2011). This includes situations such as before direct patient contact, before donning sterile gloves for procedures like inserting central intravascular catheters, and before inserting invasive devices like urinary or peripheral

vascular catheters (Mathur, 2011). It is also recommended after contact with intact patient skin, body fluids, mucous membranes, non-intact skin, and wound dressings, as well as after handling inanimate objects in the patient's vicinity or after removing gloves (Mathur, 2011). Additionally, hand hygiene should be practiced when moving from a contaminated to a clean body site during patient care (Mathur, 2011).

2.2.2 Normal flora of hands

Healthcare workers' hands can harbour two types of pathogens: transient (contaminating) microorganisms and resident (normal or colonising) microorganisms (Mani et al., 2010). Transient flora, in contrast to resident flora, colonizes the superficial layers of the skin temporarily. Healthcare workers' (HCWs) hands are frequently contaminated with transient flora through direct contact with patients, environments, or equipment during daily care activities (Shinde & Mohite, 2014). Fortunately, these microorganisms, including *Staphylococcus aureus* and Candida species, can be easily removed through mechanical methods like friction during handwashing. These bacteria, however, have the potential to cause healthcare-associated infections (HAIs) in both patients and HCWs (Shinde & Mohite, 2014).

2.2.3 Effective Hand Hygiene Techniques

Effective hand hygiene aims to remove visible dirt and reduce microbial colonization on the skin. Transient flora can be easily removed through handwashing, whereas resident flora, which colonizes deeper layers of the skin, is more challenging to eliminate mechanically (Shinde & Mohite, 2014). Fortunately, resident flora, such as negative staphylococci and Corynebacterial, is typically less aggressive and less likely to cause serious infections (Shinde & Mohite, 2014). With the information on resident and transitory bacteria discussed above, it is clear that the best method to reduce the danger of cross-contamination is to practice good hand hygiene, which includes

washing hand with antimicrobial soap or using hand cream with alcohol in it (Mathur, 2011).

2.2.4 Method of Hand Washing

Effective hand washing involves applying plain or antiseptic soap to wet hands and vigorously rubbing all hand surfaces including palms, backs, fingers, fingertips, nails, thumbs, and wrists to create a lather. This process should last about one minute (Shinde & Mohite, 2014). Fingernail length is important; artificial nails or extenders should be avoided as they can harbor bacteria. Wearing jewelry like rings or watches can also trap bacteria on the skin (Kampf & Löffler, 2010)

Hands should be thoroughly rinsed to remove all soap, avoiding hot water to prevent skin dryness (Kampf & Löffler, 2010). The position of the hands during washing whether up, down, or sideways does not affect bacterial removal (Shinde & Mohite, 2014). Drying hands is crucial, as bacteria thrive in moist environments. Hands must be dried completely before putting on gloves to avoid irritation and bacterial growth (Shinde & Mohite, 2014). Paper towels are effective for drying, providing friction that helps remove microbes. After washing, taps should be turned off using a paper towel to avoid recontamination. While hand dryers may be comparable, paper towels are quicker and more effective in removing transient flora and some resident flora (Shinde & Mohite, 2014).

Figure 2.2 How to Hand Wash??? (Step Of Hand Hygiene 2022). Sources from Unit Kawalan Jangkitan dan Epidemiologi Hospital (2022b)

2.2.5 Alcohol Based Hand Rub

Shinde & Mohite (2014) also stated that with the exception of hands that are obviously dirty, alcohol-based hand massage is advised for hand decontamination in all clinical settings. Alcohol is used in place of water in alcohol hand rub. Alcohol kills the flora, as opposed to hand washing's mechanical (friction) removal of the flora. Unlike hand washing, alcohol hand rub operates on microorganisms by denaturing their proteins, which eliminates most resident flora as well as all transitory flora. It also takes 15 to 30 seconds less than washing hands (Shinde & Mohite, 2014). Applying enough of the alcohol-based hand-rub product (liquid, gel, or foam) in accordance with the manufacturer's recommendations is the first step in the alcohol hand-rub procedure. (Usually 3 to 5 ml) and distributing it around the hands, paying particular attention to the spaces between the fingers, thumbs, and fingernails (Shinde & Mohite, 2014). Alcohol should be present in an effective concentration of 60% to 95%; concentrations over this range are not advised as they contain less water, which is necessary for the denaturation of microbes' proteins and reduces their potency (Shinde & Mohite, 2014).

Figure 2.3 How to Hand Rub??? (Step Of Hand Hygiene 2022). Sources from Unit Kawalan Jangkitan dan Epidemiologi Hospital (2022a)

2.3 Undergraduate Nursing Students as Respondents

Hands are the main carriers of germs and a major factor in spreading hospital-acquired (nosocomial) infections, which are primarily transmitted through healthcare workers' hands (Muthyala & Vankayalapati, 2019). Handwashing is therefore the most important measure to prevent these infections. Educating nursing students about hand hygiene can help reduce infections among themselves, their families, and patients. If they also educate the community, the impact can be even broader (Muthyala & Vankayalapati, 2019).

Nurses represent about 80% of the healthcare workforce providing direct patient care, making their role in infection prevention vital (Saurabh et al., 2022). Identifying gaps in their hand hygiene knowledge, attitude, and practices during undergraduate training is essential to improve compliance and reduce disease transmission (Saurabh et al., 2022). Ariyarathne et al. (2013) emphasized that both academic institutions and hospitals share the responsibility for early hand hygiene training. Evaluating the effectiveness of these training programs can help identify areas needing improvement and promote better future practices and professional ethics.

2.3.1 Factor Influencing Hand Hygiene Compliance Among Nursing Students

Few studies have explored hand hygiene (HH) compliance among undergraduate nursing students. (Barrett & Randle, 2008) found that factors like time pressure, being busy, poor role models, type of clinical procedure, skin concerns, lack of knowledge, and glove use contributed to non-compliance. Similarly, Cole (2009) noted that nursing students often overestimate their HH knowledge and practices, possibly due to a lack of self-awareness. This is concerning, as poor understanding during training may lead to continued poor compliance in their future roles. The limited research on this topic is worrying, especially since nursing students are actively involved in patient care during clinical placements. Ensuring proper HH compliance before they enter the workforce is essential to reduce healthcare-associated infections (Van De Mortel et al., 2012).

2.4 Knowledge Towards Five Moments for Hand Hygiene

Before entering training hospitals, nursing students must be well-versed in infection control to reduce the risk of infection (Tumala et al., 2019). During clinical training, they face various risks and, without proper infection control, may contribute to cross-contamination (Cruz, 2019). Since nursing students are also exposed to healthcare-associated infections (HAIs), they need to be prepared and knowledgeable in effective infection control measures.

A study by Thakker & Jadhav (2015) found most students had only moderate knowledge of hand hygiene, with just 7.59% showing high understanding. Medical students scored better than dental and nursing students. Many were unaware that healthcare workers' unclean hands are a major source of infection and that patients are the primary source of HAIs. Less than 40% knew the WHO-recommended 20-second

duration for alcohol-based hand rub, and many lacked knowledge of proper hand hygiene for specific situations, showing the need for better education.

Jemal (2018) found that 66% of 91 respondents were knowledgeable about handwashing, but 34% were not. Many (74.7%) didn't know handwashing is still required when wearing gloves, and 50.6% thought it wasn't needed for cautious individuals. These gaps may be influenced by factors like demographics, hospital setting, or outdated education.

Paudel et al. (2017) assessed 117 participants and found most had moderate knowledge. While 90% knew key hand hygiene moments like before patient contact and after fluid exposure, only 24% knew the 20-second rule for alcohol rubs. Some thought handwashing was more effective than hand rubbing, despite 66% knowing rubbing is quicker. This confusion highlights the need for targeted education to improve hand hygiene understanding.

Silago et al. (2022) found that 76.4% of participants had good general hand hygiene knowledge, especially about preventing infection before contact (96.1%) and after fluid exposure (91.2%). However, only 25.3% and 60.1% knew the correct durations for hand rub and hand washing. While participants recognized risk factors like jewelry and damaged skin, gaps in timing and technique suggest issues in practice. This highlights the importance of regular training to improve hand hygiene and prevent HAIs and the spread of drug-resistant pathogens.

The limited research on this topic is worrying, especially since nursing students are actively involved in patient care during clinical placements. Ensuring proper HH compliance before they enter the workforce is essential to reduce healthcare-associated infections (Van De Mortel et al., 2012)

2.5 Attitude Towards Five Moments For Hand Hygiene

Several studies have examined attitudes towards hand hygiene (HH), revealing a mix of positive perceptions and persistent challenges. Silago et al. (2022) found that while more than half of nurses believed HH required little effort, others viewed it as burdensome, which could hinder compliance. Although posters were considered effective reminders, and hand rubbing was seen as faster, many perceived it as less effective than hand washing. Concerns about skin dryness from alcohol-based rubs and skin damage from prolonged glove use further reflected negative perceptions, suggesting the need for better education on proper HH techniques and their benefits in preventing infection.

In contrast, Paudel et al. (2017) reported a generally positive attitude among students, with 90% expressing favorable views and 96% encouraging others to practice HH. However, over half (52%) admitted they sometimes prioritized other tasks over HH, and 84% found it challenging during emergencies. Moreover, 29% felt inadequately trained in HH during their studies. These findings point to conflicting attitudes influenced by practical barriers and insufficient early training, highlighting the importance of strengthening HH education and strategies for maintaining compliance under pressure.

Nair et al. (2014) observed that while overall attitudes among students were poor, nursing students had significantly more positive attitudes (52.1%) than medical students (12.9%). Similarly, Goswami & Baruah (2016) reported positive attitudes among respondents, likely due to their awareness of the risks associated with poor HH practices. In a more recent study, Ayyappan et al. (2021) found that out of 143 participants, 79 had excellent attitudes, 59 had good attitudes, and only 5 fell in the fair range none scored poorly. This aligns with Sallami (2016), who emphasized the need

to strengthen healthcare professionals' attitudes through intensive pre-clinical training to prevent adverse outcomes.

In summary, while attitudes towards HH among nursing students are generally positive, challenges such as time constraints, misconceptions, and inadequate training persist. These issues must be addressed through enhanced education, targeted interventions, and continuous reinforcement of the importance of HH in clinical practice to foster consistent and positive attitudes.

2.6 Practice Towards Five Moment For Hand Hygiene

Studies from developing countries show low hand hygiene (HH) compliance, especially in nations with moderate sociodemographic profiles. Reported compliance rates include Vietnam (43.6%) (Phan et al., 2018), India (3.0%) (Laskar et al., 2018), Semarang (22.0%–46.0%) (Lestari & Severin, 2009), and Malang (5.2%–24.1%). A global review by Erasmus et al. (2010) found HH compliance rates ranging from 4% to 100%, indicating wide variability.

Multiple barriers contribute to poor HH compliance. These include skin irritation, limited access to supplies, time constraints, high workloads, forgetting, glove overuse, poor role modeling, and a lack of clear evidence connecting HH to reduced infection rates (Pittet, 2001). While observational studies on nursing students are limited, Cole (2009) found that student nurses self-reported high HH compliance, though no objective assessment confirmed this.

Silago et al. (2022) reported that although most respondents routinely practiced HH and followed basic protocols (e.g., changing gloves between patients and cleaning hands after glove removal), significant gaps remained. While 94.5% had access to HH facilities, only 61.2% and 26.6% followed correct timing for hand washing and hand rubbing, respectively. Many participants failed to meet the recommended duration for

both techniques, and misconceptions about glove use persisted. These findings suggest a need for continuous training to reinforce proper practices and prevent healthcare-associated infections (HAIs).

Jemal (2018) also observed major shortcomings in HH practices. Although 78% of participants washed hands after contact with body fluids, only 36.3% did so before aseptic procedures, and just 19.8% before and after patient contact. Additionally, alcohol-based hand rubs were underused (27.5%), and only 23.1% washed hands before patient interaction. Overall, 56% exhibited poor HH practices, despite having adequate knowledge. This gap highlights the importance of addressing the discrepancy between knowledge and practice through hands-on training, compliance monitoring, and reducing practical barriers.

Saurabh et al. (2022) reported that the practice of hand hygiene (HH) among nursing students was generally unsatisfactory. Although specific practice-level percentages were not detailed, only 51.4% of students agreed that adhering to HH practices was easy in the intensive care unit (ICU) setting, indicating difficulties in maintaining proper HH practices in demanding environments. Despite good knowledge levels (83%), the actual HH practices did not meet desired standards, highlighting a persistent gap between knowledge and practice. The study emphasized the need for improved training programs, better resource availability, and addressing attitudinal barriers to enhance HH practice among nursing students.

In conclusion, existing literature demonstrates critical gaps in HH practice, particularly regarding the timing, duration, and consistency of hand hygiene. Although students and healthcare workers may have knowledge of guidelines, actual compliance is often lacking. The current study aims to assess real-world HH practices, explore

barriers, and recommend targeted interventions to improve adherence and reduce the risk of HAIs.

2.7 Association Between Knowledge, Attitude and Practice Towards Five Moments for Hand Hygiene

Research shows mixed findings regarding the relationship between knowledge, attitude, and practice (KAP) of hand hygiene. Ayyappan et al. (2021) found no significant association between knowledge and attitude ($p = 0.999$), suggesting that knowledge alone may not influence attitude among health science professionals.

Similarly, Jayarajah et al. (2019) observed a weak correlation: knowledge and attitude had limited impact on practice, though students with better attitudes tended to practice better. Interestingly, some studies found a weak negative association between knowledge and practice. The lack of strong correlation between knowledge and practice may be due to environmental constraints, such as limited time, peer influence, or lack of institutional enforcement (Badrul Hisham et al., 2023).

Jemal (2018) also found that, despite good knowledge, healthcare workers showed poor practice due to limited time, heavy duties, and lack of supplies. In contrast, Nematian et al. (2017) found a weak positive correlation ($r = 0.31$; $p < 0.001$) between knowledge and practice among nurses in Iran, indicating that improved knowledge could relate to better practice, though not strongly.

These inconsistencies suggest that knowledge alone does not guarantee proper hand hygiene behavior. External factors such as workload, stress, and facility support play a major role in influencing actual practice. Therefore, this study should also explore how these barriers affect the translation of knowledge and attitude into consistent hand hygiene behavior.

2.8 Association Between Selected Factors and Practice Towards Five Moments for Hand Hygiene

2.8.1 Gender

Gender appears to influence hand hygiene (HH) practices significantly. Mohaithef (2020) found that female nurses were more compliant (88%) compared to males (44%), possibly due to a stronger inclination toward socially acceptable behavior. Similarly, Syed & Al-Rawi (2024) reported better HH practices among female nursing students, linked to higher patient contact and emphasis on hygiene in nursing education. Kamaruddean et al. (2023) also found that female students had better HH practices despite moderate knowledge (40.7%) and good attitudes (69.3%). Only 34.1% practiced HH well, suggesting a gap between knowledge and practice.

In summary, females generally demonstrate better HH practices, influenced by positive attitudes and greater exposure, but challenges in translating knowledge into action still exist. Although female students consistently report better practice, it is unclear wheather this is influenced more by education, personal disposition, or social expectation.

2.8.2 Education Status

Educational level has a notable impact on HH practices. Silago et al. (2022) found higher HH knowledge among degree holders (85.3%) than diploma holders (74.2%), suggesting that higher education enhances understanding and compliance. However, Bülbül Maraş & Kocaçal (2024) reported no significant difference in HH scores based on educational level alone. Instead, students with HH training scored significantly higher ($p < .001$), highlighting the importance of targeted training over general education in improving practice.

In conclusion, while higher education supports better HH knowledge, recent and focused HH training has a stronger influence on actual compliance.

2.8.3 Year of Study

Year of study also affects HH practice. Muthyala & Vankayalapati (2019) found that knowledge improved with each academic year, although not always significantly ($p = 0.301$). Interestingly, fourth-year students showed the lowest HH practice despite better knowledge, possibly due to curriculum timing and reduced reinforcement over time.

Kingston et al. (2017) found first-year Irish nursing students had the highest HH compliance, while second-year students showed the best attitudes due to recent coursework. However, compliance dropped in later years, especially in practices after patient interaction. Similarly, Syed & Al-Rawi (2024) reported variation in HH practices across academic years, with knowledge improving over time but inconsistent practice. This gap highlights the need for continuous education and practical reinforcement.

2.9 Theoretical and Conceptual Framework

This cross-sectional study, "Knowledge, Attitude, and Practice Towards Five Moments for Hand Hygiene Among Undergraduate Nursing Students at USM," was guided by the Theory of Planned Behaviour (TPB), developed by Ajzen (1991). TPB is a psychological model that explains human behavior through three key constructs: attitudes, subjective norms, and perceived behavioural control, all of which influence intention, the strongest predictor of actual behavior.

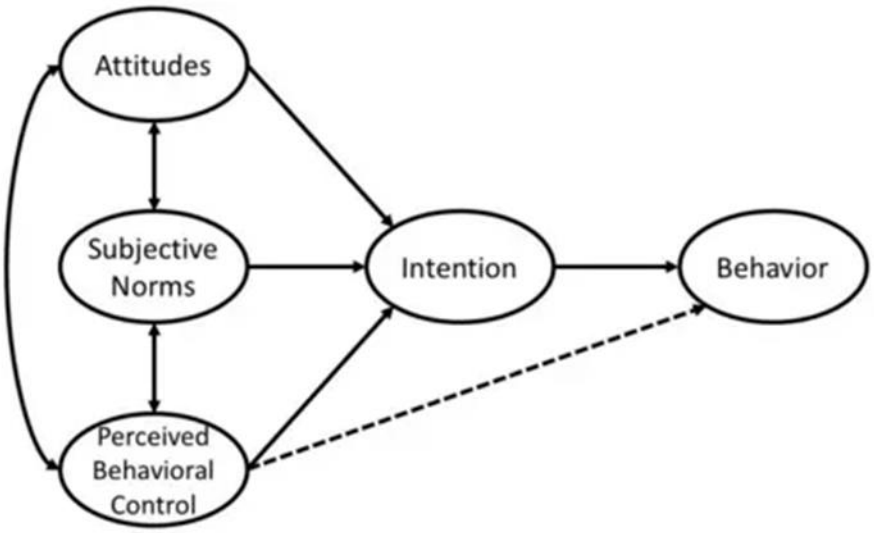

Figure 2.4 Theory of Planned Behavior model illustrating the relationship between attitudes, subjective norms, perceived behavioral control, intention, and behavior by Ajzen (1991) .

In this study, the TPB was adapted to focus on knowledge, attitude, and practice, with a modified version of perceived behavioural control integrated to suit the study objectives. The framework assumed that students' behavior in this case, practicing hand hygiene was influenced by their intentions, which in turn were shaped by attitudes, subjective norms, and perceived behavioural control. Attitude referred to the students' positive or negative evaluations of hand hygiene. A favorable attitude was believed to arise from the belief that hand hygiene is effective in preventing infections (White et al., 2015). Subjective norm described the perceived social pressure from peers, instructors, or healthcare professionals to perform hand hygiene. If students believed that important others expected them to adhere to hand hygiene practices, they were more likely to intend to comply (White et al., 2015). Although knowledge is not a core TPB construct, it is incorporated here as a precursor to attitude, in line with White et al. (2015).

Perceived behavioural control referred to the students' perception of the ease or difficulty of performing hand hygiene. This included both internal factors (such as skills and confidence) and external factors (such as availability of soap or sanitizer). Higher

perceived control was assumed to increase both the intention to practice hand hygiene and the likelihood of translating intention into action (White et al., 2015). Knowledge was incorporated as a precursor to attitude, based on the assumption that students who were well-informed about hand hygiene would develop more positive attitudes toward it. Knowledge was defined as students' understanding of the WHO's Five Moments for Hand Hygiene: before patient contact, before aseptic tasks, after exposure to body fluids, after patient contact, and after contact with patient surroundings (WHO, 2010).

According to TPB, individuals form behavioral intentions based on these constructs. In this study, intention was influenced by knowledge, attitude, subjective norm, and perceived control, and was considered the immediate predictor of the actual hand hygiene practice the dependent variable. This framework helped to explore how undergraduate nursing students' cognitive and social factors influenced their intention and behavior toward hand hygiene. It also provided insight into potential gaps between knowledge and practice and highlighted areas for educational or behavioral interventions.

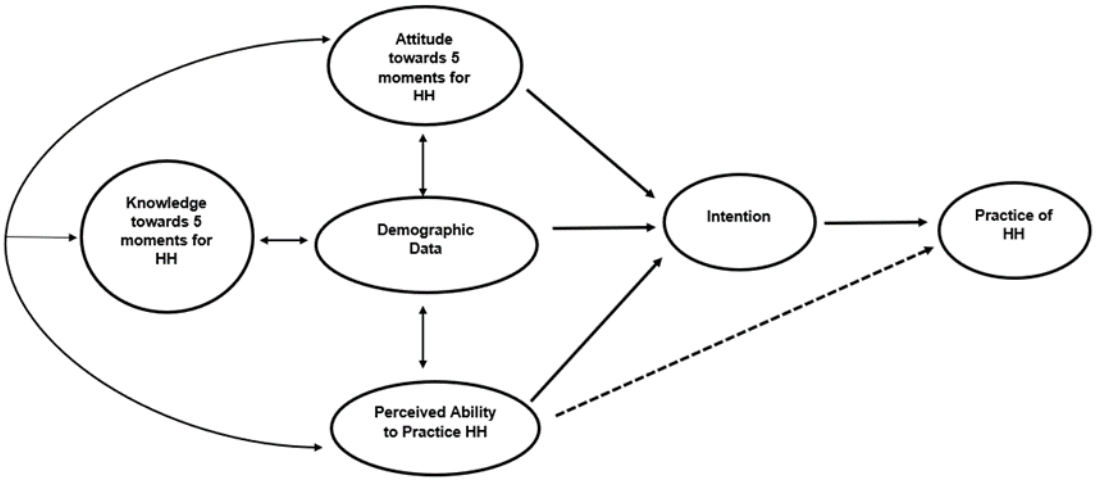

Figure 2.5 Theory of Planned Behavior model illustrating the relationship between attitudes, subjective norms, perceived behavioural control, intention, and behaviour. Adapted from Ajzen (1991).

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlined the research design, location, duration, population, subject criteria, sample size estimation, sampling method, research instrument, variables, ethical considerations, data collection plan, data analysis, and expected research outcomes.

3.2 Research Design

This study used a cross-sectional design, as it was quick and cost-effective to conduct (Wang & Cheng, 2020). Participants were selected from a readily available population relevant to the research question, without any prospective or retrospective follow-up (Wang & Cheng, 2020).

3.3 Study Setting and Population

This study was conducted among Bachelor and Diploma in Nursing students at the Health Campus of Universiti Sains Malaysia (USM).

3.3.1 Sample criteria

Several criteria were specified and set to ensure that the subject's data were suitable for research purposes and can attain the targeted goals at the end of the study to meet the research's objective.

3.3.1(a) Inclusion criteria

The specific eligibility requirements for inclusion in this study required that each participant must be:

- Nursing students from 2nd, 3rd and 4th year in Bachelor of Nursing programme.
- All nursing students from Diploma of Nursing programme.

3.3.1(b) Exclusion criteria

Subjects are excluded from this study if they:

- Nursing students from 1st year in Bachelor of Nursing. These students have not experience clinical practice during questionnaire distribution.

3.4 Sampling Plan

The process of choosing participants or sampling units from the sample frame is known as sampling (Martínez-Mesa et al., 2016). Given that the sampling technique may have an impact on the sample size estimation, the sampling strategy must be determined in advance.

3.4.1 Sample Size Estimation

Sample size of this study was determined by initially calculating the sample size for each research objective. After that, the largest sample size was chosen as the finalized sample size for this study. The sample size estimation was calculation by using the web tool from http://wnarifin.github.io (Arifin, 2024).

Objective 1: To identify the level of knowledge towards five moments for hand hygiene hand hygiene among undergraduate nursing students at USM.

Single proportion was chosen to calculate the estimate sample size. In this calculation, the value of proportion (p) was obtained from a study by Thakker & Jadhav (2015) which is 7.49% good knowledge regarding hand hygiene. The precision value is 0.05 and confidence level 95%. The total sample size estimation is n = 107.