HAND HYGIENE'S KNOWLEDGE, PERCEPTION AND SELF-REPORTED PERFORMANCE AMONG NURSES AT TERTIARY CARE HOSPITALS IN KELANTAN, MALAYSIA

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by

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LIST OF ABBREVIATIONS

AMR   Antimicrobial resistance

Dr   Doctor

HCWs   Health-Care Workers

HH   Hand hygiene

HR   Hand Rub

HW   Hand Washing

HCAIs   Health-Care Associated Infections

ICN   Infection Control Nurse

IPS   Institut Pengajian Siswazah

USM   Universiti Sains Malaysia

UHC   United health coverage

WHO   World Health Organization

Yrs.   Years

SLR   Simple linear regression

MLR   Multiple linear regression

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PENGETAHUAN, PERSEPSI DAN AMALAN KEBERSIHAN TANGAN YANG DILAPORKAN SENDIRI DALAM KALANGAN JURURAWAT DI HOSPITAL TERTIARI DI KELANTAN, MALAYSIA

ABSTRAK

Pendahuluan: Jangkitan berkaitan pusat kesihatan (HCAIs) merupakan kejadian yang paling kerap berlaku semasa rawatan di dalam fasiliti kesihatan. Sehingga kini, belum ada institusi ataupun negara yang boleh mengatakan telah menyelesaikan masalah tersebut. Jangkitan berkaitan pusat kesihatan ini boleh dikurangkan sehingga 50% seandainya pematuhan amalan kebersihan tangan sebelum dan sesudah bersama pesakit dapat ditingkatkan. Oleh itu, pemantauan amalan kebersihan tangan, pengetahuan, infrastruktur, dan persepsi adalah salah satu strategi yang penting untuk meningkatkan amalan dan mengurangkan HCAIs dan kerintangan ubat anti bakteria (AMR).

Objektif: Sehubungan itu, kajian ini bertujuan untuk mengkaji pengetahuan, persepsi dan prestasi amalan kebersihan tangan dalam kalangan jururawat serta mengkaji hubungkait yang mempengaruhi prestasi amalan pematuhan kebersihan tangan di hospital tertiari di Kelantan, Malaysia.

Kaedah: Kajian pengumpulan data keratan rentas dalam kalangan jururawat berdaftar di semua hospital tertiari di Kelantan. Tempoh pengumpulan data dari 15 Disember 2019 sehingga 15 Februari 2020. Kaedah persampelan rawak berstrata digunakan dengan anggaran subjek yang diperlukan adalah 530 orang. Pada mulanya, strata pertama adalah mengikut kadar bilangan jururawat dari empat hospital, dan strata berikutnya adalah mengikut jabatan di setiap hospital. Apabila

senarai nama yang diperolehi, persampelan rawak mudah digunakan mengikut jururawat yang ada di setiap jabatan, berkadar dengan jumlah bilangan jururawat yang ada mengikut jabatan. Data dikumpulkan dengan menggunakan borang pengetahuan kebersihan tangan dan persepsi dari Pertubuhan Kesihatan Sedunia (WHO) yang diisi sendiri oleh jururawat terpilih. Semua komponen utama diambil sepenuhnya dari borang WHO, yang terdiri daripada sosio-demografi dan ciri-ciri pekerjaan, pengetahuan kebersihan tangan dan tinjauan persepsi. Data kemudian dianalisa dengan menggunakan SPSS versi 26.0, dan analisa gambaran berserta kaedah *multiple linear regression* digunakan.

Keputusan: Sebanyak 438 peserta telah dimasukkan ke dalam kajian ini. Majoriti peserta adalah wanita dengan purata usia adalah 38 tahun. Ciri-ciri umum menunjukkan bahawa hampir semua sudah berkahwin, dan majoriti peserta mempunyai pendidikan peringkat diploma 3 tahun. Berdasarkan ciri-ciri pekerjaan, majoriti adalah jururawat yang mempunyai pengalaman kerja rata-rata purata sekitar 14 tahun. Selain itu, 91.8% peserta telah menjalani latihan, 97.5% selalu mengosok tangan secara rutin menggunakan *hand rub*, dan hanya 4.8% merupakan jururawat kawalan jangkitan infeksi.

Hasil kajian ini juga menunjukkan skor pengetahuan (15.08 ± 1.960), persepsi (68.02 ± 10.144) dan prestasi amalan kebersihan tangan (HH) yang dilaporkan kepada diri sendiri adalah (87.58 ± 12.025) peratus. Analisa *multiple linear regression* menunjukkan peramal prestasi amalan kebersihan tangan (HH) yang dilaporkan sendiri adalah skor persepsi (B=0.309; 95%CI:0.200,0.417; p<0.001), jabatan kanak-kanak (B=-5.901; 95%CI:-9.335,-2.467; p<0.001) dan jabatan

ortopedik (B=-5.130; 95%CI: -9.539,-2.287; p<0.023). (Adjusted R² = 0.102; p< 0.001).

Kesimpulan: Secara rumusan, persepsi keseluruhan dan prestasi amalan kebersihan tangan (HH) yang dilaporkan sendiri adalah tinggi, namun skor pengetahuan menunjukkan lebih rendah dari kajian terdahulu. Kekurangan pengetahuan kebersihan tangan semasa rawatan pesakit boleh menjejaskan amalan pematuhan kebersihan tangan yang, yang akhirnya meningkatkan HCAIs dan AMR. Oleh itu, strategi untuk meningkatkan prestasi amalan kebersihan tangan harus lebih memfokuskan kepada pengetahuan dan juga persepsi melalui melakukan pelaksanaan strategi WHO multimodal kebersihan tangan secara menyeluruh.

Kata kunci: Kebersihan tangan, Pengetahuan, Persepsi, Prestasi amalan kebersihan yang dilaporkan sendiri, Jururawat, Hospital tertiari

HAND HYGIENE'S KNOWLEDGE, PERCEPTION AND SELF-REPORTED PERFORMANCE AMONG NURSES AT TERTIARY CARE HOSPITALS IN KELANTAN, MALAYSIA

ABSTRACT

Introduction: Healthcare-associated infections (HCAIs) represents the most frequent adverse event during care delivery, and there was no institution or country can claim to have solved the problem yet. HCAIs can be reduced as much as 50% if the health care able to improve hand hygiene (HH) practice before and after being with a patient. Monitoring HH practices, knowledge, infrastructure, and perception is an important strategy to improve practices and reduce HCAIs and AMR.

Objective: The objective of the current study aims to assess knowledge, perception, self-reported performance scores on HH and to determine factors associated with self-reported performance among nurses at tertiary care hospitals in Kelantan, Malaysia.

Methods: A cross-sectional using primary data collection among registered nurses at all tertiary care hospitals in Kelantan was conducted. The data collection was started from 15 December 2019 until 15 February 2020. A stratified random sampling method was applied, with the sample size required was 530. Initially, the first strata were four hospitals, and the next strata were types of the department in each hospital. From the list, simple random sampling was used for all available nurses in each department, proportionate to the number of available nurses. Data were collected using the World Health Organization (WHO) HH knowledge and perception self-administered questionnaires. All domains were adapted consist of socio-demographic and working characteristics, HH knowledge and perception survey. Data were analysed using SPSS

version 26.0, and descriptive analysis with multiple linear regression method was applied.

Results: A total of 438 participants was included in the study. Majority of the participants were female with a mean age of 38 years old. The general characteristics revealed that almost all were married, and most of them had complete their study at 3-year college/Diploma level. Their average work experience was 14 years. 91.8% of participants had received HH training, 97.5% routinely used hand rub, and only 4.8% were infection control nurses. Their knowledge score was 15.08 ± 1.960; perception score was 68.2 ± 10.144, and self-reported HH performance was 87.58 ± 12.025. The predictors that significantly predict the self-reported HH performance among nurses include perception score (B=0.309; 95%CI:0.200,0.417; $p<0.001$), paediatrics department (B=-5.901; 95%CI:-9.335,-2.467; $p<0.001$) and orthopaedics department (B=-5.130; 95%CI: -9.539,-2.287; $p<0.023$).(Adjusted $R^2 = 0.102$; $p< 0.001$).

Conclusions: In summary, overall perception and self-reported HH performance were high, however knowledge score seems to be lower. Lack of HH knowledge during patient care could result in poor HH practices, thus increase HCAIs and AMR. Therefore, strategy for the intervention of HH performance should focusing more on knowledge as well as perception through performing extensive WHO HH multimodal strategy.

Keywords: Knowledge, Perception, Self-reported performance, HH, Nurses, Tertiary care

CHAPTER 1

INTRODUCTION

1.1   Introduction

Globally, thousands of people die every day from infections acquires while receiving health care (WHO, 2009d). The hands are the primary mode of transmission of microorganisms from one patient to the other during health care activities. People are recommended to do hand hygiene (HH). Hands are the most common body part to transmit healthcare-associated pathogens (WHO, 2009b). The hand is an important medium of infection transmission and can be further worsened in the hospital setting where there are abundant of contamination sources (Taslim O Lawal *et al.*, 2018).

Today, HH has become a complex issue. Around 5378, journals have been studied by using a keyword about HH (Kavitha, 2018), and this was proven that many studies were conducted and published previously. Unfortunately, even though the variety of initiatives, campaigns, and efforts were made to increase HH performance among health care workers worldwide, there are about 61% of health-care workers did not comply with the best practice recommendations for HH (WHO, 2016).

Healthcare-Associated Infections (HCAIs) are a major safety concern for both patients and health care providers (Haque *et al.*, 2018), and it continues to escalate at an alarming rate (Cole, 2011; Revelas, 2012). HCAIs are also acknowledged as 'nosocomial' or 'hospital-acquired' infection. This issue had not yet claim to have a solution as well as becoming a burden worldwide. HCAIs becomes one of the major problems for patient safety (WHO, 2011b).

The burden of HCAIs worldwide being tackled by WHO Patient Safety towards establishing ways of improving global health and save lives lost to HCAIs. The action taken was HH because HH was one of prevention and control measures with simple, low-cost, and effective but require staff accountability and behavioural change (WHO, 2019a). Appropriate HH with the correct application of basic precautions during invasive procedures can reduce the HCAIs burden.

HCAIs were represented to the most frequent adverse event during care delivery, and there were no institution or country could claim to have solved the problem yet (WHO, 2019a). Besides that, estimated HCAIs cases each year by hundreds of millions of patients around the world who are affected. This burden of HCAIs was several higher in low- and middle-income countries than in high-income ones.

Thus, HH was essential to be concerned and performed correctly at the right time among any health-care workers, caregivers of the person involved direct or indirect with patient care (WHO, 2009c). Nurses were aware of the importance and rationale of HH procedures than other health-cares. They also represented a large working group in performing the most time contact patient care in health services. Therefore, HH is one of the most effective measures to prevent infection in the hospital (Malliarou *et al.*, 2013). The study had chosen nurses as subject matters to ensure the best intervention for the issue had occurred worldwide.

1.2   Problem Statement and Rationale of the Study

HCAI is lead to a prolonged hospital stay, a long term disability, the resistance of microorganisms to treatment, and the additional financial burden due to an increase in management costs and unnecessary deaths (WHO, 2019a). Also, it increases morbidity, mortality, length of hospital stays, as well as costs (Graves *et al.*, 2007; WHO, 2011b). Besides, WHO had promoted and advocated all health care workers, including nurses, they must wash their hands along the whole process of attending the patients (WHO, 2009e). This promotion and campaign have been doing continuously until today. In 2019, Malaysia had launched World HH Day on 30th of April 2019 during Infection Control and Preventive Conference in Putrajaya (Ministry of Health Malaysia, 2019).   The conference had aimed for participants to increase their knowledge, practice, and awareness on prevention control of HCAIs cases among patients in hospitals and other health care facilities.

The burden of mortality and morbidity in Malaysia (19%) is still weighing heavily on the health system and populations (Slawomirski *et al.*, 2015). 19% is such a significant number since it becomes an urgent global public health issue today. The issue is actually can be avoided with simple and effective mitigation strategies with full cooperation from nurses as a starter point to increase the patients' safety in all tertiary hospitals in Kelantan. Access to care alone will not fully achieve the ultimate goal of improving health if patients are exposed to HCAIs within hospitals. Furthermore, patient safety has become a crucial component of the WHO and the UHC agenda. WHO had celebrated World Patient Safety Day on 17th of September as a symbol of solidarity and commitment to patient safety across the globe (WHO, 2019b). Malaysia has noted

that patients' safety better than ever before and the action has been taken by performing an effective intervention.

Up till now, there are limited studies available to determine the scores of knowledge, perception and self-reported performance on HH among nurses on HH and also the factor associated with HH. There is only one local study has reported and published the related issue, and yet the study was done in 9 years back in Sibu. That study was done in general participants among HCWs (Birks *et al.*, 2011), and not specific to nurses. The factor associated might differ according to study location, participants, and years in which it is very important because it can cause mortality if the affected patients do not get the proper way of treatment. Yet, they might affect other patients in the hospitals and indirectly increase the rate of HCAIs cases in Malaysia.

Thus, the current proposed study is useful and important for nurses in the tertiary hospitals in Kelantan by having a better way of assessing the score of knowledge, perception as well as HH of self-reported performance and also the factor associated with self-reported performance among them. The finding of the current study could become a reference for all related stakeholders to prepare intervention strategies and help the researchers to plan proper research methodology in the future.

1.3   Research Questions

The research questions for the study are as follows:

i.   What are the scores of knowledge, perception, and self-reported performance on HH among nurses at tertiary care hospitals in Kelantan?

ii. What are the factors associated with self-reported HH performance score among nurses at tertiary care hospitals in Kelantan?

1.4 Research Hypothesis

HA: There is a significant association between self-reported HH performance score with the factors associated among nurses at tertiary care hospitals in Kelantan.

1.5 Research Objectives

1.5.1 General Objective

To study the knowledge, perception, and self-reported performance on HH among nurses at tertiary care hospitals in Kelantan.

1.5.2 Specific Objectives

The specific objectives of the study are as follows:

i. To determine the knowledge, perception, and self- reported performance scores on HH among nurses at tertiary care hospitals in Kelantan.

ii. To determine the socio-demographic, working characteristics, knowledge and perception scores associated with self-reported HH performance score among nurses at tertiary care hospitals in Kelantan.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

The entire literature search on HH knowledge, perception, compliance, and factors associated were broadly doing by using search engines such as PubMed and ProQuest. The various searching strategy was applied, such as a combination of terms with the use of Boolean operators (AND, OR, NOT). The entire literature searches published from 2003 - 2019 were included. The keywords used for the study were HH, knowledge, perception, self-reported performance, and nurses.

In the 19th century, the importance of HH was first realised in a Vienna Hospital, where there were high rates of maternity patients were dying (Malliarou *et al.*, 2013). Thus, Dr. Ignaz Semmelweis had started to order his staff to wash their hands before attending the patients. He was first realised of a connection on increasing HH to that of decreasing infections on puerperal fever (childbed fever) from the year 1818 to 1865 (Famous doctors, 2009). Puerperal fever was a serious septicemia in mothers after the birth of their baby (Pittet, 2004). Today, HH has become part of important strategies from WHO to control infection all over the world.

2.2   The Burden of Health-Care Associated Infections

Globally, about 15 in every 100 patients had an infection while receiving care related to HCAIs (Allegranzi *et al.*, 2011). According to WHO (2011b), the prevalence of HCAIs in developed countries is estimated to vary between 5.1% and 11.6%. Many studies were done in developing countries shown that had reported the rate of prevalence on HCAIs is higher than rates in developed countries between 5% to 19%, and Malaysia with 13.9%.

HCAIs had caused a significant burden and serious adverse event in health care delivery. The impact of HCAIs was "prolonged hospital stays, long-term disability, increased resistance of microorganisms to antimicrobials, a huge additional financial cost for health systems, high costs for patients and family, and unnecessary deaths" (WHO, 2009b). In many locations, from hospitals to ambulatory and outpatient health-care settings, HCAIs appear to be hidden and remain a problem that no institution or nation can claim to have resolved yet.

2.3 Nurses: A Larger Working Group that Perform the Greatest Amount of Direct Patient Care in Health Services

Nurses had been trained to be professional in dealing with patients' care in health institutes, and their degrees have been approved and accepted globally. With that quality, nurses have a unique role and opportunity to reduce any potential hospital-acquired infection, and they can facilitate patients for recovery while minimising the complication related to infections by utilising the skills and nursing knowledge as well as practice (Benson and Powers, 2011). Also, the nurses are part of the members in the health-care team who lead the rest of the teams in practising prevention strategies to protect the patients from infection. Thus, routine HH should become a habit when performing patient care procedures (Benson and Powers, 2011; Malliarou *et al.*, 2013). Health-care workers, including nurses, need to be empowered to hold one another accountable to ensure that everyone is compliant with HH. The nurses are very aware of the rationale for HH procedures (Malliarou *et al.*, 2013), and the topic had been appropriately touched from the lecture and practical aspects during training period.

Despite the following recommendation of guidelines from WHO and the Centres for Disease Control, HH is the most important and easy way to control the infection in the hospital (Park *et al.*, 2014; Sharma *et al.*, 2013). Nurses seem to be the most suitable groups as they are key members of the infection control team in hospitals (Asadollahi *et al.*, 2015). Due to their critical role in patient care and in controlling the infection (Joukar and Taherri Ezbarami, 2007), nurses should have sufficient skills and everything related to infection control.

Nurses who wash their hands can reduce the risk of infecting others as well as prevent them from getting sick (Malliarou *et al.*, 2013). When they are washing their hands properly before coming into contact with others, they can prevent the infection to their patients but also their family members as well (Pittet *et al.*, 2009). Therefore, professional nurses in preventing HCAIs are significant within the scope of nursing practice.

2.4   Impacts of HH Multimodal Strategy in Preventing Health Care-Associated Infections (HCAIs)

HH refers to cleaning the hands either with the alcohol hand sanitiser or by washing the hands with soap and water. Hands are the most vehicle to spread healthcare-associated pathogens (WHO, 2009c). HH is the most standard and effective measure of prevention control and had started less than two centuries ago. The previous study had reported that improved HH practice in health care could reduce HCAIs by as much as 50% (Luangasanatip *et al.*, 2015). However, previous studies suggest that, on average, compliance with HH is around 40% - 50% among health care workers (WHO, 2009c). Others study highlight the role of HH by Marimuthu *et al.* (2014), concluded

that the improvement of HH compliance had been proved to reduce MRSA rates. HH can be an important practice for infection control.

WHO had produced a guideline about multimodal HH improvement strategy and it aims to reduce both the spread of infection and multi-resistant germs as well as the numbers of patients acquiring preventable HCAIs. The guideline involving five key components. The five key components of the strategy are system change, training/education, evaluation and monitoring, reminders in the workplace, and Institutional safety climate. The previous study has reported implementing the WHO HH program can significantly improve HH compliance (Farhoudi *et al.*, 2016). Recent evidence from systematic literature done by WHO (2017) where there is a significant improvement in practices and preventing microbial spread infections and suggest clear evidence about HH multimodal improvement strategies. Other previous findings from Allegranzi *et al.* (2011) showed a significant increase in health-care workers' HH compliance across all professional categories in all sites HH compliance from 51.0% to 67.2% and even more significant on effect in low-income and middle-income countries.

2.5   Hand hygiene Knowledge among Nurses

WHO has recommended that nurses should have essential and updated information regarding HH since HH is the most important way to control the hospital infection (Asadollahi *et al.*, 2015) since nurses act as a critical role inpatient care.

Another study on nurses' knowledge about control of nosocomial infections showed that 43% of nurses had poor knowledge (Sarani *et al.*, 2015). The result has shown that nurses' knowledge did not even reach 50%, and this should be focusing more to increase the knowledge and then reduce the infection respectively.

The previous study of systemic review of poor knowledge of HH among nurses in Iran showed that 83% of situations among nurses do not comply with HH protocols and, in most cases, they are only washing their hands after contact with patients (Najafi Ghezeljeh *et al.*, 2013).

In 2015, 68% of participants reported that they need for continuing HH education to increase their knowledge of HH (Asadollahi *et al.*, 2015). Nurses have been requested to provide them with training on the current HH guidelines. According to the researchers, the nurses' general knowledge about HH is high, but their knowledge seems to be obsolete. The issue is in line with the previous study by Askarian *et al.* (2007), where 90% of participants had reported a need to revise their training on standard precautions. Thus, training on the related issue is recommended for nurses to increase their updated knowledge on hang hygiene.

Besides, the lack of HH knowledge during patient care is mainly due to poor HH among HCWs, and even every country has been provided with HH guidelines (Suchitra, 2006). Knowledge seems to be an important aspect to improve and increase HH practice among HCWs.

Similar to a study done by Abdella *et al.* (2014) had found that knowledge of HH compliance was found to be associated with HH compliance. The study showed that those with good knowledge of HH had 3.8 times more compliance than those with poor knowledge (Abdella et al., 2014). This study provides additional evidence on the knowledge aspect in a number of ways, such as being compliant with the recommended approach, identifying the advantages and disadvantages of HH compliance, and identifying ways in which HCAIs are transmitted and how they can be prevented.

The previous study was done in Kuwait and had in line with Abdella *et al.* (2014), where knowledge is significantly essential as one of the associated factors for better HH. Moreover, the finding of another study had shown that knowledge of health care providers was significantly associated with good HH compliance (Sharma *et al.*, 2011). Hence, knowledge was one of the stronger factors associated with the current study.

2.6   Hand hygiene Perception among Nurses

Perception is defined as a thought, belief, or opinion and often held by many people and it is based on how things seem (Cambridge Dictionary, 2020), the way someone thinks and feels about something.

There are a few studies with consistent findings in which most nurses perceived the impact of HCAIs and strongly believed that HH could prevent infection. This is confirmed by their knowledge and correct attitudes (Seto, 1995; Tai *et al.*, 2009).

According to Lee *et al.* (2014), the improvement of perception of HH can increase the compliance of HH among nurses and physicians. The findings showed that HH compliance improved significantly from 19.0% in 2009 to 74.5% in 2012. At the same time, the perceptions of HH also improved significantly between 2009 and 2012. The improvement of perception is helpful in increasing the compliance of HH among participants of the study. In-line with WHO, HH compliance can be sustained more than 80% to 90% using self-assessment tools of HH (WHO, 2010a), resulting in better results on the perception among health care workers.

2.7   Self-Reported HH Performance among Nurses

HH is an indicator of performance. However, this ideal indicator of HH performance would produce an unbiased and accurate numerical measure on how appropriate the HH practice among health-care workers to prevent the negative infectious outcomes. HH performance can be monitored directly or indirectly (WHO, 2009e), where the direct method includes direct observation, patient assessment, and health-care workers ' self-reporting. The indirect method includes monitoring the consumption of products such as hand rub or soap and automated monitoring like the use of the sink and hand rub dispensers. Monitoring HH adherence can give incentives for performance improvement.

HH performance is influenced by many factors (WHO, 2009e). The ideal method is difficult to achieve today. In order to obtain approximate information on real HH

performance is to take all current measurement approaches. However, the approaches have certain advantages and disadvantages.

Besides, the perception domain is an indicator of the self-related HH performance of self and non-self (Oh, 2018). In fact, the perception domain produced from WHO was used to identify the performance (Oh, 2018; WHO, 2009d). The perception domain is used to measure self-reported performance. According to Oh (2018), perception, attitude, role model resulted in being a significant predictor of HH performance of self. Consistently with previous studies (Lee *et al.*, 2014; Tai *et al.*, 2009), the self-reported performance of HH was associated with perception, attitude, and role models.

2.8   Factors Associated on HH among Nurses

HH is the simplest procedure and yet important for infection control, and failure of performing is a complicated matter that can cause by many factors. The success of performing HH also associated with many factors as well. Below are the factors associated with HH among nurses for the study:

2.8.1   Sociodemographic

Demographics are important as they are measurable characteristics. The demographic factors were included age, marital status, education, and job tenure (Rabindarang *et al.*, 2014). Recently, the study had used demographic factors in the first part of questionnaires to participants among nurses where the items were age, gender, and education status in the study (Aygin *et al.*, 2018).

In the year 2009, WHO had produced a revised version for evaluation and feedback tools to improve HH in the form of questionnaires that focus on knowledge

and perception (WHO, 2009c). This revised version is being used now for improving HH all over the world. Within the questionnaire, there is a sociodemographic part of participants involved in the study. Sociodemographic domains are included age, sex, educational level, clinical work experience, ICN experience, position department, and job title (Birks *et al.*, 2011; Oh, 2018; WHO, 2009c). A greater focus on sociodemographic could produce an interesting finding that accounts for more variety of important discussions for future research. Like in a recent study done by Oh (2018), the findings have shown that the quality participants such as length of clinical career, educational background, and position as a full-time Infection Control Nurse (ICN) has been confirmed to be high compared with the shortness of their infection control experience. These qualities are important to ensure the experience of control infection is becoming better over time.

Over the years, many researchers had used demographic factors in their studies (Oo, 2018), and the demographic variables were including age, position, educational level, and working experience.

2.8.1(a)　Age

According to Kurtz (2017), many studies have been done on demographic domain except for gender and job description domains and there are several studies have done on age domain. This was shown that the demographic domain also important and helpful in completing the study. In 2011, the domain of age and experience years had also been found to be significant positive associated with self-reported handwashing (Al-Hussami *et al.*, 2011a). Also, strong evidence of age domain was found that age to be a significant predictor for HH as well (Diller *et al.*, 2014).

2.8.1(b)   Gender

Gender is a key variable in future research (McKeown, 2003). There was a study done by Mathieu and Zajac (1990); gender may affect workers' attitudes towards the institution. In detail, female workers were found to be more performed to their male counterparts (Forkuoh *et al.*, 2014). In a related study, Kumasey *et al.* (2014) also found out that males were found to get performed to their respective organizations than females.

Also, there were many other significant findings on sociodemographic in previous studies. Cruz and Bashtawi (2016) reported that gender and academic level were significant predictors of the practice of HH among Saudi nursing students. This finding had suggested that being a male and being in an early academic level of nursing education could be associated with better practice on HH. Conversely, a previous study had revealed that females give better adherence to HH (Anderson *et al.*, 2008). However, other previous studies reported that male students had significantly better HH practices than females (Cruz *et al.*, 2015). Male have higher confidence to complete the tasks given and less worry about their behaviour and style on doing things (Cruz and Bashtawi, 2016). The study had suggested validated gender influence in the future study.

2.8.1(c)   Educational Level

The quality of workers was measured using their educational level. High educational workers occupy higher ranks and are more accountable and later more committed to the organization (Salami, 2008). Thus, the level of education can lead to

a high level of commitment. (Amangala, 2013). However, more educated workers may affect the organization since they may have high expectations that the organization unable to meet (Al-Kahtani, 2012; Igbal, 2011). In contrast, there was also a study found that workers who were having certificates from first degrees and below had shown better performance compared to those with higher qualifications (Forkuoh *et al.*, 2014). This variable seems to be important for study benefit and somehow being an important variable for study purposes.

2.8.2 Working Characteristics

Working characteristic was one of the important variables that affect organizational commitment (Mowday *et al.*, 1982). Working characteristics were based on five core aspects, mainly skill variety, task identity, autonomy, task significance, and feedback (Hackman and Oldman, 1975). Somehow the characteristics were according to the needs of study purposes.

A previous study had used working characteristics for assessment in the study, which includes job rank, monthly income, and working time (Liu *et al.*, 2014), and these working characteristics somehow being the motivational factor for workers. These working characteristics were being selected according to the study purpose.

Recently, the study had used two items of working characteristics in the first part of the questionnaire to participants among nurses, and the items were duration of working years and duration of working years in the operating room (Aygin *et al.*, 2018). Whereas, another study done by Oh (2018) had included the type of hospital as working characteristics. The characteristics were included the type of hospital, number of beds,

HH guidelines, presence of an infection control department (ICD), presence of an infection control nurse (ICN), number of HH sinks, number of alcohol-based hand rubs, experiences of HH education in recent years, HH campaigns, HH monitoring and feedback, and mass media information (Oh, 2018). These items had been discussed for continuous improvement until they reach the standard quality of satisfaction.

2.9 Conceptual Framework

Based on the literature review, several factors influenced the performance of HH among nurses. The identified factors were **sociodemographic** characteristics including age, sex, marital status, educational level, and; health-care provider factors including knowledge, perception, attitude, motivation and role model; **working characteristics** factors including position, experience, department, hospital, receiving HH training, routinely hand rub and infection control nurse; **patient's factors** including patients risks and type of patient care; **system health-cares factors** including shortage or location sink and understanding.

Conceptual Framework

Hand Hygiene among nurses

Healthcare provider:
- Knowledge
- Perception
- Attitude*
- Role Model*
- Motivation*

Working characteristics:
- Position
- Working Experience
- Infection Control Nurse
- Department
- Type Hospital
- Received HH Training
- Routinely Hand rub

Sociodemographic factors:
- Age
- Sex
- Marital
- Education level

Patients factors:
- Patient risks (low)*
- Type of patient care*

System healthcares :
- Shortage/location sink*
- Understaffing*
- Workload*

*Study factor not included

Self-reported Hand Hygiene performance of Self

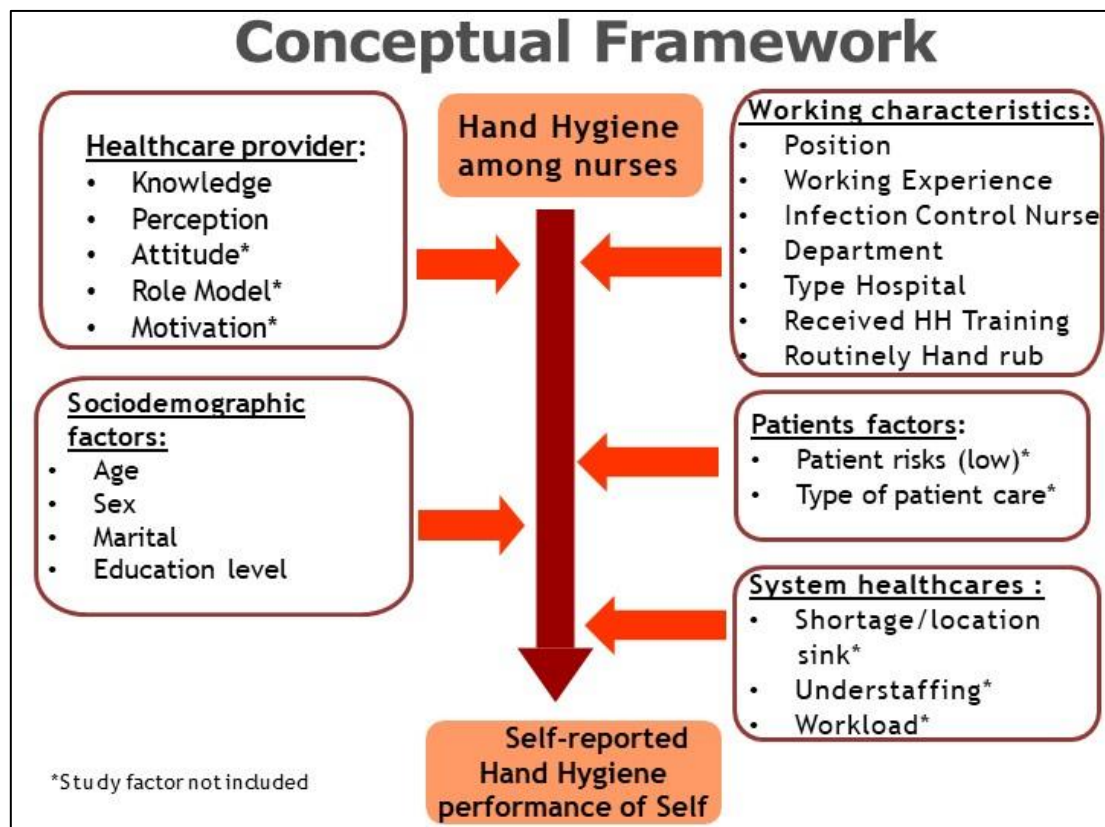Figure 2.1: Conceptual framework of associated factors of HH compliance among nurses in tertiary hospitals in Kelantan. Factors with "*" were not studied.

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CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the research design, sampling, tools, operational definition, data collection, data analysis, and summary.

3.2 Research Design

A cross-sectional study was conducted using primary data among nurses at tertiary care hospitals in Kelantan.

3.3 Study Area

The study location was conducted at all tertiary hospitals in Kelantan. They were included:

i.   Hospital Raja Perempuan Zainab II (HRPZII)

ii.   Hospital Universiti Sains Malaysia (HUSM)

iii.   Hospital Tanah Merah (HTM)

iv.   Hospital Sultan Ismail Petra (HSIP)

3.4 Study Population

3.4.1 Reference population

The reference population was registered nurses that stay in Kelantan.

3.4.2 Source population

The source population for the study was registered nurses working at tertiary hospitals.

3.4.3   Sampling population

The sampling population for the study was registered nurses who fulfilled the study criteria. The study only involves the knowledge and perception of nurses in their daily activities on patients' safety concerns.

3.5   Subject Criteria

Registered nurses that fulfilled study criteria;

Inclusion criteria:

   I.   Registered nurses working in tertiary hospitals

  II.   Working at least six months

Exclusion criteria:

   I.   Nurses do the administrative job only

  II.   Assistant nurse

 III.   Those who not available within the duration of the study

3.6   Sample Size Estimation

The sample size was calculated based on the study objectives as follow:

3.6.1   Sample Size Calculation (Objective 1)

The sample size calculation to determine the knowledge, perception, and self- reported performance scores on HH among nurses at tertiary care hospitals in Kelantan (objective 1) was done by using a single mean calculation (Oh, 2018). Conventionally, the power of the study was set at 80 % and $Z\alpha = 1.96$ for $\alpha = 0.05$ (95% CI). The sample size was calculated for each variable.

$$n = \left(\frac{Z_{\alpha/2} * \sigma}{d} \right)^2$$

σ   = Population's standard deviation
      (from the previous study)
α   = Type 1 error
d   = margin of error estimating mean

Table 3.1: Sample size calculation (objective 1)

VARIABLES	σ	Δ	n	n+ 20% anticipate dropout	LITERATURE REVIEW
Knowledge	2.5	0.3	267	334	(Oh, 2018)
Perception	0.8	0.08	385	482	(Oh, 2018)
Self-reported HH performance	27.8	3	330	413	(Oh, 2018)

Hence, the number of subjects needed for objective I was n= 482.

3.6.2   Sample Size Calculation (Objective II)

The sample size calculation to determine factors (sociodemographic and working characteristics), knowledge score, and perception score associated with self-reported performance score on HH among nurses at tertiary care hospitals in Kelantan (objective 2) was done by using two independent mean calculation. The sample size was calculated for each variable.

$$n = \left(\frac{m+1}{m}\right)\left(\frac{\sigma}{\Delta}\right)^2 \left(Z_{(1-\alpha/\tau)} + Z_{(1-\beta)}\right)^2$$

m = Ratio of sample mean
σ = Population's standard deviation
      (from previous study)
Δ = Detectable difference
α = Type 1 error
β = Power of study
τ = Number of tail

Table 3.2: Sample size calculation objective II

VARIABLES	m	σ	Δ	$Z_{(1-\alpha/\tau)}$	$Z_{(1-\beta)}$	n	n+20% anticipate dropout	LITERATURE REVIEW
Knowledge	1	2.5	1.0	1.96	0.84	198	248	(Oh, 2018)
Perception	1	0.8	0.3	1.96	0.84	224	280	(Oh, 2018)
Age	1	3.8	1.1	1.96	0.84	454	470	(Nabavi *et al.*, 2015)
Clinical Work Experience	1	5.7	2.0	1.96	0.84	256	320	(Zakeri *et al.*, 2017)
Gender (female)	1	2.6	0.05	1.96	0.84	214	268	(Nabavi *et al.*, 2015)
Had Training / Courses	1	0.11	0.03	1.96	0.84	424	**530**	(Zakeri et al., 2017)

In conclusion, based on the above calculation, the largest sample size which needs to accomplish the objectives of the study was obtained from the calculation in objective II, which was 424, with the additional assumption of a 20% drop out rate, the final total number of sample required was 530. A sample size of **530** patients was considered optimum to be able to answers all research questions.

3.7   Sampling Method

The sample size required for the study was 530.   A stratified random sampling method was applied with probability proportional to size (PSS) as below:

I.   Four tertiary hospitals in Kelantan had been identified. Stratified sampling was used according to four identified hospital localities in a given population to represent within the whole sample population total number of nurses in tertiary hospitals in Kelantan.

II.   The proportionate stratified sample was obtained using this formula = (sample size/population size) x stratum size.

III.   The first strata were hospitals (table 3.3), and the next strata were types of departments in each hospital. The total number of nurses in tertiary hospitals in Kelantan was 3366 (Kelantan State Health Department, 2019; HUSM, 2019), referring population size.

IV.   The selection of survey participants was used random sampling from the strata sample size in each department proportionate to the number of available nurses.

Table 3.3: Strata sample size of nurses in each hospital

Hospital	Number nurses (n)	Proportion (%)	Sample Size (n)
HRPZ II	1465	43.5	231
HUSM	1382	41.1	218
HTM	219	6.5	34
HSIP	300	8.9	47
Total	**3366**	**100**	**530**

3.8 Research Tools & Materials

The tools and materials used in the study were available via the WHO Patient Safety website and WHO had permitted to use it to improve HH and thus reduce HCAIs (WHO, 2009a). All domains for the study was adapted from the 2009 revision of the WHO HH Knowledge Questionnaires for Health-Care Workers and the 2009 revision of the WHO Perception Survey for Health-Care Workers. The WHO First Global Patients Safety Challenge: Clean Care is Safer Care (CCiSC) had developed tools for evaluation and feedback to facilitate the improvement of HH in health-care facilities worldwide (WHO, 2010b). The tools were developed based on evidence and experiences of pioneers and experts in HH field and are recommended to use those tools since WHO had regularly updated and support the tools for campaign purpose. Thus, the questions were validated and ready to use worldwide. Duration answering self-administered questionnaires around 10 – 15 minutes.

The data for the study was collected using self-administered questionnaires that consist of three domains:

- Domain A: Socio-demographic Data (Background and Working Characteristics)
- Domain B: Hand Hygiene Knowledge
- Domain C: Perception Survey

3.8.1 Socio-demographic (Domain A)

Sociodemographic data consists of background and working characteristics. The background data consist of 4 items that include age, gender, marital, and education.

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