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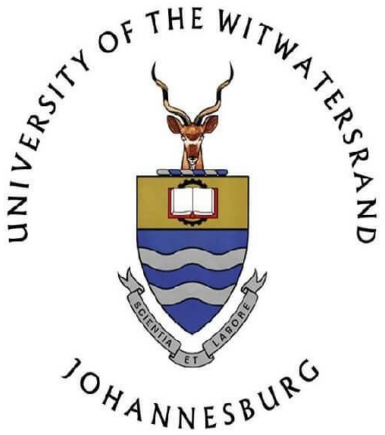

FACULTY OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

KNOWLEDGE, ATTITUDES, AND REFERRAL PRACTICES REGARDING ANIMAL BITES AND PREVENTION OF HUMAN RABIES AMONG TRADITIONAL HEALTH PRACTITIONERS IN ETHEKWINI DISTRICT IN KWAZULU-NATAL PROVINCE, SOUTH AFRICA, 2022

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Masters of Science in Field Epidemiology

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DECLARATION

I declare that the content of this research report is original except for where reference is made to the work of others. This report has never been submitted for consideration for any other degree or qualification in this, or any other University.

…… ……..

Maxwell Musa Mabona

Date: 08 June 2023

Place: Pietermaritzburg, KwaZulu-Natal

AGREEMENT BY CO-AUTHORS

Maxwell Musa Mabona, student number 1314539, wrote the protocol, acquired ethical approval, cleaned the data, performed data analysis, wrote the first draft, and received critical comments from all co-authors. By signing this declaration, the co-authors listed below agree to the use of the article by the student as part of his research report.

Poncho Bapela: _____

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Dr. Lazarus Kuonza: _____

Babongile Mhlongo:_____

DEDICATIONS

I dedicate this project to my mother and my entire family who continued to support me throughout my journey. My loving siblings who were always willing to help me where needed. My extended family that also always provided the support I needed. I would lastly also like to thank the God of mount Zion who paved my way and made all things possible.

ABSTRACT

Background: Despite the availability of effective post-exposure prophylaxis (PEP), about 24 000 people die of rabies each year in Africa, accounting for 36.4% of global rabies deaths. In South Africa, about 10 human rabies deaths are recorded each year, most resulting from dog bites. Many animal bite patients initially seek help from Traditional Health Practitioners (THPs) before considering conventional health facilities. Referring animal bite patients for PEP without delay is pivotal in preventing human rabies mortality. Our study aimed to assess the knowledge, attitudes, and referral practices regarding human rabies and the associated factors among THPs in the eThekwini District of KwaZulu-Natal.

Methods: We conducted a cross-sectional study among THPs which included all registered THPs consulting patients in the eThekwini District. We used a structured standardized questionnaire to collect data. The questionnaire was administered through physical and telephonic interviews. We managed and analyzed data using STATA statistical software (Version 17). A multivariable logistic regression model was used to analyze the factors associated with knowledge, attitudes, and referral practices in rabies and its prevention among THPs. Odds ratios (OR) were used with a 95% confidence interval, and a probability (p) - value of ≤ 0.05 was considered statistically significant.

Results: Of the 204 THPs interviewed, 74% (150/204) were female. The median age was 43 years (inter-quartile range: 22-75 years). The majority of THPs had inadequate knowledge on rabies (80%, 163/204), and poor rabies referral practices (73%, 149/204). However, 91% (186/204) had positive attitudes toward human rabies prevention. Having practiced for a longer period (more than 10 years) (OR: 4.13 95%CI: 1.52-11.21) and being employed (OR: 3.74 95%CI:1.03-13.57) were associated with adequate rabies knowledge, good attitudes, and referral practices. Additionally, there was a significant association (p=0.019) between adequate knowledge and good referral practices.

Conclusion: Despite THPs in eThekwini District having positive attitudes towards rabies prevention, gaps exist in their knowledge and referral practices. It has also shown that improving their knowledge and attitudes might lead to better referral practices for PEP. A multidisciplinary approach is needed to control and possibly eliminate dog-mediated rabies by 2030.

Keywords: Human rabies, post-exposure prophylaxis, Traditional Health Practitioners, KwaZulu-Natal.

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LIST OF ABBREVIATIONS

WHO: World Health Organization

SA: South Africa

KZN: KwaZulu-Natal

KAP: Knowledge, Attitudes, and Practices

THP: Traditional Health Practitioners

DoH: Department of Health

HIV: Human Immunodeficiency Virus

AIDS: Acquired Immunodeficiency Syndrome

RABV: Rabies Virus

RNA: Ribonucleic Acid

VIF: Variation Inflation Factor

OR: Odds Ratios

IQR: Interquartile Range

SD: Standard Deviation

CI: Confidence Interval

NICD: National Institute for Communicable Diseases

SAFETP: South African Field Epidemiology Training Programme

SPH: School of Public Health

HREC: Health Research Ethics Committee

REDCap: Research Electronic Data Capture

CHAPTER 1: INTRODUCTION

This introductory chapter starts by providing the background of human rabies, it explains the burden of the disease, its distribution globally, in Africa and locally. Through the literature review, the chapter then dives into the cause, transmission and clinical features of human rabies. It also explains the steps for preventing human rabies, the challenges hindering prevention and the role of Traditional Health Practitioners in prevention. The chapter then ends by outlining the conceptual framework, hypothesis, aim and objectives of the study.

1.1 Background

1.1.1 The burden of human rabies

Human rabies is a fatal central nervous system disease that continues to be a global health problem especially in developing countries (1, 2). Globally, the disease causes approximately 59 000 deaths every year (1). With a fatality rate of over 99%, human rabies has the highest case fatality rate compared to all other infectious diseases (3). It is reported to kill one person every nine minutes, with almost half (40%) of the global deaths being in children under 15 years of age (1). Human rabies is also associated with the loss of an estimated 3.7 million disability-adjusted life years, and economic losses of at least 8.6 billion dollars annually (2, 4).

Although rabies is present in almost all continents, the burden of the disease is not equally distributed (1, 4). Studies that explore the distribution of the disease show that low to middle-income countries in Africa, Asia, and South America are the most affected (1, 2, 4, 5). Africa and Asia account for 95% of global human rabies deaths (1, 4). The World Health Organization (WHO) recognizes rabies as one of the most neglected diseases that is severely impacting poor rural communities in low and middle-income countries (1). This is because 99% of human rabies deaths are from developing countries and 80% of human rabies cases occur in the rural parts of the world (1, 2, 4).

In Africa, rabies is known to be endemic in almost all countries as no country has declared successful rabies elimination (6). An estimated 2 1476 (37%) of the annual global human

rabies deaths are from Africa alone (1, 2, 4). Although alarming, these figures are said to more likely be an underestimate (6-8). The underestimate might be due to the lack of laboratory confirmation of deaths, sporadic epidemiologic surveillance and underreporting in developing countries (6-8). Additionally, human rabies is often misdiagnosed as other neurological diseases like malaria and meningitis (7).

Although all mammals can be infected with rabies, more than 99% of human cases and deaths in Africa are dog-mediated (1, 9). It is estimated that dog-mediated rabies accounts for at least 23 760 deaths per year in Africa (1, 2). This pattern contrasts with that of countries in North America and Europe where dog-mediated rabies has been successfully eliminated (5). For example, rabies in the United States is now rare and only seen in wild animal vectors such as bats, skunks and raccoons (7). Similarly, foxes and bats are the primary sources of rabies in European countries (7).

1.1.2 The distribution of human rabies in South Africa

In South Africa (SA), suspected human rabies cases have been reported since the 1800s (10). However, the first laboratory-confirmed cases started being reported around 1928 (11). Since then, confirmed cases were reported intermittently until a spike fueled by domestic dogs in KwaZulu-Natal (KZN) Province was seen in the 1980s (10). Between 1983 and 2007, an average of approximately 14 laboratory-confirmed human cases per year were recorded in SA (10). From 2008 to 2018, the average number of laboratory-confirmed human rabies cases in SA decreased to approximately 10.5 cases per year (12). A total of 105 laboratory-confirmed cases were reported in this period with cases frequently reported from Eastern Cape (n=34), KZN (n=31), and Limpopo (n=22) Province (12).

The geographic distribution of human rabies in SA follows similar patterns even in recent years. Most human cases are still associated with domestic dogs in KZN, Eastern Cape, Mpumalanga, Free State, and Limpopo Province (13, 14). Between 2018 and 2021, SA recorded a cumulative of 53 laboratory-confirmed human rabies cases (13, 14). Almost half of the cases (n=24) were from KZN, followed by the Eastern Cape (n=19) and Limpopo (n=8) Province (13, 14).

In KZN, rabies elimination initiatives like the collaboration between the WHO, the Alliance for Rabies Control, Partners for Rabies Prevention, and the Bill and Melinda Gates Foundation have been successful in decreasing human rabies cases (15, 16). These initiatives started in 2008 focusing on increasing rabies awareness, dog vaccination, and post-exposure prophylaxis (PEP) access and availability in the KZN Province (15, 16). Through efforts like these, on 24 July 2011, KZN was able to celebrate its first year in more than two decades without a human rabies case (15, 16). However, the province had a rabies outbreak claiming the lives of five patients in the following year of 2012 (17).

In recent years, the eThekwini District of KZN accounts for the vast majority of SA's human rabies cases (12). For example, 75% (6/8) of the eight laboratory-confirmed cases reported in SA in 2020 originated from the eThekwini District of KZN (18). The eThekwini District also contributed 62% of the 13 laboratory-confirmed human rabies cases reported in SA between January 2020 and July 2021 (18). This led to several experts and media publications unofficially coining the eThekwini District as a rabies 'hot spot' (19, 20). Among the reasons cited by the experts was a large population of unvaccinated dogs due to low vaccine coverage in the eThekwini District (19).

1.2 Literature review

1.2.1 Human rabies disease

Human rabies is primarily caused by the rabies virus (RABV) (5, 21). The single-stranded ribonucleic-acid (RNA) virus belongs to the *Lyssavirus* genus, which stems from the *Rhabdoviridae* family of viruses (21-23). The virus commonly spreads to humans through contact with saliva of infected animals (5, 24). Human infection only happens when the saliva of a rabid animal enters the mucous membrane of eyes, nose, mouth, an open wound or broken skin of a person (23). The risk of transmission is known to be low in cases of non-bite exposure or where the skin of the exposed person is intact (1, 25). In rare cases, human-human transmission can occur through organ transplants, when the organ donor had undiagnosed rabies (26, 27).

After primary infection through a bite, the rabies virus passes through the skin and infects peripheral nerves, before spreading to the central nervous system (28). The incubation period of the disease varies between people and can range between a week and one year but is usually about two to three months (5, 25). Bites on the head, multiple bites, and severe wounds are associated with shorter incubation periods (29). Single bites, bites below the waist and smaller wounds are associated with longer incubation periods (29). The virus continuously replicates in the body and once it reaches the central nervous system (prodromal phase) clinical signs and symptoms begin to show (22, 29).

The initial symptoms of human rabies are usually similar to those of common influenza including general body weakness, fever, and headache (25, 29). As the disease progresses, more severe symptoms including exposure site pruritus, hydrophobia, excessive salivation, anxiety, confusion, hallucination, delirium, and agitation develop (25, 29). Once clinical signs and symptoms are seen in rabies-exposed individuals, the disease is almost always fatal (1, 2, 21).

1.2.2 Human rabies prevention

Although there is no cure for rabies, the disease is vaccine-preventable in both animals and humans (1, 5). The prevention of human rabies starts with preventing the disease from the

source animals (5, 25, 30, 31). Vaccination of animals against rabies is said to be the most cost-effective way of protecting humans from the deadly disease (7, 31). Campaigns for vaccinating dogs in masses have been a successful strategy in reducing the prevalence of rabies in several countries in Africa, Asia, Europe and America (5, 30, 31). Several studies have shown that the control of rabies in dogs through animal vaccination programs directly reduces the incidence of human rabies (32-34). Even if prevention fails at animal level, prevention is still possible in humans (1).

To prevent rabies in humans, the WHO has developed prevention guidelines that are divided into two, preclinical management and clinical management (35). The preclinical management guidelines are steps that should be taken immediately after possible exposure before a person presents to a healthcare facility (35). These preclinical steps include washing the exposure site or bite wound with running water for at least 15 minutes (35, 36). After washing, the wound should be disinfected with virucidal substances such as soap or disinfectants, and the exposed individual should seek medical care immediately to receive PEP (35, 36). About one-third of rabies infections can be prevented through appropriate washing and disinfection of wounds (37). Preclinical practices that deviate from these recommendations like treating wounds with snuff powder, salt, or chilies have been reported in several studies and are associated with a higher risk of rabies infection (36, 37).

The clinical management guidelines outline steps that should be taken when a person exposed to rabies presents to a healthcare facility (35, 36). The WHO recommends the provision of PEP through an anti-rabies vaccine and immunoglobulin depending on the nature and category of the exposure (1, 35). Animal exposure through bites, scratches and mucous membrane contact is categorized into three categories by order of severity (35, 38). Category one, the least severe, is when an individual was touched or licked on intact skin by a possibly infected animal (35, 38). Category two is nibbling of uncovered skin, minor scratches or abrasions without bleeding (35, 38). Category three, the most severe, is a single or multiple bites or scratches that penetrated the skin, licks on broken skin or mucous membranes like the eyes and the mouth (35, 38).

At a healthcare facility, PEP is commonly given as an anti-rabies vaccine on day number 0, 3, 7, and 14 after possible exposure as well as immunoglobulin for category two and three exposure (35, 38). The sooner PEP commences after exposure, the more likely it is to prevent the exposed individual from developing human rabies (35). Timely and correct administration of PEP is almost 100% effective in preventing deaths from human rabies (39). The prevention also includes the provision of pre-exposure prophylaxis through a similar vaccine for people at-risk, such as those working with animals that might be infected (35, 38).

1.2.3 Problems hindering human rabies treatment and prevention

1.2.3.1 Delays in initiating post-exposure prophylaxis

In 2015, the WHO set a goal to reduce human dog-mediated rabies deaths to zero globally by 2030 (1, 30). The WHO's 'zero by 30' strategic plan outlines that elimination of dog-mediated rabies by 2030 is feasible through setting and achieving key objectives (1). The first objective under the strategic plan focuses on increasing access and use of rabies vaccines including PEP (1). Availability, access and appropriate administration of PEP without delay in animal bite patients is paramount to meet this objective (30). Despite the need for animal bite patients to receive PEP promptly, studies show that with many animal bite patients, PEP initiation is delayed (40).

There are several factors reported to be associated with a delay in PEP initiation after exposure. Some factors are related to the healthcare system such as the unavailability of vaccines in hospitals, and the high cost of PEP (41). For example, one study in Tanzania reported that families of animal bite patients sometimes had to sell their livestock to pay for the expensive cost of PEP (42). In countries where rabies PEP and immunoglobulin are given free of charge and available in most hospitals, other personal factors of animal bite patients might be more reasonable for delays (43). These include factors like poor rabies and PEP awareness, or undermining the risk of exposure by the animal bite patients, as is the case for South Africa (43).

Studies also show that animal bite patients from rural low-socioeconomic backgrounds tend to delay seeking care after exposure (43, 44). There are still areas in Sub-Saharan Africa where

access to PEP is limited and animal bite patients have to travel for long distances to get PEP intervention (42-44). The lack of transport and having to travel for long distances to get PEP are also some of the factors that are associated with delays or no PEP initiation (41-43). When this happens, they usually seek help from nearby Traditional Health Practitioners (THPs) (40). The problem is that the route to seeking care from THPs might further delay or stop the individual from receiving PEP (40, 44).

1.2.3.2 Traditional Health Practitioners as a factor hindering prevention

THPs are an accepted and integrated form of healthcare in many areas of the world (45). The WHO defines a THP as “a person who is recognized by the community where he or she lives as someone competent to provide healthcare by using plant, animal and mineral substances and other methods based on social, cultural and religious practices” (46). Traditional health practices are influenced by history, culture, and personal attitudes which makes them vary greatly across the world (45). In Africa, it has been approximated that about 80% of primary care needs are met through traditional health practices (47). This might be because traditional medicine has been used to treat various diseases long before the introduction of conventional medicine in Africa (48).

In rural communities especially, many animal bite patients initially seek help from THPs long before they consider conventional health facilities (40, 44). The reasons for seeking treatment from THPs after an animal bite include THPs being more accessible, less expensive, trusted to cure rabies and providing a more culturally relatable explanation of illness (40, 43, 44, 49). THPs usually speak the same language as the animal bite victim, and they tend to spend more time explaining the diagnosis, cause and treatment of the illness to the patient (49). There is also a wide belief in Sub-Saharan Africa that THPs treat conditions caused by spirits, spells, and sorcery better than conventional health practitioners (50). In some African countries, animal bite patients believe that dog bites and rabies are caused by a curse or spell (40). These factors are usually why primary health-seeking behaviors in African animal bite patients usually tend to lean more on traditional medicine.

With THPs being more accessible, relatable, and trusted by communities, they form an important pillar of primary healthcare (51). However, several studies conducted in Sub-Saharan Africa show that THPs delay conventional health services to acutely ill patients (49,

52). Despite animal bite patients needing to seek healthcare immediately to receive PEP, seeking help from THPs usually further delays or inhibits them from reaching healthcare facilities (44, 49, 52). This suggests that collaboration with THPs can ensure appropriate preclinical management and timely referral of animal bite patients for PEP (40). This could decrease PEP initiation delays and rabies mortality (40). However, not much is known about THPs knowledge, and perceptions regarding animal bites and the prevention of human rabies (40, 53). There is very little information available about how they manage animal bite wounds and if they have sufficient knowledge of rabies, rabies vaccination, and immunoglobulin and their willingness to refer their animal bite patients to medical facilities for rabies PEP in accordance with national guidelines (53).

1.2.4 Traditional Health Practitioners as key role players in healthcare

The WHO and the African Union recognized the vital role played by THPs in communities and encouraged governments to incorporate them in healthcare delivery (54). Countries like Ghana and Ethiopia have been successful in integrating THPs into the healthcare system (55). The SA government through the National Department of Health (DoH) has taken great strides in trying to incorporate THPs into the healthcare system to enhance healthcare resources (56). THPs practice under one regulatory body in SA and are recognized as vital stakeholders in community healthcare (56).

THPs play a pivotal role in the screening, referral and management of various deadly diseases in the African region (40, 57). Evidence was seen in West Africa for example, where THPs and religious healers were willing to see, care for and refer patients suspected of having the deadly Ebola Virus Disease (57). Similarly, studies done in SA have shown that THPs play an important role in the management of HIV/AIDS, especially in rural populations (51). Even though they might not be involved in the clinical management of diseases, the role they play in screening, referring, and educating patients on diseases leads to positive health outcomes (40). Usually, this can be achieved through a good relationship between THPs and conventional medicine and after capacitating them with knowledge through educational interventions (58).

1.2.5 The gap - THPs' knowledge, attitudes and practices regarding animal bites and human rabies

Although THPs are considered an essential part of primary healthcare and a preferred healthcare alternative in SA, not much is known about their knowledge levels, perceptions, and referral practices regarding human rabies. Currently, we found no studies conducted in SA on the knowledge, attitude, and practices (KAP) of THPs regarding animal bites and human rabies. According to one KAP study which included THPs in Ethiopia, 91% of the THPs believed that traditional medicine is an effective standalone treatment for rabies (59). Most KAP studies on rabies and its prevention conducted in SA and other African countries were conducted on other populations like healthcare workers and community members (24, 60-65).

Inadequate levels of knowledge, negative attitudes and ineffective practices among community members were found in KAP studies conducted in Mozambique, Tanzania and Burkina Faso (60, 65, 66). Knowledge gaps, attitudes and practices that need to improve were also found even among human and animal healthcare workers in a KAP study done in Senegal (63). KAP studies conducted among other populations such as health sciences university students also showed similar findings (64).

Most previous rabies related KAP studies agree on the relationships between socio-demographic characteristics, knowledge, attitudes and practices on rabies (9, 61, 67). Most have found that factors like age, sex, place of residency, education level and employment usually are significantly associated with knowledge, attitudes and practices on rabies (60, 62-64). KAP studies that also explore the relationship between knowledge, attitudes and practices suggest that increased knowledge improves attitudes and practices, resulting in better health outcomes (9, 62, 63, 68). In the context of THPs, other non-rabies-related studies show better referral practices by THPs achieved through increasing knowledge by educational initiatives/interventions (58).

Educational interventions amongst THPs have been proven to increase the referral rate to conventional health (58). A study done in Mozambique showed a 35% increase in referral rates of patients suspected of HIV from THPs after formally being educated on the disease

(58). A similar approach can also be taken with animal bite patients. THPs can play a crucial role in screening and referring animal bite patients and educating and encouraging them to start and finish their PEP course. However, before educating and incorporating THPs as formal rabies prevention stakeholders, their knowledge, attitudes, and referral practices towards rabies have to be assessed (69). Also, baseline knowledge levels assessed through KAP studies are pivotal in measuring the effectiveness of educational interventions (69).

1.3 KAP Conceptual framework

Based on rabies-related KAP studies done on other study populations in SA and other African countries, we formulated a similar hypothesis. We hypothesized that inadequate knowledge and negative attitudes on human rabies and its prevention and interventions were associated with poor referral practices among THPs in the eThekwini District. To summarize our hypothesized relationship between THPs knowledge, attitudes and referral practices regarding rabies, we developed a conceptual framework.

The framework positions socio-demographic characteristics of THPs as possible determinants of knowledge, attitudes and referral practices. As with previous KAP studies, the socio-demographic characteristics included sex, age, the type of THP, education levels and the number of years in practice. It then positions knowledge and attitudes of THPs as possible determinants of referral practices to conventional health for PEP. Appropriate preclinical management of animal bite wounds and the prompt referral for PEP by THPs is placed as the needed outcome that will contribute to decreasing human rabies deaths (Figure 1.1).

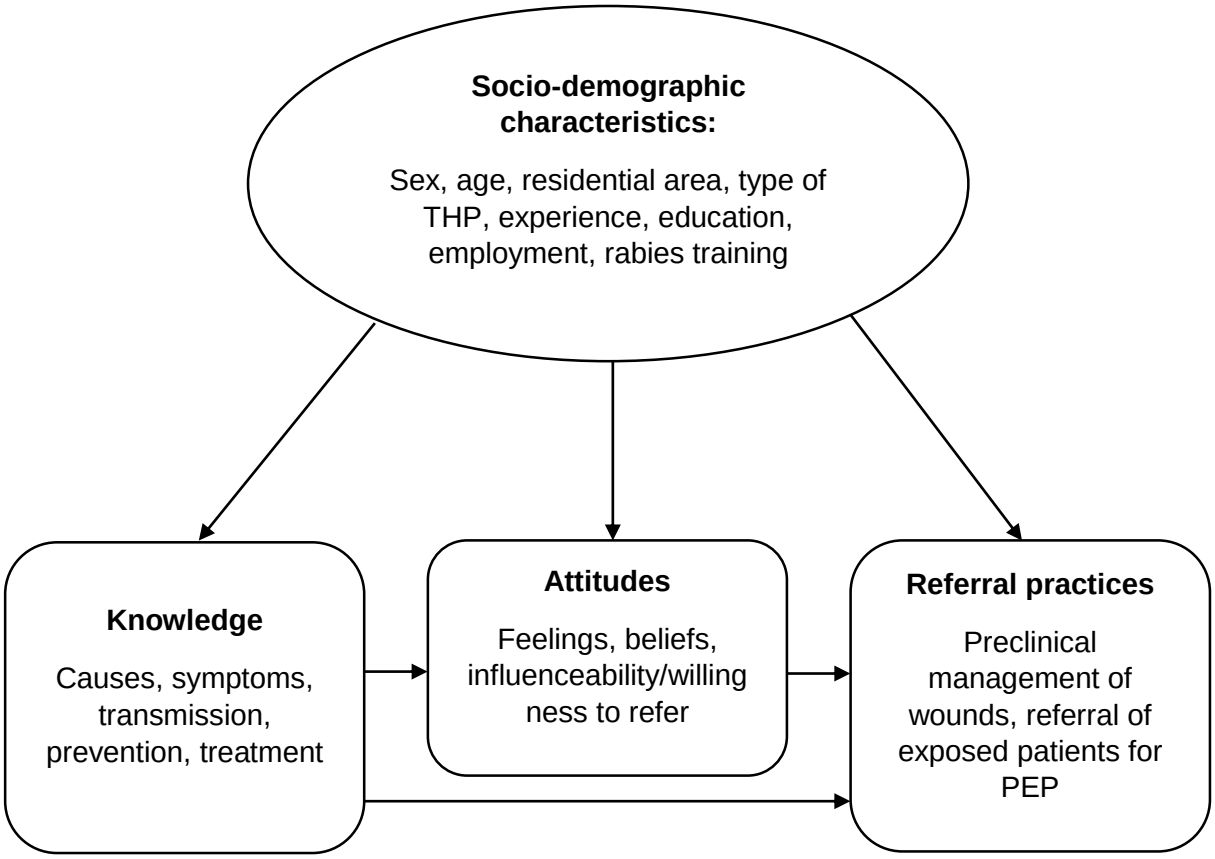

Figure 1.1: Conceptual framework on the association between Traditional Health Practitioners' socio-demographic characteristics, knowledge, attitudes and referral practices on human rabies

1.4 Problem statement

The eThekwini Health District is an epicenter of rabies in the KZN Province with an increase in the number of human rabies-related deaths in recent years (18-20). Case reports from KZN show that most animal bite patients seek help from THPs before considering conventional health services (18). This leads to delay or non-referral for PEP to healthcare centers resulting in death. Urgent measures are needed to help reduce human rabies incidence and deaths in the district by bridging the referral gap between THPs and conventional health services.

1.5 Justification

There are currently no studies conducted on the knowledge, attitudes, and referral practices regarding human rabies and its prevention among THPs in SA. This KAP study may help shed light on the knowledge that THPs have regarding animal bites and rabies, their perceptions, and

how they usually handle cases. The study findings might help the KZN provincial DoH understand the educational needs of local THPs regarding human rabies.

Understanding the awareness of THPs on rabies will allow educational interventions and engagements to be modified and made more effective. This will help with appropriate preclinical management, early detection and immediate referral for PEP in the district and province. A successful rabies referral relationship between THPs and conventional health facilities in the province and the country might help in achieving the WHOs global rabies elimination by 2030 goal.

1.6 Research question, study aim and objectives

1.6.1 Research question

Is there an association between socio-demographic characteristics, knowledge, attitudes, and referral practices regarding human rabies among THPs in eThekwini Health District, Kwazulu-Natal, South Africa?

1.6.2 Study aim

The study aims to assess knowledge, attitudes, and referral practices regarding animal bites and human rabies prevention and factors associated with these referral practices of THPs eThekwini Health District KZN.

1.6.3 Study objectives

1. To assess the knowledge, attitudes, and referral practices of THPs regarding human rabies prevention in patients with an animal bite history in 2022.
2. To identify factors associated with THP referral practices of animal bite patients to conventional health in 2022.

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CHAPTER 2: SUBMISSABLE MANUSCRIPT

Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District in KwaZulu-Natal Province, South Africa, 2022

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2.1 Manuscript abstract

Background: Despite the availability of effective post-exposure prophylaxis (PEP), South Africa records about 10 human rabies deaths each year. Many animal bite patients initially seek help from Traditional Health Practitioners (THPs) before considering conventional healthcare facilities. Prompt referral of animal bite patients for PEP initiation by THPs can be lifesaving. Our study aimed to assess the knowledge, attitudes, and referral practices regarding human rabies and the associated factors among THPs in eThekwini District, KwaZulu-Natal.

Methods: We conducted a cross-sectional study among registered THPs consulting patients in the eThekwini District. We used a structured standardized questionnaire to collect data. The questionnaire was administered through physical and telephonic interviews. We described socio-demographic characteristics using summary statistics. Multivariable logistic regression was used to analyze factors associated with knowledge, attitudes, and referral practices of

human rabies. Odds ratios (OR) were used with a 95% confidence interval, and a probability (p)-value of ≤0.05 was considered statistically significant.

Results: We interviewed 204 THPs, and 74% (150/204) were female. The median age was 43 years (inter-quartile range: 22-75 years) and 31% (64/204) had over 10 years of experience. The majority of THPs had inadequate knowledge (80%, 163/204), and poor referral practices (73%, 149/204). However, 91% (186/204) had positive attitudes toward human rabies prevention. Having more experience was associated with adequate knowledge (p<0.01), and positive attitudes (p=0.02). THPs who had adequate knowledge (aOR:2.30 95% CI: 1.12-4.75) and positive attitudes (aOR:1.21 95% CI: 0.37-3.89), had higher odds of having good referral practices.

Conclusion: Despite THPs in eThekwini District having positive attitudes towards rabies prevention, gaps exist in their knowledge and referral practices. The study highlights that improving their knowledge and attitudes might lead to better referral practices of animal bite patients for PEP initiation. A multidisciplinary approach that includes THPs is recommended to decrease human rabies deaths in eThekwini District.

2.2 Introduction

Rabies is a devastating neglected tropical disease that is reported to kill one person every nine minutes globally (1). The fatal viral infection commonly spreads to humans through contact with saliva of infected animals (2, 3). Although all mammals can be infected with rabies, more than 99% of human cases and deaths in developing countries are dog-mediated (1, 4). Despite being vaccine-preventable, rabies continues to be a global public health problem causing approximately 59 000 human deaths globally every year (1). It is estimated that 80% of human rabies cases occur in rural areas of developing countries, and almost half (40%) of the global deaths are in children under 15 years of age (1, 5). Hence low and middle-income subtropical countries in Africa are among the most affected, contributing an estimated 24 000 (44%) of the annual global human rabies deaths (1, 6).

In South Africa (SA), poor preclinical management of animal bites, and the lack of seeking PEP after exposure are key enablers making human rabies to continue to be a public health

problem (7-10). Just between 2018 and 2021, SA recorded a total of 53 laboratory-confirmed human rabies cases (7-9). The majority of these cases were from the KwaZulu-Natal (KZN) Province (46%), followed by the Eastern Cape (37%) and Limpopo (15%) Province (8, 9). Although community rabies awareness and mass dog vaccination campaigns in the KZN Province have helped decrease human rabies cases, the province still contributes the majority of laboratory-confirmed cases in SA (11-13). Furthermore, in recent years, the eThekwini District of KZN accounts for the majority of cases not only in the KZN Province but also nationally (7-10). The eThekwini District accounted for 75% of the laboratory-confirmed cases reported in SA in 2020, and 62% of those between January 2020 and July 2021 (7-9).

SA is one of the member states under the World Health Organization's (WHO) target to eliminate dog-mediated rabies by 2030 (14). One of the key elements under the strategic elimination plan to reduce cases to zero globally is improving affordability, access, and timely administration of post-exposure prophylaxis (PEP) (1, 14). In exposed individuals, the WHO's rabies elimination and prevention guidelines encourage the washing of animal bite wounds with running water for at least 15 minutes (1). After washing, the wound should be disinfected with virucidal substances such as soap or disinfectants, and the exposed individual should seek medical care immediately to receive PEP (1, 15). Timely and appropriate administration of PEP is almost 100% effective in preventing human rabies mortality (16). Despite the availability of free PEP in SA, the country still experiences delays or no PEP initiation and records about 10 human rabies deaths every year (5, 8, 9).

Human rabies case reports in the KZN Province and the eThekwini District show frequent non or late presentation for PEP by animal bite patients (10). Similar to other African countries, animal bite patients especially in rural settings initially seek treatment from Traditional Health Practitioners (THPs) (17-19). They then consider conventional healthcare facilities as their last option, usually presenting with advance clinical symptoms (18, 19). Seeking health-related care from THPs is one of the most common practices in SA and Sub-Saharan Africa (20, 21). In fact, almost 80% of primary healthcare needs in Africa are met through traditional health practices (21). THPs are usually more accessible, less expensive, trusted, and provide an explanation of the illness in a more relatable way using the local language (15, 17, 18). This makes THPs an important pillar of primary healthcare, especially in rural communities that can

help with preclinical management, referral, and rabies education if knowledgeable and willing (20, 22).

THPs in SA are recognized as vital stakeholders in primary healthcare and practice under one regulatory body, known as the Traditional Practitioners Council of South Africa (23, 24). The SA government through the National Department of Health (DoH) has also taken great strides in trying to incorporate THPs into the healthcare system to improve healthcare access and resources (24). Local studies show that they play an important role in the management of HIV/AIDS, especially in rural populations through patient screening, referral, and education (20).

A good viable referral system between THPs and conventional healthcare is usually achieved through capacitating THPs with knowledge of the illness through educational interventions (25). Educational interventions amongst THPs have been proven to increase the referral rate to conventional health significantly (25). A similar approach can be taken with human rabies through educating and incorporating THPs into primary healthcare for early PEP access and initiation. However, not much is known about their knowledge, attitudes, and referral practices regarding animal bites and prevention of rabies.

There are currently no studies conducted in SA that assess the knowledge levels and perceptions of THPs regarding human rabies. Very little is known about how they manage animal bite wounds and if they are willing to refer patients to conventional health facilities for PEP. The aim of the study was to undertake a knowledge, attitudes and referral practices survey among THPs in eThekwini District. The assessment would help understand the educational needs of local THPs and their willingness to collaborate and refer animal bite patients. Understanding their knowledge levels and awareness will also allow educational interventions to be modified and made more effective. A good referral relationship with THPs that have been educated about rabies and formal PEP administration might help with early detection and referral of animal bite patients for PEP without delay.

2.3 Methods

2.3.1 Study design

We conducted a primary study that employed an analytical cross-sectional study design.

2.3.2 Study setting

We conducted the study in eThekwini District, KZN Province, SA. KZN is an eastern coastal province with the 2nd biggest population in SA (26). It is divided into 11 districts and eThekwini is one of them. The district is divided into five sub-districts (Central, North, South, inner West & Outer West) with a mix of rural, semirural and urban areas (26). The eThekwini District is the most populated district in KZN, with an estimated population of 3 987 648 people, composed largely by the Zulu ethnic group (27).

2.3.3 Study population

The study population were all the THPs consulting patients around eThekwini District registered on the district's THP association database. The database had approximately 2 000 registered THPs divided into four categories of practitioners which included herbalists (izinyanga), diviners (izangoma), traditional birth attendants (ababelethisi), and faith healers (Abaprofethi or Abathandazi). All the THPs in the eThekwini's THP Association database were eligible for sampling.

Inclusion and exclusion criteria

The study included consenting THPs aged 18 years and older who were registered under eThekwini's THPs association. THPs who were still under training and supervision (amathwasa) of an experienced THP but consulting patients were included. Traditional birth attendants (ababelethisi) were excluded from the study since they did not consult animal bite patients.

2.3.4 Sample size

We estimated the sample size by considering 50% of the THP population knowing about rabies since there was no study about human rabies among THPs in the area. We used eThekwini's registered THP population (1 500, approximately 500 traditional birth attendants (ababelethisi) excluded), a 95% confidence interval, and a 5% margin of error to calculate the

sample size. Our required minimum sample size was calculated using the modified Cochran's Formula to be 307 THPs (28). Factoring in for a non-response rate of 20%, the study aimed to interview 384 THPs (Appendix 3).

2.3.5 Sampling strategy

We selected respondents using the convenience sampling method. This was by including all THPs who were available during the data collection period (June to July 2022), and gave consent to respond to the questionnaire to maximize the response rate.

2.3.6 Data collection method

We read the participants an information sheet (Appendix 4) explaining the purpose and objectives of the study before the interviews so that they were informed before consenting. We collected data using a structured standardized questionnaire (Appendix 6). The questionnaire included socio-demographic, knowledge, attitude, and referral practice questions. The questionnaire was adapted from a tool previously used during a THP KAP study on rabies in Ethiopia and modified (29). The Research Electronic Data Capture (REDCap) web application was used to develop the questionnaire (30). It was also used to collect and store data as it can capture responses both online and offline without an internet connection. Tablets installed with REDCap were used by the researchers to record participants' responses.

We administered the questionnaires through physical interviews conducted and led by the researcher or research assistant. Through the help of the THPs association, we held data collection gatherings in five different venues in each of the five sub-districts. THPs were invited to the gatherings by the THPs from the association responsible for each sub-district. THPs that could not attend the physical data collection gatherings were interviewed telephonically. An interview guide with pre-set close-ended questions was used during the interviews. The questionnaire and information sheet were available in isiZulu (the local language) and English to ensure understanding. The isiZulu versions of the documents were validated by an independent isiZulu speaker, reader, and writer from the health department.

2.3.7 Data management and analysis

We checked responses captured on REDCap for errors and inconsistencies. The unique anonymous participant identifiers that were generated by REDCap were used. We then imported the data from the questionnaires into STATA statistical software (Version 17) for cleaning and analysis. Data cleaning and management on STATA statistical software included creating, labelling, and renaming variables, and looking for and dropping duplicates. We used STATA statistical software (Version 17) for data analysis per objective. Firstly, we performed descriptive analysis using summary statistics to describe the socio-demographic characteristics of the THPs.

Secondly, we allocated scores to the answers for the knowledge, attitude and referral practice (KAP) section of the questionnaire. We calculated the KAP scores by giving a score of “0” for an incorrect and “1” for a correct answer. The highest possible score was for 14 for knowledge, five for attitudes and six for referral practice questions. We only assigned a score to respondents that answered all questions for that section. We used SA’s national guidelines for the prevention of rabies in humans to score knowledge, attitude, and referral practice answers as correct or incorrect. The scores were summarized using means with their standard deviations. To create binary variables, KAP scores equal to or above 60% were considered adequate knowledge, positive attitude, and good referral practices and otherwise for those less than 60%.

Thirdly, we categorized and considered the socio-demographic variables as explanatory variables against each of the binary outcomes of knowledge, attitude, and referral practice variables, respectively. The binary knowledge and attitude variables were also used as explanatory variables against the referral practice variable as an outcome. We used a Pearson chi-square test to test association between socio-demographic factors and binary KAP variables. We also used the Pearson chi-square test to test for association between the binary knowledge and attitudes variables and the binary outcome of the referral practice variable.

We used an automatic backward elimination approach to eliminate variables that are not significant predictors of outcomes. Only variables with a p-value < 0.2 were left by the

backward elimination approach to be included in the multivariable analysis. We conducted a multivariable logistic regression for each of the outcome variables, namely, knowledge, attitudes and referral practices. We entered explanatory variables into the multivariable model together with each adjusting for all other variables at the same time. Highly correlated variables were not entered in the multivariable model, a variation inflation factor (VIF) of > 10 was used to indicate multicollinearity. We considered variables with a probability (p)-value of ≤ 0.05 statistically significant in the multivariable analyses. To display results, we used bar graphs and tables. The tables included odds ratios (OR), adjusted OR, with their corresponding 95% confidence intervals (CI) and p-values.

2.3.8 Ethical considerations

An ethical clearance and approval certificate (M220123) was granted by the University of the Witwatersrand Health Research Ethics Committee (Appendix 7). Further permission to conduct the study and interview the THPs was granted by the KZN DoH African Medicine Directorate (Appendix 8), eThekwini District DoH office (Appendix 9), and the eThekwini THPs association (Appendix 10).

2.4 Results

A total of 204 THPs were interviewed (66% of target sample size). The median age of THPs was 43 years (inter-quartile range (IQR): 22-75 years) and 74% (150/204) were females. The majority of the THPs categorized themselves as Izangoma (Diviners) (51%, 105/204), followed by Izinyanga (Herbalists) (28%, 57/204), and Abaprofethi or Abathandazi (faith healers) (21%, 42/204). Most (78%, 160/204) of the THP's practices were located in a rural/semirural area (Table 2.1).

Slightly above a third (35%, 72/204) of the THPs have been practicing for 5-10 years. The median number of consultations done by the THPs was four patients (IQR: 2-5 patients) daily. About 46% (94/204), had secondary schooling as their highest level of education, followed by those with primary schooling (32%, 65/204). THPs who had tertiary education accounted for about 10% (20/204) of the studied population. Above half (56%, 115/204) had no formal employment (unemployed), they only relied on the income from their THP practices. Among the total interviewed, only seven (3%) previously attended a formal DoH rabies training.

Table 2. 1: Socio-demographic characteristics of Traditional Health Practitioners interviewed during the human rabies KAP study in eThekwini District, 2022

Socio-demographic characteristics of THPs	Frequency (n)	Percentage (%)
Sex		
Male	54	26
Female	150	74
Age		
18-29	33	16
30-39	56	27
40-49	48	24
50-59	23	11
60-69	32	16
>70	12	6
Location of practice		
Rural/semirural	160	78
Urban	44	22
Category of THP		
Izinyanga (Herbalist)	57	28
Izangoma (Diviner)	105	51
Abaprofethi or Abathandazi (faith healers)	42	21
Number of years practicing as a THP		
<5 years	68	34
5-10 years	72	35
>10 years	64	31
Patients seen in a day		
≤5	162	79
>5	42	21
Highest formal education level		
No formal education	25	12
Primary education (Grade seven and less)	65	32
Secondary education (Grade eight to Matric)	94	46
Tertiary education and higher	20	10
Employment status		
Unemployed	115	56
Employed	52	26
Self-employed	37	18
Previous DoH rabies training attendance		
Yes	7	3
No	197	97

Abbreviations: THP=Traditional Health Practitioner, DoH: Department of Health, n=number

Knowledge about rabies

The majority (92%, 187/204) of THPs had heard of rabies before, and 87% (178/204) of THPs knew what the cause of rabies was. Seventy-six percent (155/204) of THPs were able to give at least one sign or symptom of rabies in humans. The THPs scored a mean score of 2.80 (standard deviation (SD): 2.23) out of nine possible common signs and symptoms. Only 26% (53/204) of THPs correctly answered that rabies is not curable. More than three-quarters (76%, 156/204) knew that there is a vaccine to prevent illness after an animal bite, and 89% (182/204) knew that rabies is deadly. Overall, the interviewed THPs scored a mean knowledge score of 6.50 (SD: 2.61) out of a total of the 14 points possible (Table 2.2).

Attitudes towards rabies

Only 46% (93/204) of the THPs responded that they felt safe when consulting patients with a history of an animal bite. The majority (90%, 184/204) agreed that rabies is a dangerous disease but only 63% (129/204) agreed to the killing of a stray dog that has bitten someone. Almost 90% (182/204) agreed that the vaccination of animals against rabies is important, and 88% (180/204) revealed that they are open to working with the DoH to reduce the incidence of human rabies in eThekwini District. Overall, the THPs scored a mean attitude score of 3.76 (SD: 1.04) out of a total of the five points possible (Table 2.2).

Rabies referral practices to conventional healthcare

When asked about what they do or would do when an animal bite victim presents to them, 77% (158/204) of THPs gave answers that included an urgent referral to a hospital/clinic. Amongst these answers, 92% (146/158) opted for exclusive urgent referral, and 8% (12/158) opted for treating the wound with traditional medicine first and then referring. The remaining (23%, 46/204) opted for treating with traditional medicine only (20% 40/204) or sending the animal bite victim to a nearby pharmacy (3%, 6/204).

Only 29% (60/204) of the THPs had ever referred an animal bite victim to a healthcare center. Seventeen percent (34/204) reported that they only use traditional medicine to help the patients. Nearly half (47%, 95/204) reported normally washing bite wounds with soap and water, but more than two-thirds (81%, 165/204) reported encouraging patients to finish their course of PEP. Overall, the THPs scored a mean practice score of 2.85 (SD: 1.12) out of a total of six points possible (Table 2.2).

Table 2. 2: Knowledge, attitudes and referral practice scores regarding human rabies among Traditional Health Practitioners in eThekwini District 2022

Frequency of THPs who correctly answered questions	**Frequency (%)***	**Mean score**	**SD**
Knowledge			
Have you ever heard of rabies before? [1]	187 (92)	0.92	0.27
What causes rabies? [1]	178 (87)	0.87	0.33
What are the signs and symptoms of human rabies? [9]	155 (76)	2.80	2.23
Is rabies curable? [1]	53 (26)	0.26	0.43
There is a vaccine to prevent rabies after an animal bite [1]	156 (76)	0.76	0.43
Can rabies kill a person? [1]	182 (89)	0.89	0.31
Total score possible for section [14]		6.50	2.61
Attitudes			
I feel safe consulting patients with a history of an animal bite [1]	93 (46)	0.45	0.49
Rabies is a dangerous disease [1]	184 (90)	0.90	0.29
A stray dog that bites someone should be caught and killed [1]	129 (63)	0.63	0.78
It is important to vaccinate animals against rabies [1]	182 (89)	0.89	0.31
I am open to working with the DoH to reduce rabies deaths in the district [1]	180 (88)	0.88	0.32
Total score possible for section [5]		3.76	1.04
Referral practices			
What do/would you do when someone presents with a history of an animal bite? [1]	158 (77)	0.77	0.41
Have you ever referred an animal bite victim to the clinic or hospital? [1]	60 (29)	0.29	0.45
Do you normally ask animal bite patients about their rabies vaccination status when presenting to your practice? [1]	70 (34)	0.34	0.47
I use traditional medication ONLY to help patients that present with an animal bite history [1]	34 (17)	0.16	0.37
I normally wash an animal/dog bite victim's wound with soap and water [1]	95 (47)	0.46	0.50
I normally encourage animal bite patients to finish their course of rabies vaccines at the hospital [1]	165 (81)	0.80	0.39
Total score possible for section [6]		2.85	1.12

*Table only includes frequencies and percentages of THPs who gave a positive response (agree/yes) for each question. The total number of responses received is given when a question is not binary (agree/disagree). The total score possible for each response are indicated in square brackets.
Abbreviations: THP=Traditional Health Practitioner, SD=Standard deviation, DoH=Department of Health

Overall status of knowledge, attitudes and referral practices towards rabies

Figure 2.1 below shows the frequency distribution of THPs scores for each area the questionnaire assessed. The results show that most THPs (80%, 163/204) did not have adequate knowledge (scored below 60%) on rabies. Furthermore, most THPs (73%, 149/204)

had poor (scored below 60%) rabies referral practices. However, the vast majority (91%, 186/204) had positive (scored above 60%) attitudes toward human rabies and its prevention.

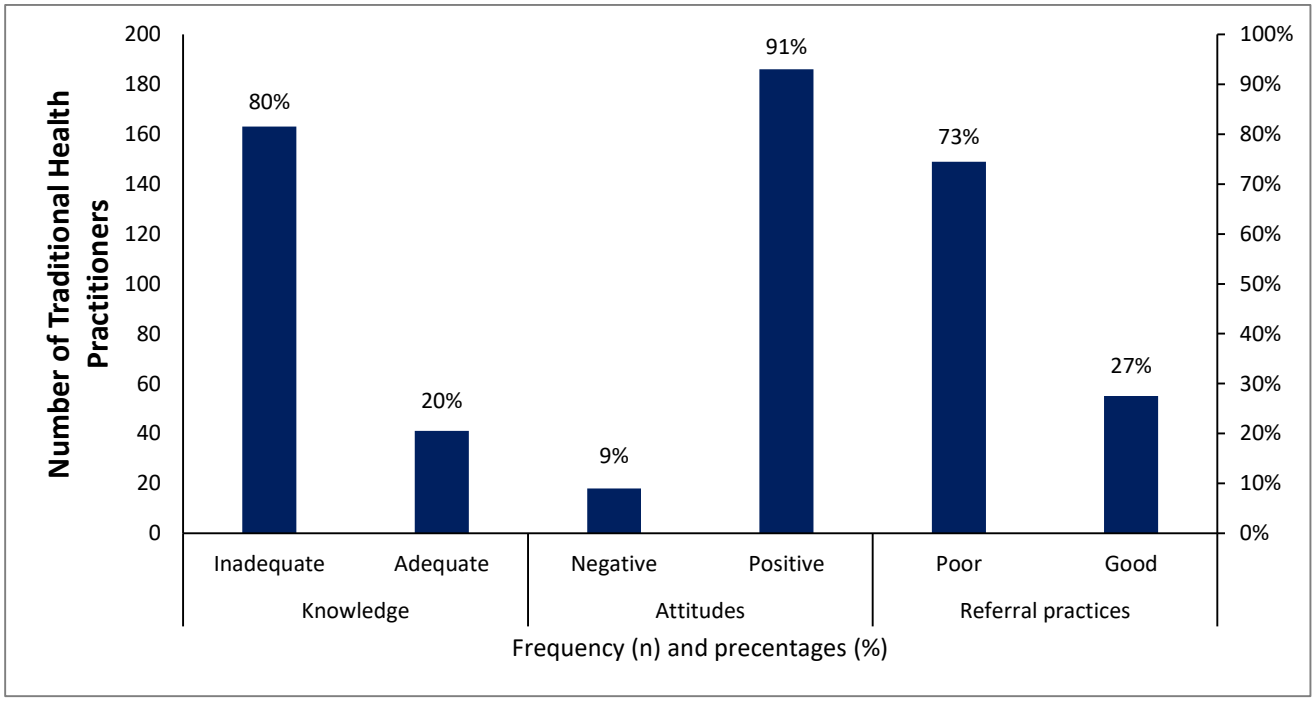

Figure 2.1: Overall scores indicating knowledge, attitudes, and referral practices among THPs in eThekwini District 2022

Association between THPs socio-demographic characteristics and knowledge, attitudes and referral practices

There was a statistically significant (p=0.025) association between THPs sex and attitudes, with more females having a positive attitude (94%) compared to males (83%). There was also a statistically significant (p=0.016) association between the category of the THP and their attitudes. Izangoma (Diviner) had more positive attitudes (96%) compared to Izinyanga (Herbalist) (88%) and Abaprofethi or Abathandazi (faith healers) (83%). (Table 2.3).

THPs who practiced for more than 10 years (98%) had positive attitudes compared to those who had practiced for less than five years (90%), and five to ten years (86%) at a statistically significant (p=0.036) level. Similarly, there was also marginal evidence (p=0.076) of an association between the number of years in practice and rabies knowledge. THPs who practiced for more than 10 years (28%) had adequate knowledge compared to those who have practiced for less than five years (21%) and five to ten years (13%).

The employment status of THPs was associated with their knowledge with marginal significance (p=0.052). THPs who were employed (31%) had adequate knowledge compared to those who were unemployed (18%) or self-employed (11%). Lastly, there was also marginal evidence (p=0.086) of an association between previous DoH rabies training attendance and referral practices. THPs who had previously attended a rabies training (57%) mostly had good referral practices compared to those who had not attended (26%).

Table 2. 3: Test of associations between THPs socio-demographic characteristics and knowledge, attitudes and referral practices towards human rabies (n = 204)

Socio-demographic characteristics	**Knowledge**		**Attitudes**		**Referral practices**	
	Adequate(%*)	**P value**	**Positive(%*)**	**P value**	**Good(%*)**	**P value**
Sex						
Male	8 (15)	0.259	45 (83)	**0.025**	15 (28)	0.875
Female	33 (22)		141 (94)		40 (27)	
Age						
40 years and younger	18 (19)	0.755	82 (87)	0.066	24 (26)	0.671
Above 40 years	23 (21)		104 (95)		31 (28)	
Location of practice						
Rural/semirural	32 (20)	0.947	145 (91)	0.769	45 (28)	0.475
Urban	9 (20)		41 (93)		10 (23)	
Category of THP						
Izinyanga (Herbalist)	8 (14)	0.391	50 (88)	**0.016**	16 (28)	0.489
Izangoma (Diviner)	23 (22)		101 (96)		25 (24)	
Abaprofethi or Abathandazi (faith healers)	10 (24)		35 (83)		14 (33)	
Number of years practicing as a THP						
<5 years	14 (21)	**0.076**	61 (90)	**0.036**	18 (26)	0.379
5-10 years	9 (13)		62 (86)		16 (22)	
>10 years	18 (28)		63 (98)		21 (33)	
Patients seen in a day						
≤5	31 (19)	0.501	146 (90)	0.377	45 (28)	0.606
>5	10 (24)		40 (95)		10 (24)	
Highest formal education level						
No formal education	5 (20)	0.990	24 (96)	0.704	4 (16)	0.187
Formal education	36 (20)		162 (91)		51 (28)	
Employment status						
Unemployed	21 (18)	**0.052**	107 (93)	0.438	28 (24)	0.354

Employed	16 (31)		47 (90)		18 (35)	
Self-employed	4 (11)		32 (86)		9 (24)	
Previous DoH rabies training attendance						
Yes	3 (42)	0.146	7 (100)	1.000	4 (57)	**0.086**
No	38 (19)		179 (90)		51 (26)	

*Table only includes percentages of THPs who had adequate knowledge, positive attitudes and had good referral practices within each level of the covariates. Abbreviations: THP=Traditional Health Practitioner, DoH= Department of Health, Bolded p-values are significant or marginally significant

Univariate analysis

The odds of having adequate rabies knowledge were 2.73 times higher for THPs who have practiced for more than 10 years than the THPs who practiced for five to 10 years (Odds Ratio (OR): 2.73 95% CI: 1.12-6.64). THPs who were employed had three times higher odds of having adequate knowledge than those who were self-employed (OR: 3.66 95% CI:1.11-12.09). Additionally, THPs who had prior training on rabies had 3.13 higher odds of having adequate knowledge than those who did not (OR:3.13 95% CI: 0.67-14.61) although non-significant. Female THPs had three times higher odds of having a positive attitude compared to their male counterparts (OR:3.13 95% CI: 1.17-8.37). THPs who had practiced for more than 10 years also had ten times higher odds of having a positive attitude towards rabies compared to THPs that practiced for five to 10 years (OR:10.16 95% CI: 1.26-81.76) (Table 2.4).

Table 2. 4: Univariate analysis of THPs socio-demographic characteristics and knowledge, attitudes and referral practices towards human rabies (n = 204)

Socio-demographic characteristics	**Knowledge**		**Attitudes**		**Referral practices**	
	OR (95% CI)	**P value**	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Sex						
Male	Ref.		Ref.		Ref.	
Female	1.62 (0.69-3.77)	0.262	3.13 (1.17-8.37)	**0.023**	0.94 (0.47-1.89)	0.875
Age						
40 years and younger	Ref.		Ref.		Ref.	
Above 40 years	1.11 (0.56-2.22)	0.755	2.53 (0.91-7.04)	0.074	1.14 (0.61-2.13)	0.70
Location of practice						
Rural/semirural	Ref.		Ref.		Ref.	

Urban	1.02 (0.44-2.35)	0.947	1.41 (0.39-5.12)	0.598	0.75 (0.34-1.64)	0.476
Category of THP						
Izinyanga (Herbalist)	Ref.		Ref.		Ref.	
Izangoma (Diviner)	1.71 (0.71-4.13)	0.228	3.53 (0.98-12.64)	0.052	0.80 (0.38-1.66)	0.552
Abaprofethi or Abathandazi (faith healers)	1.91 (0.68-5.36)	0.217	0.7 (0.22-2.17)	0.537	1.28 (0.54-3.03)	0.574
Number of years practicing as a THP						
5-10 years	Ref.		Ref.		Ref.	
<5 years	1.81 (0.72-4.52)	0.201	1.40 (0.50-3.93)	0.517	1.26 (0.58-2.73)	0.558
>10 years	2.73 (1.12-6.64)	**0.026**	10.16 (1.26-81.76)	**0.029**	1.70 (0.79-3.66)	0.168
Patients seen in a day						
≤5	Ref.		Ref.		Ref.	
>5	1.32 (0.58-2.97)	0.501	2.19 (0.48-9.93)	0.309	0.81 (0.36-1.78)	0.606
Highest formal education level						
No formal education	Ref.		Ref.		Ref.	
Formal education	1.00 (0.35-2.86)	0.990	0.39 (0.5-3.12)	0.380	2.09 (0.68-6.39)	0.195
Employment status						
Self-employed	Ref.		Ref.		Ref.	
Unemployed	1.84 (0.58-5.76)	0.293	2.08 (0.63-6.83)	0.223	1.00 (0.42-2.37)	0.998
Employed	3.66 (1.11-12.09)	**0.033**	1.46 (0.39-5.48)	0.568	1.64 (0.64-4.23)	0.300
Previous DOH rabies training attendance						
No	Ref.				Ref.	
Yes	3.13 (0.67-14.61)	0.145			3.81 (0.82-17.63)	0.086

Abbreviations: Odds Ratio, CI= Confidence interval, THP=Traditional Health Practitioner, DoH= Department of Health, Ref= Reference group, Blank OR= Removed because of collinearity, Bolded p-values are significant or marginally significant

Multivariable analysis

We included category of THP, number of years practicing, and employment status in the final model as predictors of knowledge. Adjusting for the other variables, the multivariable analysis showed that the odds of having adequate rabies knowledge were 4.13 times higher for THPs who have practiced for more than 10 years than they were for THPs who practiced for five to 10 years (aOR: 4.13 95% CI: 1.52-11.21). THPs who were employed had almost four times higher odds of having adequate knowledge than those who were self-employed (aOR: 3.74 95% CI:1.03-13.57).

The variables; sex, category of THP, and number of years practicing were included in the final model as predictors of attitude. Adjusting for the other variables, a significant association was found between years of practice and attitudes. THPs who had practiced for more than 10 years also had 12.6 times higher odds of having a positive attitude towards rabies compared to THPs that practiced for five to 10 years (aOR:12.62 95% CI:1.49-106.61) (Table 2.5).

Number of years practicing, highest formal education, employment status, and previous DoH rabies training attendance were the variables included in the final model to predict referral practices. Adjusting for the other variables, THPs who had practiced for more than 10 years also had 2.29 higher odds of having good referral practices than their counterparts (aOR:2.29 95% CI:0.97-5.37), although marginally significant (p=0.057).

Assessing the goodness of fit using Hosmer-Lemeshow goodness of fit test showed that the knowledge and referral practice models were good fit to data with p>0.05. However, the attitude model was not of good fit to data p<0.01.

Table 2. 5: Multivariable analysis of THPs socio-demographic characteristics and knowledge, attitudes and referral practices towards human rabies (n = 204)

Socio-demographic characteristics	**Knowledge**		**Attitudes**		**Referral practices**	
	aOR(95% CI)	**P-value**	**aOR (95% CI)**	**P-value**	**aOR (95% CI)**	**P value**
Sex						
			Ref.			
			2.24 (0.75-6.69)	0.148		
Category of THP						
Izinyanga (Herbalist)	Ref.		Ref.			
Izangoma (Diviner)	2.25 (0.85-5.91)	0.100	4.26 (0.97-18.70)	0.055		
Abaprofethi or Abathandazi (faith healers)	2.21 (0.67-7.24)	0.190	1.04 (0.26-4.09)	0.951		
Number of years practicing as a THP						
5-10 years	Ref.		Ref.		Ref.	
<5 years	1.14 (0.42-3.04)	0.787	1.19 (0.36-3.86)	0.766	1.05 (0.46-2.41)	0.890
>10 years	4.13 (1.52-11.21)	**0.005**	12.62 (1.49-106.61)	**0.020**	2.29 (0.97-5.37)	**0.057**
Highest formal education level						

No formal education					Ref.	
Formal education					2.65 (0.79-8.92)	0.114
Employment status						
Self employed	Ref.				Ref.	
Unemployed	1.22 (0.36-4.05)	0.745			0.86 (0.34-2.17)	0.765
Employed	3.74 (1.03-13.57)	**0.045**			1.62 (0.59-4.46)	0.348
Previous DoH rabies training attendance						
No					Ref.	
Yes					3.07 (0.60-15.50)	0.174
AOR= Adjusted odds ratio, Ref= Reference group, THP= Traditional Health Practitioner, DoH= Department of Health, Table only includes variables not eliminated through automatic backward elimination set at p<0.2 Bolded p-values are significant or marginally significant						

Association between THPs knowledge, attitudes and referral practices

THPs who had adequate knowledge of rabies had 2.33 times the odds of having good referral practices than those with inadequate knowledge (OR:2.33 95% CI: 1.13-4.78). Furthermore, those who had a positive rabies attitude had 1.32 higher odds of having good referral practices compared to those who had a negative attitude (OR:1.32 95% CI: 0.41-4.20), although not significant with a CI that spanned one (Table 2.6).

Table 2. 6: Univariate analysis of THPs knowledge, and attitudes against referral practices towards human rabies (n = 204)

			Referral practices	
		Frequency (%)	**OR (95% CI)**	**P value**
Knowledge	Inadequate	163 (80%)	Ref.	
	Adequate	41 (20%)	2.33 (1.13-4.78)	**0.021**
Attitudes	Negative	18 (9%)	Ref.	
	Positive	186 (91%)	1.32 (0.41-4.20)	0.636
Abbreviations: OR=Odds ratio, CI= Confidence interval, Ref= Reference group Bolded p-values are significant or marginally significant				

2.5 Discussion

Our study assessed the knowledge, attitudes, and referral practices regarding animal bites and human rabies and the associated factors among THPs. The study found that most of the THPs had inadequate knowledge (80%) of human rabies and poor referral practices (73%) of animal bite patients. Most (91%) of the THPs however had positive attitudes towards human rabies

prevention. After adjusting for other socio-demographic factors, having practiced for longer as a THP, and being employed were the factors associated with adequate knowledge, positive attitudes and good referral practices. Additionally, adequate knowledge and positive attitudes were found to be associated with good referral practices of animal bite patients to conventional healthcare for PEP.

More than 87% of THPs in eThekwini were aware that dogs were common transmitters of rabies, however, they did not know that there is no effective treatment for human rabies. These findings were similar to studies done in Ethiopia and India (29, 31). The THPs in India believed that they can cure rabies or it can be cured by the rabies Goddess (31). The study THPs on average were unable to list more than three signs and symptoms which remarkably lowered their knowledge scores. The inadequate knowledge of the clinical features of rabies was also observed among general community members, healthcare workers and students in SA and other African countries (4, 32-36). These findings might be due to the lack of training on rabies by health departments, proven by finding that only three percent of the study THPs had previously attended a rabies training. Factors that were significantly associated with adequate knowledge were being employed and having practiced for more than ten years.

Almost 90% of the THPs had positive attitudes toward dog vaccinations as means to prevent rabies. This is contrary to the Indian study amongst THPs who were against the vaccination of dogs against rabies (31). Their reasons for the objection against vaccination included that vaccines were against the works of the Goddess who naturally protects against rabies (31). Most of the THPs in eThekwini were willing to collaborate with the health department to reduce rabies mortality. Three other studies done in SA show that most THPs have positive attitudes towards a collaborative relationship with conventional healthcare (23, 37, 38). These were also the findings of studies that interviewed THPs in Kenya and Ethiopia (21, 39, 40). The THPs in these two studies were also willing to work hand in hand with the health department (21, 39, 40). The significant predictor of having positive attitudes in our study was again, having practiced for more than ten years.

Despite the positive attitudes and willingness to collaborate, the study THPs (73%) had poor overall referral practices of animal bite patients. Very few THPs reported to have referred an

animal bite victim to a healthcare center for PEP. Also, less than half of them usually wash animal bite wounds with soap and running water, while washing and disinfection of wounds can prevent about one-third of rabies infections (16). Having more years of practice as a THP proved to be crucial as it was also a predictor of having good referral practices. This might be because experienced THPs have seen more cases over the years, hence they practice favorably. Although not statistically significant, the study showed that the odds of having good referral practices were increased amongst THPs with adequate knowledge or positive attitude. This suggests that improving THPs knowledge and attitudes towards human rabies may lead to better referral practices. This is congruent to previous rabies KAP studies that show a direct predictor relationship between knowledge, attitudes and better practices which improve health outcomes (33, 41). Unlike socio-demographic characteristics that are not easily modifiable, the knowledge and attitudes of THPs can be improved through educational interventions.

The study was not without limitations. The total number of THPs interviewed did not meet the targeted sample size to detect a statistically significant difference. This might have been the reason for some of the non-significant associations and wide confidence intervals that spanned one. The regression analysis also adjusted for confounding blindly (through using multivariate models). Although these limitations may threaten the validity of the study findings, the study was not intended to be exhaustive but can rather be used as a preliminary investigation to the topic.

2.6 Conclusion

THPs play a pivotal role in primary healthcare and animal bite patients usually seek healthcare from them prior to conventional healthcare centers. Although they have good attitudes towards rabies, this study has shown that gaps exist in their knowledge, and referral practices in eThekwini District. It has also shown that improving their knowledge and attitudes might lead to better referral practices of animal bite patients for PEP. Lastly, it also showed that THPs in eThekwini District are open and willing to have a collaborative referral relationship with conventional health to reduce human rabies deaths. Continuous formal training on rabies is necessary, in that way, THPs can also serve as trusted stakeholders that educate their patients about rabies, especially in rural areas. A multidisciplinary approach that includes THPs is needed to control and possibly eliminate dog-mediated rabies by 2030.

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CHAPTER 3: EXTENDED METHODS AND RESULTS

This chapter explains study methods and results that were not covered in chapter two of the report. Firstly, the methods and results of pretesting the study questionnaire are explained. The results of the other tests for association that were done in the study are then also explained.

3.1 Questionnaire pretest

To ensure understandability, validity and reliability, the questionnaire was pretested using four volunteering THPs. Two were from the eThekwini THPs Association and two were not. The THPs who participated in the pretest phase were excluded from the main study. The THPs were given hard copies of both the English and isiZulu versions of the study information sheet, consent form and questionnaire. They were given a week to read and compare the documents, flag out any areas of concern and validate if both versions were providing and collecting the same information.

Of the four, feedback was received from three THPs. They were in agreement that both sets of documents were easy to understand, provided and collected exact information from respondents. A few minor grammatical suggestions were given on the isiZulu version of the questionnaire which were then relayed back to the independent isiZulu writer, reader and speaker from the health department. The isiZulu questionnaire was then modified according to the pretest suggestions before being used for data collection.

3.2 Association between THPs knowledge, attitudes and referral practices

There was a statistically significant (p=0.019) association between THPs knowledge and referral practices. More THPs who had adequate rabies knowledge had good referral practices (41%) compared to those with inadequate rabies knowledge (23%). Inversely, more THPs with inadequate rabies knowledge (77%) had poor referral practices than those with adequate knowledge (59%). There was no evidence of association found between different rabies attitudes and referral practices.

Compared to the univariate analysis of THPs knowledge and attitudes against their referral practices described in chapter two, the bivariate analysis showed similar results. Adjusting for attitudes, THPs who had adequate knowledge on rabies had 2.30 times the odds of having good referral practices than those with inadequate knowledge (aOR:2.30 95% CI: 1.12-4.75). Adjusting for knowledge, those who had a positive rabies attitude had 1.21 higher odds of having good referral practices compared to those who had a negative attitude (aOR:1.21 95% CI: 0.37-3.89), although not significant with a CI that included one. (Table 3.1).

Table 3. 1: Tests of association and bivariate analysis between the THPs knowledge, and attitudes against referral practices towards rabies (n = 204)

	Referral practices				
	Test of association			**Bivariate analysis**	
Knowledge	**Good (%)**	**Poor (%)**	**P value**	**aOR (95% CI)**	**P value**
Inadequate	38 (23)	125 (77)	**0.019**	Ref	
Adequate	17 (41)	24 (59)		2.30 (1.12-4.75)	**0.023**
Attitudes					
Negative	4 (22)	14 (78)	0.785	Ref	
Positive	51 (28)	135 (72)		1.21 (0.37-3.89)	0.749
Abbreviations: aOR= Adjusted odds ratio, CI= Confidence interval, Ref=Reference group, Bolded p-values are significant or marginally significant					

CHAPTER 4: OVERALL DISCUSSION AND CONCLUSION

This final written chapter presents the overall discussion and conclusion of the study with the extended methods and results in perspective. The chapter explains in detail the strengths and limitations of the study. The chapter then ends by listing the recommendations drawn from the study for effective human rabies control in KZN and for future studies.

4.1 Discussion and conclusion

Our study assessed the knowledge, attitudes and referral practices on human rabies among THPs. Study findings showed that most THPs had inadequate knowledge about animal bites and human rabies. THPs had some basic knowledge of rabies but lacked comprehensive knowledge that might be expected from providers of health services. While worrisome, these findings were not unique to our study. Several other studies done in the African continent amongst the general population and even healthcare workers showed inadequate knowledge on rabies (1-6).

The positive attitudes of most THPs on human rabies prevention and their willingness to collaborate with the health department was commendable. It is also a good starting point in forming a relationship that will ensure early detection and PEP initiation of animal bite patients. Such willingness to collaborate with the health department is not an anomaly in KZN (7, 8). THPs in the province already have a successful collaborative relationship with the health department in the management of HIV/AIDS (9). They play a huge role in screening, educating, referring and encouraging treatment compliance in HIV-suspected or infected patients (9).

The results also showed that the odds of having good referral practices were increased amongst THPs with adequate knowledge or positive attitude. This meant that our hypothesis was correct that inversely, inadequate knowledge and negative attitudes on human rabies and its prevention were associated with poor referral practices among THPs in the eThekwini District. These findings suggest that improving THPs knowledge and attitudes towards rabies may lead to better referral practices. This is supported by rabies conceptual frameworks defined by other studies, which show that there is a direct causal relationship between knowledge, attitudes leading to better referral practices (10, 11).

Even though the study results also showed significant socio-demographic predictors of THPs knowledge and attitudes, most of them were not modifiable. For example, the more experienced a THP was, the higher the odds were of them having good referral practices. This factor is not adjustable, or very little can be done to increase the experience of THPs. However, improving THPs knowledge and attitudes through educational interventions is possible and feasible. Even though it was not captured by the pre-designed questionnaire, the THPs expressed a dire need for in-depth training on rabies in both animals and humans.

4.2 Strengths of the study

The study was conducted in eThekwini District, the district with the highest number of human rabies cases in KZN in the past five years. Furthermore, it is known to have the largest population of THPs in KZN. Study findings from this district can be a good guide when investigating the same problem in other districts in the KZN Province. The study also adds insight to the current body of knowledge on THPs and the viability of the referral relationship between them and conventional healthcare. There is a paucity of knowledge on the views held by THPs on how animal bite cases should be managed in communities (pre-clinical), our study contributes pivotal information to help fill the gap. The questionnaire used in the study was also pretested and reviewed by the THPs association before use so that it is easy to understand, valid, and accurate, making it reliable.

4.3 Limitations of the study

Caution should be applied when interpreting the study results since it had some limitations. The total number of THPs interviewed in the study did not meet the targeted sample size to detect a statistically significant difference. The short period (June to July 2022) of data collection limited the number of responses. Additionally, the analysis adjusted for confounding blindly, the small sample size led to fewer variables being added to the multivariable analysis models. Although the failure to reach the sample size may threaten the validity of the study findings, this research was not intended to be exhaustive but should rather be used as a preliminary investigation to the topic.

As a result of the close-ended nature of the survey questionnaire, the study does not document the reasons behind the responses the THPs gave during interviews. These reasons were also going to provide crucial qualitative information on why some THPs have certain attitudes or practices towards rabies. The questionnaire also did not include questions that ask about the proximity of the THPs to the community. Responses to this question would have been helpful as THPs proximity to the community is one of the reasons why animal bite patients consult them first. There might also be information bias in the results since the survey was administered in two different ways (physically and by telephone) to maximize the response rate.

The survey questionnaire used was adopted from an Ethiopian study, ideally, it should have been one that was developed, used, and validated in SA among South African THPs. To mitigate this limitation, the researchers adapted the questionnaire by reviewing the questions and tailoring them to fit the South African context.

4.4 Overall recommendations

We recommend further studies with larger sample sizes to assess THPs rabies knowledge, attitudes and referral practices and the related associations. The findings presented in this study can be used as a baseline and preliminary findings for further studies. The baseline findings can be used to monitor and evaluate changes from training initiatives. This study together with other studies to follow might then assist the district and KZN Province to understand how much THPs know about rabies, their attitudes, and how willing they are to have a collaborative referral relationship. It can also help understand some of the predictors of good referral practices of animal bite patients.

A multidisciplinary one health approach including THPs for preventing human rabies is recommended. THPs should continue being recognized as key role players in the early management of animal bite patients in the KZN Province. Training and focus group discussions from the Department of Health in collaboration with the Department of Agriculture is recommended. The areas where THPs lacked knowledge indicated in this study like signs and symptoms, and curability can be used as a starting point. Once THPs are knowledgeable on rabies, they can be encouraged to also educate their patients about it.

4.5 References

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CHAPTER 5: APPENDICES

Appendix 1: Plagiarism Declaration Form

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

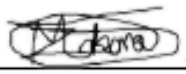
PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Maxwell Musa Mabona (Student number: 1314539) am a student registered for the degree of Master of Science in Field Epidemiology in the academic year 2023.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature:  Date: 08 June 2023

Appendix 2: Turnitin Report

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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4	J Weyer, V Dermaux-Msimang, A Grobbelaar, C Le Roux, N Moolla, J Paweska, L Blumberg. "Epidemiology of human rabies in South Africa, 2008 - 2018", South African Medical Journal, 2020 Publication	<1%
5	www.ncbi.nlm.nih.gov Internet Source	<1%
6	Tracy Zhandire, Nceba Gqaleni, Mlungisi Ngcobo, Exnevia Gomo. "Attitudes and perceptions of traditional health practitioners	<1%

Appendix 3: Sample size calculation

Sample size calculation for single proportion using the modified Cochran's Formula for small populations. We will assume that 50% of THPs have knowledge on human rabies and its prevention. eThekwini's registered THP population will be used, which is approximately 1500 after about 500 Traditional birth attendants (ababelethisi) were excluded from the target population. A 95% confidence interval, and a 5% margin of error was used factoring in for a 20% non-response rate, our sample size was calculated as:

$$n = \frac{Z_{\alpha}^{2} Pq}{E^2}$$

$$n = \frac{(1.96)^2 (0.5 \times 0.5)}{(0.05)^2}$$

n = 384.16 = **385 THPs**

Modifying for the small population of THPs:

$$n = \frac{n}{1 + \frac{(n-1)}{N}}$$

$$n = \frac{385}{1 + \frac{(385-1)}{1500}} = \textbf{307 THPs}$$

A minimum sample size of **307** THPs is required.

<u>Factoring in attrition (non-response) rate of 20%:</u>

$$\text{THPs to be recruited} = \frac{\text{Desired sample size}}{1 - (\frac{20}{100})}$$

$$\text{THPs to be recruited} = \frac{307}{1 - 0.2}$$

$$\text{THPs to be recruited} = \mathbf{384}\ \textbf{THPs}$$

n = Minimum sample size

Z = Value from standard normal table

E= Margin of error

p= Proportion

N= Population

q= 1 – p

p= 50 % = 0.5

q= 1 – p = 0.5

E = 5% = 0.05

Z = 95% CI = 1.96

N= 2000 – 500 = 1500

Appendix 4: Study Information Sheet

STUDY INFORMATION SHEET

Study title: Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022

Introduction: Good day, my name is Maxwell Mabona, a South African Field Epidemiology Training Programme resident and Master's student from the University of the Witwatersrand medical school (School of Public Health). We are conducting a study to understand the knowledge, attitudes, and referral practices of Traditional Health Practitioners on human rabies and its prevention. Research is a process used in seeking new knowledge. According to case reports from the eThekwini District, most dog bite patients sought care from the traditional healers before going to the health care facilities. We seek to understand how much traditional health practitioners know about rabies, how they see it, and how they usually deal with such patients.

Invitation to Participate: We would like to invite you to participate in this research study. Your participation will involve answering a few questions asked by the researcher or research assistant using a short questionnaire designed to gather information for the study. If the interview is face-to-face, COVID-19 infection prevention measures (wearing of masks, social distancing, and sanitizing) will be adhered to. Physical interviews will be held during THPs physical meetings or in their places of practice between the data collection period of March to July.

Voluntary participation: Your participation in the survey is voluntary and there will be no negative consequences if you do not wish to participate. You are free to withdraw/drop out of the study at any time. If you have any questions, do not hesitate to ask. No voice recording of the interviews will be done during the physical or telephonic interviews.

Study Procedures: If you agree to take part in this study, you will be participating in a face-to-face or telephonic interview with the researcher or research assistant. The interview will take about 15 minutes of your time.

Risks and Benefits: There are no risks involved in participating in this study. The benefit of the study is that the results will be used to form the basis of understanding the educational needs regarding referrals of local traditional practitioners. This will help with the early detection and prevention of human rabies in our communities. Participation in the research will not cost you any money nor will they be any payments for participation.

Confidentiality and Privacy: Responses are completely confidential and anonymous. The results will not be linked to individual participants. No one will be identified by name in any report coming out of the study. The data will be password-protected and only accessible to the principal researcher and research assistant.

A copy of the participant information sheet, a summary of your responses, and a summary of the results of the study once available is available upon request.

Date (MM/YYY): _____

Researcher:

Maxwell Mabona, MaxwellM@nicd.ac.za / Maxwell.Mabona@kznhealth.gov.za

033 940 2432 / 079 919 8332

Supervisor:

Mrs. Moshibudi Poncho Bapela, ponchob@nicd.ac.za / Poncho.Bapela@kznhealth.gov.za

033 940 2434

Contact details of HREC administrator and chair: This study will be approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights

and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Thank you for reading this Study Information Sheet.

Appendix 5: Participant Consent Form

Participant Consent Form

Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022

Interviewer's name: _____

Date and time of interview: _____ at: _____

Consent

I have been given a Participant Information Sheet which explains the nature and processes involved in this study; I was given time to read it, or had it read to me, in the language I best understand. I was given time to ask any questions I wanted to and found any answers given to me to be reasonable and satisfactory. I believe I fully understand why the study is being conducted and what the intended outcomes will be. I understand that there will be no immediate benefit to me, should I agree to participate, nor will I receive any payment; conversely, participation will not cost me anything but my time. I understand that, even if I initially consent to take part in the study, I may subsequently withdraw at any time and would not be required to give any reasons. I have been given a range of contact details, listed below. If I require further information or become concerned about any aspect of this study, I am free to speak to any of these contacts.

I, therefore, give my consent to participate in this research study: No ☐ Yes ☐

Signature or mark: _____

Date: _____ Place: _____

Appendix 6: Questionnaire

Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022

Interviewer's name: _____

Date and time of interview: _____ at: _____

Section 1- Socio-demographic details

1. Please indicate your gender:

   M ☐ F ☐
2. Please indicate your date of birth:

   DD ____ MM _____ YYYY _____
3. Where is your practice located? _____
4. Under which category of THPs do you belong?

   Izinyanga (Herbalist) ☐

   Izangoma (Diviner) ☐

   Abaprofethi or Abathandazi (faith healers) ☐
5. How many years have you been practicing as a Traditional Health Practitioner?
6. How many patients do you see per day on average?
7. What is your highest formal education level?

   No formal education ☐

   Primary education (Grade seven and less) ☐

   Secondary education (Grade eight – Matric) ☐

   Tertiary education and higher ☐
8. Other than being a THP, are you employed?

   No ☐ Yes ☐ Self Employed ☐
9. Have you attended any Department of Health rabies training?

   No ☐ Yes ☐

Section 2: Knowledge of human rabies and its prevention

10. Have you ever heard of rabies before?

    Yes(+1) ☐ No ☐

11. How do people normally get infected with rabies?

    From plants ☐ From animal bites(+1) ☐ Human bites ☐ I do not know ☐

12. What are the signs and symptoms of human rabies? (+1 for each correct sign/symptom)

    Fever ☐ Headache ☐ Nausea ☐ Vomiting ☐ Agitation ☐ Anxiety ☐ Confusion ☐

    Hyperactivity ☐ Other correct symptoms ☐ I do not know ☐

13. Is rabies curable?

    Yes ☐ No(+1) ☐ I do not know ☐

14. There is a vaccine to prevent rabies after an animal bite.

    True(+1) ☐ False ☐ I do not know ☐

15. Can rabies kill a person?

    Yes(+1) ☐ No ☐ I do not know ☐

Section 3: Attitudes of human rabies and its prevention

16. I personally feel safe consulting patients with a history of animal bites.

    Agree (+1) ☐ Disagree ☐ I do not know ☐

17. Rabies is a dangerous disease.

    Agree (+1) ☐ Disagree ☐ I do not know ☐

18. A stray dog that bites someone should be caught and killed.

    Agree (+1) ☐ Disagree ☐ I do not know ☐

19. It is important to vaccinate animals against rabies.

    Agree (+1) ☐ Disagree ☐ I do not know ☐

20. I am open to working with the DoH to reduce rabies deaths in the District

    Agree (+1) ☐ Disagree ☐ I do not know ☐

Section 4: Referral practices of human rabies and its prevention

21. What do/would you do when someone presents with a history of an animal bite?

    They should seek help from a nearby pharmacy ☐

They should be treated with traditional medicine only ☐

They should be urgently referred to Hospital (+1) ☐

Other ☐ Please Specify_____

22. Have you ever referred an animal bite victim to the clinic or hospital?

    Yes (+1) ☐ No ☐

23. Do you normally ask animal bite patients about their rabies vaccination status when presenting to your practice?

    Always(+1) ☐ Sometimes ☐ Never ☐

24. I use traditional medication ONLY to help patients that present with an animal bite history

    Always ☐ Sometimes ☐ Never (+1) ☐

25. I would normally wash an animal (e.g. dog) bite patients' wound with soap and water

    Always (+1) ☐ Sometimes ☐ Never ☐

26. I would encourage animal bite patients to finish their course of rabies vaccines at the hospital: Always(+1) ☐ Sometimes ☐ Never ☐

This completes the interview. We thank you very much for your participation.

Researcher:

Maxwell Mabona, MaxwellM@nicd.ac.za / Maxwell.Mabona@kznhealth.gov.za

033 940 2432 / 079 919 8332

Supervisor:

Mrs. Moshibudi Poncho Bapela, ponchob@nicd.ac.za / Poncho.Bapela@kznhealth.gov.za

033 940 2434

Contact details of HREC administrator and chair: This study will be approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights

and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Appendix 7: Witwatersrand Human Ethics certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Mr Maxwell Musa Mabona

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M220123

NAME: (Principal Investigator)	Mr Maxwell Musa Mabona
DEPARTMENT:	School of Public Health eThekwini District, KwaZulu-Natal, South Africa
PROJECT TITLE:	Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022
DATE CONSIDERED:	30/07/2021
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Mrs P Bapela, Miss T Zwane and Dr L Kuonza
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	22/04/2022

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions.Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.** The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **January** and will therefore be due in the month of **January** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

22/04/2022
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 8: African Traditional Medicine Directorate Support Letter

KWAZULU-NATAL PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

DIRECTORATE:
AFRICAN TRADITIONAL MEDICINE

Private Bag X454, PIETERMARITZBURG, 3200
Moses Mabhida Building, 330 Langalibalele Street, Pietermaritzburg, 3200
Tel: 033 3953096 Fax: 033 3952515 Email:Lindokuhle.khuboni@kznhealth.gov.za

30 March 2022

To Whom It May Concern

SUPPORT LETTER TO CONDUCT RESEARCH AMONG TRADITIONAL HEALTH PRACTITIONERS (THPs) AT ETHEKWINI DISTRICT, KWAZULU-NATAL

This is to confirm that the Department of Health was approached by a Masters student in Epidemiology, Mr Maxwell Musa Mabona (1314539) regarding his research on: **Knowledge, Attitude, and Referral Practices regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022.** The researcher seeks to administer questionnaire through physical interviews to assess the knowledge, attitude and referral practices regarding human rabies and its prevention among Traditional Health Practitioners at Ethekwini Districts.

The objectives of the study are outlined as being:

a) To assess the knowledge, attitudes, and referral practices of Traditional Health Practitioners regarding human rabies prevention in patients with an animal bite history in 2022.

b) To identify factors associated with Traditional Health Practitioner referral practices of animal bite victims to allopathic health in 2022.

The Directorate of African Traditional Medicine supports Mr Maxwell Musa Mabona's proposed study and believe it will add value to the human rabies eradication.

Yours Sincerely

Vukani Enliven Khoza
Director: ATM

GROWING KWAZULU-NATAL TOGETHER

Appendix 9: eThekwini District Support Letter

KWAZULU-NATAL PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

DIRECTORATE: Monitoring and Evaluation

Physical address: 83 King Cetshwayo Highway; Highway House; Mayville 4091
Postal Address: private Bag X 54318, Durban 4000 eThekwini District Office
Tel: 031 240 5308 Fax: 031 240 5555 Email: Ntombenhle.Ngcobo@kznhealth.gov.za
www.kznhealth.gov.za

Enquiries: Mrs. N.P Ngcobo
Date: 01 March 2022

Dear Mr Maxwell Musa Mabona
University of the Witwatersrand, Johannesburg
School of Public Health

RE: SUPPORT FOR RESEARCH STUDY IN "KNOWLEDGE, ATTITUDES, AND REFERRAL PRACTICES REGARDING ANIMAL BITES AND PREVENTION OF HUMAN RABIES AMONG TRADITIONAL HEALTH PRACTITIONERS IN ETHEKWINI DISTRICT, KWAZULU – NATAL, 2022"

I have pleasure in informing you that the District is granting you support to conduct the research study entitled "**Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu – Natal, 2002**" at eThekwini Health District facilities.

Please note the following:

1. Please ensure you adhere to all the policies, procedures, protocols and guidelines of the department of health with regards to this research.
2. This research will only commence once this office has received confirmation from the provincial health research committee in the KZN department of health.
3. Please ensure this office is informed before you commence your research.
4. The District office/facility will not provide any resources for this research.
5. You will be expected to provide feedback on your findings to the district office/facility.

Thanking you.
Sincerely,

Mrs. N.P. Ngcobo
(P, Monitoring and Evaluation Manager)
EThekwini Health District

GROWING KWAZULU-NATAL TOGETHER

Appendix 10: eThekwini Traditional Health Practitioners Permission Letter

9 Archie Gumede Place
Room 135 1st Floor
City Health
Durban
031 311 3145/43
Enquiries: Mr Hlongwane
Date: 10 June 2022

Dear Mr. Maxwell Mabona
KwaZulu-Natal Department of Health, Pietermaritzburg
University of the Witwatersrand, Johannesburg

PERMISSION TO CONDUCT THE STUDY "KNOWLEDGE, ATTITUDES, AND REFERRAL PRACTICES REGARDING ANIMAL BITES AND PREVENTION OF HUMAN RABIES AMONG TRADITIONAL HEALTH PRACTITIONERS IN ETHEKWINI DISTRICT, KWAZULU-NATAL, 2022"

We are pleased to inform you that the eThekwini Traditional Health Practitioners Association and Executive committee is granting you permission to conduct the research study entitled "Knowledge, Attitudes, and Referral Practices Regarding Animal Bites and Prevention of Human Rabies among Traditional Health Practitioners in eThekwini District, KwaZulu-Natal, 2022". We understand that the research includes the administration of a questionnaire through physical interviews to Traditional Health Practitioners in the eThekwini District.

Please note the following:

1. You will be expected to provide feedback on the findings of the research study to the eThekwini Traditional Health Practitioners Association and Executive committee.
2. The research has to be conducted ethically and in adherence to the guidelines of the KwaZulu-Natal Department of Health, eThekwini District and Traditional Health Practitioners Association.
3. Participation will be voluntary and results of the study cannot be linked to any individual participant.

Thank you.
Yours sincerely:

T Hlongwane

MR HLONGWANE
CHAIRPERSON