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Knowledge and Perceptions of Hand Hygiene among Nurses in a Teaching Hospital in Pahang

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ABSTRACT

Background: Healthcare-associated infections (HAIs) frequently commonly occur in hospitalised patients, yielding various consequences, including extended inpatient stays, increased microbial resistance to antimicrobial agents, and potentially substantial mortality rates. Emphasising the paramount significance of hand hygiene, it is considered the primary preventive measure against the dissemination of infectious agents. However, hand hygiene compliance among staff nurses and other healthcare workers (HCWs) was still low partly due to the lack of hand hygiene knowledge and it is able to have a significant impact on patients' health status. The objective of this study is to assess knowledge and perceptions of hand hygiene among staff nurses in a new teaching hospital.
Methods: This quantitative study used a convenience sampling method in which nurses were invited from three critical care areas and five non-critical care areas. Data were collected through a self-administered questionnaire, and Statistical Package for Social Science (SPSS) was used for data analysis.
Results: The majority of staff nurses (88.9%) had moderate knowledge with a mean score=66.6 (SD±7.4). Although there was no significant difference between the sociodemographic characteristics of nurses (age, gender, department, received formal hand hygiene training, and routinely used alcohol-based hand rub) (p>0.05) and the knowledge level of nurses, this study found that the nurses have good perceptions about hand hygiene 79.8%.
Conclusion: This study highlights the knowledge of hand hygiene at a moderate level across critical and non-critical areas. Thus, the study suggests the need for targeted interventions to enhance hand hygiene knowledge among healthcare personnel, thereby contributing to improve patient outcomes.

Keywords: Hand hygiene; Healthcare-associated infections (HAIs); Nurses; Healthcare workers; Knowledge; Perception

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INTRODUCTION

Healthcare-associated infections (HAIs) are the most common reported infections among hospitalised patients, worldwide. Examples of HAIs were catheter-associated urinary tract infection (CAUTI), surgical site infection (SSI), ventilator-associated pneumonia (VAP), central line-associated bloodstream infection (CLABSI), and Clostridium difficile infection (CDI) (1). The European Centre for Disease Prevention and Control reported an average HAIs prevalence of 7.1% in European countries (2) and Southeast Asian countries showed an overall prevalence rate of 9.1% of HAIs (3). The impact of HAIs implies prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobials, higher healthcare cost, and deaths (4). Mortality associated with HAIs was substantially higher for patients with HAIs than without HAIs. For instance, a study in Greece revealed a ninety-day mortality risk was increased by 80% in patients with HAIs compared to those without HAI (adjusted hazard ratio 1.8; 95% CI 1.3–2.6) (5).

Despite the numerous contributing factors that can give rise to HAIs, it is widely acknowledged that hand hygiene stands as the foremost pivotal measure in averting the dissemination of pathogenic agents (6). It represents the most elementary and economically efficient strategy for managing HAIs, encompassing both the techniques of hand rubbing and hand washing (7). However, the knowledge, attitude, and practice of hand hygiene are consistently a substantial cause for concern, particularly due to their crucial role in preventing the spread of infections, but the hospital still reported a substantial HAI prevalence and compliance to hand hygiene remains low (8). For example, in Southeast Asia countries, the overall prevalence of HAIs was 21.6 % (95% CI: 15.5 - 29.1%), which is alarming (9). The continuous challenges such as the work environment, team, tasks and management concerns also affected the knowledge and compliance in performing hand hygiene (10) and this is significant in relation to a new hospital.

Nonetheless, the simplicity of hand hygiene procedures is less useful for nurses and other healthcare workers (HCWs) to comply with the hand hygiene practice as hand hygiene knowledge among healthcare providers was still low to moderate level (11-12). Another issue is related to compliance to hand hygiene. For example, Menon and Shukla (13) conducted a study wherein the adherence of nurses to hand hygiene exhibited a compliance rate of 63.0%. Whereas, in the context of Malaysia, the documentation of hand hygiene, knowledge, and compliance often remains infrequent in public literature, being retained as internal records and below reported below 40% (14).

As such, the present study aimed to assess the knowledge and perceptions of hand hygiene among staff nurses in SASMEC @ IIUM, to examine the association between sociodemographics of nurses and their knowledge of hand hygiene.

METHODS

Research Design and Setting

The study was conducted in a teaching hospital; Sultan Ahmad Shah Medical Centre @ IIUM (SASMEC @ IIUM with a capacity of 300 beds with a total number of more than 600 nurses (15). The hospital was first operated in July 2016, and at the time this study conducted, it is reach four years of operation which is a relatively new teaching hospital operated in East Coast of Malaysia. It was a quantitative study using a cross-sectional study design.

Participants

The study was carried out among nurses based on the inclusion and exclusion criteria set. Inclusion criteria made to select the participants were staff nurses that work in male and female wards of the Internal Medicine ward, General Surgery ward, Orthopaedic ward, Paediatric ward, Obstetrics and Gynaecology (O&G) ward, Emergency Department (ED), Intensive Care Unit (ICU) and Cardiac Care Unit (CCU) that were voluntarily to participate in the study. Nurses who work at other than the mentioned departments were excluded from the study.

Sample Size and Sampling Method

Based on sample size calculation using Raosoft software with 5% margin error, confidence level of 95%, and response distribution of 50%. A total of 162 staff were aimed to be the participants in this study. The sampling

method that was utilised in this study was convenience sampling.

Instruments, Data Collection and Analysis

The study used the "Hand Hygiene Knowledge Questionnaire for Health Care Workers" and "Hand Hygiene Perception Questionnaire for Healthcare Workers" by the World Health Organisation (revised 2009) (16). The questionnaire was divided into three (3) parts; Part I: Sociodemographic data of the respondents, Part II: Knowledge of hand hygiene of the respondents, and Part III: Perceptions of hand hygiene of the respondents. The level of knowledge was classified into poor level of knowledge (<50%), moderate level of knowledge (50%-<75%), and good level of knowledge (≥75%). For the perception, two questions were measured by 0-100%, seven questions were rated on 7 points Likert scale, and three questions were rated on 4 points Likert scale.

Questionnaires were taken from WHO and considered valid and reliable as it is widely used to assess the knowledge of hand hygiene among healthcare workers (16). Data were collected through an online survey Google Form. The link to the questionnaire was submitted to the field supervisor of the hospital to be distributed to participants. To increase the response rate, the researcher distributed the questionnaire, which allowed the hospital to physically collect data in the study setting (due to COVID-19) restrictions). Data collection was conducted within the two months between December 2020 and January 2021. SPSS statistical software version 20 was employed for data analysis. Descriptive statistics inferential non-parametric Chi-squared test and Fisher's Exact test were used to assess the association between sociodemographic characteristics and knowledge about hand hygiene. A p-value less than 0.05 was considered to be statistically significant.

Ethical Consideration

The ethical approval to conduct this study was obtained from Kulliyyah of Nursing Postgraduate Research Committee (KNPGRC), IIUM Research Ethic Committee (IREC), and Clinical Research Committee (CRC) of SASMEC @ IIUM. The written consent letter was taken from participants, and they were allowed to refuse from participating in the study whenever they liked. The participants were ensured that their private names and specialisation would never be disclosed.

RESULTS

A total of 109 staff nurses participated in the study. This lesser number was due to challenging in data collection due to COVID-19. Females (89.7%) comprised the majority of participants, in contrast to males (19.3%), and most of them were more than 25 years old. The majority of the participating staff nurses were from the Internal Medicine ward (19.2%), followed by the Emergency Department (18.3%). The General Surgery ward accounted for 15.6% of the participation. Participation from the Orthopaedic ward was approximately 13.8%, while the Intensive Care Unit (ICU) and Paediatric Ward accounted for 12.8% and 11.0% respectively.

Obstetrics and Gynaecology (O&G) contributed only 7.3% of the participants, with the Cardiac Care Unit (CCU) representing 1.8%. Overall, 66.1% (n=72) of participants were staff nurses from non-critical care areas, while 33.9% (n=37) were staff nurses from critical care areas. A significant proportion of the participating staff nurses (95.4%) reported having received formal training in hand hygiene within the past three years, and over 90.0% of them confirmed the routine use of alcohol-based hand rubs for hand hygiene **(Table 1).**

Knowledge Level of Hand Hygiene

Findings from the study found that nurses in SASMEC @ IIUM have a moderate knowledge level of hand hygiene (89.0%). About 97 out of 109 participants had moderate knowledge as compared to only 11 staff nurses who had good hand hygiene knowledge. Only 10.1% had a good level of hand hygiene knowledge and only one (0.9%) of the staff nurses had a poor level of hand hygiene knowledge **(Table 2)**. The mean percentage (mean ± SD) of hand hygiene knowledge among staff nurses was 66.6 ±7.4.

Perceptions of Hand Hygiene

It was found that the majority of nurses agreed that among all patient safety issues, it was a high priority to maintain the importance of hand hygiene in their institution (79.8%). In terms of HAIs, 52.3% of staff nurses agreed that

there was a high impact of HAIs on a patient's clinical outcome and 54.1% of staff nurses perceived that hand hygiene has a very high effectiveness in preventing HAIs.

Table 1: Sociodemographic data of the participants (N=109)

Variables		Frequency (n)	Percentage (%)
Gender	Male	21	19.3
	Female	88	80.7
Age	20-24	24	22.1
	25-29	43	39.4
	>30	42	38.5
Department	**Non-critical care area**	72	66.1
	Internal medicine ward	21	19.2
	General surgery ward	17	15.6
	Orthopaedic ward	15	13.8
	Paediatric ward	12	11.0
	Obstetrics and gynaecology ward	8	7.3
	Critical care area	37	33.9
	Emergency department	20	18.3
	Intensive care unit	14	12.8
	Cardiac care unit	2	1.8
Receive formal training in hand hygiene for the last three years	Yes	104	95.4
	No	5	4.6
Routinely use alcohol-based hand rub for hand hygiene	Yes	99	90.8
	No	10	9.2

Table 2: Knowledge of hand hygiene (n=109)

Knowledge of hand hygiene	Frequency (n)	Percentage (%)	Mean ± SD
Poor (<50%)	1	0.9	
Moderate (50-75%)	97	89.0	66.7 ± 7.4
Good (≥75%)	11	10.1	

Sixty-five out of 109 participants agreed that their quality of hand hygiene was strongly important for their head department (59.6%). The same result was found in another question where 59.6% of the staff nurses believed that it was strongly important to their patients in terms of the staff nurse's hand hygiene performance. Meanwhile, about 62.4% of staff nurses reported that their hand hygiene quality was strongly important for their colleagues. More than half of the studied participants perceived that they required a huge effort (67%) to perform hand hygiene in their facility, especially during caring for the patients **(Table 3)**.

Referring to **Table 4**, the questions were mainly about perceptions of the effectiveness of measures for improving adherence to hand hygiene. Leader and senior managers' support and promotion of hand hygiene (51.5%), alcohol-based hand rub availability at each point of care (56.0%), displays of hand hygiene posters (49.5%), education on hand hygiene (61.5%), visible clear and simple instructions for hand hygiene (56.9%), regularly receive feedback on hand hygiene performance (40.4%), being a good example for colleagues (51.4%) and patient reminding healthcare workers to perform hand hygiene (41.3%) were found as significant interventions to promote and improve hand hygiene practices in the hospital.

Table 3: Perceptions of hand hygiene (n= 109)

Details	Low priority n (%)	Moderate priority n (%)	High priority n (%)	Very high priority, n (%)
Among all patient safety issues, how important is hand hygiene at your institution?	0 (0)	3 (2.8)	19 (17.4)	87 (79.8)
	Very low n (%)	Low n (%)	High, n (%)	Very high, n (%)
In general, what is the impact of a healthcare-associated infection on a patient's clinical outcome?	0 (0)	15 (13.8)	57 (52.3)	37 (33.9)
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	2 (1.8)	6 (5.5)	42 (38.5)	59 (54.1)

Details	Strongly no important n (%)	No important n (%)	Somewhat no important n (%)	Neutral n (%)	Somewhat important n (%)	Important n (%)	Strongly important n (%)
What importance does the head of your department attach to the fact that you perform optimal hand hygiene?	0 (0)	0 (0)	0 (0)	4 (3.7)	7 (6.4)	33 (30.3)	65 (59.6)
What importance do your colleagues attach to the fact that you perform optimal hand hygiene?	0 (0)	0 (0)	0 (0)	1 (0.9)	7 (6.4)	33 (30.3)	68 (62.4)
What importance do patients attach to the fact that you perform optimal hand hygiene?	0 (0)	0 (0)	0 (0)	1 (0.9)	6 (5.5)	37 (33.9)	65 (59.6)

Details	Strongly no effort n (%)	No effort n (%)	Somewhat no effort n (%)	Neutral n (%)	Somewhat big effort n (%)	Big effort n (%)	Strongly big effort n (%)
How do you consider the effort required by you to perform good hand hygiene when caring for patients?	2 (1.8)	0 (0)	1 (0.9)	1 (0.9)	4 (3.7)	28 (25.7)	73 (67.0)

Table 4: Perceptions of the effectiveness of measures for improving adherence to hand hygiene (n= 109)

Details	Strongly not effective n (%)	Not effective n (%)	Somewhat not effective n (%)	Neutral n (%)	Somewhat effective n (%)	Effective n (%)	Strongly effective n (%)
Leaders and senior managers at your institution support and openly promote hand hygiene	4 (3.7)	3 (2.8)	0 (0.0)	2 (1.8)	5 (4.6)	39 (35.8)	56 (51.5)
The health-care facility makes alcohol-based hand rub always available at each point of care	3 (2.8)	4 (3.7)	1 (0.9)	4 (3.7)	2 (1.8)	34 (31.2)	61 (56.0)
Hand hygiene posters are displayed at point of care as reminders	3 (2.8)	4 (3.7)	1 (0.9)	1 (0.9)	7 (6.4)	39 (35.8)	54 (49.5)
Each health-care worker receives education on hand hygiene	4 (3.7)	3 (2.8)	1 (0.9)	2 (1.8)	2 (1.8)	30 (27.5)	67 (61.5)
Clear and simple instructions for hand hygiene are made visible for every health-care worker	3 (2.8)	4 (3.7)	1 (0.9)	1 (0.9)	10 (9.2)	28 (25.7)	62 (56.9)
Health-care workers regularly receive feedback on their hand hygiene performance	3 (2.8)	5 (4.6)	0 (0.0)	4 (3.7)	17 (15.6)	36 (33.0)	44 (40.4)
You always perform hand hygiene as recommended (being a good example for your colleagues)	3 (2.8)	4 (3.7)	0 (0.0)	2 (1.8)	8 (7.3)	36 (33.0)	56 (51.4)
Patients are invited to remind health-care workers to perform hand hygiene	3 (2.8)	5 (4.6)	0 (0.0)	6 (5.5)	15 (13.8)	35 (32.1)	45 (41.3)

DISCUSSION

Knowledge of Hand Hygiene

The results revealed that the majority of staff nurses (89.0%) possessed moderate knowledge of hand hygiene, with a mean score of 66.6%. This finding aligns with global studies indicating that healthcare workers often exhibit moderate levels of hand hygiene knowledge (17). The moderate knowledge levels (mean score 66.6%) highlight several important considerations in healthcare worker hand hygiene compliance. This finding mirrors similar results found in multicenter studies, where knowledge scores typically range between 60.0-75.0% among nursing staff (18-20). Notably, only 10% of participants demonstrated good knowledge, underscoring a critical need for enhanced training programmes tailored to address specific gaps (1,21). The small percentage (10%) of nurses demonstrating good knowledge is particularly concerning from a patient safety perspective.

Research by Martos-Cabrera and colleague et al. (22) suggests that knowledge gaps often cluster around specific areas such as proper duration of hand hygiene procedures, selection of appropriate products for different clinical scenarios and understanding of the "Five Moments of Hand Hygiene". Factors contributing to moderate knowledge levels include the complexity of guidelines, inconsistency in training delivery, and inadequate emphasis on hand hygiene during professional education (10). Additionally, knowledge disparities might result from varying levels of exposure to evidence-based practices and institutional reinforcement (6,23).

The complexity of guidelines presents a significant barrier to comprehensive knowledge acquisition. Healthcare workers often struggle with reconciling different sets of guidelines, particularly when institutional protocols differ from national or international standards. This complexity can lead to confusion and reduced compliance rates (24).
The inconsistency in training delivery represents another crucial factor. Gammon et al. (25) identified that institutions utilising multimodal training approaches, including simulation-based learning and regular competency assessments, achieved higher knowledge retention rates compared to those relying solely on traditional lecture-based instruction. Institutional factors play a vital role in knowledge maintenance. Dunlop et al. (26) demonstrated that healthcare facilities with robust quality improvement programmes and regular audit feedback systems maintained higher levels of hand hygiene knowledge among staff. Their research suggested that consistent reinforcement through visual reminders, peer monitoring, and regular updates on compliance rates contributed to better knowledge retention. The impact of evidence-based practice exposure varies significantly across healthcare settings. Wang et al. (27) found that nurses working in academic medical centres demonstrated higher knowledge scores compared to those in community hospitals, potentially due to greater exposure to research activities and evidence-based practice initiatives. In essence, the study revealed that 89.0% of nurses demonstrated moderate knowledge of hand hygiene, with only 10.0% achieving a good level of understanding, highlighting critical gaps. The possible explanation for these findings would be the adjustment of nurses in the study setting that relatively new to the guideline and limited exposure to evidence-based practices. For example, according to Australian Commission of Safety and Quality in Health Care (28), the institutions that utilise multimodal training approaches, quality improvement programmes, and regular feedback systems achieve better knowledge retention.

Perceptions of Hand Hygiene

The study revealed that staff nurses generally perceived hand hygiene as a critical aspect of patient safety and infection prevention. The high percentage of nurses (79.8%) rating hand hygiene as a priority reflects a growing awareness in healthcare institutions about its fundamental role in patient safety. This awareness has been shaped by extensive research demonstrating the direct relationship between hand hygiene compliance and reduced healthcare-associated infections (HAIs). For instance, a comprehensive study by Blomgren and teams (29) found that proper hand hygiene protocols could prevent up to 40.0% of HAIs in acute care settings.

The gap between knowledge and practice, highlighted by the 67.0% of nurses reporting significant effort required for optimal hand hygiene, points to a well-documented phenomenon in healthcare behaviour research.

Research on hand hygiene compliance among healthcare workers reveals a significant intention-behaviour gap. Despite adequate knowledge, healthcare providers often struggle to maintain consistent hand hygiene practices due to various barriers (30-31). Similar barriers have been noted in studies conducted in high-resource and low-resource settings, where time constraints, insufficient facilities, and physical workload negatively impact adherence rates (32).

The effectiveness ratings of different interventions provide valuable insights into successful implementation strategies. Recent studies have demonstrated the effectiveness of educational interventions in improving hand hygiene compliance (HHC) among healthcare workers. A meta-analysis found that educational and training programmes significantly increased HHC among nurses (33). Another study reported that multilevel interventions addressing individual, interpersonal, and organizational factors were most effective in improving (34).

The emphasis on alcohol-based hand rubs (56.0%) as an effective intervention connects with recent studies that have highlighted the effectiveness of strategic interventions to improve hand hygiene compliance in healthcare settings. Elia et al. (35) found that a combined nudge intervention, including localized dispensers and visual reminders, significantly increased hand hygiene compliance from 11.4% to 18.7%. Similarly, Dick et al. (36) demonstrated that optimizing the number and positioning of alcohol-based hand rub (ABHR) dispensers in patient rooms increased consumption from 20.6 to 25.3 mL/patient-day. Hansen et al. (37) reported that varying contextual features in hospital entrances improved visitor hand hygiene compliance from 0.4% to 19.7%. Additionally, Ng et al. (38) showed that tailored religion-relevant interventions positively impacted healthcare workers' ABHR use compliance and beliefs in a culturally diverse setting. These studies collectively emphasize the importance of environmental design, strategic placement, and culturally appropriate interventions in promoting hand hygiene compliance in healthcare environments.

Leadership support (51.5%) as a key factor reflects broader organizational behaviour research. Leadership plays a crucial role in improving hand hygiene compliance among healthcare workers. A study in Oman found that implementing a role model project with leadership involvement significantly increased hand hygiene compliance from 52.6% to 74.1% after three months, sustaining at 70% after 15 months (39). Similarly, research in German nursing homes highlighted the importance of nursing managers' role modelling in influencing staff behaviour (40). A large-scale study in China revealed that positive traits of self-expectation leadership positively affected both organizational commitment and hand hygiene behaviour (41). Furthermore, a strong correlation was found between leaders' and followers' hand hygiene compliance, with followers' compliance significantly associated with that of their (42). These findings collectively emphasize the critical impact of leadership on hand hygiene practices in healthcare settings.

The moderate effectiveness of visual reminders (49.5%) and feedback mechanisms (40.4%) points to the value of what behavioural scientists call "environmental cues" and "performance feedback loops." Recent studies have explored various interventions to improve hand hygiene compliance (HHC) among healthcare workers. Visual reminders and feedback mechanisms have shown moderate effectiveness in increasing HHC. Stangerup et al. and Iversen et al. (2020) (43-44) found that combining visual nudging with performance feedback significantly improved HHC for both doctors and nurses, with individual feedback being particularly effective. Fish et al. (45) reported that individual-level feedback, especially when publicly posted, could enhance HHC. However, Schmidtke et al. (46) found that olfactory and visual priming interventions did not consistently influence hand hygiene at ward entrances. Their follow-up survey identified environmental resources and social influences as major barriers to hand hygiene compliance. These studies suggest that while visual cues and feedback systems can be effective in improving HHC, the specific implementation and context may influence their success, highlighting the need for tailored approaches in different healthcare settings.

The study indicates that nurses recognise the importance of hand hygiene for patient safety. However, a knowledge-practice gap persists, as heavy workloads and time constraints hinder

compliance. WHO guidelines indicate that the most effective interventions for improving adherence include education, alcohol-based hand rubs, and support from leadership. Research shows that multi-level interventions, such as behavioural nudges and environmental changes, can significantly enhance hand hygiene compliance (43). Given that leaders' role modelling has been shown to boost employee compliance, engaging leadership is highlighted as essential. Additionally, while visual reminders and feedback mechanisms are relatively effective, they should be tailored to specific healthcare settings for optimal impact (47). As healthcare environments continue to evolve, particularly considering emerging infectious diseases, maintaining and improving hand hygiene knowledge becomes increasingly critical for patient safety and healthcare quality.

CONCLUSION

This study emphasises the importance of hand hygiene in reducing healthcare-associated infections (HAIs) and the necessity of targeted initiatives to enhance nurses' moderate levels of knowledge at SASMEC @ IIUM. Practical obstacles, such as perceived effort and low adherence, continue to pose significant challenges, even in the face of extensive formal instruction and generally favourable views on the importance of hand cleanliness. The results indicate a systematic need for hospital-wide interventions, as knowledge gaps and compliance issues are not related to sociodemographic characteristics.

Increasing adherence to hand hygiene requires a multifaceted approach. Institutional support is crucial, including leadership involvement and ongoing promotion of hygiene practices. Adherence can be improved by providing resources such as visual reminders and alcohol-based hand sanitiser at care points. Education programmes must emphasise useful, situation-specific tactics in addition to addressing knowledge gaps. Furthermore, fostering a culture of regular hand hygiene requires behavioural reinforcements and feedback systems. Hospital organisations may significantly reduce HAIs, improve patient outcomes, and create a safer hospital environment by addressing these aspects. Future research should utilise larger, multicentre studies and qualitative approaches to build on these findings and gain a deeper understanding of the factors that encourage and hinder compliance in various healthcare settings.

LIMITATIONS AND RECOMMENDATIONS

The limitation of this study was poor distribution of participants due to the low response rate. There was a restriction to collect data physically due to the strict Standards Operating Procedure (SOP) that need to be adhered to due to the COVID-19 pandemic. As a result, the low response rate from the participants affects the generalisation of the study. Findings of participants having moderate hand hygiene knowledge cannot be assumed to all staff at SASMEC as it was only conducted among staff nurses in some departments hence, it did not reflect the knowledge and perceptions of all staff in SASMEC @IIUM and other ward settings of other hospitals.

The next research should be conducted with a larger sample size that includes multiple and involves various healthcare providers to capture a broader perspective. This would enhance the generalisation of the findings. Another recommendation should also consider to use of a qualitative approach for richer insights.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare about this work.

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AUTHOR CONTRIBUTIONS

NM: critically revised the manuscript, revisited data analysis, interpreted findings as well as approved the final version of the manuscript.
NA: drafted the manuscript and involved in data collection analysis of the article.

KT: actively involved in literature review and advised before finalising the manuscript.

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