Indonesian Journal of Global Health Research
Volume 7 Number 2, April 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

THE RELATIONSHIP BETWEEN KNOWLEDGE, ATTITUDES AND BEHAVIORS OF HEMODIALYSIS NURSES TOWARDS PREVENTING RISK OF CATHETER INFECTION DOUBE LUMEN TUNNELING AT X JAKARTA HOSPITAL

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ABSTRACT
Infection in Catheter Double Lumen (CDL) tunneling is a complication that often occurs in patients with hemodialysis.The prevention of infection in tunneling CDL can be achieved through nurses' possession of adequate knowledge, attitudes, and behaviors regarding the care of tunneling CDL access, as well as the provision of proper information to patients and families.The objective of this study is to ascertain the relationship between nurses' knowledge, attitudes, and behaviors regarding the prevention of infection in tunneling CDL at Hospital X Jakarta. The research method employed is quantitative, utilizing a descriptive correlation research design with a cross-sectional approach.The sample collection technique employed total sampling of 46 hemodialysis nurses. The results of univariate analysis indicated that the majority of respondents were female (93.5%), aged 31-40 years (47.8%), had a Diploma 3 education level (69.6%), exhibited good category knowledge (65.2%), good category attitude (65.2%), and good category behavior (69.6%). The results of Kendal's Tau B analysis demonstrated a relationship between nurses' knowledge and attitude regarding the prevention of CDL infection (p-value 0.014) and a relationship between nurses' behavior and the prevention of CDL infection (p-value 0.004). The knowledge, attitudes, and behaviors of nurses have been identified as a crucial component in the prevention of infection in the context of CDL tunneling. Hospitals are expected to implement training programs, disseminate Standard Operating Procedures on infection control in CDL, and conduct ongoing monitoring and evaluation to mitigate the risk of CDL infection.

Keywords: attitude; behavior; CDL; knowledge; nurses

How to cite (in APA style)
Verawati, Y., & Natalia, L. (2025). The Relationship between Knowledge, Attitudes and Behaviors of Hemodialysis Nurses Towards Preventing Risk of Catheter Infection Doube Lumen Tunneling at X Jakarta Hospital. Indonesian Journal of Global Health Research, 7(2), 603-612. https://doi.org/10.37287/ijghr.v7i2.5768.

INTRODUCTION

End-stage renal disease (ESRD) is defined as the damage or decline in kidney function that persists for a duration exceeding three months, exhibiting a progressive and irreversible nature ((Black & Hawks, 2014). According to the World Health Organization (WHO), there has been a 50% increase in patients afflicted with chronic renal failure since the previous year. Globally, the prevalence of Chronic Renal Failure exceeds 500 million individuals, with 1.5 million requiring hemodialysis (WHO, 2018). In the United States, that the number of patients with Chronic Renal Failure approached 786,000, with 71% undergoing dialysis and the remaining 29% living with kidney transplants (Centers for Disease Control and Prevention, 2021). In Indonesia, the prevalence of Chronic Renal Failure, as determined by physician diagnosis, among individuals aged 15 and above, is 0.38% of the population, amounting to 713,738 patients ((Riset Kesehatan Dasar, 2018).

Hemodialysis is a medical procedure that requires either temporary access through a double lumen catheter (CDL) or permanent access via an arteriovenous shunt (AV shunt), more commonly referred to as a cimino (Bauldoff et al., 2020) . There are two types of CDL: tunneled cuffed double lumen catheter and non-tunneled cuffed.The CDL procedure involves

the insertion of a catheter into a central vein, typically located in the neck or thigh area (Rockholt, 2023). In Indonesia, the number of patients undergoing hemodialysis with AV shunt access is 1,526,022 (75%), and Tunneled CDL is 12% (PERNEFRI, 2018).

CDL has been shown to have several advantages over other types of hemodialysis access. It is universal, meaning that it can be installed on almost everyone. It is relatively safe, easy to install and replace, becomes a quick access in urgent situations, and serves as a bridge to create permanent access ((Bream, 2016). However, there are notable disadvantages associated with CDL, including the potential for thrombosis, infection, stenosis, and central vein occlusion, which can result in CDL dysfunction. Additionally, CDL has been observed to exhibit a reduced blood flow rate, also referred to as "quick blood" (Iqbal et al., 2021).The complications arising from CDL infection have been documented to occur either locally, at the exit site, or systemically. Furthermore, the prevalence of complications arising from bloodstream infection or bacteremia due to CDL infection has been documented to be 17.9%, with 9.4% of these infections occurring in tunneling CDL users and 24.6% in non-tunneling CDL users (Basri & Patrianef, 2017).

The most common complaint associated with CDL infection during hemodialysis is fever accompanied by chills and stiffness (Sedhain et al., 2019) . According to the 11th Report of the Indonesian Renal Registry (PERNEFRI, 2018), the incidence of fever during hemodialysis was 6,495 cases, and the incidence of chills was 12,852 cases. Furthermore, patients with diabetes mellitus who have tunneling CDL installed in the left internal jugular vein exhibit a higher incidence of catheter-related bloodstream infection (CRBSI) compared to those with it installed in the right (Widani & Suryandari, 2021). Anatomically, the installation of CDL through the left jugular vein will be longer towards the right atrium than through the right jugular vein. Therefore, the wider the area through which CDL passes, the more conducive it becomes to microbial growth (Kovesdy, 2022).

Hyperglycemia, a hallmark of diabetes mellitus, has been demonstrated to impede humoral immunity and augment the risk of infection, including CRBSI. Consequently, it is imperative to implement preventive measures to avert such infections, as mitigating the risk of infection is of equal importance to treatment (Ignatavicius et al., 2020). The objective of prevention is to avert infection, thereby reducing morbidity and mortality rates, and curtailing the need for prolonged treatment, thus enhancing the patient's quality of life (Sedhain et al., 2019). Educational materials have been shown to be instrumental in empowering patients to undertake autonomous CDL care (Maia et al., 2019).

Nurses, as health care professionals, play a pivotal role in the maintenance of unobstructed CDL access through their preventive and promotive functions. A key component of this responsibility is the education of patients on the proper maintenance and care of CDL dressings, ensuring their cleanliness and moisture control (Ramos-Martinez et al., 2022). In order to prevent infections, nurses must adhere to stringent hand hygiene practices, utilize sterile personal protective equipment, employ chlorhexidine, adhere to catheter site dressing protocols, and meticulously monitor for signs of infection, such as redness, pus, and pain in the CDL exit site area ((Bayoumi & Mahmoud, 2017).

It is imperative to examine the knowledge, attitudes, and behaviors of hemodialysis nurses in order to prevent the risk of CDL tunneling infection. A comprehensive understanding of the necessity for different types of CDL, the methods of connection and removal, the proper aseptic and antiseptic procedures, exit site conditions, and complications arising from CDL

utilization is essential. Adequate knowledge has been demonstrated to influence the attitudes and behaviors of HD nurses, including adherence to existing SOPs, heightened awareness of the significance of PPE, and conscientious conduct towards patients and themselves. This heightened awareness has been shown to contribute to a more vigilant approach towards the prevention of CDL infection. The results of this study are expected to serve as a reference for hospitals, particularly the Hemodialysis Unit, in the development of routine training and socialization programs on infection control in CDL. These programs are designed to monitor and evaluate the implementation of standard operating procedures, thereby mitigating the risk of CDL infection.Additionally, it is anticipated that nurses will continuously enhance their knowledge and implement appropriate standard operating procedures to prevent infections in hemodialysis patients with CDL Tunneling.

METHOD

This research employs a quantitative research design with a cross-sectional method, utilizing the Kendall tau B test for bivariate analysis.The study was conducted at Hospital X Jakarta from June to July of 2023.The sample collection technique employed total sampling, encompassing 46 nurses who satisfied the stipulated inclusion and exclusion criteria.The inclusion criteria for this study are as follows:

1. All hemodialysis nurses employed at Hospital X Jakarta who consented to participate as respondents.
2. The study's participants were recruited from among the hemodialysis nurses working at Hospital X Jakarta who met the specified criteria and were present during the data collection period.

The exclusion criteria included hemodialysis nurses on sabbatical leave or major leave, as well as the head of the hemodialysis unit. The data collection process entailed the administration of questionnaires via Google Forms and the utilization of observation sheets.Prior to implementation, the knowledge, attitude, and behavior questionnaires underwent a rigorous validation and reliability assessment at Murni Teguh Hospital. The knowledge questionnaire contained 20 valid questions and a Cronbach's Alpha value of 0.963, the attitude questionnaire contained 15 valid questions and a Cronbach's Alpha value of 0.874, and the behavior questionnaire contained 15 valid questions and a Cronbach's Alpha value of 0.868. Data collection method employed observation, with each hemodialysis nurse being observed to ascertain their performance in changing the dressing according to Standard Operating Procedure (SOP).The assessment entailed the allocation of a score of "2" if the procedure was executed in accordance with the stipulated steps, a score of "1" if the procedure was partially executed, including the regularity of the stages according to the SOP, and a score of "0" if the procedure was not fully executed.

RESULT

Table 1.
Responden Characteristics

Characteristics	f	%
Age		
21 – 30 years old	13	28,3
31 – 40 years old	22	47,8
41 – 50 years old	11	23,9
Gender		
Male	3	6,5
Female	43	93,5
Educational Level		
Diploma 3 degree	32	69,6
Bachelor degree	14	30,4

Table 1 presents the frequency distribution of nurse characteristics based on age, gender, and education level. The data illustrate that the majority of respondents were between 31 and 40 years old (47.8%), female (93.5%), and had a Diploma 3 education level (69.6%).

Table 2.
Distribution of Knowledge, Attitude, Behavior and Risk Prevention of Nurses towards Prevention of CDL Tunneling Infection Risk

Variables	f	%
Knowledge		
Fair	18	39,1
Good	30	60,9
Attitude		
Fair	16	34,8
Good	30	65,2
Behavior		
Fair	14	30,4
Good	32	69,6
Prevention of CDL Tunneling Infection Risk		
Fair	15	32,6
Good	31	67,4

As illustrated in table 2, the data indicates that hemodialysis nurses possess a strong understanding of the methods to prevent tunneling CDL infection, with 60.9% of nurses demonstrating a favorable attitude towards this practice. Furthermore, the analysis reveals that 65.2% of nurses exhibit a positive stance on the role of behavior in preventing tunneling CDL infection, while 69.6% of nurses demonstrate a commitment to this aspect of prevention. The majority of respondents (67.4%) were classified as "good" in terms of preventing the risk of CDL tunneling infection.

Table 3.
The Relationship between Nurses' Knowledge, Attitude and Behavior towards Prevention of CDL Tunneling Infection Risks

Variables	Prevention of CDL Tunneling Infection Risk				p-value
	Fair		Good		
	f	%	f	%	
Knowledge					
Fair	9	19.5	7	15.2	0.014
Good	6	13.0	24	52.3	
Attitude					
Fair	9	19.5	7	15.2	0.014
Good	6	13.0	24	52.3	
Behavior					
Fair	9	19.5	5	10.8	0.004
Good	6	13.0	26	56.7	

As illustrated in table 3, a statistically significant relationship is evident between the knowledge and attitudes of hemodialysis nurses regarding the prevention of tunneling CDL infection, as determined by the Kendall's Tau B statistical test with a p-value of 0.014 ($p<0.05$). Furthermore, the data in table 3 indicates a substantial relationship between the behavior of hemodialysis nurses and the prevention of the risk of tunneling CDL infection, with a p-value of 0.004 ($p<0.05$).

DISCUSSION

Nurse Characteristics Overview

The population of hemodialysis nurses at Hospital X Jakarta is predominantly comprised of nurses between the ages of 31 and 40, a phenomenon attributable to several factors. Primarily, the recruitment of hemodialysis nurses generally occurs at an age beyond 30 years.

Additionally, the turnover rate of hemodialysis nurses is relatively low, and the retirement age of 55 years contributes to a prolonged tenure of nurses within the hospital. This phenomenon is associated with the permanent employee status granted by the hospital to its personnel. The predominance of female nurses in the hemodialysis unit is consistent with the higher demand for the nursing profession among women. This phenomenon is further supported by the observation that the majority of nurses applying to Hospital X Jakarta are women, aligning with the findings of (Tahoun et al., 2022), who reported that 68 out of 70 (98%) hemodialysis nurses were female. The proportion of hemodialysis nurses with a Diploma 3 education level is 69.6%, indicating a significant emphasis on specialized knowledge in applied science.The majority of hemodialysis nurses at Hospital X Jakarta are senior nurses who have not pursued further education at the undergraduate level.The findings of this study are consistent with those reported by (Bny Uoda, 2019), who found that 19 out of 25 nurses (76%) possessed a Diploma 3 nursing education level.

Overview of Nurses' Knowledge, Attitudes and Behavior towards Prevention of CDL Tunneling Infection Risks

The nurses' knowledge regarding the prevention of CDL tunneling infection was found to be satisfactory, with a percentage of 60.9%. It is anticipated that the nurses' knowledge will be enhanced through the integration of formal education and the participation in CDL infection prevention training activities, both of which are of an internal and external nature. The acquisition of knowledge is predicated on the ability to discern the location of an object after it has been perceived (Pakpahan Martina, 2021). A subsequent analysis of the survey responses revealed that nurses demonstrated a strong understanding of hand hygiene, recognizing symptoms of CDL tunneling infection, and the benefits of utilizing CDL tunneling. However, there is a need to enhance nurses' knowledge regarding the use of antiseptics and the comprehensive utilization of personal protective equipment (PPE).

The findings of this study are consistent with those of the study conducted by (Tahoun Ahmed Hussein Mohamed et al., 2022) in Benha City, which examined nurses' knowledge of CDL, Tuinneiling, CDL Infection, and CDL treatment. Among the 70 nurses who participated in the study, 44 nurses achieved a satisfactory result, defined as a score of more than 80%. The attitude of nurses towards the prevention of CDL tunneling infection risk was found to be in the "good" category at 65.2%. This is indicative of a sense of responsibility and concern among hemodialysis nurses for both their own well-being and that of their patients, underscoring the significance of preventing infections carried out by health workers.The findings of this study are consistent with those of a study conducted by (Bny Uoda, 2019), which revealed that hemodialysis nurses expressed positive sentiments regarding adherence to standard operating procedures (SOPs), hand hygiene, and personal protective equipment (PPE) compliance.

The questionnaire analysis revealed that nurses' positive attitudes towards hand hygiene practices are associated with a reduced risk of CDL infection. However, there is room for improvement in the adherence to complete PPE and the removal of PPE after CDL installation. The nurses' performance in the prevention of CDL tunneling infection was found to be satisfactory, with a percentage of 69.6%. The effectiveness of this performance can be attributed to the nurses' advanced knowledge in this field. Additionally, the hospital-provided internal training program plays a pivotal role in enhancing the nurses' competence. This training assists hemodialysis nurses in acquiring and recalling the necessary procedures for CDL tunneling treatment. The supervision provided by the Infection Prevention and Control Nurse (IPCLN) from the Infection Control Prevention (PPI) committee is another contributing

factor. The IPCLN routinely conducts surveillance and reports to the PPI committee on hand hygiene compliance. The routine evaluation conducted by the head of the service unit and the leader in the hemodialysis room before and after work also contributes to shaping nurses' behavior to prevent CDL tunneling infection risk.

Overview of Prevention of Tunneling CDL Infection Risks

The performance of hemodialysis nurses in preventing central catheter-related infections (CCRIs) was examined, and it was found that they performed well in 67.4% of cases. The results of this study are consistent with the findings of research conducted by (Rimy Primasari, 2020), which determined that the majority did not occur. Infection occurs in the installation area CDL in Hemodialysis at Islamic Hospital Pondok Kopi Jakarta for the period of January to February 2020, with a total of 26 cases (86.7%). This finding suggests that patients with CDLs are not prone to infection, likely due to their adherence to standard operating procedures (SOPs) for wound care during CDL installation. Additionally, the hemodialysis room is equipped with an infection prevention and control team that diligently monitors wound care on a daily basis.

It is imperative to implement infection prevention measures, as catheter-related infections (CRIs) are the most common complication of hemodialysis (Miller et al., 2016). The fundamental steps to mitigate the risk of infection encompass the following: (1) the implementation of CDL care, (2) the promotion of proper hand hygiene, (3) the provision of education to patients, and (4) the training of nurses in vascular access care.An analysis of the observation results revealed that hemodialysis nurses identified signs of infection at the exit site during the following procedures: (1) the opening of the CDL dressing, (2) the administration of heparin, (3) the closure of the CDL, and (4) the cleansing with alcohol. Ensuring optimal care at the exit site is paramount to prevent it from becoming a port of entry for microorganisms in CDL access (Iqbal et al., 2021).The utilization of heparin at CDL is instrumental in averting complications, such as CDL access dysfunction due to thrombosis (Patriawati, 2020). The findings of the present study further underscore the necessity for hemodialysis nurses to enhance their infection prevention practices in the context of tunneling CDL access. This entails the education of patients and families on maintaining the cleanliness and dryness of the dressing, as well as the judicious application of antibiotic ointment in the exit site area.

Relationship between Knowledge and Prevention of CDL Tunneling Infection Risk

The present study found a significant relationship between nurses' knowledge and the prevention of tunneling CDL infection, indicating that as nurses' knowledge improves, the efficacy in preventing tunneling CDL infection also increases. This finding aligns with the research conducted by (Tahoun et al., 2022), which reported that 40 out of 70 nurses (62.9%) demonstrated satisfactory knowledge. This assertion is further substantiated by the findings of research undertaken by (Al-Yateem et al., 2021) in Saudi Arabia, which examined the knowledge, behaviors, and attitudes of nurses concerning the prevention of Central Line Associated Blood Stream Infections (CLABSI). This study was conducted in a military hospital in Saudi Arabia, encompassing a sample of 150 nurses, including 60 nurses in the ICU and 90 nurses in Hemodialysis. The findings of the T-test revealed a statistically significant disparity in the knowledge scores of nurses in the ICU (p-value 0.025) and the Hemodialysis Unit with respect to the occurrence of CLABSI (p-value 0.000). In this study, nurses' knowledge about preventing the risk of infection in CDL tunneling was found to be satisfactory, primarily due to the consistent attendance of all nurses in the hemodialysis unit of Hospital X Jakarta at routine training sessions and seminars, which were conducted in

collaboration with the Infection Control Prevention committee. Furthermore, to ensure the continuous enhancement of their knowledge, nurses are systematically and periodically sent to attend training on hemodialysis, ensuring they are updated with the latest information. Additionally, nurses actively seek out seminars and workshops related to hemodialysis, with a particular focus on infection prevention in hemodialysis access.The education level of hemodialysis nurses is predominantly at the Diploma 3 level, which is advantageous in facilitating a rational response to information. Furthermore, Hospital X is strategically located in Jakarta, a city with ample access to information regarding infection prevention through various print and media sources, thereby enhancing nurses' knowledge about CDL tunneling infection prevention.

Relationship between Attitude and Prevention of CDL Tunneling Infection Risk

The correlation between nurses' attitudes and the prevention of tunneling CDL infection is significant. A positive attitude on the part of the nurse has been shown to be associated with a reduction in the risk of CDL tunneling infection.The attitudes of nurses in the "good" category with regard to the prevention of CDL tunneling infection are influenced by several factors, including personal experience, with an average hemodialysis nurse having worked in the field for a period ranging from three to ten years. Furthermore, the prevalence of cases of CDL infection among nurses has been found to be associated with heightened vigilance and caution in their approach to patient care, with the aim of averting the occurrence of infections.

The influence of peers, particularly senior nurses who exemplify optimal practices such as adhering to stringent sterile principles and practicing proper hand hygiene, has also been identified as a contributing factor. Cultural factors and the media have been observed to exert an influence on the attitudes of nurses, particularly within the hemodialysis unit of Hospital X Jakarta. The prevailing culture in this setting entails a senior nurse's responsibility to provide guidance to junior nurses on the utilization of appropriate methods and techniques aimed at averting contamination from nurses to patients.Additionally, the pervasiveness of accessible mass media through various devices has been identified as a significant source of information concerning the prevention of CDL infection.This study finds congruence with the findings of (Al Qahtani & Almetrek, 2017), who posited that positive nurse attitudes can influence the risk of CDL infection.

Behavioral Relationship to Prevention of CDL Tunneling Infection Risk

Nurse behavior has been demonstrated to have a significant relationship with the prevention of the risk of tunneling CDL infection, indicating that optimal nurse behavior is associated with a greater capacity to prevent the aforementioned risk. Catheter-associated bloodstream infections (CABI) are a significant source of morbidity and mortality in patients with end-stage renal disease (ESRD). The colonization of the catheter through skin flora leads to the production of biofilm, which acts as a reservoir for virulent bacteria. Therefore, one of the necessary measures is prevention through proper catheter care and infection control measures (Soi et al., 2016). The factors influencing nurses' behavior in preventing the risk of tunneling CDL infection include predisposing factors, such as the extent of knowledge about infection prevention, which has been shown to positively impact nurses' confidence and motivation to adhere to standard operating procedures (SOPs). The second factor pertains to the infectious room facilities available at Hospital X Jakarta, in addition to the ready availability of hand hygiene facilities and sinks in each hemodialysis unit.This research is supported by the findings of (Al Qahtani & Almetrek, 2017), who concluded that nurse behavior significantly impacts the risk of CDL infection, with knowledge having a substantial influence on nurse behavior.

CONCLUSION

A significant relationship has been demonstrated between knowledge, attitude, and behavior on the one hand, and the prevention of the risk of tunneling CDL infection on the other.It is imperative for nurses to make preventive and promotive efforts by educating and caring for CDL access in accordance with the correct SOP.Good nurse knowledge about how to care for CDL access and adequate information for patients and families can prevent infectious complications of CDL tunneling. The correlation between knowledge, attitude, and behavior in nurses' education and care practices for tunneling CDL is a subject meriting further investigation.

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