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Factors Influencing the Practices of Health Care Workers on Prevention and Control of Infection at Keetmanshoop District Hospital, Namibia

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Abstract

Introduction: According to World Health Organisation, prevention and control of infection is a strategy designed to protect both patients and health care workers from infections. Lack of such strategy among health care workers has negative impact such as long-term hospitalization, death, and morbidity. Therefore, the aim of this study was to determine the practices of health care workers on prevention and control of infection at Keetmanshoop district Hospital.

Method: A descriptive correlational cross-sectional study design was employed. Structured questionnaire was used to collect data from participants. Data collected were analysed using SPSS version 27. Multiple regression analysis was used to determine, the factors influencing the practices of health care workers on prevention and control of infection.

Results: The findings shows that more than 50% of the health care workers in Keetmanshoop district hospital have poor adherence to IPC. However, factors such as demographic characteristics and resources availability do not have any significance influence on the practices of prevention and control of infection. Significance contributing factors effect such as access of IPC resources ($\beta = 0.31$), individual health worker practices on IPC ($\beta = 0.31$) and practices of IPC at the facility ($\beta = 76$). Practices of hand hygiene was found at ($\beta = -0.45$) which is the negative effect on adherence.

Conclusion: Therefore, this study concluded that hand hygiene; access of IPC resource and individual practices on prevention and control of infection were the main factors influence poor adherence on IPC at Keetmanshoop hospital.

Keywords: Infection prevention and control, Healthcare Associate Infections, nosocomial infection, healthcare workers, adherence

1. Introduction

According to World Health Organisation (WHO) (WHO, 2016), prevention and control of infections (IPC) is a strategy designed to protect both patients and healthcare workers from infections. In the field of patient safety and quality universal healthcare coverage, IPC occupies a unique place as it applies to healthcare workers and patients at every single healthcare session (WHO, 2016). Universally, no health facility can claim to be free from the threat of health-related infections if each health facility cannot implement and adhere to infection prevention and control strategy. Therefore, the need for IPC services at the health facilities is strongly illustrated within the WHO 100 Key Health Indicators List (WHO, 2016). Infection prevention and control practices which include hand hygiene, safe disposal of waste and needles, and the use of personal protective equipment (PPE) are essential in the prevention of healthcare-associated infections (HAI's). However, adherence to these practices requires a deep understanding by healthcare workers to ensure a successful implementation. Adherence to infection prevention and control practices is essential to providing safe and high-quality patient care across all settings of healthcare provision (WHO, 2010).

Accordingly, there are several quality assurance initiatives implemented in health facilities (De Jonge, Nicolaas, Van Leerdam, & Kuipers, 2011), but IPC stands out as the most effective approach in decreasing nosocomial

infections. For the same reason, it has the potential of protecting the health of the healthcare practitioners at the same time improving patient health security (MoHSS, 2015). IPC guidelines provide the infection prevention practices. These practices involve excellent hand hygiene, universal blood and blood fluid precautions, cleaning and disinfection of healthcare equipment and instrument sterilisation. Additionally, the guidelines provide procedures of decontamination of surfaces, the right use of disinfectants, aseptic methods, and secure disposal of wastes, sharp equipment, soiled linens, and handling and patient(s) isolation (MoHSS, 2015). It is a method that creates and applies secure evidence-based practices to improve healthcare quality (Mehtar, 2010). Moreover, it is not a stagnant process but consists of daily activities of prevention and control measures which are associated with the health of patients and healthcare workers in healthcare facilities. IPC can be split into three stages, primary prevention, secondary prevention, and tertiary prevention. Mehtar (2010), states that the primary prevention stage relates to ways of stopping illness and injury before it occurs. To make this a success, the primary prevention stage comes with the necessary education mainly for the healthcare workers on aspects of health and safety living. These aspects comprise of hand hygiene, safe disposal of wastes and needles, use of personal protective equipment (PPE), disease-free immunisation, and health care workers must adhere to. Several factors such as culture, economic and social factors, self-efficacy, and lack of knowledge can influence adherence. (De Jonge, Nicolaas, Van Leerdam, & Kuipers, 2011). These activities if well implemented, have the potential of preventing infections associated with healthcare (nosocomial infections). As of 2002, the World Health Organization estimates at least over 1.4 million people suffer from healthcare-associated infections (HAI's) at any given during hospitalization (WHO, 2002). Sadly, (Pittet & Donaldson, 2005), put this figure to be at least 20 times more in developing and low-income countries. It is from this argument that the WHO contends that this estimate might still be less, as there is much inadequate surveillance in several healthcare systems across the globe (Otieno-Ayayo et al., 2015).

It is of great concern that the available IPC items in Namibian healthcare facilities are below average, and this can only mean one thing, the high possibilities of reinfection in the healthcare facilities. Additionally, the census survey does not indicate and or report on the adherence to IPC practices despite having the required supplies in almost all the facilities. Therefore, this study determines the factors influencing the adherence to infection prevention and control practices by healthcare workers.

There are several studies that have been conducted, which demonstrate the incidence rates of infections associated with healthcare around the world (Khan, Baig, & Mehboob, 2017; Gheshlagh, Aslani, Shabani, Dalvand, & Parizad, 2018; Ali et al., 2018). These studies equally show the role played by the healthcare workers' (HCWs) in spreading microorganisms in the healthcare environments and ultimately to patients mainly through their hands. These microorganisms can survive for several minutes in HCWs' hands after contamination (Stewardson, Allegranzi, & Pittet, 2017). Now, if hand hygiene guidelines are not well reinforced and implemented to the required standards, the transmission of microbial to patients becomes inevitable. At the same time, the transmission of microbial can be accelerated through fomite exposure (Pittet, 2017).

Based on this information and the evidence of its effectiveness, hand hygiene practice can prove to be the cornerstone of prevention of nosocomial infections or health associated infections. The unfortunate reality is that healthcare workers' adherence to these best practices of hand hygiene remains poor in most health care environments (Allegranzi & Pittet, 2009). In the African context, the prevalence of nosocomial infections seems to be less researched and or published, but there are indications that Africa has begun to recognise the significance of nosocomial infections. This is evident in the findings of the World Health Organisation that most African countries have created and enforced healthcare settings documentation or instructions on the prevention and control of diseases (WHO, 2009).

The study done in Nigeria indicates that many HCWs do not disinfect their hands as often as they need or use the correct method (Allegranzi et al., 2011; Bukhari et al., 2011). This implies that some regions of their hands may be missed (Naderi, 2012), and thus capable of transmitting nosocomial infections. Against this background, it defies the purpose of medical treatment which is meant to save lives and promote good health. For the same reason, it is also the duty of all healthcare workers to prevent and if possible, stop the transmission of infections associated with healthcare. In the same way, it is the responsibility of nurses to comply with injection safety methods and associated infection control measures to prevent patients and health workers from possible exposure to nosocomial infections (WHO, 2010). The challenge of hand hygiene practices is more highlighted in low-and middle-income states. In many of these countries, strategies for disease prevention and control are non-existent; where they exist, there are either badly adapted or underfunded by governments. Evidence of high nosocomial infections is a good example of poor quality of health service, thus, nosocomial infections levels within a hospital are the best measure of the quality of healthcare services offered (Raka, 2010). Most of these nosocomial infections can easily be avoided with accessible, comparatively, and cheap methods. Healthcare workers can achieve this by effectively

implementing the adherence to the recommended infection prevention and control measures (Raka, 2010). These include the adherence to hand hygiene, wearing of gloves and paying attention to well-established decontamination methods. Specifically, the cleaning of soiled tools and other products which must be followed by either sterilisation or high-level disinfection and or improvisation (WHO, 2009). Nosocomial infections pose true and severe danger to patients and healthcare workers alike. It is because of these dangers posed by nosocomial infections that many nations around the globe have and or developed policies and guidelines in healthcare facilities as preventative measures of avoiding and controlling infections (WHO, 2009). As health-related infections have no age limit and or gender (WHO, 2009). According to Armstrong et al., (2020), these infections are responsible for human diseases around the world. Therefore, through these guidelines and regulations, these health-related infections can be minimised.

2. Materials and Methods

2.1 Research Design

The study adopted a quantitative descriptive correlational cross-sectional study designs to examine the relationships or association between demographic factors such as age, years of experience, educational background and availability and accessibility to IPC materials and their adherence to IPC practices.

2.2 Research Setting

The study was conducted in a public national district hospital in the Southern part of Namibia in which the following departments were included, namely' Male, Female, Tuberculosis ward (TB), Paediatric and Maternity ward, Outpatient department (OPD) Casualty, theatre, Dental clinic, Anti-retroviral (ARV) clinic and Eye clinic were used in the study.

2.3 Population

The study population were doctors, nurses, cleaners, and porters working at Keetmanshoop District Hospital. Keetmanshoop district has 5 medical doctors, 8 Dental staff and 60 nurses (De Waal, 2019), 39 cleaners and 2 porters (Lazarus, 2019). The population was divided into two groups, the clinical group 73 (Doctors and Nurses) and non-clinical group 41 (cleaners and porters).

2.4 Sampling and the Sample

The sample size was calculated using the Stat calculator for descriptive study design, taking into consideration the population size, confidence interval of 95%. Stratified random sampling was employed. Participants from the nursing categories were drawn randomly from the nurse manager's register as means of sample frame, while the cleaners were also randomly selected from the leader cleaner's register. The doctors and porters' categories used the entire population as per calculation. The population was given from the sample frame, which were the register of the nurse manager in the health facility. The sample size was calculated using a simple Slovan formula for all the categories starting with nurses as follows and found to be 52.

Table 1. Sample size per category

Categories	**Population**	**Sample size**
Nurses	60	52
Doctors	5	5
Dentist	8	8
Cleaners	39	36
Porters	2	1
Total	**114**	**102**

Table 2. A Sample size of clinical and non-clinical

Clinical and non-clinical	Population	Sample size
Clinical	73	65
Non-clinical	41	37
Total	**114**	**102**

2.5 Data Collection Procedure

The questionnaires with closed and open-ended questions were distributed among HCWs both night and day shift. Follow-up contacts were made telephonically to the Nurse Manager and Control Officer to ensure a high response rate.

2.6 Data Analysis

Data were analysed using SPSS version 27. The Pearson's correlation was used to determine the associations. Consequently, the significant Pearson's correlation results were used to guide the regression analysis. Based on the correlation results, the study employed a three-step hierarchical multiple regression model to explore the contributory relationships. The p-value was set at 0.05

2.7 Research Ethics

Permission to conduct research was granted by the Ministry of Health and Social Services (MoHSS) and respective study sites. Participants were informed that they could withdraw from the study at any point or choose not to answer some questions without any consequences. The questionnaire was carefully structured to avoid emotional stress to participants. To respect the privacy of the participants, the study ensured anonymity of the participants through coding.

3. Findings

The study selected a sample of 102 from a population of 113 Healthcare workers of the Keetmanshoop Hospital. The response rate was 64% (N = 65) which resulted to an 8.5% margin of error, instead of the traditional 5%. The detailed descriptive statistics are presented as demographical data related to the 1) the participant's primary classification as a healthcare worker, 2) gender, 3) Age of participant, 4) profession, 5) current hospital department, 6) period worked in current hospital unit, 7) level of education, 8) primary work are in hospital.

3.1 Participant's Profession by Clinical Task

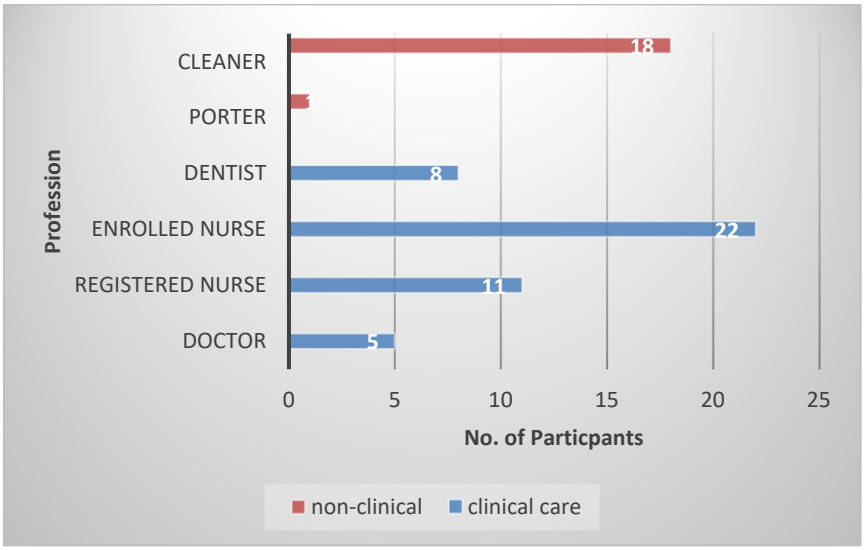

Figure 1. Participants' Primary classification as a healthcare worker by Profession

Figure 1 presents the demographic characteristics of the participant's primary classification as a healthcare worker. The findings show that the major professions in the hospital were enrolled nurses (33.8%) and cleaners (27.7%).

The sample was also representative of registered nurse (16.9%), dentist (12.3%), doctors (7.7%) and one porter (1.5%) in the hospital. In terms of gender, majority were female 78.5%.

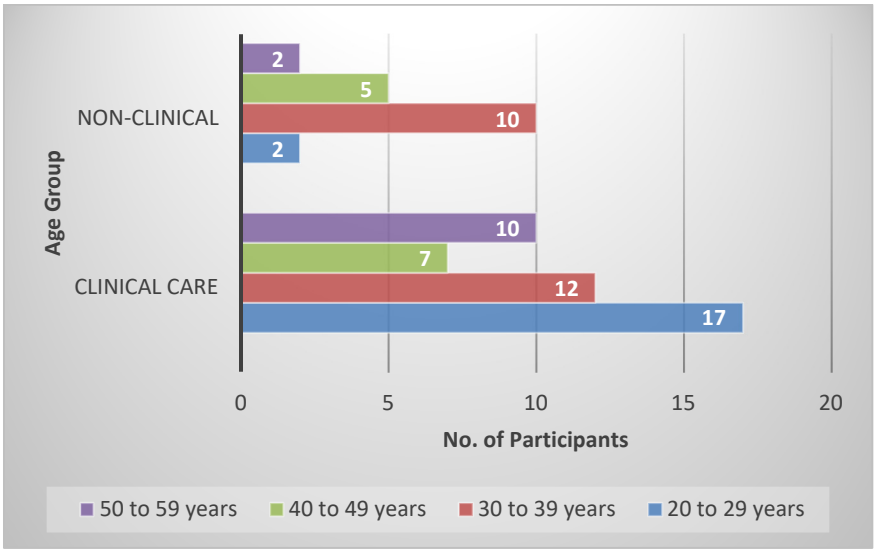

Figure 2. Participant's Clinical Classification by Age

Figure 2 findings indicated that the largest age group from the non-clinical care staff was the 30–39 years (n = 10/52.6%), while, for the professional staff the majority group was younger ranging from 20–29 years (n = 17/37%). Overall, the 30–39 years age group was in the majority (n = 22/33.8%), followed by age group 20–29 years (n = 19/29.2%). While the older groups above 40 were equally distributed at (n = 7/18.5%).

3.2 Correlation Analysis

The study carried out a bivariate data analysis using the Pearson's correlation coefficient, in order to explore any association between the variables in line with the study objectives. The relational effects were interpreted according to Pallant's recommendations (2010) of small (0.1–0.29), mild/medium (0.3–0.49), strong (0.5–1.0). The correlation coefficients result in Table 4.7 indicated small to strong relationships between the variables, ranging from -0.02 to 0.932 with a significance level varying ($p < .1$, $p < .05$ and $p < .01$).

Table 3. Correlational Matrix

Code	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Age	1										
2	Profession	0.03	1									
3	Education level	-0.02	-.909**	1								
4	Clinical Task	0.06	.932**	-.900**	1							
5	Period IPC_Training Attended	0.05	-0.19	0.11	-0.11	1						
6	Availability_Resources	-0.04	-.291*	0.18	-.264*	.275*	1					
7	Accessibility_Resources	0.15	-0.07	0.06	-0.07	.315*	.396**	1				
8	IPC_Practices_Facility	-0.01	-.880**	.765**	-.861**	0.22	.454**	0.14	1			
9	**Adherence_Variable (DV)**	0.17	-.452**	.339**	-.356**	.388**	.441**	.467**	.616**	1		
10	Individual_Practice_Factors	0.04	-.666**	.609**	-.636**	.369**	.552**	.376**	.741**	.651**	1	
11	Hand_Hygiene	-0.10	-.879**	.769**	-.916**	0.16	.430**	0.14	.892**	.487**	.728**	1
12	Disinfection_Use	0.08	-.550**	.451**	-.490**	.350**	.333**	0.19	.695**	.480**	.545**	.542**

Note. Significance level set at *p < .1; **p< .05; ***p<.01.

The correlation matrix in Table 3, indicates that all the variables had significant mild to strong associations with the total adherence score (Adherence variable) ranging 0.339 to .651. Consequently, the correlation results were used to guide the regression analysis. Based on the strong correlations between the IPC adherence practices, the study employed a three-step hierarchical multiple regression model to explore the relationship between total adherence score (adherence variable) with demographic variables and the six contributory factors to non-adherences to IPC scores, which includes availability and accessibility of resources, facility IPC practices, hand hygiene, disinfection use and Individual IPC practices.

3.3 Regression Results

Table 4 displays the unstandardized regression coefficients (B), the standardized regression coefficients (Beta), the significance of the coefficients (Sig.) for a three-step regression analysis.

Table 4. A three-step hierarchical multiple regression results

Model	**1**			**2**			**3**		
DV: Adherence Variable	**B**	**Beta**	**Sig.**	**B**	**Beta**	**Sig.**	**B**	**Beta**	**Sig.**
(Constant)	-12.206		0.249	-5.486		0.597	3.607		0.885
Accessibility Resources	0.287	0.248	**0.019**	0.363	0.313	**0.002**	0.326	0.281	**0.006**
Individual Practice Factors	0.727	0.530	**0.000**	0.426	0.311	**0.038**	0.426	0.310	**0.044**
Availability Resources	0.384	0.050	0.660	0.024	0.003	0.977	-0.534	-0.070	0.531
IPC Practices Facility				4.871	0.769	**0.002**	5.636	0.890	**0.001**
Hand Hygiene				-0.308	-0.450	**0.027**	-0.197	-0.287	0.204
Disinfection Use				-0.050	-0.041	0.739	-0.137	-0.113	0.368
Period IPC_Training Attended							2.521	0.118	0.230
Age							1.642	0.097	0.269
Profession							-0.388	-0.044	0.885
Education							-2.658	-0.315	0.141
R	0.695			0.765			0.795		
R Square	**0.483*****			**0.586*****			0.632		
Adjusted R Squared	0.458			0.543			0.564		
R Square Change	0.483			0.102			0.047		
F	19.026			4.774			1.710		
Sig.	**.0001*****			**.0005*****			0.161		

Notes. Significance level set at *p < .05; **p< .01; ***p<.0001, Dependent Variable: Total Adherence Score (Adherence Variable), B= Unstandardized Coefficients, Beta=standardized Coefficients, Sig.= statistical significance.

In Step 1 of the analysis, three variables related to adherence practices including *Individual Practice Factors, Accessibility Resources,* and *Availability Resources,* were entered in the Total adherence score equation. In step 2, variables related to facility practices including *IPC Practices Facility, Hand Hygiene* and *Disinfection Use* variables were added next. Lastly, in Step 3, the social demographic variables including *Period IPC_Training Attended, Age, Profession* and *Education* were added.

The findings indicated that the model in Step 2 had the best statistical significance and variables explaining 58.6% of variability in the Total Adherence Score (Adj. R-squared = 0.586, $p < 0.01$). The regression analysis indicated a significant relationship between *Total Adherence Score* and *Individual Practice Factors* (Beta = 0.530, p=0.001) when modelled together with three main adherence factors in Model 1. However, when other IPC practices factors were entered into the equation, the relationship effects weaken for the *Individual Practice Factors*. While it increased for the Accessibility variables. Table 4 summarizes the relationship effects between Total Adherence Score and the significant adherence to IPC factor variables.

Table 5. Factor contributing to the Adherence with IPC practices

Variables	Interpretation
Accessibility Resources	10% increase in the *Accessibility of Resources* score will result in a 3.1% increase in the *Total Adherence Score*
Individual Practice Factors	10% increase in the Individual IPC practices score will result in a 3.1% increase in the *Total Adherence Score*
Availability Resources	No significant effect on the *Total Adherence Score*
IPC Practices Facility	10% increase in the Facility IPC practices score will result in a 7.7% increase in the *Total Adherence Score*
Hand Hygiene	10% increase in the Facility IPC practices score will result in a 4.5% decrease in the *Total Adherence Score*
Disinfection Use	No significant effect on the *Total Adherence Score*
Demographic variables	No significant effect on the *Total Adherence Score*

4. Discussion

The presentation of the findings on the demographic characteristics of the study sample were guided by the correlational relationship between the demographic variables and was split into two cohorts based on their clinical tasks. The correlational analysis results indicated no significant associations from demographic variables such as the age of the participant, the current hospital department and the period worked in current hospital unit. The Period of last IPC training only become statistically significant after recoding the never attended IPC training, attended before 2015 and attended in the last 5 years. Additionally, showing that only 26.2% of the participants had attended an IPC training in the last five years, while 53.8% indicated that they had never attended an IPC training. The lack of continuous ongoing medical education on infection prevention has been the main causes of poor adherence with conventional precautions (Moyo, 2013). Fashafsheh et al. (2017) proposes that nurses need constant updating of IPC knowledge and application through in-service training for nurses on duty to keep up breast of new developments, updating the training curriculum for training institutes. The findings indicate a general lack of periodic refresher training that is necessary to keep the healthcare workers up to date on universal infection control precautions knowledge and procedures (Atalla, Aboalizm, & Shaban, 2016).

Knowledge and execution of infection prevention has been correlated with sociodemographic variables and considerations of health facilities (Desta et al., 2018). Accordingly, in this study the socio-demographic variables of interest were Period IPC Training Attended, Profession and Education, which were found to have strong correlational associations with the contributory factors to non-adherence factors such as the IPC practices factors related to facility IPC practice ($r = 0.765$, $p < 0.05$) and individual IPC practices ($r = 0.609$, $p < 0.05$) (see Table 4.7). However, the regression analysis indicated no statistically significant direct relationships between the total adherence with IPC practices score and the sociodemographic variables like age, IPC training, education levels and profession. The findings are consistent with studies on that argued whether advancement in understanding will increase rates of adherence with IPC. For instance, El-Greeb et al., (2018) conducted a survey among nursing learners and found that most learners have excellent IPC understanding, but some have unsatisfactory IPC practices. While De Wandel et al. (2010) observed that theoretical knowledge of hand hygiene rules tends not to influence hand hygiene procedures. Hence, in the current study, the sociodemographic factors are only associated with the contributory factors to non-adherence with IPC practices but cannot directly influence that total adherence with IPC score. The findings also indicated strong correlational associations between availability of resources and the other contributory factors to non-adherence. While the hierarchical regression results indicated that availability of resources did not have a significant effect on the total adherence score. However, non-availability of material for IPC practice is known to be one of the barriers to IPC adherence and practices (Gulilat & Tiruneh, 2014). With, Moyo (2013) noting that non-availability of infection prevention equipment was one of the main reported causes of non-adherence to conventional precautions. Bekele et al. (2018) also discovering that nurses did not adhere to IPC due to lack of resources. Yet, the findings in this study are contrary to these studies in that the availability of resources were not a significant contributory factor to non-adherence with IPC practices. However, for the HCWs to fully compile with IPC, it is necessary for the facility to have sufficient IPC material and resources.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

References

Abdulraheem, I. S., Amodu, M. O., Saka, M. J., Bolarinwa, O. A., & Uthman, M. M. B. (2012). Knowledge, awareness, and compliance with standard precautions among health workers in north eastearn Nigeria. *J Community Med Health Edu, 2*(3), 1-5.

Adly, R. M., Amin, F. M., & Abd El Aziz, M. A. (2014). Improving nurses' compliance with standard precautions of infection control in pediatric critical care units. *World J Nurs Sci, 3*, 1-9.

Al-Hussami, M., & Darawad, M. (2013). Compliance of nursing students with infection prevention precautions: effectiveness of a teaching program. *American journal of infection control, 41*(4), 332-336. https://doi.org/10.1016/j.ajic.2012.03.029

Allegranzi, B., & Pittet, D. (2009). Role of hand hygiene in healthcare-associated infection prevention. *Journal of hospital infection, 73*(4), 305-315. https://doi.org/10.1016/j.jhin.2009.04.019

Allegranzi, B., Nejad, S. B., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet, 377*(January 15, 2011), 228-4. https://doi.org/10.1016/S0140-6736(10)61458-4

Armstrong, J., Rudkin, J. K., Allen, N., Crook, D. W., Wilson, D. J., Wyllie, D. H., & O'Connell, A. M. (2020). Dynamic linkage of COVID-19 tests results between Public Health England's second-generation surveillance system and UK biobank. *Microbial genomics, 6*(7), e000397. https://doi.org/10.1099/mgen.0.000397

Atalla, H. R., Aboalizm, S. E., & Shaban, H. A. (2016). Effect of nursing guidelines compliance to infection control among nursing students. *IOSR Journal of Nursing and Health Sciences, 5*(1), 23-34.

Bekele, I., Yimam, I., & Akele, G. (2018). Adherence to Infection Prevention and Factors among Nurses in Jimma University Medical Center. *Immunome Research, 14*(2), 1-7. https://doi.org/10.4172/1745-7580.1000156

Brink, H., Van der Walt, C., & Van Rensburg, G. (2018). *Fundamentals of research methodology for health care professionals*. Cape Town: Juta and Co Ltd.

Chitimwango, P. C. (2017). *Knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia* (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). London: Sage. https://doi.org/10.5772/53196

Creswell, J. W. (2014). *Educational research: Planning, conducting, and evaluation quantitative and qualitative research* (7th ed.). Boston: Pearson.

Cypress, B. S. (2017). Rigour or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing, 36*(4), 253-263. https://doi.org/10.1097/DCC.0000000000000253

De Wandel, D., Maes, L., Labeau, S., Vereecken, C., & Blot, S. (2010). Behavioral determinants of hand hygiene compliance in intensive care units. *American Journal of Critical Care, 19*(3), 230-239. https://doi.org/10.4037/ajcc2010892

Efstathiou, G., Papastavrou, E., Raftopoulos, V., & Merkouris, A. (2011). Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: A focus group study. *BMC nursing, 10*(1), 1. https://doi.org/10.1186/1472-6955-10-1

El-Greeb, H. E., Amel, I. A., Hussien, M. A., & Samia, M. A. M. (2018). Assessment of nurses' compliance with infection control standard precautions at outpatient clinics of Urology and Nephrology Center-Mansur University. *J Nurs Health Sci, 7*(3), 54-59.

Fashafsheh, I., Ayed, A., Eqtait, F., & Harazneh, L. (2015). Knowledge and Practice of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals. *Journal of Education and Practice, 6*(4), 79-90.

Fischer, F., Lange, K., Klose, K., Greiner, W., & Kraemer, A. (2016). Barriers and Strategies in Guideline Implementation-A Scoping Review. *Healthcare*. https://doi.org/10.3390/healthcare4030036

Gaikwad, U. N., Basak, S., Kulkarni, P., Sande, S., Cahavan, S., Mudey, G., & Gaikwad, N. R. (2018). Educational intervention to foster best infection control practices among nursing staff. *Int J Infect, 5*(3), e81531.

https://doi.org/10.5812/iji.81531

Geberemariyam, B. S., Donka, G. M., & Wordofa, B. (2018). Assessment of knowledge and practices of healthcare workers towards infection prevention and associated factors in healthcare facilities of West Arsi District, Southeast Ethiopia: a facility-based cross-sectional study. *Archives of Public Health, 76*(1). https://doi.org/10.1186/s13690-018-0314-0

Gebremariyam, B. S. (2019). Determinants of occupational exposure to blood and body fluids, healthcare workers' risk perceptions and standard precautionary practices: A hospital-based study in Addis Ababa, Ethiopia. *Ethiopian Journal of Health Development, 33*(1).69.

Gheshlagh, R. G., Aslani, M., Shabani, F., Dalvand, S., & Parizad, N. (2018). Prevalence of needlestick and sharps injuries in the healthcare workers of Iranian hospitals: an updated meta-analysis. *Environmental health and preventive medicine, 23*(1), 44. https://doi.org/10.1186/s12199-018-0734-z

Hoes, M. S. (2019). *Factors influencing Nurses' decisions and actions when applying Standard Precautions for infection prevention in a private hospital in Namibia*.

Khan, H. A., Baig, F. K., & Mehboob, R. (2017). Nosocomial infections: Epidemiology, prevention, control and surveillance. *Asian Pacific Journal of Tropical Biomedicine, 7*(5), 478-482. https://doi.org/10.1016/j.apjtb.2017.01.019

Koo, E., McNamara, S., Lansing, B., Olmsted, R. N., Rye, R. A., Fitzgerald, T., ... & Team, T. I. P. T. S. (2016). Making infection prevention education interactive can enhance knowledge and improve outcomes: Results from the Targeted Infection Prevention (TIP) Study. *American journal of infection control, 44*(11), 1241-1246. https://doi.org/10.1016/j.ajic.2016.03.016

Lazarus, M. (2019). *Leader cleaner: Keetmanshoop District Hospital*. Keetmanshoop.

Lim, S. A. H., Antony, J., & Albliwi, S. (2014). Statistical Process Control (SPC) in the food industry-A systematic review and future research agenda. *Trends in food science & technology, 37*(2), 137-151. https://doi.org/10.1016/j.tifs.2014.03.010

Maroldi, M., Felix, A., Dias, A., Kawagoe, J. Y., Padoveze, M. C., Ferreira, S. A., … Figueiredo, R. M. (2017). Adherence to precautions for preventing the transmission of microorganisms in primary health care: a qualitative study. *BMC nursing, 16*, 49. https://doi.org/10.1186/s12912-017-0245-z

MoHSS. (2015). *Infection Prevention Control Guidelines. Windhoek: Ministry of Health and Social Services*.

Moyo, G. M. (2013). *Factors influencing compliance with infection prevention standard precautions among nurses working at Mbagathi district hospital*. Nairobi, Kenya.

Nejad, B. S., Allegranzi, B., Syed, S. B., Ellis, B., & Pittet, D. (2011) Health-care associated infection in Africa: a systematic review. *Bull World Health Organ, 89*, 757-765. https://doi.org/10.2471/BLT.11.088179

Nofal, M., Subih, M., & Al-Kalaldeh, M. (2017). Factors influencing compliance to the infection control precautions among nurses and physicians in Jordan: A cross-sectional study. *Journal of infection prevention, 18*(4), 182-188. https://doi.org/10.1177/1757177417693676

Nwachukwu, N. C., Orji, F. A., & Ugbogu, O. C. (2013). Health care waste management–public health benefits, and the need for effective environmental regulatory surveillance in federal Republic of Nigeria. *Current topics in public health*, *2*, 149-178. https://doi.org/10.5772/53196

Oh, E., & Choi, J. S. (2019). Factors influencing the adherence of nurses to standard precautions in South Korea hospital settings. *American journal of infection control, 47*(11), 1346-1351. https://doi.org/10.1016/j.ajic.2019.05.015

Okwor, T. J., Tobin-West, C., Oduyebo, O., Anayochukwu-Ugwu, N., Adebola, O., Shuaib, F., ... & Ogunsola, F. (2015). Identifying infection prevention and control gaps in healthcare facilities operating in Rivers state during the EVD outbreak in Nigeria 2014. *Antimicrobial Resistance and Infection Control, 4*(1), O11. https://doi.org/10.1186/2047-2994-4-S1-O11

Otieno-Ayayo, Z. N., Gichuhi, A. W., Kamau, S. M., & Nyangena, E. (2015). Health care workers adherence to infection prevention practices and control measures: A case of a level four district hospital in Kenya. *American Journal of Nursing Science, 4*(2), 39-44. https://doi.org/10.11648/j.ajns.20150402.13

Qiao, F., Huang, W., Zong, Z., & Yin, W. (2018). Infection prevention and control in outpatient settings in China-structure, resources, and basic practices. *American journal of infection control, 46*(7), 802-807.

https://doi.org/10.1016/j.ajic.2017.12.006

Rennert-May, E., Conly, J., Leal, J., Smith, S., & Manns, B. (2018). Economic evaluations and their use in infection prevention and control: a narrative review. Antimicrobial resistance and infection control. https://doi.org/10.1186/s13756-018-0327-z

Rinaldi, A., Marani, A., Montesano, M., Berdini, S., Petruccioli, M. C., Di Ninno, F., ... & De Luca, A. (2016). Healthcare Associated Infections: educational intervention by "Adult Learning" in an Italian teaching hospital. *Ann Ig, 28*(6), 441-449.

Russell, D., Dowding, D. W., McDonald, M. V., Adams, V., Rosati, R. J., Larson, E. L., & Shang, J. (2018). Factors for compliance with infection control practices in home healthcare: findings from a survey of nurses' knowledge and attitudes toward infection control. *American journal of infection control, 46*(11), 1211-1217. https://doi.org/10.1016/j.ajic.2018.05.005

Salem, O. A. (2019). Knowledge and Practices of Nurses in Infection Prevention and Control within a Tertiary Care Hospital. *Annals of Medical and Health Sciences Research, 9*(1).

Stewardson, A. J., Allegranzi, B., & Pittet, D. (2017). *Dynamics of hand transmission. In Hand hygiene: a handbook for medical professionals*. Wiley-Blackwell. https://doi.org/10.1002/9781118846810.ch4

Stone, P. W., Herzig, C. T., Pogorzelska-Maziarz, M., Carter, E., Bjarnadottir, R. I., Semeraro, P. K., ... & Schweon, S. (2015). Understanding infection prevention and control in nursing homes: A qualitative study. *Geriatric Nursing, 36*(4), 267-272. https://doi.org/10.1016/j.gerinurse.2015.02.023

Storr, J., Twyman, A., Zingg, W., Damani, N., Kilpatrick, C., Reilly, J., & Curiel, E. V. (2017). Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. *Antimicrobial Resistance and Infection Control, 6*(6). https://doi.org/10.1186/s13756-016-0149-9

Vikke, H. S., Giebner, M., & Kolmos, H. J. (2018). Prehospital infection control and prevention in Denmark: a cross-sectional study on guideline adherence and microbial contamination of surfaces. *Scandinavian journal of trauma, resuscitation and emergency medicine, 26*(1), 71. https://doi.org/10.1186/s13049-018-0541-y

Ward, F. (2016). Florence nightingale: Where most work is wanted. *Nursing's Greatest Leaders: A History of Activism, 21*. https://doi.org/10.1891/9780826130082.0002

Wasswa, P., Nalwadda, C. K., Buregyeya, E., Gitta, S. N., Anguzu, P., & Nuwaha, F. (2015). Implementation of infection in health facilities in Arua district, Uganda: a cross-sectional study. *BMC infectious Diseases, 15*(1), 268. https://doi.org/10.1186/s12879-015-0999-4

Wendt, C. (2004). Compliance in der Umsetzung von Hygienerichtlinien. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz*, *47*(4), 329-333. https://doi.org/10.1007/s00103-004-0807-6

World Health Organization. (2015). *Water, sanitation and hygiene in health care facilities: status in low and middle income countries and way forward*. Retrieved March 20, 2017, from http://apps.who.int/iris/bitstream/10665/154588/1/9789241508476_eng.pdf