

Gaining insights into the patient safety training by Evaluating the Nursing Care Facilities and Their Impact on Nurses' Infection Control Practices During Antenatal and Postnatal Care in a Developing Country

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KEYWORDS

nurses' facilities
mean medical
supplies such as
gloves, gauze,
cotton, cannula, IV
set, syringe,
catheters, and
antiseptic solutions.
Attitude: defined as
an effective
orientation toward
an attitude object, a
person, place, thing,
situation, or
concept.

ABSTRACT

The current study assessed the adequacy of medical supplies and their effect on nurses' infection control behavior at antenatal and postnatal care wards of the maternity Hospital affiliated with El-Manial Cairo University Hospital. The sample consisted of all staff nurses (90) working in the above wards. Data were collected throughout six months. Nurses' observation checklist was used to assess nurses' infection control behavior and an inventory checklist to audit supplies records, both tools were developed by the researcher. The study results revealed that nurses didn't follow infection control precautions consistently; several factors were perceived to be the causes including nurses' negligence, inadequate supplies, inconvenient physical setting, lack of infection control training and nursing care standard in addition to poor supervision. The study recommended training program, setting nursing care standards and supplies standards based on actual utilization, nurses' participation in designing hospital setting, and proper selection and training for head nurses.

Background: The adequacy of medical supplies and Infection prevention is challenging for healthcare providers, particularly nurses.

Purpose: The current study assessed the adequacy of medical supplies to gain insights into patient safety training and their effect on nurses' infection control behavior at antenatal and postnatal care wards of the maternity Hospital affiliated with El-Manial Cairo University Hospital.

Methods: A descriptive research design was employed. The sample consisted of all staff nurses (15) working in the above wards. Data was collected throughout six months. Nurses' observation checklist was used to assess nurses' infection control behavior and an inventory checklist to audit supplies records, both tools were developed by the researcher.

Results: The study results revealed that nurses didn't follow infection control precautions consistently; several factors were perceived to be the causes including nurses' negligence, inadequate supplies, inconvenient physical settings, lack of infection control training and nursing care standards in addition to poor supervision.

Conclusions/Implications for Practice: The study supports the important role of

The study recommended training programs, setting nursing care standards and supplies standards based on actual utilization, nurses' participation in designing hospital settings, and proper selection and training for head nurses.

Attitude: defined as an effective orientation toward an attitude object, a person, place, thing, situation, or concept.

Introduction

Sepsis significantly contributes to maternal and neonatal mortality, causing 15% of neonatal deaths and 1 in every 10 maternal deaths. Maternal sepsis refers to life-threatening organ dysfunction caused by infection during pregnancy, childbirth, post-abortion, or the postpartum period. Neonatal sepsis, especially early-onset sepsis (within the first 7 days of life), is a blood infection in newborns transmitted from mother to child during birth or in the post-birth caregiving environment. While the evidence is somewhat limited or of lower quality, practices ensuring clean and hygienic births have been linked to reduced overall neonatal mortality, mortality from infections, and umbilical cord infections. Central to these practices is the hand hygiene of healthcare workers (HCWs) (Buxton et al., 2019). Each year, around 3 million children die during the neonatal period (birth to 28 days), with infections contributing to about 26% of these deaths. Newborns born in healthcare facilities (HCFs) in low-income countries face a significantly higher risk, ranging from three to 20 times, of acquiring healthcare-associated infections (HAIs) compared to those born in high-income countries. Women are also vulnerable to HAIs during childbirth and deaths related to sepsis account for about one-tenth of the global burden of maternal mortality. The majority of sepsis-related maternal deaths occur in low- and middle-income countries (LMICs) (Buxton et al., 2019).

Many LMICs have not yet integrated fundamental components of infection prevention and control (IPC) into their policies and practices. Training on IPC for healthcare workers is often insufficient and may not be readily accessible to frontline staff. Additionally, dedicated surveillance for HAIs often faces challenges due to limited resources and expertise. Many healthcare facilities (HCFs) lack the necessary physical infrastructure to support IPC measures. Globally, it's estimated that 55% of HCFs in the least-developed countries do not have basic water services, and one in five lack improved sanitation facilities (*WASH in Health Care Facilities*, n.d.). In 54 LMICs, data shows that 35% of HCFs do not have soap available for hand washing. The necessity of invasive procedures during childbirth, along with their high frequency, presents specific challenges for infection prevention and control (IPC). These challenges are further complicated by insufficient infrastructure and equipment in these facilities. There is a lack of comprehensive data on the firsthand experiences of staff members implementing infection prevention strategies at the facility level in LMICs. Understanding these experiences could shed light on the

constraints faced by current IPC improvement programs and help identify areas for enhancement (Cronk & Bartram, 2018).

Standard precautions are fundamental practices aimed at preventing the transmission of pathogens during healthcare. Nurses who effectively utilize standard precautions operate under the assumption that all patients could be infected or carry organisms that may spread in a healthcare setting. While the Occupational Safety and Health Administration's Bloodborne Pathogens Standard primarily focuses on blood-borne pathogens, it's important to note that Standard Precautions encompass all potentially infectious body fluids and materials. These precautions involve acknowledging that both patients and the healthcare environment can harbor infectious organisms. Implementing standard precautions requires recognizing these risks and taking measures to prevent the spread of such organisms. Key components of standard precautions include: 1) hand hygiene and ensuring proper hand hygiene practices; 2) environmental cleaning and disinfection by maintaining cleanliness and disinfecting surfaces; 3) injection and medication safety via safely handling injections and medications; 4) risk assessment and personal protective equipment (PPE) use; 5) minimizing potential exposures by taking steps to minimize exposure to infectious materials and 6) reprocessing reusable medical equipment via properly sterilizing and reusing medical equipment. These core elements collectively form the basis of effective Standard Precautions in healthcare settings (*CDC's Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings | Infection Control | CDC, 2022*).

Nurses have maintained their status as the most trusted profession for the sixteenth consecutive year, according to the December 2017 Gallup Poll. This recognition underscores the enduring value placed on ethics and integrity by the public, including our patients and their families. Our communities rely on us to deliver our best effort during every shift, every day, and in every interaction. Healthcare faces significant challenges in both access to and the quality of care provided. As nurses, it is our duty to consistently deliver care that aligns with evidence-based best practices. One critical area where adherence to best practices is crucial for infection prevention and control. Instances of pathogen transmission within healthcare environments and the rise of antibiotic-resistant organisms highlight the ongoing challenges in maintaining this alignment (Carrico et al., 2018). Nurses play a vital leadership role in healthcare at all levels. Senior nursing leaders, alongside other organizational leaders, have the responsibility to ensure that healthcare organizations allocate adequate resources to enable frontline staff to consistently follow infection prevention practices. Senior leaders should also guarantee that personnel responsible for implementing the infection prevention program receive appropriate education specifically focused on infection prevention. These individuals require the support and empowerment from leaders to ensure the program's effectiveness (Carrico et al., 2018).

This study aimed to assess the adequacy of nursing care facilities used by nurses and their relation to daily consumption in the antenatal and postnatal care wards and to find out the relationship between the adequacy of medical supplies and nurses' infection control behavior to gain insights in the patient training at El-Manial University Hospital.

Methods

The study was implemented according to the following steps:

- 1- —An official letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Cairo University, and submitted to the responsible authorities of the study settings.
- 2- Ethical and legal consideration Approval was obtained from the ethical committee of the Faculty of Nursing, Cairo University.

All participants were informed about the **study's purpose. They were assured about the anonymity and confidentiality of their answers, that data would be used only for this study**, and that the study would not entail any harmful effect. Their rights to withdraw from the study at any time were guaranteed.

Study Design and Participants

A descriptive research design was utilized to achieve the aim of the current study. The study was conducted in section 10 at El-Manial University Hospital. This study was conducted at the antenatal and postnatal units. Each has a capacity of 18 and 17 beds, respectively. The total number of nurses in the antenatal and postnatal was 90 nurses, they all had a diploma, and they were distributed among three shifts. Admission to this unit is 24 hours a day, seven days a week. Each unit is managed by a head nurse. These units are the training sites for junior medical staff and nursing students. According to the hospital policy, one nurse is responsible for receiving monthly fixed stock from the store and then distributing a daily same fixed number of medical supplies for each unit regardless of the number of patients in the units. There is a small number of emergency supply stock in the units used when a deficiency occurs in the afternoon and night shifts.

Instruments

The data required for this study was collected using two tools, designed by the investigator based on reviewing the related literature (Harisa M. et al., 2002). The two tools are:

The nurses' infection control behavior observation checklist

It is further divided into two parts: the socio-demographic characteristics datasheet that aimed to collect data related to nurses' socio-demographic characteristics such as nurses' age, years of experience, and previous attended training programs; and the second part consisted of 36 items, to assess nurses' infection control behavior which is divided into 8 groups as follows:

1. Universal precautions (7 items).
2. Personal hygiene (4 items).
3. Handling of needles and sharps (6 items).
4. Cleaning, disinfection, and sterilization (3 items).
5. Handling and disposing of clinical waste (7 items).
6. Handling of linens (3 items).
7. Notification and isolation (2 items).
8. Patient care (4 items).

Medical Supplies Checklist

This was used to determine the types and number of supplies used/needed to audit the supplies records for the amount ordered. Also, regarding the shortage of linens, the frequency of unavailability of linen was counted and there was no linen in the unit.

Data Collection

A letter from the faculty of nursing was sent to the general director of Cairo University Hospital seeking his approval for conducting the study. After his approval, the letter was sent to the director of the Maternity hospital at Cairo University. The investigator then met the nursing director and selected several nurses working in antenatal and postnatal units. Then the investigator met the nurses and explained the purpose of the study. This study was carried out over a month, starting from January to the end of 2005. The investigator spent six hours a day at different units and shifts, for three days weekly. To assess nurses' infection control behavior six intermittent observations at different shifts were performed for each nurse. The observation session ranged between 45:60 minutes. The observed nurses' infection control behavior to be studied was checked as either performed or not performed and results were presented by percentage. To collect data about medical supplies the investigator calculated what is used and what is needed. According to what were calculated what were calculated as follows: syringe and I.V set were calculated according to the number needed and the frequency of using the same syringe medication for different doses for the same patient. Also, the deficiency of linens was calculated by the frequency of time there were no linens on beds during the observation session. The deficiency of disposable and sterile gloves was calculated by what was needed and what was ordered. The shortage of supplies was calculated by comparing the amount used from each type plus an estimation of the number required as determined from the patient records and observation, compared to what was ordered specific period.

Data Analysis

Data were collected and fed into a computer for analysis and presentation. Mean, SD, and percentage were used for data analysis.

Results

Demographic Characteristics of Participants

Table. 1 shows the demographic characteristics of nurses who participated in the study sample. Their age ranged from 19 – 46 with a mean age of 27.1 ± 26.8 and their years of experience ranged from 1 to 20 years with a mean of 11.3 ± 5.4 . Regarding training courses, 20% of them attended infection control courses, while 13.3% attended obstetrics and gynecology courses.

Table 1

Demographic Characteristics of Study Participants

Age	No	%
19 - < 26	48	53.3
26 - < 33	12	13.3
33 - <40	24	26.7

40 – 46	6	6. 7
Mean ±SD	27.1±26.8	
Years of nurse experience		
1 - < 6 years	42	4 6. 7
6 - <11	30	3 3. 3
11- < 16	6	6. 7
16 - 20	12	1 3. 3
Mean ±SD	11.3±5.4	
Training course attended		
Infection control courses		
Yes	18	2 0
No	72	8 0
Obstetrics and gynecology courses		
Yes	12	1 3. 3
No	78	8 6. 7

The study reports a positive correlation between staff nurses' behavior regarding infection control precautions and lack of supplies.

A high percentage of nurses (77.8%) used disposable gloves during procedures when needed. On the other hand, the lowest percentage of nurses (3.3%) used sterile disposable gloves during labor with 8 sudden labor reported (table 2). Almost half of the nurses didn't wear clean uniforms and didn't remove jewelry during work (57.8% and 55.6%, respectively). Meanwhile, fewer of them (33.3%) keep their fingers and nails short and clean (Table 3). Notably, 73.3 % of nurses apply cleaning techniques for surgical instruments correctly before sterilization (Table 4). The highest percentage of nurses (62.2 %) stored Clean linens in a clean place until distributed; However only 31.1% put Linens soaked with blood in double plastic bags (Table 5). Data clarifies that there is a statistically positive significant correlation between staff nurses' behavior regarding infection control precautions and lack of supplies. The percentage of nurses with negative infection control behavior was higher during the lack of medical supplies (Table 6).

Table 2

Staff Nurses' Observation of Their Behavior Regarding Infection Control Precautions (no of observation =90)

Items	Yes		No	
	No	%	No	%
Wash hands between patients.	25	27.8	65	72.2
Wash hands before the nursing procedure.	21	23.3	69	76.7
Wash hands after handling contaminated equipment.	27	30	63	70
Wash hands after contact with blood and secretions.	64	71.1	26	28.9
Wear a mask and gown during the procedure when required.	3	3.3	87	96.7
Use sterile disposable gloves during labor.	2	2.5	6	7
Use disposable gloves during the procedure when needed.	70	77.8	20	22.2

Table 3

Staff Nurses' Observation of Their Behavior Regarding Personal Hygiene (no of observation =90)

Items	Yes		No	
	No	%	No	%
Wear a clean uniform.	38	42.2	52	57.8
Remove jewelry during work.	40	44.4	50	55.6
Keep fingers and nails short and clean.	30	33.3	60	66.7
Change unit uniform when soiled with blood or body finger.	42	46.7	48	53.3

Table 4

Staff Nurses According to Observation of Their Infection Control Behavior Regarding Handling Needles and Sharps (no of observation =90)

Items	Yes		No	
	No	%	No	%
Needles not recapped.	58	64.4	32	35.6
Properly discard needles and sharps in the special sharps containers.	52	57.8	38	42.2
Never leave sharps lying around.	60	66.7	30	33.3

Needles not be bent or broken before disposable.	49	54.4	41	45.6
Use one syringe once for each medication.	38	42.2	52	57.8
Apply cleaning technique for surgical instruments correctly before sterilization.	66	73.3	24	26.7

Table 5

Staff Nurses' Observation of Their Infection Control Behavior Regarding Handling Linens (no of observation =90)

Items	Yes		No	
	No	%	No	%
Clean linens are covered during transportation.	44	48.9	46	51.1
Clean linens are stored in a clean place until distributed.	56	62.2	34	37.8
Linens soaked with blood are put in double plastic bags.	28	31.1	62	68.9

Table 6

Relation between Staff Nurses' Behavior Regarding Infection Control Precautions and Lack of Medical Supplies.

Items	Lack of supplies		Total	P value
	frequency	%		
Wash hands between patients				
Yes	25	41.7	60	0.04
No	35	58.3		
wash hands before the nursing procedure				
Yes	21	34.4	61	0.02
No	40	65.6		
wash hands after handling contaminated equipment				
Yes	27	44.3	61	0.035
No	34	55.7		
wash hands after contact with blood and secretions				
Yes	64	76.1	84	0.01
No	20	23.8		
wear a mask and gown during the procedure when required				
Yes	3	3	82	0.0001
No	80	97		
Use sterile disposable gloves during labor.				

Yes	2	40	5	0.001
No	3	60		
Use disposable gloves during the procedure when needed.				
Yes	70	82.4	85	0.011
No	15	17.6		

We also found a statistically positive significant correlation between staff nurses' behavior regarding infection control precautions and negligence. The percentage of nurses with negative infection control behavior was higher in neglected nurses.

Table 7

Relation Between Staff Nurses' Behavior Regarding Infection Control Precautions and Negligence.

Items	Negligence		Total	P value
	Frequency	%		
Wash hands between patients				
Yes	25	45.5	55	0.04
No	30	54.5		
wash hands before the nursing procedure				
Yes	21	42	50	0.03
No	29	58		
wash hands after handling contaminated equipment				
Yes	27	48.2	56	0.04
No	29	51.8		
wash hands after contact with blood and secretions				
Yes	64	91.4	70	0.01
No	6	8.6		
wear a mask and gown during the procedure when required				
Yes	3	30	10	0.2
No	7	70		
Use sterile disposable gloves during labor.				
Yes	2	40	5	0.03
No	3	60		
Use disposable gloves during the procedure when needed.				
Yes	70	93.3	75	0.001
No	5	6.7		

Discussion

Prenatal care consists of care, behavior, and procedures for the health of the pregnant woman and the fetus; to detect, cure, or control diseases early, avoiding complications during pregnancy and childbirth. It thus proposes to guarantee quality maternal and fetal health and consequently reduce maternal and fetal morbidity and mortality rates (Domingues et al., 2015). Therefore, this study aimed to assess the adequacy of nursing care facilities used by nurses and its relation to daily consumption in the antenatal and postnatal care wards and to

find out the relationship between the adequacy of medical supplies and nurses' infection control behavior at El-Manial University Hospital.

The data indicates that the majority of nurses do not attend infection control courses and obstetrics and gynecology courses. These results disagree with Nguyen LG *et al.* who discovered that most participants in this study trained as midwives during or after the Australian antenatal care guidelines were updated to include oral health (Nguyen et al., 2020). Meanwhile, others reported only one-third of the midwives took part in IC training courses (Tabatabaei et al., 2016). From the researcher's point of view, these results might be due to the shortage of clinical nursing staff preventing them from attending any training courses to avoid work interruption or unavailability of obstetrics and gynecology training courses.

Concerning staff nurses' behavior regarding infection control precautions, the results show that a high percentage of nurses used disposable gloves during procedures when needed and the lowest percentage of the nurses used sterile disposable gloves during labor. Our findings are in agreement with the results from Tabatabaei SM *et al.*, who found that midwives' compliance with optimal IC practices was low, and unused sterile gloves were available in only 60% of the facilities (Tabatabaei et al., 2016). From a researcher's point of view, noncompliance with IC practices might occur as a result of slips, lapses, mistakes, and sometimes violations of protocols, which is a function of the healthcare workers' skills and knowledge levels.

The current study revealed that the highest percentage of nurses didn't wear clean uniforms, didn't remove jewelry during work and a low percentage of them kept fingernails short and clean. These results are incongruent with (Mahmood et al., 2015) who showed that a higher percentage of nurses (nearly 66.0%) wear jewelry during work and about 38.0% of them wear artificial fingernails during work. Researchers suggested that results might be due to a lack of training related to infection control.

Regarding nurses' infection control behavior regarding handling needles and sharps, the results showed that the highest percentage of nurses apply cleaning techniques for surgical instruments correctly before sterilization. Our findings were in agreement with the results from (Tabatabaei et al., 2016), who found that safe injection performances were suboptimal and the highest percentage of nurses apply safe disposal of medical waste, safe collection, safe transport of medical waste and safety boxes disposed of when 3/4 full. Similarly, the highest percentage of nurses stored clean linens in a clean place until distributed. On the other hand, a low percentage of them put Linens soaked with blood in double plastic bags. Ginny Kaushal *et al.* revealed similar results where the highest percentage of nurses had a minimum level of standard precautions for linen handling (Kaushal et al., 2015). From the researcher's point of view, these results might be due to the unavailability of an infection control policy inside the clinical area and lack of training.

Bridging the gap

There was an explosion of literature on patient safety issues, after publication of revolutionary IOM report (Kohn et al 1999), however, we found it surprising that the literature, much less frequently, addressed the education of healthcare students on patient safety.

Patient Safety — A New Discipline with New Concepts

Reason R. (2000) was one of the pioneers who put forward a revolutionary concept in medicine that error is not necessarily associated with incompetence and that punishment or blame has not

been effective in reducing adverse events. According to him, humans will make mistakes due to their inherent characteristics. He challenged the concept of blaming an individual in case of any adverse event during treatment.

Reason's article formed the basis of a revolutionary report 'To Err is human' published by the US Institute of Medicine (IOM), about two decades ago. Kohn et al(1999) emphasized the gravity of patient harm that accompanies medical treatment. They suggested strategies to mitigate them. Standardization and simplifying the processes minimizes the load on working memory and results in avoidance of errors due to human factors. They also suggested to pay attention to working conditions, eg, workhours, workloads, staffing ratios, sources of distraction, and shift changes. The authors remarked that individuals cannot remain vigilant for longer periods of time. Therefore, approaches for reducing the need for vigilance include, providing checklists, limiting long shifts, rotating staff, and employing equipment that automates some functions may be helpful.

Conclusion

Based on the findings of this study, it was concluded that nurses didn't follow infection control precautions. Shortage of supplies, nurses' negligence, and lack of supervision seemed to be the causes. The infection control nurses' role was not activated, and the head nurse supervisory role got the lowest performance related to administrative responsibilities. Nurses didn't have written nursing care standards.

Recommendations

In the light of findings of the current study, the following recommendations are made:

1. A written infection control standard should be available and well-known to all healthcare workers.
2. Periodic training should be available for all nurses and healthcare teams to keep them up to date regarding infection control measures.
3. Infection control nurses' role must be activated and they have to be trained for their role.
4. Standards for supplies based on actual utilization must be set based on scientific study.
5. Periodic medical examination and immunization should be given to the health care workers.
6. The physical setting must have separately located places for each clean and soiled linen.
7. Nurses must be members of the hospital design team to benefit from their experience and they must be consulted when making changes in the unit's physical setting.
8. Proper selection and training for the head nurses.

The way forward

Patient safety is now a new international standard that healthcare providers need to learn, and which has been addressed in this research study. The WHO patient safety curriculum guide for medical schools can be a good start, as it is authored by global experts in the field and is a comprehensive resource, with ready-to-teach material. It also includes a Teacher's Guide, so that an existing faculty can be utilized in accomplishing the teaching program. However, to fully benefit from this guide, capacity building of faculty would be an added advantage.

Today's students will be tomorrow's healthcare professionals and it is imperative that we make them competent and safe for ourselves and our future generations. Patient safety education is a step forward in making medical treatment virtually error-free.

Author Contributions

Study conception and design: TA

Data collection: TA

Data analysis and interpretation: TA

Drafting of the article: TA

Conflicts of interest

None were declared.

References

- Buxton, H., Flynn, E., Oluyinka, O., Cumming, O., Esteves Mills, J., Shiras, T., Sara, S., & Dreibelbis, R. (2019). Hygiene During Childbirth: An Observational Study to Understand Infection Risk in Healthcare Facilities in Kogi and Ebonyi States, Nigeria. *International Journal of Environmental Research and Public Health*, 16(7), 1301. <https://doi.org/10.3390/ijerph16071301>
- Carrico, R. M., Garrett, H., Balcom, D., & Glowicz, J. B. (2018). Infection Prevention and Control Core Practices: A Roadmap for Nursing Practice. *Nursing*, 48(8), 28–29. <https://doi.org/10.1097/01.NURSE.0000544318.36012.b2>
- CDC's Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings Infection Control CDC. (2022, November 29). <https://www.cdc.gov/infectioncontrol/guidelines/core-practices/index.html>
- Cronk, R., & Bartram, J. (2018). Environmental conditions in health care facilities in low- and middle-income countries: Coverage and inequalities. *International Journal of Hygiene and Environmental Health*, 221(3), 409–422. <https://doi.org/10.1016/j.ijheh.2018.01.004>
- Domingues, R. M. S. M., Viellas, E. F., Dias, M. A. B., Torres, J. A., Theme-Filha, M. M., Gama, S. G. N. da, & Leal, M. do C. (2015). [Adequacy of prenatal care according to maternal characteristics in Brazil]. *Revista Panamericana De Salud Publica = Pan American Journal of Public Health*, 37(3), 140–147.
- Harisa M., E. S., Amany M., S., & Ola AbdelAty, A. (2002). *Developing and validating a job description for the staff nurse working in the emergency departments at Ain Shams University Hospitals*. 23–34.
- Kaushal, G., Doke, P., Shah, A., & Verma, V. (2015). An Analysis of Knowledge, Attitude and Practices regarding Standard Precautions of Infection Control and Impact of Knowledge and Attitude of ICU Nurses on Self-reported Practices of Infection Control. *International Journal of Research Foundation of Hospital and Healthcare Administration*, 3(2), 79–85. <https://doi.org/10.5005/jp-journals-10035-1041>
- Kohn LT, Corrigan JM, Donaldson MS, eds. To err is human: building a safer health system. Washington, DC: National Academy Press, 1999.

- Mahmood, S. E., Verma, R., & Khan, M. B. (2015). Hand hygiene practices among nursing students: Importance of improving current training programs. *International Journal Of Community Medicine And Public Health*, 2(4), 466–471. <https://doi.org/10.18203/2394-6040.ijcmph20151031>
- Nguyen, J. G., Nanayakkara, S., & Holden, A. C. L. (2020). Knowledge, Attitudes and Practice Behaviour of Midwives Concerning Periodontal Health of Pregnant Patients. *International Journal of Environmental Research and Public Health*, 17(7), 2246. <https://doi.org/10.3390/ijerph17072246>
- Reason J. Human error: models and management. *BMJ*. 2000;320(7237):768-770.
- Tabatabaei, S. M., Pour, F. B., & Azadeh, H. (2016). Infection Control Practices and Program Management in Labor and Delivery Units: A Cross-Sectional Study From Iran. *International Journal of Infection*, 3(2), Article 2. <https://doi.org/10.17795/iji-32788>
- WASH in health care facilities: Global baseline report 2019. (n.d.). Retrieved April 20, 2024, from <https://www.who.int/publications-detail-redirect/9789241515504>