International Journal of Public Health Science (IJPHS)
Vol. 13, No. 1, March 2024, pp. 200~207
ISSN: 2252-8806, DOI: 10.11591/ijphs.v13i1.23071

Infection prevention and control compliance among nurses and nursing students during COVID-19 in Malaysia

Siti Hazariah Abdul Hamid[1], Haliza Hasan[1], Wan Hasliza Wan Mamat[2], Dina Syazana Ho Imran Ho[3], Muhammad Kamil Che Hasan[4]

[1]Department of Special Care Nursing, Kulliyyah of Nursing, International Islamic University of Malaysia, Pahang, Malaysia
[2]Department of Professional Nursing Studies, Kulliyyah of Nursing, International Islamic University of Malaysia, Pahang, Malaysia
[3]Clinical Management Unit, Sultan Ahmad Shah Medical Centre@IIUM (SASMEC@IIUM), Kuantan Pahang, Malaysia
[4]Department of Medical Surgical Nursing, Kulliyyah of Nursing, International Islamic University of Malaysia, Pahang, Malaysia

Article Info

Article history:

Received Feb 13, 2023
Revised Jul 10, 2023
Accepted Jul 20, 2023

Keywords:

Compliance
Endemic COVID-19
Infection prevention
Nurses
Qualitative study

ABSTRACT

The Malaysian COVID-19 hospital admission rate and the intensive care wards usage are now declining as the health service system enters a stage of recovery in the endemic phase. This study aimed to explore the barriers to and facilitators of infection prevention and control (IPC) compliance among staff nurses and nursing students and to observe their IPC compliance when attending to the patients in the respective wards. Qualitative study using in-depth interviews was conducted with staff nurses and the nursing students as primary data collection methods and supported with direct observation in the wards. A total of 21 staff nurses and 14 undergraduate nursing students from multiple wards were purposively sampled from April to December 2022. Data were analyzed using thematic analysis in Nvivo software. Four key themes were emerged in this study such as the partcipants i) Narrating IPC compliance; ii) IPC compliance adherence; iii) Perceived barriers for noncompliance to IPC; iv) Empowering staff nurses and nursing students on IPC compliance. The study findings served as key evidence for the hospital top management and the nursing faculty in planning the strategies to improve the IPC training and monitoring by empowering staff nurses and nursing students at their teaching hospitals.

Corresponding Author:

Siti Hazariah Abdul Hamid
Department of Special Care Nursing, Kulliyyah of Nursing, International Islamic University of Malaysia
25200 Kuantan Pahang, Malaysia
Email: shazariah@iium.edu.my

1. INTRODUCTION

Malaysia has entered endemic phase transition since April 1st, 2022. Endemic COVID-19 refers to the presence of virus in the community, but the infection rate is static where the cases are neither rising nor falling [1]. The number of COVID-19 patients are declining despite the reported number of cases averaging around 1,000 cases per day. Thus, the healthcare providers and the community must continue to follow the stardard precautions [2]. Hospitals university like other government hospitals in Malaysia which are involved in treating and managing patients with COVID-19, also focus on community health development and economics centric [3]. The quality assurance process is always in place so that the public is convinced of the safety and quality of care.

By portraying a good medical practice, staff nurses become the role models to the trainees and practical students. It is expected that staff nurses and nursing students have a good understanding of COVID-19 and related infection prevention and control (IPC) practices. Global report on IPC reported that good IPC programme could prevent 70% of health care-associated infections (HAIs) [4]. There were series of

IPC trainings conducted with all the healthcare staff including the practical students in Malaysia during the emergence of COVID-19 phase. Sultan Ahmad Shah Medical Centre, International Islamic University Malaysia known as SASMEC@IIUM is one of teaching hospitals in East coast Malaysia that train their healthcare staff as well as the academicians of the campus. This is to ensure the staff and students are equipped with IPC knowledge and practices prior to the clinical attachment. The IPC compliance needs to be monitored from time to time as the preventive measure. This is because workplace safety has become a critical component of the healthcare facilities response to mitigate the risk of COVID-19 transmission during pandemic [5].

Malaysia has been recognised as showing the most satisfying level of preparedness in terms of healthcare facilities and managing COVID-19 pandemic [3]. Malaysia became a reference for ASEAN countries and some parts of the world especially on the strategies our country took in achieving herd immunity and vaccination as a way to prevent the spread of COVID-19. Strict border control including ban on the international travel, nationwide lockdown that led to closure of schools and non-essential business, testing, tracing, and isolation, open, clear and consistent messaging, daily press conferences, and evidence and fact-based decisions are among the great strategies adopted by the Malaysian government led by the Director General of Health Tan Sri Dato Noor Hisham Abdullah [6].

The important fact is that COVID-19 cases are still present, and the rate of spread is predictable in Malaysia and the world. There are cases reported from the workplace before being transferred to the main hospital. For example, an asymptomatic positive case for COVID-19 was detected (150th case) during health screening on employee reporting duty in early September 2020. There are almost about 3,000 COVID-19 cases among healthcare providers in Malaysia even after being vaccinated in 2021 [6]. This raised the questions 'Do the nurses including the nursing students in teaching hospital comply toward IPC practices during endemic phase? What are the barriers and facilitators of IPC compliance among nurses and nursing students in SASMEC? The high demand for empowerment of great IPC compliance among nurses and the nursing students in battling COVID-19 justifies the need to observe the evaluation on the implementation of the existing IPC practices. This qualitative study was aimed to explore the barriers to and facilitators of IPC compliance among nurses and nursing students and to observe their IPC compliance during attending the patients in the respective wards.

Yellew *et al*. [7] had identified barriers to IPC practices among healthcare workers working at Amhara region teaching hospitals in Ethiopia. The authors identified the shortage of material supply, lack of maintenance of facilities, equipment, high patients flow, healthcare professionals' own behaviour and awareness on IPC, emergency and the overflow of families and visitors to the hospitals. Meanwhile, high rate of health staff turnover, time spent for training new staff, and heavy clinical workload were among the barriers compliance on IPC in India and Pakistan [8], [9]. Contrary to studies by [10], [11] among nurses conducted in Hong Kong and Ghana respectively reported that level of compliance was low due to unclear policy of IPC and having proper handling of patients. Tanzanian healthcare workers also face major challenges on IPC compliance due to lack of training [12].

A well-developed infection control team and hospital prioritizing infection prevention and control were the major facilitators [13]. These studies were conducted before the COVID-19 pandemic. Health workers compliance towards IPC reported only 22% (n=404) in public hospital Western Ethiopia [14]. This study revealed that inadequate supplies of personal protective equipments, insufficience supportive medication, and lack of provision of adequate ventilation were the barriers to IPC compliance among healthcare workers. A study comparing hand hygine compliance among healthcare staff before and during the COVID-19 pandemic suggesting qualitative study is needed to verify the quantitative results and further identify the barriers to hand hygine compliance among staff [15], [16]. A systematic review of the IPC adherence suggests similar factor as highlighted by previous study and emphasizes on the importance of awareness on IPC and considering them during implementing IPC guidelines [17].

In Malaysia there were quantitative studies conducted to evaluate IPC compliance among healthcare workers by [18] and [19]. These researchers used an online google form to assess the risk exposure and identify prevention measure among healthcare workers who were directly working at COVID-19 wards. The researchers also asked about healthcare workers adherence to IPC and concluded that more than 90% of them followed the IPC practices [18]. It could be argued that this figure is self-reported, and it has potential to response bias. Another quantitative study [19] that aimed to determine IPC compliance and its association with sociodemographic and organisation factors among healthcare providers during COVID-19 pandemic in Malaysia. The result showed that the participants complied to the IPC guideline but their compliance level differed based on the department, work assignment, and the years of service. Another quantitative conducted in 2021 by [20] among healthcare providers in one of teaching hospitals in Malaysia also reported the high level of compliance to IPC standard. A qualitative approach done by [21], [22] in Iran showed that individual, societal, and institutional level are among the factors that influence IPC compliance among healthcare workers. These studies only conducted interviews with their participants without observing the IPC compliance.

It can be argued that it is difficult to make conclusions on the actual compliance of IPC practices by using self-administered questionnaires as conducted by many previous studies. Moreover, it is a need to

evaluate IPC compliance that relate to COVID-19 among the nurses and the nursing students from time to time to ensure the quality of health services to the community. The actual experience, facilitators, and barriers of compliance to IPC have not been well researched qualitatively which become the main aim of this study.

2. METHOD

2.1. Design

This qualitative study applied two methods of data collection. In-depth interviews with staff nurses and the nursing students were carried out as primary data collection methods. Direct observation in the respective wards was conducted to complement the interview data.

2.2. Sample

A total of 21 staff nurses and 14 undergraduate nursing students were purposely sampled for the semi structured in-depth interview and the observation between April 2022 and December 2022 based on their experience attending IPC training, handling patients, and their willingness to participate in this study. These participants were recruited from various disciplinaries such as medical, surgical, orthopaedic, paediatric, obstetrics and gynaecology, emergency and trauma department (ETD), and critical care unit.

2.3. Interview guide and observation checklist

The interview topic guide was developed based on the review of literature on the barriers and challenges to the IPC practices. The interview guide was checked and verified by the research team before the data collection. A pilot interview was conducted with three staff nurses to ensure the claririty and appropriateness of the interview questions. A face-to-face in-depth interview lasted approximately 45 minutes to one hour with the participant in a quiet area at the hospitals. The interview was tape-recorded for the transcription and analysis. Direct observation was applied to provide contextual information and the environment of the study sites to assist staff nurses and nursing students in applying infection prevention and control. This research used observational checklist developed by WHO in 2017. The tool was adopted to observe the compliance of IPC among staff nurses and practical students in one of teaching hospitals in Malaysia. The participants were explained briefly that their care practices will be observed to fulfil the research objective.

2.4. Data collection

The poster containing the information of the study and contact detail of the researchers was distributed through the email and put on the notice board. The participants contacted the researcher to be part of the research. Each of the staff nurses and nursing students was approached individually and they were explained about the objectives and were provided with participant information sheet. Once consented, an appointment was made to find the most convenient place and time to proceed with the interview. Staff nurses and nursing students who were approached for interviews were also invited to participate during observation. They were informed that written notes would be taken during observation when they carried out treatment or handled their patient.

Informal direct observation took place to familiarise with the surroundings of each clinical environment. Direct observation was also conducted to collect 'naturally occurring data' in the study sites [6]. The researcher did not interfere with observing the situation or event to prevent potential biases from any of the researcher's actions. Data from the observation would supplement the data from the interview in understanding the barriers and facilitator of adherence to the infection and prevention control initiative. There were 35 direct observations conducted which were guided by the observation checklist to set the focus on the observation. The observation field notes were familiarised by reading and rereading them for a number of times while rethinking and questioning about the elements of IPC and their adherence towards IPC during handing the patients.

This study was approved by Kulliyyah of Nursing Postgraduate and Research Committee (KNPGRC), IIUM Research Ethical Committee (IREC), Clinical and Research Centre (CRC) of the teaching hospital. Informed consent was obtained from the participants before the interview and observation. They were informed of their right to withdraw from the study at any time. This study was funded by Sultan Ahmad Shah Medical Centre SASMEC@IIUM (Grant no: SRG21-052-0052).

2.5. Data analysis

Data was also analysed and checked against research questions and objectives of interview data. Then, process of labelling and indexing was conducted and preliminary thematic framework was built in the NVivo software. The interview and observation data were anonymised using pseudonyms for each interview transcript and observation to ensure anonymity of the participants [23].

3. RESULTS AND DISCUSSION

There were 21 staff nurses and 14 final year nursing students who participated in this study. The working experience for the staff ranged from one year to 10 years while nursing students almost completed their clinical requirement by Malaysian Nursing Board (MNB). All the staff nurses and the students had an average of two training courses on IPC from the hospital management and the nursing faculty respectively. Table 1 outlines the participant's background information.

Table 1. Participant's background information

No	Designation	Age range	Gender	Department	Working experiences	IPC training/ Year
1	Staff nurse	35-40	Male	ETD	3	3
2	Staff nurse	20-25	Male	ETD	2	3
3	Staff nurse	20-25	Female	CCU	1	2
4	Staff nurse	35-40	Female	CCU	3	4
5	Staff nurse	20-25	Female	ICU	1	1
6	Staff nurse	45-50	Female	ICU	10	1
7	Staff nurse	20-25	Female	NICU	1	3
8	Staff nurse	20-25	Female	NICU	1	2
9	Staff nurse	30-35	Female	NICU	2	2
10	Staff nurse	20-25	Female	NICU	1	3
11	Midwife	30-35	Female	O&G	4	2
12	Midwife	25-30	Female	O&G	4	3
13	Staff nurse	25-30	Female	Peads	4	3
14	Staff nurse	30-35	Female	Peads	5	1
15	Staff nurse	30-36	Male	Ortho	4	3
16	Staff nurse	45-50	Female	Ortho	10	4
17	Staff nurse	25-30	Female	Surgical	4	2
18	Staff nurse	20-25	Female	Surgical	4	2
19	Staff nurse	20-25	Male	Surgical	2	4
20	Staff nurse	45-50	Male	Medical	10	2
21	Staff nurse	30-35	Female	Medical	4	3
22	Student nurse	20-25	Male	Nursing		2
23	Student nurse	20-25	Female	Nursing		2
24	Student nurse	20-25	Female	Nursing		2
25	Student nurse	20-25	Female	Nursing	Year four	2
26	Student nurse	20-25	Female	Nursing		2
27	Student nurse	20-25	Female	Nursing	(52 weeks of clinical	2
28	Student nurse	20-25	Male	Nursing	posting in various areas	2
29	Student nurse	20-25	Male	Nursing	in teaching hospital)	2
30	Student nurse	20-25	Female	Nursing		2
31	Student nurse	20-25	Female	Nursing		2
32	Student nurse	20-25	Male	Nursing		2
33	Student nurse	20-25	Female	Nursing		2
34	Student nurse	20-25	Male	Nursing		2
35	Student nurse	20-25	Female	Nursing		2

ETD: Emergency and Trauma Department, ICU/CCU: Intensive/Cardiac Care Unit: NICU: Neonate Intensive Care Unit

We explored the IPC compliance, facilitators, and barriers of the participants during endemic phase using in-depth interview and direct observation. We found four emerging themes with subthemes that are summarized in Table 2. The findings have answered the research questions of the barriers to and facilitators of IPC compliance among staff nurses and nursing students.

3.1. Theme 1: Narrating IPC compliance

This qualitative analysis showed that IPC compliance changed with time for the three periods studied: before the pandemic, during the pandemic, and during the endemic period. It was clear from comparing these phases that nurses perceived the risk of infection to be lower before the pandemic than it was during the pandemic and endemic. This is likely because there was less information available on addressing COVID-19 patients during the early pandemic period. The healthcare workers' concern over the COVID-19 outbreak may be caused by a lack of access to current information and communication [24]. They were unprepared for and unprepared to deal with an unknown disease when they encountered it [25]. The precaution was decreased from personal protective equipment (PPE) level 2 to PPE level 1 due to the vaccination campaign and with less restrictive standard operating procedures. This reduction may influence the nurses and student's adherence to IPC during the patients' care; whereby in this study, it is found that the lighter compliance during the endemic phase.

Table 2. Emerging themes based on the interview

No	Themes	Subthemes	Quotations
1	Narrating infection prevention and control compliance	Before COVID-19	"…comply most wearing mask and glove when treating or attending a low-risk patient"
			"The emphasize on infection prevention and control during orientation month"
			"Rarely joining the training for IPC except posting in critical area"
			"Strictly comply with the PPE level 2 for the whole shift. We have to changed it after attending a COVID-19 patient"
		Pandemic COVID-19	"At least we apply PPE level 1 with face shield, even though at one time short supply of mask, glove and plastic gown".
			"The hospital provides a scrub suit for the staff nurses as we need to used it during our shift. We change our staff uniform to scrub suit before and after our shift"
			"Level 1 PPE is used when treating general patients. Level 2 PPE is used when handling PUI (Patient under investigation) whereas Level 3 PPE is to handle patients with COVID-19"
			"If we used to comply with PPE level 2 but now, we just adhere to PPE level 1"
			"I could say the adherence to PPE much lesser than before"
			"I could say that face shield and google seem no longer applicable"
		Endemic phase	"Apply PPE Level 3 in severe acute respiratory infection (SARI) zone for COVID-19 patient"
			"Many staff and students lightly comply with the standard precaution unless attending suspected and confirmed infectious diseases.
2	Infection prevention and control Adherence	Roles of clinical nursing instructor (CNI)	"The CNI will come to do inspection and guide on IPC practices, while the team leader will be in charge for observing the staff nurse's compliance"
			"Teaching hospital and school of nursing working collaboratively to provide IPC training for staff and students. There are IPC briefing for students every time they start the practical session rather than one-time briefing in the first year"
			"The CNI should play his/her role in ensuring the correct IPC practices among the students"
		Roles of link nurses	"Assign a link nurse at each ward to monitor the IPC practices among the health care professionals and the practical students"
			"The hospital management can assign a link nurse to ensure the compliance to IPC practices"
			"Assign a link-nurse at each ward to ensure the compliance of IPC among the healthcare profesionals (HCPs) and practical students"
			"Assign a link nurse to do regular inspection and audit the IPC practices for each staff"
			"The IPC unit should follow up from assigned link nurse about the IPC compliances among HCPs in each department"
3	Perceived barriers for not compliance	Less quality of face shield	"In this teaching hospital, the management make a compulsory for face shield…but we tend to refuse it due to blurry, unclear view and it is unsuitable for certain procedure with the patient. It really distracting us caused by cold temperature of room"
			"We did demand a good quality of face shield and google especially when dealing with COVID-19 patient"
			"Face shield quite difficult to comply as I am wearing spectacle"
			"The uses of face shield sometimes disrupt the view so many HCPs and practical students do not wear the equipment unless when they treat the patients with symptoms and involving body fluid"
			"We are facing short supply of N95 mask, linen, jumpsuits due to high number of COVID-19 patients and those who also need urgent treatment. Luckily the management solve it swiftly"
		Lack of supply	"We are using double layer mask and glove. There are staff buy N95 mask on their own used instead of waiting hospital supply"
			"During peak number of COVID-19 cases, lack supply of equipment sometimes disrupt the students to fully comply to IPC practices"
			"I am petite and need smaller size of glove and gown. But the supply is always limited.
		Personal factors	"I am suffering eczema and allergy; thus, management provides us with non-powdery glove…I heard there is also liquid lotion for hand rub especially for those allergic to hand sanitizer"
			"I witness a colleague and a student who less comply to the PPE especially when attending patient for giving medication or taking vital signs"
			"High number of waiting patients in lines sometimes cause the HCPs and students cannot properly practice the IPC such as changing the glove and apron after handling each patient"
4	Empowering staff nurses and nursing students on IPC compliance		"I strongly believed that, all the healthcare providers must have self-awareness on the importance of IPC, and top management must organise frequent trainings on all staffs to increase the awareness among them"
			"The staff nurse stated that individual self-awareness on the importance of IPC is the most important thing to ensure the compliances to the practices"
			"Top management provide more trainings on IPC, which can be done online (Google Meet) to include the participation of all staff and practical students"
			"I suggest that hospital might provide the reward to those who are able to perform the most accurate IPC practices...this is because reward can motivate people to perform better"
			"For the staff and students, they need to change into other uniform once they go into the clinic/ward to prevent them from bringing the virus from outside"
			"Increase the frequency of sudden inspection by the representative from IPC unit in order to ensure that the HCPs and practical students always practicing the correct IPC practices"
			"Hospital has set a complete standard protocol on IPC practices that should be practiced by all the HCPs and practical students, but the implementation of the protocols should be tighten"

3.2. Theme 2: IPC compliance adherence

The clinical nursing instructor (CNI) and infection control link nurses (ICLN) were extremely important in ensuring that the IPC was followed while providing care. CNI has more responsibilities because they will instill in students the discipline to follow safety precautions while they are still in university, ensuring that they maintain the same attitude throughout their career. ICLN were responsible to locate, oversee, facilitate, and inform on issues pertaining to their wards that dealt with infection prevention [26], [27]. The study's participants emphasized the ICLN and CNI's partnership, which may benefit each other. For instance, CNI will be given additional credit for adhering to the IPC while the ICLN will have more staff on hand to supervise and support the staff nurses' and students' adherence to the IPC. Instead of conducting the IPC briefing yearly, the hospital and nursing school should conduct the IPC briefings more frequently.

3.3. Theme 3: Perceived barriers for not compliance to IPC

Our research also sheds light on the difficulties faced by the staff nurses and the student nurses in order to comply with IPC: less quality of face shield, lack of supply, as well as personal factors that imposed an additional challenge on hospitals and their IPC programmes, similar in [28]. In contrast to our study, the participants did not perceive that the level of compliance was low due to unclear policy of IPC and having proper handling of patients as reported in the studies by [10], [11] in Hong Kong and Ghana. Additionally, the lower quality face shield can be a result of the hospital's financial constraints on the design options available, because of the Malaysian government's financial allocation that impacted the hospital for adequate supply of PPE. Additionally, the hospital needs to address the individual-specific issues, such as their unsuitable PPE and glove allergy, to ensure the staff nurses' IPC. The use of masks, physical barriers made of plastic or acrylic, and technology has restricted their ability to provide compassionate care to patients [29]. The PPE were uncomfortable to wear due to the warm and humid weather in Malaysia, which resulted in condensation and impaired eyesight when using the face shield for procedures, and excessive sweating when donning the gloves, likewise in Turkey [30], in this instance, adjustments that preserve the sterility or cleanliness of the PPE may be implemented. Personal attitudes and awareness of the risks associated with noncompliance with IPC may also contribute to this lack of adherence. Hence, it is crucial to empower both students and staff nurses about IPC compliance.

3.4. Theme 4: Empowering staff nurses and nursing students on IPC compliance

One of the interventions to increase the IPC compliance of the staff nurses and students is by empowering them. This includes strict enforcement of IPC compliance among the students and staff nurses via a top-down approach. Other than that, self-awareness needs to be improved by offering sufficient and regular training [19]. Incentive programmes, such as staff of the month for adhering to IPC and offering additional allowances as an honorarium, can be implemented to encourage the staff nurses as well as the students. The study also showed nurses and students could be given priority in the planning and targeting of actions for IPC from the policy maker's perspectives. Staff nurses should receive frequent training to better understand their issues with the implementation of IPC guidelines and to strengthen their work involvement in IPC [11]. Importantly, the findings served as a blueprint for management as they develop interventions to build safe and supportive work environments for staff nurses and students.

3.5. Strengths and limitations

This research has several limitations. The participants in the interviews worked in various fields, thus the environment's rules or culture may have a significant impact on how the IPC is practised. Most respondents were female, which corresponds to the percentage of female nurses working in the hospital. The actual IPC practise of the hospital could not be fully portrayed because most of the nurses had less than 10 years of work experience. Additional research may be conducted on a variety of healthcare professionals. By concentrating on a specific work area, it may be possible to identify the particular practise, obstacles, and reasons for facilitating IPC practise among the staff. Longer observation methods are possible to allow genuine IPC compliance.

4. CONCLUSION

The findings of this study become key evidence for the hospital top management and the Faculty of Nursing for planning the strategies on the improvement of IPC training and monitoring by empowering healthcare providers especially nurses and practical students at teaching hospitals. Moreover, this study contributes to strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction, and management of national and global health risks. Moreover, this finding support on the achieving quality universal coverage including financial risk protection, access to quality essential health-care services and access to safe, effective, quality, and affordable essential medicines and vaccines for all.

ACKNOWLEDGEMENTS

Thanks to SASMEC@IIUM for the opportunity to conduct this study and in providing the funding. Appreciation also goes to the respondents who had provided their time and input during the interview and observation.

REFERENCES

[1] A. Katzourakis, "COVID-19: endemic doesn't mean harmless," *Nature*, vol. 601, no. 7894, pp. 485–485, Jan. 2022, doi: 10.1038/d41586-022-00155-x.
[2] S. J. Curtis, A. Trewin, L. M. McCormack, K. Were, K. McDermott, and N. Walsh, "Building a safety culture for infection prevention and control adherence at Howard Springs: A workplace survey," *Infection, Disease & Health*, vol. 28, no. 1, pp. 47–53, Feb. 2023, doi: 10.1016/j.idh.2022.07.004.
[3] M. T. Abdullah *et al.*, "Framework of Measures for Covid-19 Pandemic in Malaysia: Threats, Initiatives and Opportunities," *Journal of Sustainability Science and Management*, vol. 17, no. 3, pp. 8–18, Mar. 2022, doi: 10.46754/jssm.2022.03.002.
[4] World Health Organization, "Global report on infection prevention and control," Geneva, 2022. Accessed: Dec. 05, 2023. [Online]. Available: https://iris.who.int/handle/10665/354489
[5] M. H. Al Lawati, S. Dennis, S. D. Short, and N. N. Abdulhadi, "Patient safety and safety culture in primary health care: A systematic review," *BMC Family Practice*, vol. 19, no. 1, Jun. 2018, doi: 10.1186/s12875-018-0793-7.
[6] J. H. Hashim, M. A. Adman, Z. Hashim, M. F. Mohd Radi, and S. C. Kwan, "COVID-19 Epidemic in Malaysia: Epidemic Progression, Challenges, and Response," *Frontiers in Public Health*, vol. 9, May 2021, doi: 10.3389/fpubh.2021.560592.
[7] W. W. Yallew, A. Kumie, and F. M. Yehuala, "Barriers to infection prevention and control practice among Amhara region teaching hospitals in Ethiopia: Qualitative study," *International Journal of Infection Control*, vol. 15, no. 2, 2019, doi: 10.3396/ijic.v15i2.007.19.
[8] A. K. Barker, K. Brown, D. Siraj, M. Ahsan, S. Sengupta, and N. Safdar, "Barriers and facilitators to infection control at a hospital in northern India: a qualitative study," *Antimicrobial Resistance & Infection Control*, vol. 6, no. 1, p. 35, Dec. 2017, doi: 10.1186/s13756-017-0189-9.
[9] S. Batool, S. Kousar, and K. Chandio, "Infection control practices among nurses working at tertiary care hospitals of Quetta, Pakistan," *RADS J Pharm & Allied health Sci*, vol. 1, no. 1, pp. 1–6, 2023.
[10] M. E. Ashinyo *et al.*, "Infection prevention and control compliance among exposed healthcare workers in COVID-19 treatment centers in Ghana: A descriptive cross-sectional study," *PLoS ONE*, vol. 16, no. 3 March, 2021, doi: 10.1371/journal.pone.0248282.
[11] E. L.-Y. Wong *et al.*, "Compliance with standard precautions and its relationship with views on infection control and prevention policy among healthcare workers during COVID-19 pandemic," *International Journal of Environmental Research and Public Health*, vol. 18, no. 7, p. 3420, Mar. 2021, doi: 10.3390/ijerph18073420.
[12] R. P. Bahegwa *et al.*, "Factors affecting compliance with infection prevention and control standard precautions among healthcare workers in Songwe region, Tanzania," *Infection Prevention in Practice*, vol. 4, no. 4, 2022, doi: 10.1016/j.infpip.2022.100236.
[13] M. Salwa *et al.*, "Compliance of healthcare workers with the infection prevention and control guidance in tertiary care hospitals: quantitative findings from an explanatory sequential mixed-methods study in Bangladesh," *BMJ open*, vol. 12, no. 6, p. e054837, 2022, doi: 10.1136/bmjopen-2021-054837.
[14] W. Etafa, G. Gadisa, S. Jabessa, and T. Takele, "Healthcare workers' compliance and its potential determinants to prevent COVID-19 in public hospitals in Western Ethiopia," *BMC Infectious Diseases*, vol. 21, no. 1, p. 454, Dec. 2021, doi: 10.1186/s12879-021-06149-w.
[15] S. G. Sandbøl, E. N. Glassou, S. Ellermann-Eriksen, and A. Haagerup, "Hand hygiene compliance among healthcare workers before and during the COVID-19 pandemic," *American Journal of Infection Control*, vol. 50, no. 7, pp. 719–723, Jul. 2022, doi: 10.1016/j.ajic.2022.03.014.
[16] J. Hammerschmidt and T. Manser, "Nurses' knowledge, behaviour and compliance concerning hand hygiene in nursing homes: A cross-sectional mixed-methods study," *BMC Health Services Research*, vol. 19, no. 1, 2019, doi: 10.1186/s12913-019-4347-z.
[17] C. Houghton *et al.*, "Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis," *Cochrane Database of Systematic Reviews*, vol. 2020, no. 8, pp. 1–55, Apr. 2020, doi: 10.1002/14651858.CD013582.
[18] N. A. M. Azami *et al.*, "COVID-19 in Malaysia: exposure assessment and prevention practices among healthcare workers at a teaching hospital," *Journal of Infection in Developing Countries*, vol. 15, no. 12, pp. 1816–1824, 2021, doi: 10.3855/jidc.15277.
[19] N. Mohamad *et al.*, "Compliance to Infection Prevention and Control Practices Among Healthcare Workers During COVID-19 Pandemic in Malaysia," *Frontiers in Public Health*, vol. 10, p. 878396, 2022, doi: 10.3389/fpubh.2022.878396.
[20] S. H. Abdul Hamid, W. H. Wan Mamat, H. Hassan, D. S. H. Imran Ho, and M. K. Che Hasan, "Knowledge and compliance on infection prevention and control among healthcare professionals in Teaching Hospital, Pahang Malaysia during pandemic COVID-19: a cross sectional study," *International Journal of Care Scholars*, vol. 6, no. 1, pp. 12–19, Mar. 2023, doi: 10.31436/ijcs.v6i1.293.
[21] S. Ahmadi *et al.*, "Social determinants of adherence to COVID-19 preventive guidelines in iran: a qualitative study," *Inquiry: The Journal of Health Care Organization, Provision, and Financing*, vol. 59, p. 004695802210841, Jan. 2022, doi: 10.1177/00469580221084185.
[22] N. NeJhaddadgar, R. Toghroli, J. Yoosefi lebni, I. A Melca, and A. Ziapour, "Exploring the barriers in maintaining the health guidelines amid the COVID-19 pandemic: a qualitative study approach," *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, vol. 59, p. 004695802211003, Jan. 2022, doi: 10.1177/00469580221100348.
[23] U. Flick, "The sage qualitative research kit," *The SAGE Qualitative Reseach Kit*, p. 8 v., 2007.
[24] G. Giorgi *et al.*, "COVID-19-related mental health effects in the workplace: A narrative review," *International Journal of Environmental Research and Public Health*, vol. 17, no. 21, pp. 1–22, 2020, doi: 10.3390/ijerph17217857.
[25] P. Arcadi *et al.*, "Nursing during the COVID-19 outbreak: A phenomenological study," *Journal of Nursing Management*, vol. 29, no. 5, pp. 1111–1119, Jul. 2021, doi: 10.1111/jonm.13249.
[26] S. J. Dawson, "The role of the infection control link nurse," *Journal of Hospital Infection*, vol. 54, no. 4, pp. 251–257, Aug. 2003, doi: 10.1016/S0195-6701(03)00131-2.
[27] M. Dekker *et al.*, "Role perception of infection control link nurses; a multi-centre qualitative study," *Journal of Infection Prevention*, vol. 23, no. 3, pp. 93–100, May 2022, doi: 10.1177/17571774211066786.

[28] N. Podgorica, C. Zenzmaier, C. Rungg, B. Bertini, and S. Perkhofer, "Facing the unknown COVID-19 pandemic: A qualitative study with nurses and nursing assistants in three European countries," *Frontiers in Public Health*, vol. 10, Nov. 2022, doi: 10.3389/fpubh.2022.985702.
[29] M. Jongdeepaisal, P. Chunekamrai, R. R. Maude, and R. J. Maude, "Risks and challenges in COVID-19 infection prevention and control in a hospital setting: perspectives of healthcare workers in Thailand," *medRxiv*, p. 2022.04.21.22274131, 2022.
[30] Y. Akkuş, Y. Karacan, R. Güney, and B. Kurt, "Experiences of nurses working with COVID-19 patients: A qualitative study," *Journal of Clinical Nursing*, vol. 31, no. 9–10, pp. 1243–1257, May 2022, doi: 10.1111/jocn.15979.

BIOGRAPHIES OF AUTHORS

Siti Hazariah Abdul Hamid is an Assistant Professor in Kulliyyah (Faculty) of Nursing, International Islamic University Malaysia (IIUM). She is a project leader for mixed methods research related to infection prevention and control. Her research also focuses on the children and young people health. She can be contacted at email: shazariah@iium.edu.my

Haliza Hasan is an Assistant Professor in Kulliyyah of Nursing, IIUM. Her niche areas are community health, disability and rehabilitation, women's health and health economic using mixed method approach. She can be contacted at email: hhaliza@iium.edu.my.

Wan Hasliza Wan Mamat is an Assistant Professor in the Kulliyyah of Nursing IIUM. Her research activities related to quantitative study design (statistical modelling) and qualitative study design (narrative inquiry), within the topics of decision-making, spiritual care, nursing ethics and chronic illness. She can be contacted at email: whasliza@iium.edu.my.

Dina Syazana Ho Imran Ho is a medical officer at Sultan Ahmad Shah Medical Centre@IIUM or SASMEC@IIUM, a teaching hospital. She is involved with the research related to infection prevention and control. She can be contacted at email: dinasyazana@iium.edu.my.

Muhammad Kamil Che Hasan is an Associate Professor at the Department of Medical Surgical Nursing, Kulliyyah of Nursing, IIUM. His areas of interest are rehabilitative nursing, patients' safety, musculoskeletal health, promotion of healthy ageing, prevention of falls, orthopaedics and traumatology nursing using mixed-methods approach and health-related intervention trial. He can be contacted at email: mkamil@iium.edu.my.