Nurses' Knowledge and Practice Regarding the Prevention of Cesarean Section Surgical Site Infection in Indonesia

Shinta Novelia
Master of Nursing Science
Faculty of Nursing Prince of Songkla University,
Thailand & Universitas Nasional, Indonesia
cdrchinta@yahoo.com

Wipa Sae Sia
Assistant Professor of Surgical Nursing Department
Faculty of Nursing Prince of Songkla University
Hatyai, Thailand
wipa.sa@psu.ac.th

Praneed Songwathana
Associate Professor of Surgical Nursing Department
Faculty of Nursing Prince of Songkla University
Hatyai, Thailand
praneed.s@psu.ac.th

Abstract— **Objectives: To identify the level of nurses' knowledge and practices regarding the prevention of Cesarean Section (CS) Surgical Site Infection (SSI).**
Methods: Participants were nurses and midwives working in the labor rooms and postnatal wards. Data collection was conducted at ten government hospitals selected in West Sumatra Indonesia using self-report questionnaires. A total of 201 nurses completed the questionnaires. The levels of knowledge and the levels of practice were categorized as very low, low, moderate, high, and very high.
Results: Nurses had low levels of knowledge and high levels of practice regarding the prevention of CS-SSI in Indonesia.
Conclusions: Nurses' knowledge and practice in certain areas of the prevention of CS-SSI need to be improved. Education and training programs should be conducted in Indonesia to improve nurses' knowledge and practice regarding CS-SSI prevention using evidence-based practice.

Keywords-nurses' knowledge and practice; prevention of surgical site infection; cesarean section.

I. INTRODUCTION

A. Significance and Aim of the Study

A Surgical site infection (SSI) after a Cesarean Section (CS) is the second most frequent infectious complication in the area of obstetrics in Germany. The incidence of CS ranged between 5-51% in some countries including Germany, England, USA, and Nigeria [1-6]. The CS-SSI in Indonesia ranged from 6.67% to 20% [7-9]. A Caesarean Section (CS) SSI is a cause of prolonged hospital stay and resource consumption, maternal anxiety, breast feeding production disturbance, and decreased quality of life of new moms and babies [10].

The prevention of CS-SSI is the result of a complex interaction between patient-related factors, environmental factors, and nurse related factors [11]. Nurses play a role in CS-SSI prevention. Nurse related factors regarding the prevention of SSI were knowledge, age, gender, levels of education, attendance to the infection control training program, work experience, and attitude [12-15]. Due to the different risk factors of SSI in CS compared to general surgery, such as the premature rupture of membranes (PROM), pre-eclampsia, and unscheduled CS, nurses should have enough knowledge about the risk factors of CS-SSI. Also, nurses' practice was related to SSI [16]. The guidelines for SSI prevention have been established by the Center for Disease Control (CDC) [17, 18]. The components of SSI prevention include pre-operative, intra-operative, and post-operative prevention strategies. However, these guidelines are not specific to CS.

Some studies have been conducted on nurses' knowledge and practice regarding the prevention of SSI. For example, a study in Nigeria found that 60% of the nurses who worked in surgical wards and operating rooms had poor knowledge about the prevention of SSI [19]. Another study conducted in Italy found that the current state of nurses' knowledge related to healthcare-associated infections was poor [15]. Furthermore, a survey study conducted in England found that nurses lacked knowledge and practice in respect to wound care and the poor management of wounds with inappropriate usage of dressing techniques [11].

A study has been conducted in Indonesia regarding the prevention of CS-SSI; however, it only explored nurses' and midwives' knowledge and practice regarding aseptic techniques, and hand washing [7]. The other components of

the prevention of SSI endorsed by CDC regarding the prevention of CS-SSI have not yet been explored. Therefore, this study was proposed to identify the level of nurses' knowledge and practices regarding the prevention of CS-SSI.

B. Conceptual Framework of the Study

The framework of this study was developed based on the CDC guideline of SSI prevention [17, 18] and literature reviews. The prevention of SSI in the CDC guideline includes pre-operative, intra-operative, and post-operative preventive strategies. However, this study has included only pre-operative and post-operative prevention strategies of CS-SSI. The intra-operative prevention strategy has not been included because the operating theatres in Indonesia are mostly controlled by surgeons. The components of the pre-operative and post-operative prevention strategies of knowledge and practice are similar. The pre-operative prevention strategies are hand washing, the maintenance of hygiene and the preparation of skin with antiseptic, the control of any underlying medical conditions, the maintenance of the nutritional status of the patient, prophylactic antibiotic use and the assessment of the risk factors of CS-SSI. Post-operative prevention strategies include hand washing before and after dressing changes and any contact with the surgical site, the protection of the wound with a sterile dressing for 24 to 48 hours post-operatively, wound dressing using sterile techniques, a wound assessment for SSI, patient nutritional support, patient education regarding proper incision care, symptoms of SSI, and patient education regarding the need to report such symptoms.

II. METHODOLOGY

A. Study Design and Setting

A descriptive study was used to obtain information on knowledge and practices regarding the prevention of CS-SSI among nurses in Indonesia. This study was conducted from November 2015 to January 2016 at ten government hospitals in West Sumatra, Indonesia.

B. Participants

Ten government hospitals in West Sumatra were selected based on being conveniently located within a 125 kilometer radius from the capital city as well as having a large number of nurses and midwives who work in the labor rooms and post-natal wards. There were 227 midwives and nurses who worked in the labor rooms and post natal wards in the ten government hospitals selected. However, only 223 midwives and nurses were recruited in this study following the inclusion criteria which were nurses who were: (1) have a minimum qualification of three years of certified diploma in nursing or midwifery, (2) currently working in labor rooms and post-natal wards, and (3) have at least six months of work experience in labor rooms and post-natal wards. Two hundred and twenty-three questionnaires were delivered. However, 22 participants (9.87%) did not response to the questionnaire.

C. Instrumentation

A set of questionnaires was including (1) demographic characteristics, (2) knowledge regarding the prevention of CS-SSI, (3) practice regarding the prevention of CS-SSI. The knowledge questionnaire was modified from the previous questionnaire [19]. This knowledge questionnaire included pre-operative (18 items) and post-operative (12 items) CS-SSI prevention. The correct answer for each item receives a score of "1" and the incorrect answer receives "0". The score ranges from 0-30 and is transformed into a percentage. The higher scores indicate a higher level of knowledge. For the purpose of interpretation, this is categorized into five levels as very low, low, moderate, high, and very high.

The practice questionnaire was modified from the previous questionnaire [19]. This practice questionnaire is composed of pre-operative (15 items) and post-operative (15 items) prevention practice of CS-SSI. The total score ranges from 0 to 90 and is transformed into a percentage. The higher scores indicate a higher level of practice. For interpretation, the score is divided and transformed into five levels using the same criteria as the knowledge questionnaire.

The content validity of the original English version questionnaires was assessed by a panel of three experts in the surgical and maternity fields. All questionnaires were examined for content validity index and ranged from .87 to .91. The Kuder-Richardson (KR-20) coefficient to determine the internal consistency reliability of knowledge questionnaire was .81, the Cronbach alpha coefficient to determine the internal consistency reliability of the practice questionnaire was .86. The translation of the questionnaires was conducted using the back translation technique [20].

D. Ethical Consideration

Approval and permission were obtained from the Institutional Review Board (IRB), Faculty of Nursing, Prince of Songkla University, Ministry of Health of West Sumatra Indonesia, Research Ethics Committee of West Sumatra Province and Hospital Directors. All potential participants who met the criteria were approached and informed about the nature and objective of the study, and the right protection of the subject. After each participant was willing to participate in this study and had given informed consent, they were required to answer the questionnaires.

E. Data Analysis

Descriptive statistic was used to present the demographic data, knowledge scores and practices scores regarding the prevention of CS-SSI. The levels of knowledge and practice regarding the prevention of CS-SSI were categorized and described as a mean and standard deviation.

III. RESULTS

A. Participants' Demographic Characteristics

All participants were female (100%). The average age was 32.92 years old ($SD = 8.41$) ranging from 19 to 58 years old. All participants were Muslim (100%). The majority of the participants (71.1%) were married. The majority of them

(78.6%) had completed three years of certified diploma in midwifery. The majority of the participants (54.2%) worked in wards which combined both post natal and labor rooms in the same ward. More than one-third of the participants (40.8%) had 0-5 years of total work experience. The majority of the participants (74.6 %) had 0-5 years of work experience in the present ward. Most of the participants (83.1%) had not trained in an infectious control training program.

B. Knowledge Regarding the Prevention of CS-SSI

The results show that the level of total knowledge regarding CS-SSI prevention was at a low level (M = 69.17%, SD = 8.59%) with the minimum scores of 40% and maximum scores of 86.67%. More than a third of the participants (37.8%) had knowledge of CS SSI prevention at a moderate level.

As shown in Table 1, five items of knowledge that were correctly answered by the lowest percentage of nurses were: (1) Identifying the best agent for pre-operative skin preparation, (2) identifying the best method for pre-operative hair removal to prevent CS-SSI, (3) identifying the diagnosis of SSI, (4) recognizing the laboratory tests used to ensure SSI,(5) comprehending the prophylactic antibiotics for high risk patients to prevent CS-SSI.

TABLE 1. FIVE ITEMS OF NURSES' KNOWLEDGE OF THE LOWEST PERCENTAGE OF CORRECTLY ANSWERED (N = 201)

No	Items	Sub-dimension	N	%
1	Identifying the best agent for pre-operative skin preparation	Pre-operative care, hygiene and skin preparation	14	7.0
2	Identifying the best method for pre-operative hair removal	Pre-operative care, hygiene and skin preparation	24	11.9
3	Identifying the diagnosis of SSI	Post-operative care, wound assessment of CS-SSI	48	23.9
4	Recognizing the laboratory tests used to ensure SSI	Post-operative care, wound assessment of CS-SSI	49	24.4
5	Comprehending prophylactic antibiotics for high risk patients	Pre-operative care, prophylactic antibiotics	58	28.9

C. Practice Regarding the Prevention of CS-SSI

The result revealed that the nurses' practice regarding CS-SSI prevention was at a high level (M = 87.58%, SD = 9.28%) with the minimum scores of 50% and maximum scores of 100%. More than half of the participants (59.7%) reported their practices regarding the prevention of CS-SSI were at a very high level.

As shown in Table 2, five items of the practice

questionnaire that the lowest percentage of nurses "always practice" were: (1) Assessing a patient's body mass index (BMI) before and after surgery, (2) using alcohol or chlorhexidine gluconate antimicrobials for patient's skin preparation, (3) using a face mask during cleansing surgical wound dressing, (4) advising obese patients to intake more food containing high levels of protein, and (5) advising pre-operative patients to avoid self-hair removal.

TABLE 2. FIVE ITEMS OF NURSES' PRACTICE THAT THE LOWEST PERCENTAGE OF NURSES "ALWAYS PRACTICE" (N = 201)

No	Items	Sub-dimension	N	%
1	Assessing patient's body mass index (BMI) before and after surgery	Pre-operative care, maintaining nutritional status	69	34.3
2	Using alcohol or chlorhexidine gluconate antimicrobials for patient's skin preparation	Pre-operative care, hygiene and skin preparation	38	38.8
3	Using face mask during cleansing surgical wound dressing	Post-operative care, wound dressing with sterile technique	82	40.8
4	Advising obese patient to intake more food containing high protein	Pre-operative care, maintaining nutritional status	97	48.3
5	Advising pre-operative patients to avoid self-hair removal	Pre-operative care, hygiene and skin preparation	110	54.7

IV. DISCUSSION

A. Nurses' Knowledge Regarding the Prevention of CS-SSI

The low level of nurses' knowledge in this study was consistent with a previous study in Italy [15], which found that nurses' knowledge related to disinfection procedure was poor. Many factors might contribute to the low level of knowledge regarding the prevention of CS-SSI among nurses in this study. Firstly, most of the participants (78.6%) had completed three years of certified diploma in midwifery. The three years of certified diploma in midwifery curriculum in Indonesia does not specifically focus on evidence-based practice regarding the prevention of CS-SSI [21]. The previous study conducted in Mongolia revealed that infection prevention and control was not taught in the curriculum of undergraduate students which affected the low level of knowledge regarding infection prevention and control [22]. So, it could be assumed

that having no specific focused on teaching CS-SSI during the curriculum [23] might influence the level of nurses' knowledge regarding the prevention of CS SSI in this study.

Secondly, the majority of the participants (83.1%) had never attended an infection control training program be a reason for the low level of knowledge of the participants. Training and education have been considered to prepare nurses to gain better knowledge on nosocomial infections [24]. Although attending infection control training programs was reported to be related to improved knowledge, an unspecified CS SSI infection training program might not improve CS-SSI prevention. A study conducted in Zimbabwe found that the infection control workshops were poorly organized because 68% of the nurses did not attend any workshop of infection prevention and control, which contributed to poor infection prevention and control practice [25]. Thirdly, work experience might affect nurses' knowledge. The majority of the participants (49.8%) had a total work experience of 0-5 years. A study found that nurses who had more years of work experience showed a higher level of knowledge regarding infection control [26].

The lack of nurses' knowledge in determining the best agent for skin preparation, determining the best method of hair removal, and comprehending prophylactic antibiotics for high risk patients to prevent CS-SSI indicated that nurses lacked knowledge regarding evidence-based nursing practice of CS-SSI prevention. Another study also found that nurses' lack of knowledge in some areas of SSI prevention included the best time for pre-operative hair removal and the hair removal method for the pre-operative preparation of surgical patients [19].

The diagnosis of CS-SSI item was one of the lowest percentages of nurses who correctly answered. A patient assessment is very important to recognize the early signs of CS-SSI either in the hospital or at home after patient discharge. Nurses need to have the ability to assess the signs and symptoms of CS SSI. It is suggested to add this issue for the revision of the education and training program regarding the prevention of CS-SSI.

B. Nurses' Practice Regarding the Prevention of CS-SSI

The results showed that the average practice score of nurses regarding the prevention of CS-SSI was at a high level. This result is supported by a previous study [19], which found that nurses had a high level of practice regarding the prevention of SSI in Bangladesh. Some factors are assumed to influence nurses' level of practice regarding the prevention of CS-SSI. Firstly, the working environment might influence nursing practice in the wards. The availability of resources including water, washbasin, gloves, masks, and hand soap can help nurses to perform good practice. One previous study found that surgical infection control was related to sufficient resources of caring for surgical patients [27]. Secondly, the supervision of infection control practice by the infection control department in the hospitals might influence nurses' practice regarding the prevention of CS SSI. Nurses tend to perform good practice if they are under clinical supervision. Clinical supervision supplies nurses with an opportunity to improve nursing care in particular for maintaining standards of care [28]. Lastly, social desirability might be the individual factor that influenced the participants' responses to the self reported questionnaires. Social desirability responding is the tendency for people to present a favorable image of themselves on questionnaires [29]. Participants tend to give responses in order to get a higher score even though they might not have performed the activities which are included in the questionnaire [30].

Another analysis found that the nurses had low performed practice of CS SSI prevention in some areas including using alcohol or chlorhexidine gluconate antimicrobials for a patient's skin preparation, advising pre-operative patients to avoid self-hair removal, advising obese patients to up their intake of food containing high protein, assessing a patient's body mass index (BMI) before and after surgery, using a face mask during the cleansing of a surgical wound dressing. These results are supported by the previous study [19], which found that nurses had low practice in assessing BMI to maintain the nutritional status of surgical patients and learning shaving methods from others nurses. It is indicated that nurses had limited resources to assess the evidence-based practice in these areas and assessing BMI is not a routine practice in obstetric gynecology wards in Indonesian hospitals. It is suggested that nurse administrators include BMI in the assessment form of women undergoing CS.

In the regular practice in obstetric wards in Indonesian hospitals, nurses often asked the women undergoing CS to perform self-hair removal using a razor in pre-operative preparation. In some hospitals, hair removal is still included in the procedure operational standard (hospital guideline) for patients undergoing CS without any consideration as to whether it is necessary or not. The wards provide disposable razors for the women undergoing CS, and usually nurses ask the women to do self-hair removal. It is against the evidence-based practice regarding CS-SSI prevention for two reasons. Firstly, hair removal (shaving using a razor) is not recommended anymore unless the hair hinders the incision area [31]. Secondly, the self-hair removal performed by the women undergoing CS increases the incidence of CS-SSI [10]. Education regarding avoiding self-hair removal is very important. Nurses should educate patients undergoing CS, or pregnant women who plan to have a CS to avoid self-hair removal. A previous study found that a 51% reduction was seen in the CS-SSI after the rate of hair removal decreased from 41% to 27% in Canada [10].

The result revealed that nurses had low practice of using face masks during surgical wound dressing. This result is consistent with a previous study conducted in Egypt which found that nurses had low compliance of using face masks and using sterile gloves in the dialysis unit [32]. A study conducted in Indonesia found that nurses had the poor practice of using masks during wound dressing because the hospital

guideline of wound dressing did not include the face precaution (using masks) [33].

V. CONCLUSION AND RECOMMENDATION

It is crucial to enhance nurses' knowledge and practice regarding the prevention of CS-SSI in Indonesia. The finding suggests that the nurse administrators should evaluate and revise the education and training program regarding the prevention of CS-SSI in Indonesia. An implementation of CS-SSI prevention guidelines is important in the hospitals. Body Mass Index is necessary for inclusion in the assessment form of women undergoing CS and the hair removal procedure in the hospital guideline should be revised. In addition, a policy for precautions regarding infection prevention and control specific to CS SSI needs to be presented in the hospitals.

ACKNOWLEDGMENT

REFERENCES

[1] S. Barwolff, D. Sohr, C. Geffers, C. Brandt, R.P Vonberg, H. Halle,... & Gastmeier, P. (2006). Reduction of surgical site infections after caesarean delivery using surveillance. *Journal of Hospital Infection, 64*, 156-161. doi:10.1016/j.jhin.2006.06.009

[2] M. Dryden, C Goddard, A Madadi, M Heard, K Saeed, & J. Cooke. (2014). Using antimicrobial surgihoney to prevent caesarean wound infection. *British Journal of Midwifery, 22*, 111-115. Retrieved from http://eds.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid =3&sid=d28194ee-56d4-4ebf-a6ae-9864a4063873%40sessionmgr110&hid=103

[3] O.C. Ezechi, A. Edet, H. Akinlade, C.V. Gab-Okafor, & E. Herbertson. (2009). Incidence and risk factors for caesarean wound infection in Lagos Nigeria. *BioMed Central Research Notes, 2*(1), 1-5. doi:10.1186/1756-0500-2-186

[4] A. Johnson, D. Young, & J Reilly. (2006). Caesarean section surgical site infection surveillance. *Journal of Hospital Infection, 64*, 30-35. doi:10.1016/j.jhin.2006.03.020

[5] L.L Thornburg, M.A. Linder, D.E. Durie, B. Walker, E.K Pressman, & J.C Glantz. (2012). Risk factors for wound complications in morbidly obese women undergoing primary cesarean delivery. *Journal of Maternal-Fetal and Neonatal Medicine, 25*, 1544-1548. doi:10.3109/14767058.2011.653422

[6] H. Yeeles, S. Trinick, C. Childs, H. Soltani, & T. Farrell.(2014). Postpartum infection in morbidly obese women after c-section: Does early prophylactic oral antibiotic use make a difference. *Journal of Women's Health Care, 3,* 2167-0420. doi:10.4236/ojog.2014.49077

[7] H. Himatusujanah, & F. B. Rahayuningsih. (2008). The relationship between wound care practice and cesarean section surgical site infection in Moewardi hospital Surakarta [Hubungan tingkat kepatuhan pelaksanaan protap perawatan luka dengan kejadian infeksi luka post sectio caesarea (SC) di ruang mawar I RSUD dr. Moewardi Surakarta]. *Journal News in Nursing. 1*(4), 175-180. Retrieved from http://www.researchgate.net/publication/277997435

[8] M. Djamil Hospital Profile. (2015). M. Djamil Hospital profile 2015 [Profil rumah sakit M.Djamil 2015]. Ministry of Health of West Sumatra, Indonesia.

[9] F. Hastuti. (2010). Overview of the implementation of postoperative caesarean section (SC) wound care and the incidence of infection in dr. Moewardi Hospital [Gambaran pelaksanaan perawatan luka post operasi sectio caesarean (SC) dan kejadian infeksi di ruang mawar I RSUD dr. Moewardi]. (Unpublished thesis). Muhammadiyah University, Surakarta, Indonesia. Retrieved from http://eprints.ums.ac.id/10344/3/J210060042.PDF

[10] W. Ng, A. Brown, D. Alexander, M.F. Ho, B. Kerr, M. Amato, & K. Katz. (2015). A multifaceted prevention program to reduce infection after cesarean section: Interventions assessed using an intensive post discharge surveillance system. *American Journal of Infection Control, 43*, 805-809. doi:10.1016/j.ajic.2015.04.001

[11] H. Hollinworth, D. Taylor, & T. Dyble. (2008). An educational partnership to enhance evidence-based wound care. *British Journal of Nursing, 17*(9), 25-33. Retrieved from http://dx.doi.org/10.12968/bjon.2008.17.Sup9.31662

[12] H. H. Atiyah. (2012). Evaluation of nurses' practices toward postoperative wound dressing in surgical wards. *Iraqi National Journal of Nursing Specialties, 25*(1), 29-39 Retrieved from http://www.iasj.net/iasj?func=fulltext&aId=68767

[13] A. M. Bady, H. Kusnanto, & D. Handono. (2007). Analysis of nurses' practice of nosocomial infection control in dr. Sardjito Hospital [Analisis kinerja perawat dalam pengendalian infeksi nosokomial di Irna RSUP dr. Sardjito]. (Unpublished thesis). University of Gajah Mada, Indonesia. Retrieved from http://www.infodiknas.com/wp-content/uploads/2014/11/ANALISIS-KINERJA-PERAWAT-DALAM-PENGENDALIAN-INFEKSI-NOSOKOMIAL-DI-IRNA.pdf

[14] S. O. Labeau, S. S. Witdouck, S. S., D. M. Vandijck, B. Claes, J. Rello, K. H. Vandewoude, ... & S. I. Blot.(2010). Nurses' knowledge of evidence-based guidelines for the prevention of surgical site infection. *Worldviews on Evidence-Based Nursing, 7*, 16-24. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/1741-6787.2009.00177.x/pdf

[15] A. Sessa, G. Di Giuseppe, L. Albano, & I. F. Angelillo.

(2011). An investigation of nurses' knowledge, attitudes, and practices regarding disinfection procedures in Italy. *BioMed Central Infectious Diseases, 11*, 1-7. doi:10.1186/1471-2334-11-148

[16] P. Widiyanto, R. T. S. Hariyati, & H. Handiyani. (2013). The effect of supervision training program on clinic supervision implementation of head nurse and wound care quality improvement measures in PKU Muhammadiyah Hospital Temanggung [Pengaruh pelatihan supervisi terhadap penerapan supervisi klinik kepala ruang dan peningkatan kualitas tindakan perawatan luka di RS PKU Muhammadiyah Temanggung.]. Unpublished thesis, University of Indonesia. Retrieved from http://jurnal.unimus.ac.id/index.php/psn12012010/article/view/848/902

[17] A. J. Mangram, T. C. Horan, M. L. Pearson, L. C. Silver, & W. R. Jarvis. (1999). Guideline for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. *Infection Control & Hospital Epidemiology, 20*, 250-278. Retrieved from http://www.cdc.gov/hicpac/pdf/SSIguidelines.pdf

[18] Center for disease control. (2015). Surgical site infection event. *Procedure-associated Module SSI.* Retrieved from http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurre t.pdf

[19] H. K. Sickder. (2010). Nurse's knowledge and practice regarding prevention of surgical site infection in Bangladesh (Unpublished thesis). Prince of Songkla University, Thailand.

[20] A. D. Sperber. (2004). Translation and validation of study instruments for cross-cultural research. *Gastroenterology, 126*, 124-128. doi:10.1053/j.gastro.2003.10.016

[21] Ministry of Health of Indonesia. (2013). Diploma III curriculum of education for health [Kurikulum D-III pendidikan tenaga kesehatan]. Center for Health Education and Training, Agency for Development and Empowerment Human Resources, Indonesia. Retrieved from http://www.pdpersi.co.id/diknakes/data/pendidikan/kurik ulum_d3.pdf

[22] B. E. Ider, J. Adams, A. Morton, M. Whitby, & A. Clements. (2012). Perceptions of healthcare professionals regarding the main challenges and barriers to effective hospital infection control in Mongolia: A qualitative study. *BioMed Central Infectious Diseases, 12*, 1-170. doi:10.1186/1471-2334-12-17

[23] M. P. Tavolacci, J. Ladner, L. Bailly, V. Merle, I. Pitrou, & P. Czernichow. (2008). Prevention of nosocomial infection and standard precautions: Knowledge and source of information among healthcare students. *Prevention, 29*, 642-647. doi:10.1086/588683.

[24] J. B. Suchitra, & N. L. Devi. (2007). Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections. *Indian Journal of Medical Microbiology, 25*, 181-187. doi:0.4103/0255-0857.34757

[25] T. Chipfuwa, A. Manwere, & P. Shayamano. (2014). Barriers to infection prevention and control (IPC) practice among nurses at Bindura Provincial Hospital, Zimbabwe. *Journal of Nursing and Health Science, 3*(1), 69-73.Retrieved from http://digilib.buse.ac.zw:8090/xmlui/bitstream/handle/111 96/333/ Chipfuwa%20pub%20upload.pdf?sequence=1

[26] A. Vij, S. N. Williamson, & S. Gupta. (2001). Knowledge and practice of nursing staff towards infection control measures in a tertiary care hospital. *Journal of the Academy of Hospital Administration, 13*(2), 1-6. Retrieved from http://www.indmedica.com/journals.php?journalid=6&iss ueid=20&articleid=167&action=article

[27] K. V. Nguyen, P. T. M. Nguyen, & S. L. Jones. (2008). Effectiveness of an alcohol-based hand hygiene programme in reducing nosocomial infections in the urology ward of Binh Dan Hospital, Vietnam. *Tropical Medicine & International Health, 13*, 1297-1302. doi: 10.1111/j.1365-3156.2008.02141.x

[28] S. Brunero, & J. Stein-Parbury. (2008). The effectiveness of clinical supervision in nursing: An evidenced based literature review. *Australian Journal of Advanced Nursing, 25*(3), 86-94. Retrieved from https://opus.lib.uts.edu.au/bitstream/10453/12822/1/20080 00703.pdf

[29] T. F. Van de Mortel. (2008). Faking it: Social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, 25*(4), 39-48. Retrieved from http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1001 &context=hahs_pubs

[30] S. A. Adams, C. E. Matthews, C. B. Ebbeling, C. G. Moore, J. E. Cunningham, J. Fulton, J. R. & Hebert.(2005). The effect of social desirability and social approval on self-reports of physical activity. *American Journal of Epidemiology, 161*, 389-398. doi:10.1093/aje/kwi054

[31] National Institute for Health and Clinical Excellence [NICE]. (2008). Surgical site infection. (Clinical guideline 74). Retrieved from https://www.nice.org.uk/guidance/CG74

[32] N. Y. A. El-Enein, & H. M. El Mahdy. (2011). Standard precautions: A KAP study among nurses in the dialysis unit in a University Hospital in Alexandria, Egypt. *The Journal of the Egyptian Public Health Association, 86,* 3-10. doi:10.1097/01.EPX.0000395430.92943.69

[33] D. D. Nurkusuma. (2009). Factors related to the incidence of "methicillin-resistant staphylococcus aureus" (MRSA) in the case of postoperative wound infection in operating room of dr. Kariadi Hospital [Faktor yang berpengaruh terhadap kejadian "methicillin-resistant staphylococcus aureus" (MRSA) pada kasus infeksi luka pasca operasi di ruang bedah RS dokter Kariadi Semarang]. (Unpublished thesis). Diponegoro University, Indonesia. Retrieved from http://core.ac.uk/download/pdf/11728168.pdf