

Knowledge and Practice of Ebola Prevention Among Healthcare Workers in Yei River County – South Sudan

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Abstract: The third Sustainable Development Goal (SDG3) of the United Nations aims to ensure the healthy and well-being of people of all ages. SDG3 is further divided into sub-goals addressing different health challenges, aiming to reduce their global impact by 2030. To combat diseases, SDG3 has sub-goals devoted to communicable diseases. Healthcare professionals are considered a vulnerable group due to the contagious nature of Ebola, which carries a high risk of mortality. This study, aligned with SDG3, aims to assess healthcare workers' comprehension of the Ebola virus disease (EVD) in Yei River County, South Sudan. Since healthcare staff play a vital role in minimizing the risk of transmission in several ways, evaluating their attitude is of utmost importance. Consequently, an empirical study has been conducted. A cross-sectional study of 133 healthcare professionals working in health centers of Yei River County was conducted using a combination of purposive and simple random sampling methods. Data was collected via questionnaires that included demographic information, as well as knowledge, attitude, and practice questions pertaining to EVD. SPSS version 21.0 was utilized for data analysis. The study demonstrates that 93% of respondents possess knowledge regarding EVD, with health workers (43.3%) and radio (56.7%) being the primary sources of information. Regarding symptoms of EVD, 50% of respondents indicated bleeding, while 53% recognized bodily contact with an infected person as a potential transmission route. Notably, there is a significant dearth of positive attitudes among health workers responsible for handling EVD patients. There was a subpar level of compliance with EVD prevention measures amongst health workers, with just 43.3% washing their hands regularly, 46.7% washing them once each day, a mere 30% utilizing hand washing as a preventive measure, and 40% of them using PPE for such purposes. A non-parametric analysis employing the Wilcoxon Signed Ranks Test was performed to investigate the potential link between the educational level of healthcare workers and their Ebola disease knowledge, attitude, and practice. The findings demonstrate a significant association between the level of education of healthcare workers and their knowledge, attitude, and practice of Ebola disease since the t-test statistic is -4.80, which is less than the p-value of 0.001. As health worker knowledge regarding Ebola virus disease (EVD) is currently at a moderate level, it is recommended that training and intervention programs be implemented for healthcare workers. Particular emphasis should be placed on transmission routes and signs of EVD in order to improve participants' knowledge and attitudes towards the disease.

Keywords: *Ebolavirus, Knowledge, Attitude, Health Personnel.*

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I. INTRODUCTION

Previously known as Ebola Hemorrhagic Fever, the Ebola Virus Disease (EVD) is a serious and usually fatal illness that affects people. In what is now the Democratic Republic of the Congo, the disease was initially identified in 1976 close to the Ebola River (Centres for Disease Control and Prevention, 2020). The case fatality rate for EVD is roughly 50% on average, although in previous outbreaks, the rate has fluctuated from 40% to 90% (Gupta et al., 2021; Hamid et al., 2018; World Health Organisation, 2021b). Five species of the Ebolavirus are known to exist: Zaire, Sudan, Ta' Forest,

Bundibugyo, and Reston. Each is associated with a consistent case fatality rate and a somewhat well-established endemic location. Zaire ebolavirus is known as the deadliest Ebola virus species, with case fatality rates as high as 90%, according to Bausch and Schwarz (2014).

Although EVD is initially communicated to humans by wild animals, transmissions between people are ultimately what drive the disease's spread (WHO, 2018). Therefore, community involvement is essential for the successful containment and management of outbreaks as well as the fight against EVD. Comprehensive interventions, such as case

management, infection prevention and control procedures, surveillance and contact tracing, dependable laboratory services, safe and respectable burials, and social mobilization, are required to achieve effective outbreak control (Gupta et al., 2021; Olu et al., 2016).

The World Health Organisation (WHO) said in its 2020 report that EVD vaccinations had been used to help contain different Ebola outbreaks in Guinea and the Democratic Republic of the Congo (DRC). Two medications have been authorised by the U.S. Food and Drug Administration (FDA) to treat both adults and children who have EVD brought on by the Zaire ebolavirus, a species of the Ebola virus. The first medication, Inmazeb™, which will be authorized in October 2020, combines three monoclonal antibodies. The second medication, called Ebanga™, a monoclonal antibody, was authorised in December 2020 (CDC, 2019; World Health Organisation, 2022a). The most extensive, deadliest, and difficult EVD outbreak since the virus's discovery in 1976 occurred between 2014 and 2016, impacting Guinea, Liberia, and Sierra Leone (Olu et al., 2016; Shoman et al., 2017). The outbreak has claimed 11,000 lives to yet and has cost an estimated US\$4.3 billion in total. It has not yet totally dissipated.

Guinea declared a new Ebola epidemic in February 2021, requiring the neighboring nations to impose preventative measures (World Health Organisation, 2021a). In August 2018, the eastern provinces of North Kivu and Ituri in the Democratic Republic of the Congo have been coping with a significant EVD outbreak that has now extended to Goma and South Kivu provinces. The WHO reports that from August 2018 to November 2019, the tenth EVD epidemic to be identified in the nation, infected 3,303 people and killed 2,199 people. According to records, 28% of the cases documented during the epidemic till November 2019 were in children, which is the greatest percentage of kid EVD burden ever. The WHO declared the Ebola epidemic in the DRC a public health emergency of worldwide concern in July 2019 as a result of the significant rise in cases, particularly among youngsters (Eurosurveillance Editorial Team, 2019; WHO, 2019). There were 130 EVD cases registered in the nation between 1 June 2020 and 18 November 2020. 119 confirmed cases and 11 suspected cases were included in this total. In February 2021, Butembo, a city in the North Kivu Province of the DRC, reported the discovery of a fresh EVD case. The risk of disease spreading within the DRC as well as to other nations in the region, such as Burundi, Central African Republic, Rwanda, South Sudan, Uganda, and Zambia, increased due to unstable conditions brought on by armed conflict, violent outbreaks, and social and economic problems in the affected areas (Riad et al., 2019; Schmidt-Sane et al., 2020; Wadoun et al., 2021). Following the confirmation of a fatal case, the Ugandan Ministry of Health and the WHO Regional Office for Africa jointly announced on September 20, 2022, that there was an Ebola Virus Disease (EVD) epidemic in Uganda's Mubende District, which was brought on by the Sudan ebolavirus. There were 64 confirmed cases of the Ebola virus disease (EVD) as of October 19, 2022, with 25 deaths (case fatality rate: 39%, including probable fatalities 54%). Five of these individuals—at least 11 medical professionals—died as a result of the

sickness. Additionally, 20 additional fatalities among those who passed away before a test could be done but were connected to verified cases are likely (European Centre for Disease Prevention and Control, 2022). Since 2012, Uganda has not seen an Ebola virus disease (EVD) outbreak brought on by the Sudan virus (SUDV) (World Health Organisation, 2022b). Increased human-wildlife contact as a result of widespread deforestation, hunting, mining, and other factors is to blame for the increased frequency of Ebola Virus Disease (EVD) outbreaks in Uganda, Guinea, and the DRC. This highlights the need for an effective monitoring framework to direct future preventive policy measures. The risk of cross-border transmission to nearby nations like South Sudan has gone from 'high' to 'very high' as a result of the EVD epidemic in the Republic of Uganda. South Sudan has now been classed as a nation where EVD prevention and preparation are priorities. Due to its poor healthcare infrastructure, open borders, sociocultural and traditional beliefs, and economic inadequacies, South Sudan is more at danger.

Although there have been no instances of EVD documented in South Sudan, there is a potential that the illness might spread through the neighbouring countries of Uganda and the Democratic Republic of the Congo (DRC), as well as through unofficial access points, international airports, and routine trade between Uganda and South Sudan. The danger is heightened by a lack of lab resources for specimen diagnosis, the absence of epidemic confirmation at the entry site, lax surveillance, and a lack of communication between the health sector and wildlife. Being the first to interact with patients, healthcare personnel are at a higher risk of getting Ebola and transmitting it to the general public. Healthcare professionals are essential in the provision of over-the-counter pharmaceuticals, understanding of various illnesses, and information regarding disease prevention. Healthcare professionals must be aware of the signs and symptoms as they are the first point of contact before the general population arrives at the hospital, and they must quickly and appropriately refer any suspected Ebola virus patient. There is currently no published study on Yei, South Sudan-specific healthcare personnel' understanding of the prevention of Ebola infections. Therefore, the purpose of this study was to evaluate healthcare professionals in Yei River County, South Sudan, in terms of their level of knowledge, attitudes, and practises towards the prevention of Ebola infections.

➤ *Statements of the Problem*

Effective communication is crucial in outbreak situations since it can alleviate fears and encourage desired changes in behavior among the population. Successful communication fosters public confidence. It raises society's awareness. As a result, it enhances the preparedness of society as a whole (WHO, 2012). Risk communication enhances the healthcare workers' knowledge and attitude toward the modes of transmission and prevention methods of EVD.

Intensive health education, communicated through various channels, leads to attitudinal and behavioral changes over time. Conversely, inadequate communication can generate fear and panic. The widespread dissemination of misinformation, largely via the media, may be responsible for

unwarranted panic (APA, 2014). When society is misinformed, it may lose trust in the government and the media. Public confusion and delusion can arise from unreliable sources of information, especially during outbreaks.

In South Sudan, the Ministry of Health (MoH) has collaborated with Humanitarian and UN agencies to reinforce EVD preparedness and response systems. A variety of measures have been deployed to prevent EVD from spreading throughout South Sudan. These measures involve strengthening the EVD surveillance system, preparing health facilities for quarantine, setting up isolation units, training health workers, and organizing public awareness programs. The preparation of EVD guidelines was also an important aspect of the preparedness efforts. Although there have been no reported cases of EVD in South Sudan to date, there are factors that increase the risks of outbreaks, such as its proximity to the neighboring DRC and Uganda, as well as the possibility of importing the virus through international airports, unofficial entry points, and frequent business transactions between Uganda and South Sudan. The hazards are made worse by limited monitoring, insufficient information exchange between the health sector and wildlife, and a lack of laboratory capacity for specimen diagnosis and epidemic confirmation at entrance sites. Health professionals are more likely to develop Ebola and spread the disease to the general population because they have first-hand contact with patients. The distribution of over-the-counter pharmaceuticals, education of the public about various health issues, and illness prevention are all important functions of community health professionals. Healthcare professionals should be aware of the signs and symptoms of people suspected of having EVD since they are the first point of contact before the population arrives to the hospital, ensuring early and appropriate referral. Currently, there are no published studies on the awareness of healthcare workers in South Sudan, especially in Yei, regarding the control of Ebola infections. The purpose of this study is to evaluate the degree of knowledge, attitude, and practises of healthcare professionals on the prevention of the spread of the Ebola virus in Yei River County, South Sudan.

➤ Objectives and Research Questions

The study's overall goal is to evaluate healthcare personnel' knowledge, attitudes, and practises about the Ebola virus epidemic in Yei River County, especially.

- To evaluate healthcare professionals' familiarity with EVD in Yei River County.
- To evaluate the attitudes of health professionals about EVD in Yei River County.
- To investigate the EVD practises of health professionals in Yei River County.

To reach the intended objectives, the following Research questions are posed:

- What is the level of knowledge of healthcare workers in Yei River County about Ebola disease?

- Do healthcare workers in Yei River County have attitudes favorable enough to influence their willingness to prevent the transmission and spread of Ebola disease?
- Are the practices of healthcare workers in Yei River County adequate to have a positive impact on the prevention and control of Ebola and EVD?

➤ Significance of the Study

The Ministry of Health would benefit from the study's findings in developing a communication strategy to raise healthcare professionals' awareness of EVD and in creating papers that act as preventative recommendations to shield them from infectious infections. Healthcare professionals' attitudes and actions regarding EVD and This discovery can be used by other researchers to advance their EVD study.

➤ Theoretical Framework

The study looked into two main behavioural theories to understand how healthcare professionals' knowledge, attitudes, and behaviours related to the Ebola virus.

• Social Cognitive Theory (SCT):

Environmental influences influencing human behaviour and social interaction impacting the behaviours and beliefs of a group of individuals are features of the interpersonal level model. According to social cognitive theory, learning is an internal mental process that may or may not be immediately manifested in alterations in behaviour. The Social Cognitive Theory (SCT) asserts that social contexts play a crucial role in how humans learn. People can learn about norms, abilities, practises, beliefs, and attitudes through observing others. By looking at instances and the outcomes of such activities, people can learn about the efficacy and appropriateness of certain behaviours. Then, people take activities that are consistent with their expectations of how those acts would turn out. According to Bandura (1989), the Social Cognitive Theory is a direct response to behaviourism.

• The Knowledge-Attitude-Behavior Theory:

The use of cognitive theory in health education is expanded upon by the Knowledge-Attitude-Behavior theory. The Knowledge-Attitude-Behaviour paradigm (Du SZ, Yuan CH, 2009) contends that health knowledge and information are the cornerstones for developing active and correct beliefs and attitudes towards disease, which serve as the driving factors for changing patient behaviour. According to the information-Attitude-Behavior model, learning may help people achieve the information and skills they need to modify their attitudes and behaviours. Therefore, it is important for patients and their families to actively seek out information that might help them gradually form good beliefs and attitudes that are reinforced by engaging in healthy behaviours. Zhao, Zhang, and Wang (2011) claim that using the Knowledge-Attitude-Behaviour model on patients resulted in the establishment of healthy beliefs and motivation for them to replace unhealthy lifestyle habits with good ones.

II. LITERATURE REVIEW

The case fatality rate for Ebola virus disease (EVD), an acute and deadly sickness for which there are no known

therapies, can reach 90%. Despite being a major worldwide health problem, little is known about the condition in the population, especially among healthcare professionals. Healthcare professionals have a crucial role in providing over-the-counter drugs, raising illness awareness, and distributing knowledge about various diseases and associated preventative techniques among the community as they are often the initial point of contact with patients. Healthcare professionals must thus be aware of the symptoms and indications of EVD in order to swiftly and correctly refer suspected cases.

➤ *Knowledge of EVD*

The earliest attempt to define knowledge was made in Plato's dialogues, where it was stated to be "justified true belief". Knowledge is a list of possible acts that reality permits, not an image or depiction of reality. It is a group of ideas, semantic connections, and activities that help us accomplish our objectives. A collection of structural connection patterns is what is meant by the term "knowledge." Meyer and Sugiyama (2006) assert that research has demonstrated the value of knowledge in accomplishing objectives. Knowledge has traditionally been defined as views that are true and supported by evidence. If a "true" view accords with how things, people, processes, and events actually exist and behave in reality, then it can be said to be reasonable. A belief needs to be both true and justified in order to be considered to be knowledge. According to a generally held concept, individuals act in accordance with their knowledge and beliefs (Hunt, 2003). Knowledge is defined by Blanchard and Thacker (2009, referenced in Radwa, 2012) as an organised body of information that has been gathered over time.

According to a survey done in Nigeria by (Aniekan Jumbo Etokidem), television (reported by 76.3% of respondents) and lecturers (reported by 84.5% of respondents) were the two most popular sources of knowledge on EVD. Students' fellow classmates (37.3%), family members (9.6%), radio (41.8%), newspapers (24.3%), the internet (36.2%), medical journals (11.9%), and textbooks (11.3%) were other sources of knowledge about EVD. The illness was named after a river in the Democratic Republic of the Congo, according to more than 66% of responders. Nearly 68% of respondents named the monkey as the Ebola virus's natural host, but the chimpanzee, gorilla, fruit bat, and pig were also mentioned. 71.8% of respondents who were asked about the method of transmission of the Ebola virus mentioned direct contact with blood and other bodily fluids and secretions of infected people, while others mentioned sexual activity (29.4%), cooking and eating infected bush meat (58.8%), and studying in the same space as someone who has not yet displayed symptoms of EVD. This study solely focuses on students' knowledge; it ignores the expertise of healthcare professionals, who are on the front lines and potentially at danger of contracting and spreading EVD to communities.

Research on the Knowledge, Attitude, and Practise of Communities in Kailahun District towards EVD conducted in Sierra Leone by Kangbai JB, et al. reveals that there is only a minimal understanding that EVD may be transmitted through contact with blood (32%), semen (17%), breast milk (13%) and other bodily fluids (43%) of an infected individual.

However, more knowledge is available on the following transmission routes: shaking hands or any other physical contact with an infected person (55%), eating or cooking bush meat (52%), and fruits that bats are likely to devour - "bat mot" (33%). Despite being false, 39% of those polled think that it is possible to get EVD from an infected individual who hasn't shown any symptoms or indications of illness.

In general, nothing is known about EVD preventive strategies. Only 39% of participants accurately cited three preventative strategies and disproved three myths. Adopting practises that reduce the risk of EVD requires more than just thorough understanding about Ebola transmission and prevention. Knowing the right modes of transmission is just as important for self-protection as being aware of the erroneous ones. According to the survey, radio (88%) is the most popular medium for learning about EVD, followed by religious institutions (42%), loudspeaker announcements (21%), and television (21%).

According to a comparable research carried out in Senegal among students at a health training college, the majority of knowledge on EVD was likely learned through informal conversations (58.0%), the internet (64.1%), and television (89.4%). Almost all students (79.8%) had access to at least two sources of information about EVD, and 88.4% of them understood what the illness included. According to the study, the most common clinical symptoms of EVD, as stated by the students who participated in the survey, were fever (86.3%), diarrhea (77.1%), vomiting (73.9%), headache (64.3%), abnormal bleeding (62.6%), weakness (59.8%), and sweating (54.5%). The research population recognized blood (79.8%), contact with a deceased infected person (77.8%), bushmeat (77.6%), contact with a deceased infected animal (76.1%), contact with contaminated clothes (75.5%), saliva (73.1%), vomiting (61.1%), and faeces (54.5%) as the main EVD spreading mechanisms. Gloves (98.2%), masks (96.1%), shoe coverings (75.3%), and safety glasses (69.8%) were the top personal protective equipment (PPE) items identified by the students who were polled with regard to individual protection. However, the respondents seldom ever cited the combo (26.7%) or the hood (22.5%).

According to a research done in Tanzania (Manyanga et al., 2021) television (71.8%), newspapers (67.9%), and radio (67.5%) were the main sources of knowledge about EVD for community pharmacy workers. According to the study, air transmission (38.5%) and direct contact with blood (81.3%) were shown to be the two main ways that Ebola is spread. The symptoms and indications of EVD were correctly identified by about 80.6% of respondents. 65.5% of interviewees listed high fever as an Ebola symptom, while 60.7% of people noted internal and external bleeding. Other EVD symptoms that have been observed include a headache, body weakness, diarrhoea, vomiting, appetite loss, sweating, red eyes, body rashes, wounds, loss of consciousness, and muscular pains. According to the survey, compared to 41% of individuals who believe a virus is the disease's source, 74% of people are more inclined to connect bats, monkeys, and wild animals as the disease's causes. Comparatively, to those with secondary education or above, people with no education or little education were less

likely to believe that a virus was the cause of EVD. Less than 2% of respondents think that God, witchcraft, bad deeds, or a curse are to blame for EVD. Further research is required because this study did not take into account healthcare professionals' general understanding of EVD prevention.

According to a study carried out in Uganda, television was the most commonly cited source of information (40 respondents, 95.24%), followed by print media (28 respondents, 66.67%). 61.91% (26 respondents) of the participants used the Internet as a source of information whereas 47.62% (20 respondents) mentioned their colleagues or health workers as the source. On the other hand, radio was the least cited source, with only 28.57% (12 respondents) referring to it. Most of the respondents mentioned all possible symptoms of Ebola. Bleeding (unexplained), fever, weakness, and fatigue were referred to by all 42 respondents as the symptoms of Ebola. Severe headache was cited by 41 respondents (97.62%), abdominal pain accompanied by vomiting was mentioned by 30 respondents (71.43%) whereas diarrhea was referred to by 22 respondents (52.38%).

According to a study conducted in South Sudan by Augustino T. Mayai Bior K. Bior (2022), radio was the most popular channel for health-related information on Ebola among most respondents (76%). Health community mobilizers (49%) and government officials (25%) followed. The symptoms of EVD, which include vomiting with or without blood, internal bleeding, diarrhea with or without blood, severe headache, or sudden onset of fever, topped the list. Nevertheless, the ratio of respondents who duly identified these symptoms (without prompting, i.e. unaided recall) remains under 50%, across the board. 70% of respondents cited wild animals such as bats, monkeys, and chimpanzees as the cause of EVD, and only 28% specified the virus as the causative agent for EVD. This study focuses on evaluating the knowledge, attitude, and practices of households in South Sudan but does not cover the knowledge of healthcare professionals on EVD in South Sudan and Yei in particular. Hence, it is of paramount importance to carry out another study on the knowledge, attitude, and practices.

➤ *Attitude on EVD*

According to Gumucio (2011), attitude is a way of being or a stance. They are inclinations or tendencies. It functions as a steppingstone between the circumstance and the answer. In response to a stimulus, it helps to understand why a person chooses one practice over another. Because attitudes, unlike practices, cannot be observed directly, it is important to evaluate them.

In a research conducted in Nigeria (by Aniekan Jumbo Etokidem), 88.1% of the participants stated that they were terrified as a result of the EVD outbreak. In addition, 26.5% of them stated that the fear of EVD had diminished their interest and excitement for the nursing profession, and 30.5% stated that they were no longer at ease utilizing public transit during the outbreak. In addition, 26.6% of the respondents said they no longer felt at ease visiting medical wards, and 12.4% said they were uncomfortable sitting in the same row as their

classmates in class. More than 72% of those surveyed said they would suggest a flatmate who could have EVD go to a hospital. While 7.9% of the respondents said they would leave the room but come back after learning that their flatmate had successfully treated their EVD, 24.3% of the respondents said they would leave the room even after their flatmate had been declared EVD-free. All of the respondents (100%) said they would stay friends with someone who had EVD and had been effectively treated, however 40.1% said they would refuse to consume food from someone who had EVD in the past but has since been properly treated. In addition, 12.4% of respondents said they would not work as theatre nurses during a surgical procedure for a patient who has received effective EVD treatment.

According to a research by Manyanga et al. (2021), community pharmacy employees in Tanzania had a favourable opinion on methods to limit the spread of the Ebola virus. Over 90% of the workers thought that avoiding bodily fluid contact, reporting suspects to the hospital, avoiding the handling of contaminated materials, and avoiding close contact with infected animals or symptomatic infected people were effective preventive measures. People generally have optimistic views and convictions about the main strategies for avoiding Ebola. 87% of the respondents agreed that avoiding contact with blood and bodily fluids would help prevent the disease. 85% also concurred that avoiding funeral or burial practices involving contact with the body of a person who died from Ebola is another way of preventing the disease. 91% also believed that suspected cases should urgently be reported to a health facility to reduce the risk of spreading the disease.

➤ *Practices on EVD*

The outward activities that a person takes in reaction to stimuli are referred to as behavioural practises. It is a topic that addresses actual events (Gumucio, 2011).

In research in Nigeria by Aniekan Jumbo Etokidem, it was discovered that every respondent said they had increased how frequently they cleaned their hands in reaction to the EVD outbreak. The epidemic, according to all participants, boosted the usage of personal protective equipment. In a same vein, every participant admitted that during the epidemic they began to carry their own hand sanitizers. Although 58.2% of participants said they would be willing to participate in an EVD vaccination study, just 12.4% said they would encourage their friends and relatives to do the same. Only 37.3% of the participants had gone to an EVD prevention course or training. The participants' usage of personal protective equipment (PPE), regular hand sanitization, and handwashing with soap and water when dealing with patients, even after using gloves, showed that the measures for the transmission, dissemination, and prevention of Ebola were effective. According to the isolation of suspected patients in different cubicles and adherence to infection control procedures, the management of potentially contagious cases was also successful.

UNICEF conducted a study in South Sudan in 2019 on the behavioral intent of families with regard to the deaths and safe burials of their members suspected to have been infected with Ebola. According to the study, only 16% of the

respondents stated that they wouldn't wash the body, and 34% said that they wouldn't touch it. 74% of the respondents said that they would not wait for more than a day for an SDB team and would instead bury the body themselves. The study found that only 50% of the respondents would call the Ebola hotline 6666 if they suspected a family member to have contracted EVD.

When it comes to managing and preventing EVD, the participants shown positive behaviour and practises. Only a small number of individuals engaged in unacceptable behaviour and practise, with more than 80% of responders providing acceptable answers to practise questions. 95% of people claim that their behaviour has changed as a result of knowing about the Ebola virus. However, the low number of persons (36%) who claim to avoid physical touch is alarming.

➤ *The Study Gap*

According to a study conducted in South Sudan by Augustino T. Mayai Bior K. Bior (2022), radio was the most popular channel for health-related information on Ebola among most respondents (76%). Health community mobilizers (49%) and government officials (25%) followed. The symptoms of EVD, which include vomiting with or without blood, internal bleeding, diarrhea with or without blood, severe headache, or sudden onset of fever, topped the list. Nevertheless, the ratio of respondents who duly identified these symptoms (without prompting, i.e. unaided recall) remains under 50%, across the board. 70% of respondents cited wild animals such as bats, monkeys, and chimpanzees as the cause of EVD, and only 28% specified the virus as the causative agent for EVD. This study focuses on evaluating the knowledge, attitudes, and practices of household members in South Sudan but does not cover the knowledge of healthcare professionals on EVD in South Sudan and Yei in particular. Hence, it is of paramount importance to carry out study on the knowledge, attitude, and practices.

III. METHODOLOGY AND RESEARCH DESIGN

➤ *Research Design*

The study design is cross-sectional and descriptive quantitative data analysis is used. The study is conducted in the Central Equatoria State of South Sudan's Yei River County, which has five Payams: Yei town, Mugo, Lasu, Tore, and Otego. It has boundaries with Lainya County to the east, Morobo County to the south, and Maridi and Mundri West counties in Western Equatoria to the north. Additionally, it reaches into the Democratic Republic of the Congo to the west. Hills, a lot of trees, and various rivers, including the Yei River, which flows from the county's western to eastern portions, make up the county's topography. The area was deliberately chosen as it is close to the researcher.

➤ *Sampling*

The study employed both purposive sampling and simple random sampling. The selection of health facilities for the study is based on purposive sampling, where the list of the health facilities is obtained from the County Health

Department of Yei River County. Meanwhile, simple random sampling is used to select the respondents from each chosen health facility for the study.

➤ *Target Populations and Sample Size*

The study involved all healthcare workers in Yei River County. There are 40 health facilities in Yei River County. Nevertheless, as a consequence of the 2016 conflict, some of these facilities are now closed and non-operational. Of these facilities, only 18 are operational, and the study's focus is based on the health workers employed by them. Yei River County consists of 18 operational health facilities that employ 200 healthcare workers, according to the County Health Department report. These workers are used as the participants in this study.

As the total number of healthcare workers in Yei River County is known, the sample size for this study is determined using Slovin's Formula (1960),

$$n = N \div (1 + Ne^2),$$

Where n represents the required sample size that is statistically representative and N represents the target population size which is 200 healthcare workers. The small *e* represents the confidence level (0.05). Therefore, the sample size for this study is $(200/1+200*0.05*0.05) = 133$.

➤ *The Data Collection*

Data gathering was done by administering a standardised questionnaire. The participants were informed of the study's goals, and their verbal and written agreement was acquired. Healthcare professionals pretest the questionnaire to make sure it is valid and that the required modifications have been done. The questionnaire was then broken down into three pieces, containing questions about sociodemographic traits, behaviours that put persons at risk for EVD, knowledge, and attitude. Evaluation of knowledge, attitudes, and practises on the transmission and risk factors, prevention and control, cause, signs, and symptoms of EVD included both open-ended and closed-ended questions. Correct answers to knowledge and attitude questions received a score of 1, while unsatisfactory responses received a score of 0. Equal weight was assigned to each query. Missing replies were not evaluated, while those that said "don't know" received a score of 0. The percentage score was then determined in accordance with that.

➤ *Data Analysis*

In order to analyse quantitative statistical data, SPSS version 21.0 and an Excel programme were also used. The findings were displayed using narratives, tables, charts, and graphs. Based on the distribution of knowledge and attitude percentages, cutoff criteria were defined, and median scores were obtained. The median percentage score of 50% was chosen as the standard for knowledge scoring. Individuals scoring less than 50% were labelled as having inadequate knowledge, while those scoring 50% and more were labelled as having strong knowledge since the scores had a bimodal curve distribution. When the median score was 50% or higher, attitudes were classified as positive and negative, respectively.

The Wilcoxon Signed Ranks Test was then used in non-parametric analysis to ascertain the relationship between health professionals' education level and their knowledge, attitude, and practise of Ebola disease control and prevention.

➤ Ethical Considerations

While receiving approval to conduct the study from the Yei River County health department, the project was given

ethical clearance by the Yesbud University School of Doctorate Studies. At each study site, healthcare professionals were asked to participate after giving their oral informed permission. The researcher closely monitored moral concerns such plagiarism, dishonesty, data fabrication or falsification, duplicate publishing or submission, redundancy, and other behaviours.

IV. RESEARCH FINDINGS

➤ Descriptive Analysis of the Data

Table 1 Age of Respondents

Age of Respondents	N = 133	%
Age 26-35 years	31	23.3%
Age 36-45 years	62	46.7%
Age 46 Above	40	30.0%

Among the 195 participants in the study, 23.3% were between 26-35 years, 46.7% were between 36-45 years and 30% were above the age of 46. Fig 1 indicates the gender of the respondents, majority 53% were male while 47% were female. Table 2 indicates the educational level of the respondents, majority 66.7% have a certificate level, 26.7% Diploma level, and 6.6% have degree-level qualifications.

Figure 2 depicts the job distribution of those surveyed, with the largest percentage 30% being nurses, followed by others 26.7%, midwives 16.7%, cleaners 10%, guards 6.7%, and merely 3.3% comprised of medical doctors. This outcome implies that Yei River County is experiencing a lack of medical doctors in its healthcare facilities too.

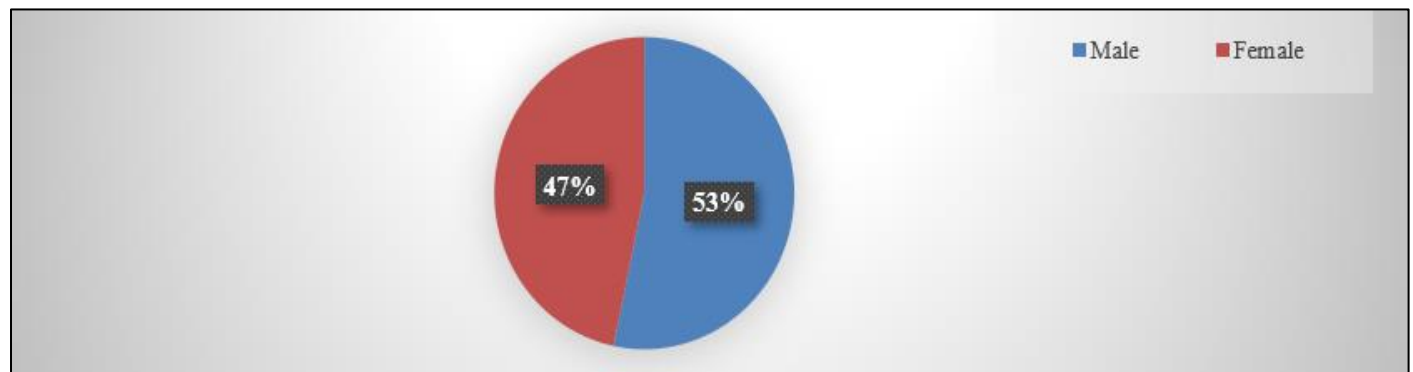


Fig 1 Gender of Respondents

Table 2 Education

	N = 133	%
Certificate	89	66.7%
Diploma	36	26.7%
Degree	9	6.6%

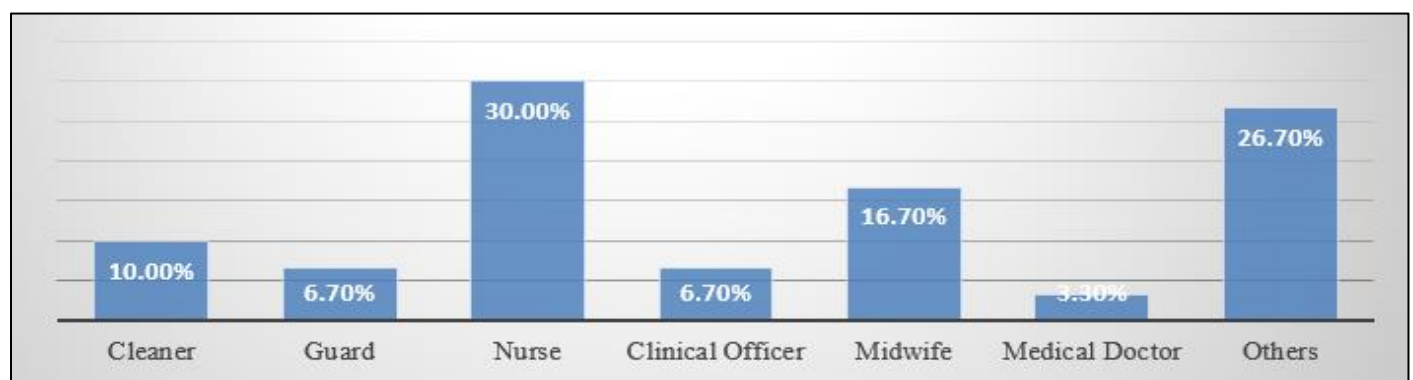


Fig 2 Occupation

Table 3 illustrates the level of knowledge on Ebola virus disease (EVD) among healthcare workers.

A significant proportion 93% of respondents stated they were aware of EVD, whereas only a minority 7% reported being unaware. In terms of sources of information on EVD, 43.3% reported obtaining it from health workers, while the majority 56.7% obtained information from radios. There were no responses regarding information obtained from printed media. Only 3.3% of participants are unaware of the symptoms of Ebola virus disease (EVD), while 96.7% are knowledgeable about the signs. The identified symptoms of EVD include bleeding 50%, fever 23.3%, vomiting 13.3%, and diarrhea

13.3%. When asked about their response to suspected EVD, 60% expressed confidence that they know what to do, while 40% reported uncertainty in their knowledge. Participants were asked about their role in the event of a suspected case of Ebola virus disease (EVD) in their facility. Of those surveyed, 23.3% indicated they would isolate the patient, 50% stated they would refer the patient, and 26.7% reported they would conduct health education for the relatives of the suspected case. The majority 90% of participants reported no confirmed cases of EVD, while 3.3% reported encountering a confirmed case. Of those, 96.7% confirmed that EVD can be transmitted, with only 3.3% indicating they did not know.

Table 3 Knowledge of Healthcare Workers

Variables	Frequency	Percentage
Healthcare workers aware of Ebola		
Yes	124	93.3%
No	9	6.7%
Sources where the workers get information		
Health Workers	56	43.3%
Radio	75	56.7%
Printed media	0	0
Healthcare workers' awareness of EVD symptoms		
Yes	129	96.7%
No	3	3.3%
Knowledge on symptoms of EVD		
Bleeding	67	50.0%
Fever	31	23.3%
Vomiting	18	13.3%
Diarrhea	18	13.3%
Do they know what to do in case of suspected EVD case		
Yes, they know	80	60.0%
Don't know	53	40%
Action of health care worker in case of suspected EVD case in the facility		
Isolation of Patient	31	23.3%
Referral	67	50.0%
Health education of parents	36	26.7%
Has the worker come across the confirmed case		
Yes	13	10 %
No	120	90 %
Do healthcare workers know that EVD can be transmitted?		
Yes	129	96.7%
No	4	3.3%

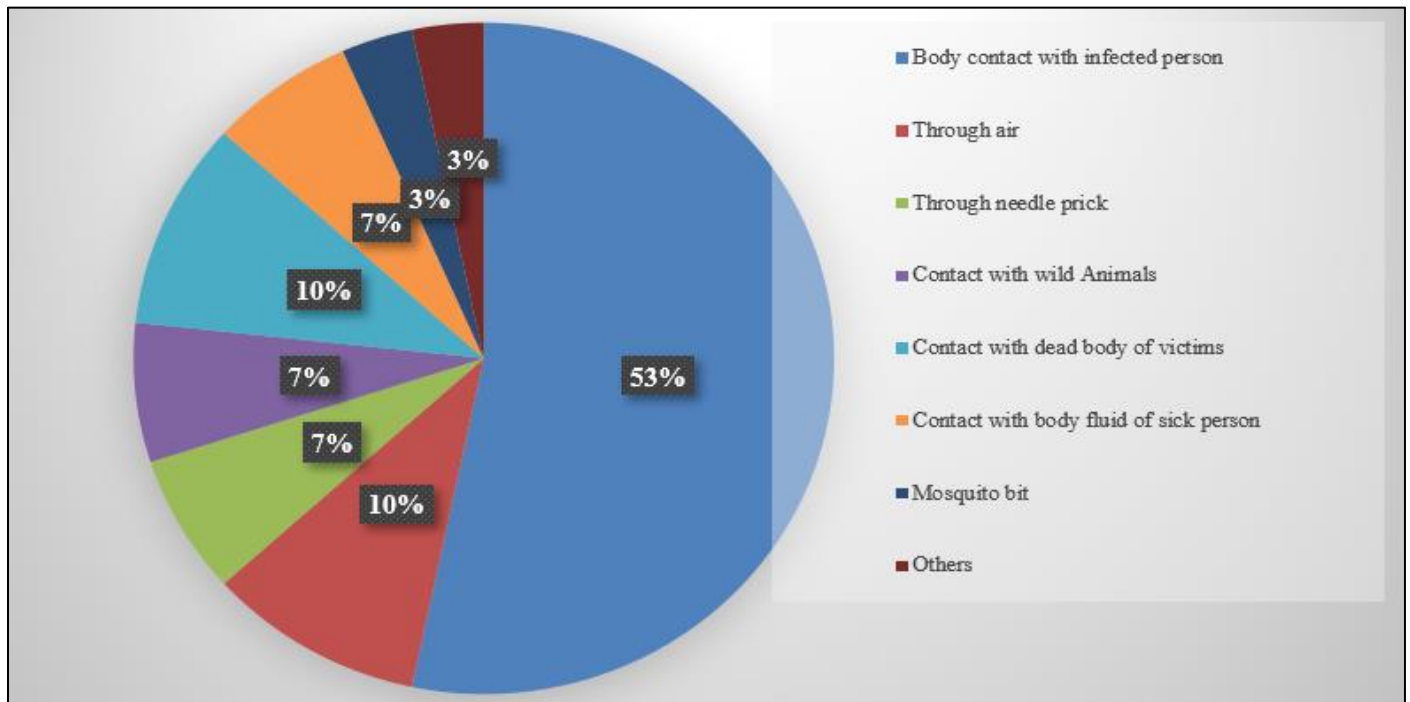


Fig 3 Mode of Transmission

Fig 3. Indicates the level of knowledge of health care workers on the mode of transmission of EVD. 53% said EVD can be transmitted through body contact with an infected

person, 10% through air, 7% through needle prick, 7% through contact with wild animals, and 10% through dead bodies of the victims.

Table 4 Knowledge Due to Asymptomatic

Variables	Frequency	Percentage
Do Health care workers know that one can get infected by asymptomatic patients?		
Yes	91	70 %
No	40	30 %
Can one be infected after fruits are bitten by infected bats?		
Yes	97	73.3%
No	36	26.7%

As in Table 4, it is found that 70% of health workers agreed that one can contract infections from asymptomatic patients, whereas 30% did not agree. This suggests that health workers possess substantial knowledge regarding infections

through asymptomatic patients. Additionally, 73% of health workers agreed that one can get infected by eating fruits bitten by bats, whereas only 26.7% disagreed.

Table 5 Knowledge on Breast Milk Transmission

Can EVD be transmitted through breast milk?		
Yes, it can	62	46.7%
No, it can not	71	53.3%

Out of the 195 participants interviewed, 46.7% believed that EVD could be transmitted through breast milk, while the majority 53.3% asserted that it could not. These findings

suggest that healthcare workers may lack adequate knowledge regarding the transmission of EVD through breast milk.

Table 6 Knowledge of Prevention

Can EVD transmission be prevented?		
Yes, it can be prevented	115	86.7%
No, it can't be prevented	18	13.3%

Table 6 illustrates the level of knowledge among healthcare professionals regarding EVD prevention. According to the findings, 86.7% of respondents agreed that

EVD can be prevented, whereas only 13.3% believed it cannot be prevented.

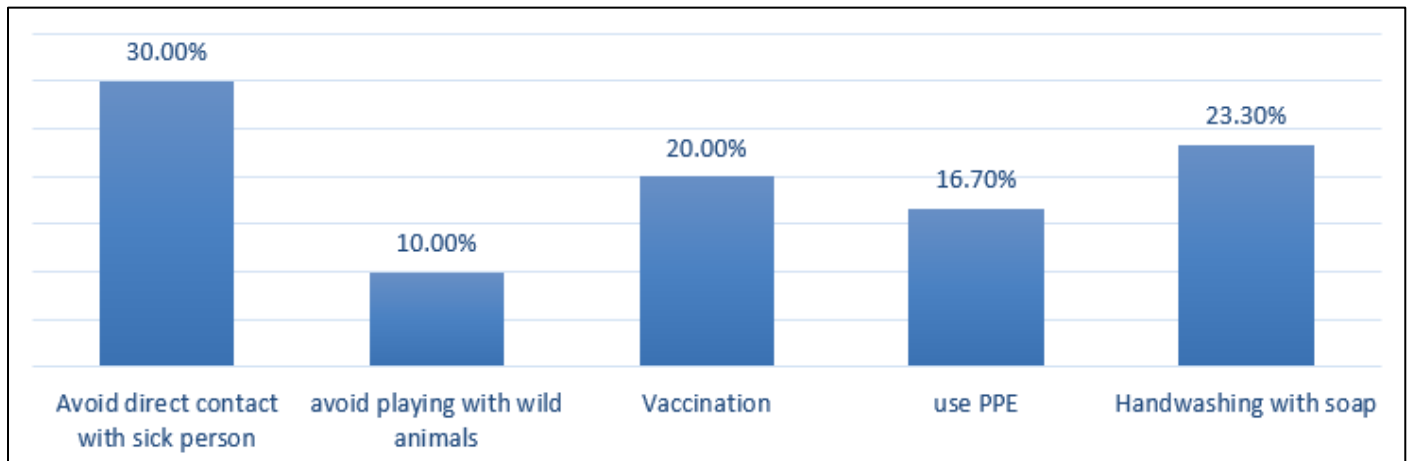


Fig 4 Knowledge on Prevention Methods

Of the respondents, 30% stated that avoiding contact with sick individuals can prevent EVD, 10% believed avoiding contact with wild animals is effective, 20% cited vaccination, 16.7% mentioned personal protective equipment (PPE), and only 23.3% suggested handwashing as a prevention measure.

Figure 4 illustrates the level of knowledge among healthcare professionals regarding Ebola virus disease prevention methods. These results suggest a low level of knowledge among healthcare workers regarding EVD prevention methods.

Table 7 Training on EVD

Yes	89	66.7%
No	44	33.3%

Table 7 displays the figures for healthcare workers who had received training on EVD. The majority of 66.7% stated that they had undergone EVD training, with 33.3% of

healthcare workers indicating that they had not received any. Still, their knowledge and attitude on various dimensions of EVD are not satisfactory.

Table 8 General Knowledge on EVD

Strong knowledge	71	53.3%
Medium Knowledge	53	40.0%
Weak Knowledge	9	6.7%

When asked about their understanding of EVD, at least 53% of participants reported a strong level of knowledge, while 40% reported a moderate level and 6.7% were uncertain. Consequently, this indicates that healthcare employees in Yei health facilities possess a satisfactory understanding of EVD.

➤ *Nonparametric Analysis using Wilcoxon Signed Ranks Test*
A non-parametric analysis, utilizing the Wilcoxon Signed Ranks Test, was conducted to establish the correlation between the educational level of healthcare workers and their

knowledge surrounding Ebola disease control and prevention. The results demonstrate that the education level of healthcare workers in Yei River County significantly impacts their knowledge this is because the t-test statistic is -4.79 which is less than 0.001 level of significance. This result demonstrates that healthcare professionals with a high level of education possess sufficient knowledge about controlling and preventing the Ebola virus disease in Yei River County. The test Statistics is in Table 9.

Table 9 Test Statistics on Education and Knowledge

Z	-4.790 ^b
Asymp. Sig. (2-tailed)	<.001
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

Table 10 Attitude of Health Care Workers.

Healthcare workers consider themselves at high risk of getting EVD		
Yes, we are at high risk	89	66.7%
No, we are not at high risk	40	30.0%
Don't know	4	3.3%
If case is suspected in your facility, what will you do?		
isolate the case	75	56.7%

Refer	53	40.0%
I will run away	4	3.3%
Is EVD treatable?		
Yes it can be treated	71	53.3%
No, it can't be treated	62	46.7%
Health care workers attitude on the use of EVD vaccine		
The vaccine is very good	102	76.7%
The vaccine is not good because we hear some people died of it	31	23.3%
Health care workers general attitude toward handling patients with EVD		
Positive	22	16.7%
Negative	49	36.7%
I don't know	62	46.7%

Table 10, presents the perspectives of healthcare professionals towards the prevention and control of EVD. Results indicate that 66.7% of respondents perceive themselves to be at high risk, compared to 30% who view their risk as being low. Only 3.3% of participants did not know their status. In the event of a suspected case, 56.7% of healthcare professionals reported they would isolate the patient, while 40% would refer the patient to a different health facility. 3.3% would flee the health facility. Additionally, 53.3% of respondents believed that EVD could be treated while 46.7%

believed otherwise. Regarding the utilization of the Ebola virus disease (EVD) vaccine, 76.7% of respondents regarded it positively while 23.3% held negative opinions. In regard to their overall attitude towards treating patients with EVD, 16.7% displayed a positive attitude, 36.7% exhibited a negative attitude, and the remaining majority of 46.7% reported uncertainty. This data suggests that healthcare professionals in Yei River County, South Sudan, possess a negative attitude towards treating patients with EVD.

Table 11 Test Statistics on Education and Attitude

Z	-4.802 ^b
Asymp. Sig. (2-tailed)	<.001
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

A non-parametric analysis employing the Wilcoxon Signed Ranks Test was conducted to establish the correlation between the educational qualifications of healthcare professionals and their approach towards controlling and preventing Ebola disease. The findings indicate that the educational level of healthcare workers in Yei River County highly impacts their attitudes towards healthcare. This is

supported by a t-test statistic of -4.802, which falls below the 0.001 level of significance. This study demonstrates that healthcare professionals with higher levels of education possess a favourable attitude towards Ebola disease control and prevention in Yei River County compared to those with low education qualification.

Table 12 Health care Worker's Practice

Health care workers prevention measures on EVD at the facility		
Proper handwashing with soap	40	30.0%
Use of PPE	53	40.0%
Health Education	40	30.0%
How often health care workers wash their hands at the facility		
All times	58	43.3%
once's a day	62	46.7%
don't know	13	10.0%
How often health care workers use PPE in the facility		
All times	4	3.3%
Never use PPE	111	83.3%
don't know	18	13.3%

Table 12, displayed above, presents the extent of adherence by healthcare workers to EVD prevention and control measures. Respondents were asked to report the frequency with which they washed their hands in their healthcare facilities, with 43.3% responding "all times," 46.7% responding "once a day," and 10% stating that they did not know.

Regarding the prevention measures employed in their facilities for EVD, 30% of participants reported using handwashing, 40% reported using PPE, and 30% reported utilizing health education.

When participants were surveyed about PPE usage frequency, 3.3% reported consistent use, 83.3% indicated they never used PPE, and 13.3% were unsure. These results suggest

inadequate implementation of EVD prevention measures by healthcare workers in Yei River County.

Table 13 Test Statistics on Education and Practice

Z	-4.795 ^b
Asymp. Sig. (2-tailed)	<.001
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

A non-parametric analysis, using the Wilcoxon Signed Ranks Test, was conducted to investigate the correlation between the education level of healthcare workers and their practices towards the control and prevention of Ebola disease. The findings demonstrate a significant impact of educational level on the practices of healthcare workers in Yei River County, as shown by a t-test statistic of -4.795, which is less than 0.001. This study demonstrates that healthcare workers with a high level of education exhibit effective practices for controlling and preventing Ebola disease in Yei River County compared to their counterparts with low education qualifications.

V. DISCUSSION

➤ *Knowledge of Healthcare Workers on EVD Prevention and Control*

The primary research objective for this study was to evaluate the degree of Ebola knowledge among Yei River County's medical personnel. As a result, the survey reveals that 93% of the respondents are aware of EVD and that they learned about it via health professionals (43.3%) and radio (56.7%). The participants also had high understanding of the symptoms of EVD, with 50% correctly identifying bleeding, while 53% correctly identified the mechanism of transmission as body contact with an infected individual. This research is consistent with a study done in Tanzania by Manyanga et al. (2021), which found that radio, newspapers, and television were the main sources of knowledge on EVD for community pharmacy workers (71.8%). According to the study, air transmission accounted for 38.5% of all Ebola cases, while direct blood contact accounted for 81.3% of all cases. The signs and symptoms of EVD were properly identified by about 80.6% of respondents. Internal and external bleeding were mentioned as symptoms of Ebola by about 60.7% of individuals, while severe fever was mentioned by 65.5% of people. Other EVD symptoms that have been described include headache, muscular pain, body weakness, diarrhoea, vomiting, appetite loss, sweating, red eyes, body rashes, sores, and loss of consciousness. According to the survey, 74% of respondents believe that bats, monkeys, and wild animals are more likely to be the disease's primary cause, while just 41% believe that a virus is to blame.

The results of this study indicate that there is a low level of knowledge among health workers about the transmission of EVD through breast milk 46%, while there is a high level of knowledge among health workers about the transmission of EVD through fruit-bitten by bats 73.3%. This study is consistent with one by Kangbai et al. in Sierra Leone to assess the knowledge, attitudes, and practises of communities living

in Kailahun District regarding EVD, which reveals that there is only a minimal understanding that EVD can be transmitted through contact with the blood, semen, breast milk, and other body fluids of an infected person, 32%, 17%, and 43%, respectively, of an infected person. On the other hand, there is more knowledge of the following mechanisms of transmission: shaking hands or another personal contact with an infected person (55%), eating or cooking bush meat (52%), and fruit likely to be consumed by bats ('bat mot') (33%).

The Wilcoxon Signed Ranks Test was used in the study to find the relationship between healthcare professionals' expertise and educational attainment. With a t-test of -4.79, which is less than the p-value of 0.001, the results show a statistically significant association between the amount of education and the knowledge of healthcare personnel about the management and prevention of the Ebola illness.

➤ *Attitude of Health Care Workers on EVD Prevention and Control.*

Understanding, if healthcare personnel in Yei River County had attitudes that were favorable enough to impact their readiness to stop the transmission and spread of the Ebola illness, was the second research question for this study. According to the study's findings, health professionals' attitudes towards treating individuals with EVD were noticeably negative. Contrary to this conclusion, research done in Tanzania in 2021 by Manyanga et al. revealed that community pharmacy employees had a favourable attitude towards Ebola protection strategies. The survey did discover that health professionals (66.7%) had a positive attitude towards EVD prevention and control. This result is consistent with research done in Nigeria by Aniekan Jumbo Etokidem, in which 88.1% of respondents stated that they were terrified due to the EVD pandemic.

The Wilcoxon Signed Ranks Test was used to assess the relationship between healthcare professionals' attitude and educational attainment. With a t-test of -4.80, which is less than the p-value of 0.001, the findings show a statistically significant link between education level and health professionals' attitudes towards Ebola disease control and prevention.

➤ *Practices of Health Care Workers on EVD Prevention and Control*

The third research question was to understand if the practices of healthcare workers in Yei River County are adequate enough to have a positive impact on the prevention and control of Ebola disease. In this regard, the study shows that healthcare workers' practice of EVD prevention is low,

with only 43.3% of healthcare workers washing their hands all the time, 46.7% washing their hands once a day, only 30% using hand washing as a preventive measure, and 40% using PPE as a preventive measure against EVD. This result contrasts with one from research carried out in Nigeria by Aniekan Jumbo Etokidem, which discovered that all respondents had increased their frequency of hand washing in response to the EVD outbreak. The epidemic, according to all participants, boosted the usage of personal protective equipment.

The link between a healthcare worker's level of education and level of practice is examined using the Wilcoxon signed-rank test. With a t-test of -4.79, which is smaller than the p-value of 0.001, the findings show a statistically significant association between the degree of education and the practice of health personnel in the control and prevention of the Ebola illness.

VI. CONCLUSIONS AND RECOMMENDATIONS

Healthcare workers in Yei River County have good knowledge about the signs and symptoms of EVD however they also have low knowledge when it comes to the mode of transmission through breast milk and preventive measures of EVD while their attitude toward handling patients suspected of EVD and practice level on the control and prevention of EVD is low. Further, it is explored that the health workers' knowledge, attitudes, and practices are significantly influenced by their level of education. In comparison to health personnel with a low level of education, those with a high level of education had better knowledge, attitudes, and practices regarding the control and prevention of the Ebola illness.

It is strongly advised that the South Sudanese government and key ministries create and execute continuous education programs and workshops on the Ebola virus in order to fulfill the UN's mandate on SDG 3. In order to create training programs that effectively raise participants' knowledge and alter their attitudes, training programs must take into account the possible participants' degrees of education and professional experience. Because the Ebola virus may persist in breast milk for a long period, healthcare professionals need to be made aware of potential EVD transmission routes, such as transfer from mother to child through breast milk (CDC, 2021). Additionally, it is needed to develop an efficient and consistent communication plan to educate healthcare professionals about EVD. In order to ensure appropriate monitoring and early EVD identification, the government should supply Ebola testing and diagnostic equipment in all healthcare facilities. It is advised that more studies be conducted in other South Sudanese counties to confirm and generalize the suggestions. More Research needs to be conducted to compare the knowledge, attitude, and practices of health professionals with the non-health professionals in Yei River County of South Sudan.

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