



Predictors of HIV Infection Risk among Health-Care Workers in Sub-Saharan Africa: A Systematic Review

David Nzioka Mutisya¹

nziovid@gmail.com¹

Jomo Kenyatta University of Agriculture and Technology¹

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ABSTRACT

The study set out to investigate the predictors of HIV infection risk among healthcare workers in SSA through a systematic review. The aim of the study was to identify, collect and systematically review and synthesize existing literature articles on the predictors of HIV infection risk among healthcare workers in SSA. The objectives of the study were to: determine the prevalence of health care workers' exposure to HIV risky conditions in health care settings in SSA; identify selected predictors of HIV infection risk among Health care workers in SSA (major focus in Nigeria, South Africa, and Tanzania) and apply effective strategies to prevent issues associated with HIV infection risk among Health care workers. The study conceptualizes that HCWs in the SSA region are at risk of HIV infection due to factors related to lack of healthcare resources, their knowledge, attitude and practice, and barriers to reporting. The combined effect of these factors is that hoped to determine the propensity of HCWs to be infected by HIV/AIDS. The key themes guiding the systematic review were: risk to exposure to HIV among HCWs; lack of health care resources and facilities. The findings of the study confirmed all the three alternative study hypotheses that: there is a significant relationship between lack of health care resources and facilities and the risk of HIV infection among HCWs in SSA; there is a significant relationship between HCWs' knowledge, attitude, and practice on HIV and their risk of HIV infection in SSA and; there is a significant relationship between barriers to reporting and the risk of HIV infection among HCWs in SSA. In this regard, the study found out that HCWs in SSA are at high risk of HIV exposure whilst working. In this regard, this is a result of lack of enough equipment, poor practices at work and barriers to reporting, including stigmatization and lack of well-stipulated reporting guidelines. As such, the following recommendations were made:: there is a need to increase funding in the health care sector to enhance access to the right equipment, microbicides, vaccination, and PEP for HCWs; there is a need for psychosocial support systems to make it easy for HCWs to report infection with ease and that; the government should adopt recommended global best standards to enhance protection of HCWs while at work in SSA. Two areas for further study were also recommended. As such, there is a need for studies on each of the study objectives, and; there is a need for a descriptive study on the topic under investigation in this study for correlation purposes.

Keywords: HIV infection, Health Care Workers, Predictors of HIV Infection Risk; Sub-Saharan Africa

I. INTRODUCTION

According to the Center for Disease Control (CDC, 2017), HIV (Human Immunodeficiency Virus) is a virus that destroys the cells in our immune system specifically T cells, and weakens our ability to fight everyday infections and disease. Research shows that the AIDS epidemic is rampantly devastating rural and urban populations in Sub-Saharan Africa (SSA). HIV has made life hard for the poor in the region. It affects millions of people and challenges household incomes, increases risk for health care workers, food and crop production, workplace conditions, human life expectancy, the infrastructure of local and governmental economies, as well as the shape, size, and structure of African families among others (Kalhorn, 2011).

In this paper, I look at the risks placed on risks associated with HIV infection among healthcare workers (HCWs) in the SSA region. The challenge facing health care workers hereinafter referred to HCWs is confounded by the fact that 70% of HIV patients the world over are found in Africa (UNECA, 2015). This leaves HCWs whose work involves contact with HIV patients to be at risk of infection. This is as a result of their contact with body fluids, surgical equipment, and needle sticks among others (Matsubara, Sakisaka, Sychareun, Phensavanh, and Ali, 2017). This confounds the problems since these HCWs can infect their patients (UNAIDS, 2011).

I conceptualize that HCWs in the SSA region are at risk of HIV infection due to factors related to lack of healthcare resources, their knowledge, attitude and practice, and barriers to reporting. The combined effect of these

factors is that hoped to determine the propensity of HCWs to be infected by HIV/AIDS. This conceptual framework is presented in Figure 1.

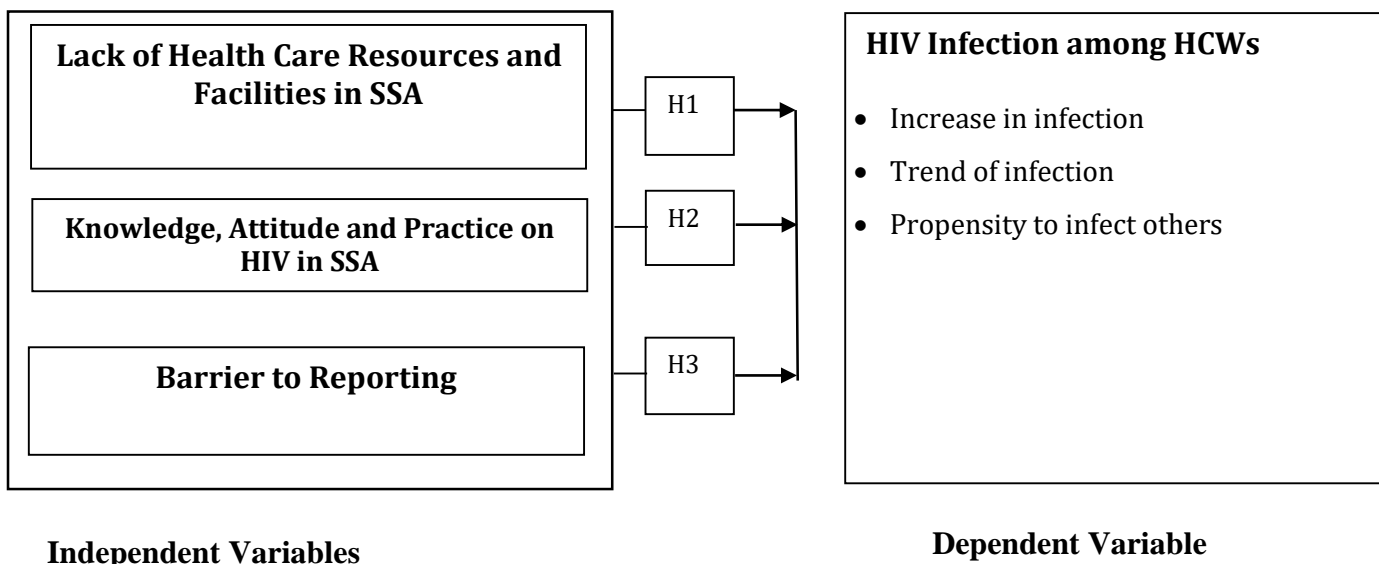


Figure 1: Conceptual Framework

1.2 Purpose of the Study

To identify, collect and systematically review and synthesize existing literature articles on the predictors of HIV infection risk among healthcare workers in SSA.

1.2.1 Objectives

- (i) To determine the prevalence of health care workers exposure to HIV risky conditions in health care settings in SSA
- (ii) To Identify selected predictors of HIV infection risk among Health care workers in SSA (major focus in Nigeria, South Africa, and Tanzania)
- (iii) Apply effective strategies to prevent issues associated with HIV infection risk among Health care workers

1.2.3 Hypotheses

- (i) There is a significant relationship between lack of health care resources and facilities and the risk of HIV infection among HCWs in SSA
- (ii) There is a significant relationship between HCWs' knowledge, attitude, and practice on HIV and their risk of HIV infection in SSA
- (iii) There is a significant relationship between barriers to reporting and the risk of HIV infection among HCWs in SSA.

II. LITERATURE REVIEW

Literature shows that various factors predispose HCWs to HIV infection. One of the main factors that confound the challenge of health infection among these workers is the lack of health care resources and facilities in sub-Saharan Africa. This has been noted by various scholars. Jones, Cremin, and Abdullah (2014) for example are of the view that inadequate supplies of basic safety equipment, including sharps containers, personal protective equipment (PPE), and disposable needles place medical staff at the risk of exposure to HIV infection. In some instances, hospitals and health facilities suffer from an immense shortage of staff as well as high workloads. When they are overworked, HCWs find themselves at the risk of fatigue, and can easily injure themselves with infected equipment.

In some instances, HCWs find themselves working in environments that lack basic amenities such as ventilation, lighting, comfortable seating arrangement, restrooms, and water facilities (Shelton, 2014). In some instances, post-exposure prophylaxis (PEP) following an occupational needle stick injury among health workers in SSA countries is



often needed, but not always available (WHO, 2017). This leaves HCWs unable to protect themselves from exposure to contaminated blood and other body fluids.

Another factor that has been isolated in this study as a factor that predisposes HCWs to HIV infection is their knowledge, attitude, and practice on HIV in SSA. Extant literature shows that HCWs are often faced with a lack of training on infection prevention as well as issues related to their attitude and practice when dealing with patients. Their ability to assimilate PEP (WHO, 2017) issues related to the management of medical waste (Dasimah, Siti and Subramaniam, 2012; Osaretin Owie and Apanga, 2016) and lack of experience regarding how to avoid infection during the process of offering services to patients (Mishta, Banerjee and Gosain, 2014).

On another note, challenges related to barriers to reporting also predispose HCWs to infection. In some instances, it becomes hard for some HCWs to get tested since they often fear the consequences associated with a positive result such as the stigma attached to HIV. It has also been noted that in some cases, HCWs lack appropriate information on reporting procedures (Tirivanhu, Ancia, and Petronella, 2014.). Some even fear possible consequences such as being punished or sacked, lack of confidentiality, the side effects of antiretroviral drugs, and loss of personal relationships with the persons conducting the test. This study shall review extant on the themes highlighted below.

The key themes to be highlighted by the search included:

1. Risk of exposure to HIV among HCWs
2. Lack of health care resources and facilities
3. Knowledge, attitude, and practice on HIV
4. Barriers to reporting

2.1 Theoretical Review

This section reviews the literature on the key themes as well as the aims of the study. To begin with, I look at extant literature on the prevalence of health care workers' exposure to HIV risky conditions in health care settings. I also include sections on selected predictors of HIV infection risk among Health care workers; the relationship between HCWs' knowledge, attitude, and practice on HIV and their risk of HIV infection, and; the relationship between barriers to reporting and the risk of HIV infection among HCWs. To begin with, literature is looked at from a global as well as SSA perspective. Later on, under the section on results and discussions, studies done on the key thematic issues in SSA (with a special focus on Nigeria, South Africa, and Tanzania) shall be reviewed

2.2 Prevalence of Health Care Workers Exposure to HIV Risky Conditions in Health Care Settings

Sharma, Rasania, and Verma (2010) studied the level of HIV infection among HCWs. The findings obtained show that an estimated 4.4% of all HIV infections among HCWs in the country were due to occupational exposures. The three went on to establish that most of the cases (over 50%) took place in SSA.

A follow-up related study was undertaken by Beyera and Beyen (2014) in Ethiopia shows that each year, myriads of health care workers are exposed to HIV risky conditions all over the world. Regrettably, almost half of the healthcare practitioners who are exposed to HIV risky conditions are in SSA countries. In a study targeting 401 health care workers, Beyer and his colleagues found out that 162(40.4%) of them reported having been exposed to occupational exposure to HIV/AIDS risky conditions within one year. These findings show the immense health risks faced by Health Care Practitioners in the continent.

Mbaisi, Ng'ang'a, Wanzala, and Omolo (2010) carried out a study on the factors that predispose Kenya health workers to HIV infection in provincial hospitals. The findings obtained show that there is a high prevalence of HIV infection among health workers in the country. This is a result of the fact that within the process of offering their services, HCWs are exposed to sharp injuries due to "lack of safer sharp devices, lack of information and non-adherence to standard precautions" among other factors.

Ngatu et al. (2012) carried out a study on the practice of universal precautions and the risk of occupational blood-borne viral infection among Congolese health care workers. The findings obtained show that there is a high level of HIV infection riskiness among sex workers in the country. Among all HCWs, nurses and doctors were the most at risk of HIV/AIDS infection. The findings are presented in Figure 1.

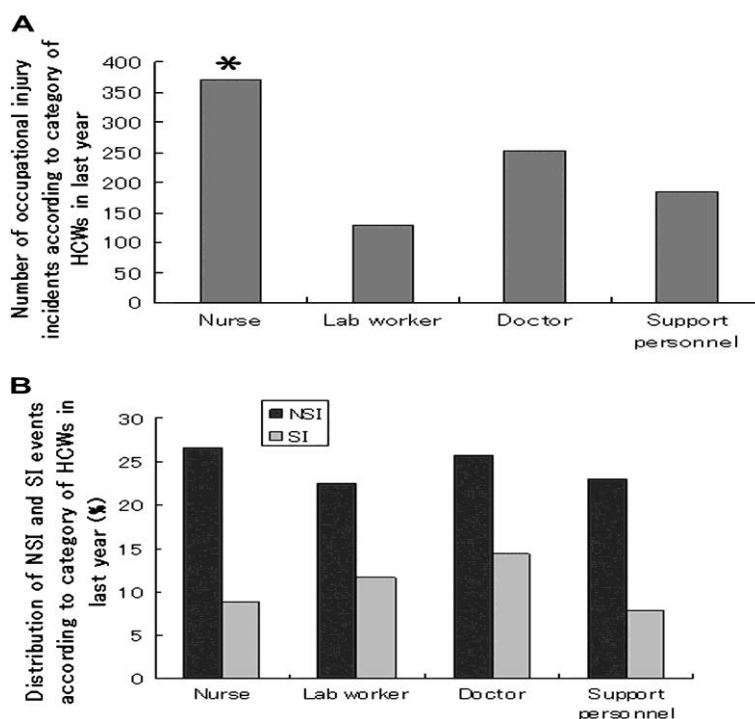


Figure 2 Distribution of occupational injury by health care workers (Ngatu et al., 2012)

2.3 Predictors of HIV Infection Risk among Health Care Workers

As argued in Figure 1, this study conceptualizes that more than lack of access to safety devices and protective equipment exposed millions of HCWs to HIV infection the world over. A study by Sultan, Benn, and Waters (2014) shows that HCWS work in environments characterized by “...crowded hospitals, high patient load per HCW, inadequate personal protective equipment (PPE), lack sharps containers, limited knowledge of risks and utilization of Post Exposure Prophylaxis (PEP), low adherence to universal precautions (UP), and high prevalence of patients with blood-borne infections.” As such, I will endeavor to find out the level to which the level of lack of access to Health care resources poses the risk of HIV infection among HCWs in SSA.

In the same accord, Beyera and Beyen (2014) point out that HCWs work in environments that lack established surveillance systems for In other cases, there is a lack of proper treatment, including PEP, and follow-up. This leaves many HCWs at the risk of contracting HIV, infecting their patients, or even leaving work. As shown by Agbulu et al. (2013). The most common sources of HIV infection were needle stick injuries, sharp cuts from scalpels, broken glasses as well as contact with mucous membrane (mouth, eyes, nose, and broken skin with contaminated blood/fluid) as presented in Figure 2.

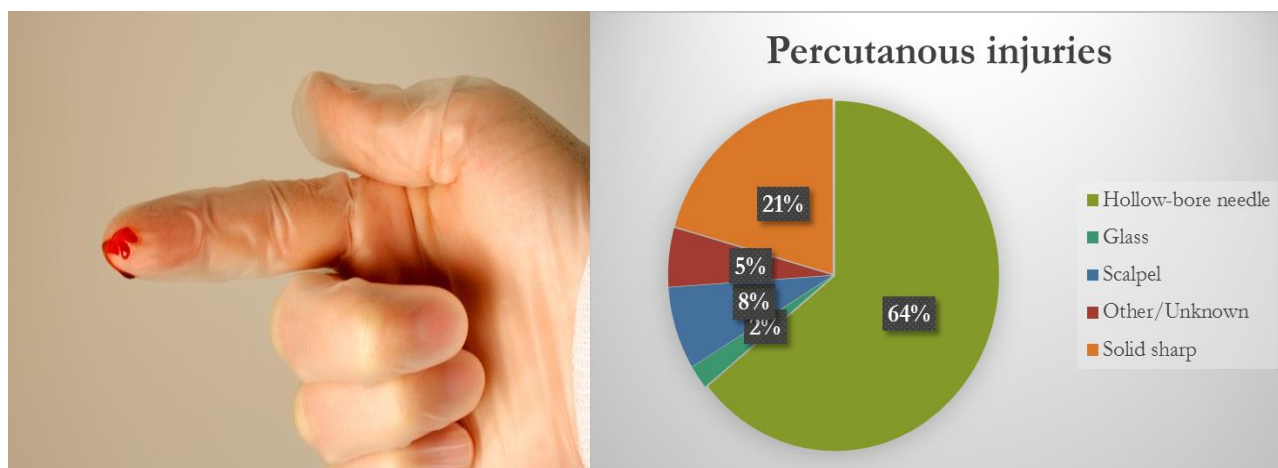


Figure 3 Common Occupational Exposures

On another note, literature also shows that the knowledge, attitude, and practice on HIV by HCWs could also augment their risk of HIV infection. Studies such as those of Kebede, Molla, and Sharma (2012) show that sometimes HCWs are exposed to working for long hours with little protection as well as limited knowledge on how to protect themselves from HIV infection. Indeed the study of Kebede and others shows that “working more than 48 hours per week significantly increased history of reporting occupational exposure to HIV/AIDS risky conditions in one year compared to those who had worked less or equal to 48 hours per week”.

There is also a severe lack of health care resources and facilities in sub-Saharan Africa. In this regard, studies show that inadequate supplies of basic safety equipment, including sharps containers, personal protective equipment (PPE), and disposable needles, including staff shortages and high workloads predisposes HCWs to HIV infection (Bott et al., 2014). Similarly, unavailability of basic amenities such as ventilation, lighting, comfortable seating arrangement, restrooms, and water facilities (Senthil et al., 2014) and lack of Post-exposure prophylaxis (PEP) following an occupational needle stick injury among health workers in SSA countries (Delobelle et al., 2009) increase the risk of HIV infection among HCWs in the region.

The findings of Kebede et al. (2012) show that the practice of HCWs when dealing with HIV/AIDS patients was positively correlated with their propensity to get infected with HIV and vice versa. Conversely, David (2013) shows that the absence of work or procedural guidelines at the workplace played a key role in exposing HCWs to HIV/AIDS risky conditions whilst at work.

Barriers to reporting have also been associated with an increased risk of HIV infection among HCWs. Cohen, Chen, and McCauley (2011) show that the consequences of HIV-related stigma may deter HCWs from getting tested. This increases their likelihood of getting infected and posing risks to their colleagues at work. I shall thus set to find out extant literature deals with the issues of barriers and this increases the likelihood of HIV infection among HCWs.

Bekele, Gebremariam, Kaso, and Ahmed (2017) argue that lack of information about appropriate reporting procedure, fear of being punished or sacked, fear of confidentiality, side effects of antiretroviral drugs, and fear of loss of personal relationships with those conducting the test are some of the major barriers hindering reporting and access to treatment for HCWs who are exposed to HIV infection at work.

Studies such as that of Zamberia (2011) in Swaziland show that HCWs are not exempt from stigmatization. As such, it has been established that in that country, as well as in other SSA countries such as Ethiopia (Feyissa, Abebe, Girma and Woldie, 2012), stigmatization of HCWs also decreases the willingness of HCWS to be tested for HIV. This stems from the fact that the Stigmatization of those infected with HIV/AIDS infection stems from the association of HIV infection with immoral behaviours and fears related to contagion. Stigmatization is also exacerbated by limited knowledge on how HIV is spread with many HCWs fearing that their patients may not trust them if they realize that they were HIV positive for fear of “infection.”

2.4 Strategies for preventing HIV infection risk among Health care workers

Horn et al. (2016) in their model of comprehensive HIV prevention processes are of the view that upon testing those who are found to be positive should be placed in supervised care. On their part, those who test negative should be placed on prevention interventions. If employed to HCWs, the level of HIV infection among such workers would be reduced drastically.

On their part, Robbins et al. (2012) point out that the government should strengthen and design campaigns aimed at reducing HIV infection among various at-risk populations including HCWS. In addition, the authors recommend that enough funding should be sought to train HCWs on how to protect themselves from exposure to HIV infection.

Sørli (2017) argues that in addition to existent HIV prevention strategies such as ABC (Abstinence, Being Faithful and Use of Condoms) there is a need to enhance the capacity of HCWs to protect themselves as well as the communities they work in the Ruhira cluster of villages, Mbarara, Uganda (Brown, 2014). As such, there is a need for sufficient access to microbicides, vaccination, and Pre-exposure Prophylaxis, a position also held by UNAIDS (2016).

2.5 Review Aims

It is important to understand the predictors (factors) contributing to increased HIV infection among HCWs in SSA. Although the literature shows that health systems in the region may lose one-fifth of their employees due to HIV/AIDS over the next several years (Kebede, Molla, and Sharma, 2012) there is a need to carry out a regular review to find out the level to which selected factors, such as those conceptualized in this study (see *Figure 1*) contribute to HIV infection in the SSA. This is vital since although there is an existing misconception that the healthcare setting is ‘clean’ and without risk, the blood-borne exposures encountered can be life-ending (Yenesew and Fekadu, 2014), little research attempts to understand the relative effect of all the factors identified by this study on HIV infection among SSA. As



such, the absence of this and related studies may continue to cost the health sector millions of dollars as qualified personnel succumb to HIV/AIDS-related infections. This necessitates this current study.

III. METHODOLOGY AND PROTOCOL

3.1 Research Design

The systematic review approach will be used to review and synthesise existing literature articles. In this form of review, I will look at the studies that respond to my research question. In the process, I will reject some of these studies and reject others (exclusion) based on their ability to respond to the predetermined study questions (Khan, Kunz, Kleijnen and Antes, 2003) as well as their geographical scope. In this case, only studies focusing on Nigeria, South Africa, and Tanzania and countries neighbouring these countries shall be considered. This is for delimitation purposes to make the study tenable because there is a plethora of literature in SSA and it would be untenable to include all of them. Notably, the study adopts the qualitative survey design (Kombo and Tromp, 2006). In this regard, qualitative data obtained from a desk review of available literature on the study questions shall be used.

3.2 Search Strategy

This study uses the five steps to conduct a systematic review approach as suggested by Khan et al. (2003). In this regard, five steps of the review were employed. These included (a) organizing the questions (themes) for the review in such a way that it would be possible to obtain literature with ease in response to these questions; (b) identifying the relevant work from multiple online published sources; (c) Assessing the quality of studies in terms of design used, type of data available and were published; (d) Summarizing the evidence to make it easy to analyze and present and finally; (e) interpreting the findings to make inferences against the backdrop of the study questions.

In this regard, the key themes (which correspond to the research objectives) studied include Prevalence of health care workers exposed to HIV risky conditions in health care settings in SSA; Selected predictors of HIV infection risk among Health care workers in SSA (major focus in Nigeria, South Africa, and Tanzania) namely: Barrier to Reporting; Knowledge, Attitude and Practice on HIV in SSA and; the Lack of Health Care Resources and Facilities in SSA. Finally, the study shall establish the strategies used to prevent issues associated with HIV infection risk among Health care workers.

3.2.1 Study Selection

In selecting the studies to be included or excluded in this systematic review, the research employed the following criteria:

(a) Inclusion criteria

The study included published articles in English from 2007 to 2017, studies focused on occupational hazards affecting HCWs in sub-Saharan Africa with a special focus on Nigeria, South Africa, and Tanzania

(b) Exclusion criteria

Regarding the exclusion criteria, the study excluded research conducted in non-Sub-Saharan African countries as well as articles published before 2007.

3.2.2 Justification of the Criteria

The criteria highlighted above were used to obtain numerous studies that were used in this systematic review. The use of these criteria was vital since it was possible to obtain keynote studies that could provide information on the question under investigation.

3.2.3 Limitation to studies

The study focused on research conducted in non-Sub-Saharan African countries as well as published articles before 2007. This was a limitation since some studies that were not available in the public domain could not be reviewed. As such, important information could be excluded from the study unintentionally.

3.2.4 Critical Appraisal

In determining the study quality, I used only studies that were published in recognized journals. This was vital since studies from such journals are subjected to peer review by medical practitioners and other professionals. It was thus possible to obtain verifiable information. In appraising the studies, the following processes were used. First and



foremost, the research sought to find out if the studies were published in renowned journals or were conducted in registered institutions of higher learning.

Secondly, the study looked at the designs used in conducting the studies. This entailed assessing if the study designs were clear, the limitations of those designs, and the forms of data analysis utilized. In this case, it was possible to determine the level to which the information presented in these studies could be used in my study. Through the use of these processes, I could select reliable studies which could be used to respond to my study questions.

3.2.5 Ethical Appraisal

In conducting this review, I endeavored to ensure that present the findings presented in the studied review were as accurate as possible. In this case, I acknowledged the authors of the studies reviewed, their study designs used. The ethical considerations employed in the studies reviewed were also assessed. By so doing, it was possible to ensure that the studies reviewed were informed by clear ethical standards. This was vital since it was possible to infer (extend) such ethical consideration to this current systematic review.

3.2.6 Data abstraction

In summarizing the data for use in this study, I used an online-based review of the data. In this regard, findings that were cited by two more persons were considered suitable for use in this review. Data was sought for the following variables:

- Health care workers exposure to HIV risky conditions
- Barrier to Reporting; Knowledge, Attitude, and Practice on HIV in SSA
- Lack of Health Care Resources and Facilities in SSA
- Strategies to prevent issues associated with HIV infection risk among Health care workers

3.2.7 Analysis

This study used qualitative meta-synthesis. This form of data analysis, and as posited by Altree (2005) is “an intentional and coherent approach to analyzing data across qualitative studies.” In this regard, I will “search for, select, appraise, summarize, and combine qualitative evidence” to address the research question identified in this systematic review. This form of analysis is essential for this systematic review since it is a practical and effective approach of inquiry that can help one to understand the progress made by researchers in understanding the “the predictors of HIV infection risk among health-care workers in SSA.”

IV. RESULTS & DISCUSSION

4.1 Results

In this section, the studies that I systematically reviewed in line with the study objectives are presented. Table 1 summarizes the studies reviewed in terms of the questions that the study sought to answer. In this regard, information regarding the authors (researchers), the topics of their study, the study designs employed, the results obtained, and the significance/relevance of the study to the study questions are presented.

Table 1 Summary and Analysis of the Studies Reviewed

Study Objective	Author	Topic of Study	Study Design	Result	Relevance to this study
Question I: What is the prevalence of health care workers' exposure to HIV risky conditions in health care settings in SSA?	WHO (2016)	HIV/AIDS fact sheets	Descriptive Survey	25.6 million HIV/AIDS infected individuals live in SSA. Many of these 25.6 million infected individuals are South Africans, with large numbers being health workers	There is a high level of risk of HIV exposure in South Africa by HCWS in the country
	UNAIDS (2013)	Epidemiological status	Desk review of Existing Literature	South Africa has the fastest-growing rate of newly infected individuals and ranks second behind Nigeria for the most AIDS-	South Africa and Nigeria have the second-highest levels of HIV infection rates among health workers in Africa



				related deaths worldwide, which poses serious risks to health workers	
	Okpala, Uwak, and Ada (2017)	Nurses' knowledge and attitude to the care of HIV/AIDS patients in. South East, Nigeria	Descriptive survey design, with the aid of a five-point Likert questionnaire administered on 240 nurses caring for PLWHA in University of Nigeria Teaching Hospital Enugu, Nigeria	Nurses play a critical role in caring for persons living with HIV/AIDS (PLWHA) and are often exposed to HIV themselves at work	A high level of risk faces nurses as they care for PLWHA in Nigeria
	Mbilinyi, D., Daniel, M. and Lie, G. (2011)	BMC Health Services Research	In-depth interviews were conducted with health workers across the range of health care professions in health facilities in two high HIV-prevalence districts of Mbeya Region, Tanzania. A qualitative framework analysis was adopted for data analysis	HIV-related challenges undermine motivation among health workers in Mbeya, Tanzania with the burden falling most heavily on lower status HCWs.	HIV infection levels among health workers lower the motivation of health workers in Tanzania
Question II: What determines HIV infection risk among Health care workers in SSA (major focus in Nigeria, South Africa, and Tanzania)?	Saleh and Adamu (2015)	Barriers to HIV/AIDS Treatment in Nigeria	Systematic review	Barriers to HIV/AIDS treatment in the developing world are related to health systems-related, patients, and community. Health system-related barriers include the growing shortage of health manpower especially physicians due to high turnover, highly congested and poorly coordinated health care facilities, knowledge gap among HCWs, and side effects of the drugs.	Healthcare workers barriers at their place of work and this challenge their ability to protect themselves from the risk of exposure to HIV
	Zamberia (2011).	HIV-related stigma and access to health care among people living with HIV in Swaziland	Descriptive Survey	In Swaziland, HCWs are not exempt from stigmatization. As such, it has been established that in that country, stigmatization of HCWs also decreases the	Stigmatization reduces the likelihood of South African HCWs getting tested when exposed to HIV.



				willingness of HCWS to be tested for HIV	
	Maselobe (2016).	Assessment of Knowledge, Attitudes, and Utilization of HIV Post-Exposure Prophylaxis among Adults, Roma, Lesotho	A quantitative cross-sectional study among 96 adult outpatients at St Joseph's Hospital, Lesotho	Awareness of HIV PEP among the HCWs was found to be very low and for most HCWs, knowledge of HIV PEP was either non-existent or very poor	Poor knowledge of PEP predisposes HCWs to increased levels of exposure to HIV infection
	Kijakazi, Mashoto, Mubyazi, Makundi, Mohamed, and Malebo (2013)	Estimated risk of HIV acquisition and practice for preventing occupational exposure: a study of healthcare workers at Tumbi and Dodoma Hospitals, Tanzania	Desk review of Hospital Records	The estimated risk of HIV transmission due to needle stick injuries was calculated to be 7 cases per 1,000,000 HCWs-years. Over half of the observed hospital departments did not have guidelines for the prevention and management of occupational exposure to HIV infections and lacked well-displayed health and safety instructions.	Poor ability to deal with exposure to HIV infection increased the level of HIV infections among HCWs
	Ogoina, Pondei, Adetunji, Chima and Isichei (2015).	Knowledge, attitude, and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria	Cross-sectional in 2011/2012 among HCWs in two tertiary hospitals in Nigeria.	The majority of the HCWs' studies had poor knowledge of injection safety and complained of inadequate resources to practice standard precautions.	Generally, there is poor compliance with standard precautions of infection control among HCWs in Nigeria.
Question III: Which strategies can be used to prevent issues associated with HIV infection risk among Health care workers?	Ogoina, Pondei et al. (2015).	As Above	As Above	Policies that foster the training of HCWs in standard precautions and guarantee the regular provision of infection control and prevention resources in health facilities are required in Nigeria	The right policies can enhance the ability of the right resources to protect HCWs from HIV infection in Nigeria
	Mponela, Oleribe, Abade and Kwesigabo (2015).	Post-exposure prophylaxis following occupational exposure to HIV: a survey of health care workers in Mbeya, Tanzania, 2009-2010.	A cross-sectional study was conducted in Mbeya Referral Hospital, Mbozi, and Mbarali District Hospitals from December 2009 to January 2010 with a sample size of 360 HCWs	Despite the observed rate of occupational exposure to HCWs in Tanzania, the use of PEP is still low. Effective prevention from HIV infection at workplaces is required through proper training of HCWs on PEP with emphasis on timely reporting of exposures.	There is a need for more training to enhance the ability of HCWs to deal with HIV exposure



	Odimegwu, Akinyemi, and Alabi, (2017).	HIV-Stigma in Nigeria: Review of Research Studies, Policies, and Programmes	Quasi-experimental design	Nigeria has relevant policies; what needs to be strengthened are the design, planning, implementation, monitoring, and evaluation of context-specific stigma reduction programs.	There is a need to enforce policies to control stigmatization to encourage HCWs to access PEP
	Duarte and Hancock (2017)	An Exploration on HIV/AIDS Funding in South Africa	Desk-review of existing literature	Enhancing funding to increase access to equipment and equipment for HCWs who contract HIV	The government should put in place mechanisms for enhancing access to equipment and treatment for HCWs who contract HIV in South Africa.
	Maswanya, Mutalemwa, Shayo, Kisoka, Kilima, Mbilinyi, Munga, Kamugisha, and Kisinza (2010)	Drivers of HIV/AIDS Epidemics in Tanzania Mainland: “Case Study of Makete, Temeke, Geita, Lindi, Kigoma & Meru Districts	Multi-stage sampling technique was adopted. Study regions were stratified into three categories depending on the level of HIV transmission categorized into regions with the highest HIV prevalence, moderate HIV prevalence and, regions with the lowest HIV prevalence.	The study found that : There should be an integrated HIV/AIDS policy with explicit goals and targets based on international agreements and national priorities; Formulation of explicit targets at a disaggregated level for the high risk/vulnerable groups which have to be monitored properly by using reliable indicators; Need for a comprehensive strategy to strengthen the health care system (including, drugs and reagents, equipment, and other infrastructure) with a focus on prevention Streamlining and strengthening procurement systems and commodities supply.	Tanzania needs to come up with an explicit way of handling deficiencies in access of healthcare by HCWs after infection at policy as well as operation levels of the health care sector

4.2 Discussions

The findings as shown in the literature review shows that there is a high level of risk of HIV exposure by HCWs in South Africa (WHO, 2016). The study by UNAIDS (2013) shows that South Africa and Nigeria have the second-highest levels of HIV infection rates among health workers in Africa. Still, in the same accord, Okpala, Uwak, and Ada (2017) show that a high level of risk faces nurses as they care for PLWHA in Nigeria. In Tanzania, high levels of HIV infection levels among health workers (about 0.005% of the workforce) lowers the motivation of health workers as shown by Mbilinyi, Daniel, and Lie (2011). The findings show that in SSA, HCWs operate in an environment with high cases of HIV infections and are prone to fall victim to such infections themselves.

Various factors have been identified as possible causes of HIV exposure among HCWs. To begin with, Saleh and Adamu (2015) posit that healthcare workers face barriers at their place of work, and this challenges their ability to protect themselves from the risk of exposure to HIV. Zamberia (2011) is of the view that stigmatization is a key barrier faced by HCWs since it reduces the likelihood of South African HCWs getting tested when exposed to HIV. Maselobe (2016) is of the position that poor knowledge of PEP predisposes HCWs to increased levels of exposure to HIV infection. On their part, Kijakazi et al. (2013) point out that poor ability to deal with exposure to HIV infection (through PEP)

increased the level of HIV infections among HCWs. Ogoina et al. (2015) elicit that there is poor compliance with standard precautions of infection control among HCWs in Nigeria, this contributes to increased levels of exposure to HIV among HCWs.

Regarding ways in which exposure to HIV infection among HCWs could be abated, the findings obtained show that the right policies can enhance the ability of the right resources to protect HCWs from HIV infection in Nigeria (Ogoina et al. 2015). In Nigeria, Odimegwu et al. (2017) are of the view that there is a need to enforce policies to control stigmatization to encourage HCWs to access PEP.

Duarte and Hancock (2017) argue that the government should put in place mechanisms for enhancing access to equipment and treatment for HCWs who contract HIV in South Africa. Mponela et al. (2015) argue that there is a need for more training to enhance the ability of HCWs to deal with HIV exposure in Tanzania. Still in Tanzania, Maswanyana et al. (2010) are of the view that there is a need to come up with an explicit way of handling deficiencies in access to healthcare by HCWs after infection at policy as well as operation levels of the health care sector.

4.3 Limitations of the review

The literature reviewed is from selected African countries. As such, the findings depicted may not relate to all SSA countries since each country. The review was also limited to selected themes on the subject under investigation. As such, all the predictors of exposure to HIV infection among HCWs in SSA may not be exhaustively captured by the studies reviewed.

4.3.1 Conclusion:

The findings of the study confirmed all the three alternative study hypotheses that: there is a significant relationship between lack of health care resources and facilities and the risk of HIV infection among HCWs in SSA; there is a significant relationship between HCWs' knowledge, attitude, and practice on HIV and their risk of HIV infection in SSA and; there is a significant relationship between barriers to reporting and the risk of HIV infection among HCWs in SSA. In this regard, the study found out that HCWs in SSA are at high risk of HIV exposure whilst working. In this regard, this is a result of lack of enough equipment, poor practices at work and barriers to reporting, including stigmatization and lack of well-stipulated reporting guidelines.

4.3.2 Recommendations

- (i) There is a need to increase funding in the health care sector to enhance access to the right equipment, microbicides, vaccination, and PEP for HCWs,
- (ii) There is a need for psychosocial support systems to make it easy for HCWs to report infection with ease
- (iii) The government should adopt recommended global best standards to enhance the protection of HCWs while at work in SSA.

Recommendation for further research:

- (i) There is a need for studies on each of the study objectives
- (ii) There is a need for a descriptive study on the topic under investigation in this study for correlation purposes.

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APPENDICES

Appendix I: Studies excluded in at Full-Text Reading

- [1] Bott, S., Neuman, M., Helleringer, S., Desclaux, A., Asmar, K. and, Obermeyer, C. (2014) 'Rewards and challenges of providing HIV testing and counselling services: health worker perspectives from Burkina Faso, Kenya and Uganda', *Health Policy and Planning*, 30(8), pp.964-975.
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Appendix II: Critical Appraisal Tool

a)	Was the study conducted between 2007-2017
b)	Was the study conducted in SSA with a special focus on Nigeria, South Africa, and Tanzania
c)	Was the study published in a recognized journal
d)	Was the study subjected to peer review by medical practitioners and other professionals
e)	What was the design used in the study
f)	What was the source of data
g)	Does the study relate to: <ul style="list-style-type: none"> • Health care workers exposure to HIV risky conditions • Barrier to Reporting; Knowledge, Attitude, and Practice on HIV in SSA • Lack of Health Care Resources and Facilities in SSA • Strategies to prevent issues associated with HIV infection risk among Health care workers

Appendix III: Completed Search Summary for At Least One Full Database Search

Database Search: HIV Prevalence among HCWs
Okpala, Uwak and Ada (2017) Mbilinyi, D., Daniel, M. and Lie, G. (2011) Saleh and Adamu (2015) Zamberia (2011). Maselobe (2016). Kijakazi, Mashoto, Mubyazi, Makundi, Mohamed, and Malebo (2013) Ogoina, Pondei, Adetunji, Chima and Isichei (2015). Ogoina, Pondei et al. (2015). Mponela, Oleribe, Abade and Kwesigabo (2015). Odimegwu, Akinyemi, and Alabi, (2017). Duarte and Hancock (2017) Maswanya, Mutalemwa, Shayo, Kisoka, Kilima, Mbilinyi, Munga, Kamugisha, and Kisinza (2010)