



**UNIVERSITY OFTM
KWAZULU-NATAL**

**INYUVESI
YAKWAZULU-NATALI**

**A TRIANGULATION STUDY OF THE USE OF TRADITIONAL
MEDICINE AND PRESCRIBED ANTISCHISTOSOMAL MEDICINES
IN COMMUNITIES WITH HIGH PREVALENCE SCHISTOSOMIASIS
INFECTIONS: PERSPECTIVES FROM TRADITIONAL HEALERS,
PATIENTS AND HEALTHCARE WORKERS.**

**Submitted in fulfilment of the requirements for the degree of Masters of Pharmacy,
Discipline of Pharmaceutical Sciences in the School of Health Sciences, University of
KwaZulu-Natal**

By

AGANZE Gloire-Aimé MUSHEBENGE (BPharm)

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2019



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Supervisor: Dr MANIMBULU NLOOTO

Janvier 2019

DECLARATION OF ORIGINAL WORK

I, Mr Aganze Gloire-Aimé Mushebenge, declare as follows:

1. That the work in this thesis has not been submitted to UKZN or other tertiary institutions for purposes of obtaining an academic qualification, whether by myself or any other party.

2. That my contribution to the project was as follows: I was the main author of the project proposal for this thesis, as well as the main author for the thesis. I collected data and analyzed it. Thereafter, I drafted the manuscripts included in the thesis. I was also the first author of the manuscripts submitted to BMC Systematic Reviews and BMC Complementary and Alternative Medicine.

3. That the contribution of others to the project was as follows:
 - a. Dr Manimbulu Nlooto was the supervisor and spearheaded the direction of the project. He was the link during the submission and acceptance of the project proposal to the Biomedical Research Ethics Committee, Westville Campus. He also contributed with the conception of manuscripts, added to the content and approved the final versions submitted to journals.
 - b. Dr Tivani Mashamba-Thompson assisted in the conception of the systematic scoping review protocol.
 - c. Mukanda Gideon Kadima assisted in data analysis and interpretation of the results in the manuscripts.
 - d. Carrin Martin for her professional editing services.

Candidate: AGANZE Gloire-Aimé MUSHEBENGE,

4. Signed Date

As the candidate's supervisor, I agree to the submission of the thesis:

Dr MANIMBULU NLOOTO

Signed Date

DEDICATION

I am greatly indebted to my mother, Velard BATACHOKA and my father, Deogratias MUSHEBENGE, who continue to learn, grow and develop and who have been a source of encouragement and inspiration to me throughout my life. Moreover, for the myriad of ways in which, throughout my life, they have actively supported me in my determination to find and realise my potential, and to make this contribution to our world.

Most of all thanks to God the Divine who continues to make the impossible possible.

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I am grateful for the support received from the KwaZulu-Natal Department of Health through the healthcare facilities during the data collection period in the ILembe Health District.

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RESEARCH OUTPUTS

1. MANUSCRIPTS SUBMITTED FOR PUBLICATION

Authors contributed equally in drafting these manuscripts

- a. ***“Mapping evidence of the concomitant management of schistosomiasis by Traditional Health Practitioners and Health care Professionals in communities with high prevalent infections: A systematic scoping review protocol”***

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- b. ***“Knowledge, perceptions and experiences of traditional health practitioners about the management of female urogenital schistosomiasis: the Case of I Lembe District, KwaZulu-Natal, South Africa”***

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- c. ***“A Triangulation of information from Healthcare workers and patients about the concurrent use of traditional medicine and conventional prescribed medicines for schistosomiasis in I Lembe district, KwaZulu-Natal, South Africa.”***

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2. CONFERENCE

The abstract of the following manuscript: *“Knowledge, perceptions and experiences of traditional health practitioners about the management of female urogenital schistosomiasis: the Case of I Lembe District, KwaZulu-Natal, South Africa”* was selected for presentation in the 1st Joint International conference on potential of ethnopharmacology and traditional medicine held in Dakar, Senegal from 30 November – 02 December 2018. Conference theme: “Natural Products-based Drug Discovery and Development: Basic research and Clinical Applications of Recent Research findings for Sustainable Development” (See Appendix 9)

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List of Acronyms

ATM	: African Traditional Medicine
CDC	: Centre for Diseases Control
CHC	: Community Health Centre
CT	: Conventional Treatment
DST/NRF	: Department of Science and Technology / National Research Foundation
FUS	: Female Urogenital Schistosomiasis
HCP	: Healthcare Professional
HCW	: Healthcare Worker
HIV/AIDS	: Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
LMICs	: Low and Middle Income Countries
MMAT	: Mixed Method Appraisal Tool
NMC	: Notification of Medical Conditions
NTDs	: Neglected Tropical Diseases
PHC	: Primary Healthcare
PMR	: Patient Personal Medical Record
PZQ	: Praziquantel
SD	: Standard Deviation
SPSS	: Statistical Package for Social Sciences
STH	: Soil Transmitted Helminthes
STIs	: Sexually Transmitted Infections
THO	: Traditional Health Organization
THP	: Traditional Health Practitioner
TM	: Traditional Medicine
UNAIDS	: United Nations Program on HIV/AIDS
WHO	: World Health Organization
WM	: Western Medicine

ABSTRACT

Background

Schistosomes are parasitic worms found in tropical and sub-tropical fresh waters. An estimated 4.5 million South Africans, mainly in settings of rural poverty, are in need of treatment for urogenital schistosomiasis. Women with schistosomiasis are exposed to HIV infection prevalent in African countries. Praziquantel is the treatment used in the mainstream healthcare system to manage schistosomiasis. Although conventional treatment is available, traditional medicine (TM) has been reported to be used for schistosomiasis. This study evaluated the prevalence of the use of traditional medicine and prescribed antischistosomal medicines in communities having high prevalence schistosomiasis infection in ILembe District, KwaZulu-Natal and established whether the unavailability of prescribed antischistosomal medicines led to the use of traditional medicine.

Methods

This study was a cross-sectional descriptive study using a questionnaire. An exploratory mixed-method approach through interviews was conducted from December 2017 to April 2018 in the ILembe District, KwaZulu-Natal. In addition, a review of medical chart records of patients with schistosomiasis was further carried out to triangulate the information from interviews. Qualitative data were coded and analyzed using thematic analysis while descriptive statistics including frequency and percentage were used for quantitative data, categorical data were presented as tables. Chi-squared tests were performed for the association between continuous variables. A p -value ≤ 0.05 was estimated as statistically significant.

Results

A protocol mapping evidence of the concurrent use of TM and antischistosomal treatment was drafted. It anticipated findings on identified gaps in the current literature on this topic and provided direction for future research. After mapping for evidence, face-to-face interviews were conducted in phase 1 of this study among 22 traditional health practitioners (THPs) who diagnosed and managed schistosomiasis symptoms based on their knowledge and experiences using plants either alone or in combination with other plants. *Senecio serratuloides* (Asteraceae) and *Hypoxis hemerocallidea* (Hypoxidaceae) were prominently used in the study area by THPs for the management schistosomiasis. THPs provided services to individuals who did not want to be treated in the mainstream health care system for schistosomiasis.

Following the interviews with THPs, 124 healthcare workers (HCWs) were interviewed with the majority of them (114/124; 91.9%) reporting that Praziquantel was readily available in healthcare

facilities. However, most of HCWs (76/124; 61.3%) did not know whether patients seen by them used concurrently TM and Praziquantel for schistosomiasis. No significant relationship between the availability of Praziquantel and the concurrent use of TM by patients for schistosomiasis ($\chi^2 = 3.042$, $p = 0.551$) was found.

Patients seen by THPs (20) were also interviewed in the same phase 1. They reported that they used TM only for schistosomiasis. Patients attending outpatient departments were also interviewed in this phase. More than half of them (8/15, 53.3%) crossed from TM to the mainstream healthcare system, but they did not disclose their use of TM to HCWs.

After the interviews in phase 1, a medical chart review was conducted in phase 2 of the study to analyse the concurrent use of traditional medicine with conventional medicine for schistosomiasis. None of the medical chart records analyzed; documented the concurrent use of TM and Praziquantel.

Conclusion

TM played a key role in the management of schistosomiasis in the study area. HCWs indicated that although Praziquantel was readily available and free in public sector healthcare facilities, patients used TM for schistosomiasis. HCWs reported not to be aware of whether patients used concurrently TM and Praziquantel for the treatment of schistosomiasis. Further investigations are needed to establish the reasons for use, potential benefits or risks of the concurrent use of modern and traditional medicine for schistosomiasis. Biological studies on TM used for schistosomiasis in the study area are warranted to confirm the pharmacological properties and active compounds of medicinal plants used by THPs for schistosomiasis.

Keywords: Schistosomiasis, Praziquantel, Traditional Medicine, Conventional Treatment, Healthcare workers, Patients, Traditional Health Practitioners

UKUQALA (ISIZULU)

Ingemuva

I-Schistosomes yizibungu ezinamapayipi ezitholakala emanzini ahlanzekile ashisayo nasemanzini ashisayo. Kulinganiselwa ukuthi abantu abayizigidi ezingu-4,5 baseNingizimu Afrika, ikakhulukazi ezimisweni zobuphofu basemaphandleni, badinga ukwelashwa ye-Abesifazane abanesichenene bavezwe ukutheleleka ngegculazi emazweni ase-Afrika. I-Praziquantel yindlela yokwelashwa esetshenziswa ohlelweni lwezempilo olulawula isifo sesichenene. Yize ukwelashwa okuvamile kuyatholakala, imithi yendabuko ibikwa ukuthi isetshenziselwa isifo sesichenene. Lolu cwaningo lwahlola ukusabalala kokusetshenziswa kwemithi yendabuko kanye nemithi enqunywe yi-antischistosomal emiphakathini enokutheleleka okuphezulu kwesichenene esifundazweni sase-ILembe, KwaZulu-Natali futhi yabeka ukuthi ukungatholakali kwemithi enqunyiwe ye-antischistosomal kuholela ekusetshenzisweni kwemithi yendabuko.

Izindlela

Lolu cwaningo lwaluyinkimbinkimbi echazayo yesigaba esilandelayo besebenzisa emibuzo. Indlela yokuhlolisisa indlela eyaxutshwa ngayo ngokusebenzisa izingxoxo yenziwa kusukela ngoDisemba 2017 kuya ku-Ephreli 2018 esifundeni sase-ILembe, KwaZulu-Natali. Ngaphezu kwalokho, ukubuyekeza kwamarekhodi wezatifiketi zezokwelapha iziguli ezinesichenene kwaqhutshelwa phambili ukuze kuhlolisise ulwazi oluvela ezinkulumweni. Idatha efanelekayo ibhalwe futhi ihlaziye ngokusebenzisa ukuhlaziya kwezingqikithi ngenkathi izibalo ezichazayo kufaka phakathi imvamisa kanye namaphesenti asetshenziselwa idatha yokulinganisa, idatha yezinhlawulo yanikezwa njengamatafula. Ukuhlolwa kwe-Chi-squared kwenziwa ngenhlangano phakathi kwezinguquko eziqhubekayo. Inani le- $p \leq 0.05$ lalinganiselwa njengenani elibalulekile.

Imiphumela

Ubufakazi bokumepfulwa kwemithetho yeprotocol yokusetshenziswa okufanayo kwe-TM kanye nokwelashwa kwe-antischistosomal kwalungiswa. Kwakulindele ukutholakala kwezikhala ezikhonjisiwe ezincwadini zamanje ngalesi sihloko futhi sinikeze isiqondiso socwaningo oluzayo. Ngemuva kokumekwa kobufakazi, ukuxoxisana ubuso nobuso kuqhutshwa esigabeni sokuqala salolu cwaningo phakathi kwabelaphi bendabuko abangama-22 abathola futhi baphatha izimpawu zesichenene ngokusekelwe kolwazi lwabo nokuhlangenwe nakho ngokusebenzisa izitshalo zodwa noma zihlangene nezinye izitshalo. I-*Senecio serratuloides* (i-Asteraceae) ne-*Hypoxis hemerocallidea* (i-Hypoxidaceae) yasetshenziswa ngokucacile endaweni yokucwaninga kwabelaphi bendabuko ekulawuleni isichenene. Umulaphi bendabuko inikeze izinsizakalo kubantu ababengafuni ukulashwa ohlelweni lokunakekelwa kwempilo olujwayelekile lwesichenene.

Ngemuva kokuxoxisana kwabelaphi bendabuko, abasebenzi abangu-124 bezempilo baxoxwa iningi labo (114/124; 91.9%) ukubika ukuthi i-Praziquantel yayitholakala kalula ezindaweni zokunakekelwa kwezempilo. Kodwa-ke, iningi lakwa-abasebenzi bezempilo (76/124; 61.3%) lalingazi ukuthi iziguli zithintana yini n-Imithi yendabuko kanye ne Praziquantel ngesikhathi sesichenene. Akukho buhlobo obubalulekile phakathi kokutholakala kwe-Praziquantel kanye nokusetshenziswa okufanayo kwe-Praziquantel kanye nokusetshenziswa okufanayo kwabelaphi bendabuko iziguli zesichenene ($X^2 = 3.042$, $p = 0.551$) okwatholakala.

Iziguli ezibonwa abelaphi bendabuko (20) nazo zaxoxwa ngesigaba esifanayo sokuqala. Babika ukuthi basebenzisa imithi yendabuko kuphela kwisichenene. Iziguli (15) eziya eminyangweni yeziguli ezidlulele ngaphandle kwaxoxwa nazo ngalesi sigaba. Abangaphezu kwengxenywe yabo (8/15, 53.3%) bawela emithonjeni yendabuko baya ohlelweni lwezempilo olujwayelekile, kodwa abazange bakuveze ukusebenziswa kwabo imithi yendabuko kwabasebenzi bezempilo.

Ngemuva kokuxoxisana ngesigaba sokuqala, ukubuyekeza kweshadi lwezokwelapha kwenziwa esigabeni sesibili socwaningo ukuhlaziya ukusetshenziswa okufanayo komuthi wendabuko nemithi ejwayelekile yesichenene. Awekho amarekhodi wezeshadi zezokwelapha ahlaziywe asebenzisa ukusetshenziswa okufanayo no-Praziquantel.

Isiphetho

Imithi yendabuko idlala indima ebalulekile ekuphatheni kwisichenene endaweni yocwaningo. Abasebenzi bezempilo abonisa ukuthi nakuba i-Praziquantel isheshe itholakale futhi mahala ezindaweni zokunakekela ezempilo zomphakathi, iziguli zisebenzisa imithi yendabuko ukulapha isichenene. Abasebenzi bezempilo abike ukuthi angaqapheli ukuthi iziguli ezisetshenziswa ngokufanayo imithi yendabuko kanye no-Praziquantel zokwelashwa kweskripthi. Uphenyo olwengeziwe luyadingeka ukuze kutholakale izizathu zokusetshenziswa, izinzuzo ezingenzeka noma izingozi zokusetshenziswa okufanayo komuthi wesimanje nendabuko we-isichenene. Ucwano lwezinto eziphilayo ngemithi yendabuko olwenzelwe isichenene endaweni yokucwaninga kuqinisekisiwe ukuba kuqinisekise izakhiwo zemithi kanye nezinhlanganisela ezisebenzayo zezitshalo zokwelapha ezisetshenziswa y-abasebenzi bendabuko ye-isichenene.

Amagama angukhiye: Isichenene, i-Praziquantel, Imithi Yendabuko, Ukwelapha Okuvamile, Izisebenzi Zempilo, Iziguli, Abasebenzi Bempilo Yendabuko (Abelaphi Bendabuko)

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CHAPTER ONE: INTRODUCTION

This chapter outlines the general topic, gives some background and provides a review of the literature related to the topic (section 1.1). Section 1.2 outlines the statement of the problem/justification or rationale of the study (evaluate the current situation identifying the gap and the importance of the proposed research). Section 1.3 describes the research aim and objectives, section 1.4 states the hypothesis, section 1.5 outlines the general methodology and finally, section 1.6 includes an outline of the remaining chapters of the thesis or layout of the thesis.

CHAPTER ONE: INTRODUCTION

1.1. Background

Approximately 750 million people across the world are infected with schistosomiasis and 261 million in sub-Saharan Africa (Banhela et al., 2017). Infectious diseases are major public health and socioeconomic problems in Africa. Furthermore, in rural and some urban areas of poor countries, there are many Neglected Tropical Diseases (NTDs) which are the cause of much suffering (Hotez and Kamath, 2009). Highly prevalent, in Africa alone, schistosomiasis kills about 280,000 people annually (Mitra and Mawson, 2017). Even though data have not been updated over the past 20 years (Banhela et al., 2017, Barsoum et al., 2013), an estimated 4.5 million South Africans, mainly in surroundings of rural poverty, are in need of treatment for urogenital schistosomiasis (Hotez and Kamath, 2009, King and Dangerfield-Cha, 2008). Moreover, these NTDs often occur in people who are also infected with Human Immunodeficiency virus (HIV), malaria, or Tuberculosis making the problem even more serious since co-infections are common (Downs et al., 2012, Hotez and Kamath, 2009). A study showed that *Schistosoma haematobium* prevalence was associated with HIV prevalence in sub-Saharan Africa, each *S. haematobium* infection per 100 individuals was associated with a 2.9% (95% CI: 0.2–5.8%; $p=0.038$) relative increase in HIV prevalence (Christinet et al., 2016).

Different organizations worldwide have tried several methods to bring schistosomiasis infection under control (Lai et al., 2015). In many countries, the mass treatment for schistosomiasis has been successfully implemented (Sokolow et al., 2016). With over half of South Africa's population at risk of schistosomiasis, regular treatment in transmission areas is required for preventing morbidity and secondary infections (Chitsulo et al., 2000, Savioli et al., 2009). Several countries have successfully established schistosomiasis national control programs with generic Praziquantel at a price of less than 0.10 American dollar (USD) per tablet, and there has been no evidence of the development of any resistance (Berge et al., 2011). Thus, the generics have proven to be of the same excellent quality at a current 1/50th of the South African market's price of the speciality or trade mark Biltricide®, where 10 tablets in blister are sold at Rand (R) 4.49/tablet (Lai et al., 2015). This cost of Praziquantel was reported to be 50 times higher than the World Health Organization (WHO) standard treatment that is in use in the rest of Africa, and hence this mass treatment cannot be implemented (Berge et al., 2011).

For most of these NTDs, vaccines and medicines are either unavailable, ineffective, or too expensive (Boraschi et al., 2008). Since the efficacy of Praziquantel may probably decrease with worm burden (Kjetland et al., 2006), a WHO working group was established on urogenital schistosomiasis and HIV transmission. The WHO has proposed a prospective study to evaluate the effect of Praziquantel treatment on HIV incidence as the next step toward developing a new protocol to treat schistosomiasis for HIV prevention (Hotez and Kamath, 2009).

In poor constrained settings, plants are used as an alternative to classic vaccines and medicines because of their antibacterial, anthelmintic, antischistosomal, anti-amoebic, antioxidant, anti-inflammatory and antimalarial activity. Although the use and prescription of traditional medicine are not regulated in South Africa, the risk of misadministration of toxic plants in particular always exists (Fennell et al., 2004). Not much is known about the effectiveness of the management of intestinal or urogenital Schistosomiasis by traditional healers as well as the concurrent use of Praziquantel with traditional medicine. Due to beliefs and unavailable stock of conventional therapy or the expensive price, people mostly in rural areas may not have access to modern treatment for schistosomiasis leading them to traditional medicine. Therefore, this study aims to evaluate the prevalence of the use of traditional medicine and prescribed antischistosomal medicines in communities having high prevalence schistosomiasis infections in ILembe District, KwaZulu-Natal and to establish whether the unavailability of prescribed antischistosomal medicines leads to the use of traditional medicine.

1.2. Literature Review

This section gives a brief overview of the literature. The local and international literature is reviewed with respect to the epidemiology, statistics and availability of antischistosomal drugs, Schistosomiasis co-morbidities and treatment option across South Africa. However, a comprehensive literature review has been included in the Introduction section of chapter two, chapter three and chapter four presented in the format of manuscripts in this dissertation.

1.2.1. Epidemiology, statistics and availability of antischistosomal drugs

Schistosomiasis is caused by five species of flatworms that live in fresh water in the tropics and sub-tropics. The Schistosomes are reproduced in snails which release infectious parasites that burrow into the skin of individuals in contact with contaminated water. There are often no symptoms at the first infection with schistosomes, while some develop a rash or itchy skin, and later fever, chills, cough and muscle aches (Chitsulo et al., 2000, Steinmann et al., 2006). The most common of all types is *Schistosoma mansoni*, which is found mostly in Africa and causes intestinal schistosomiasis. *Schistosoma japonicum* and *Schistosoma mekongi* also cause intestinal schistosomiasis, but mainly in Asia and Pacific regions, Africa and the Eastern Mediterranean while *Schistosoma haematobium* causes urinary schistosomiasis (WHO, 2013).

People are infected with schistosomiasis through contact with contaminated water, as well as while swimming, doing personal or domestic cleaning, fishing and cultivating rice. Due to lack of information and appropriate sanitation facilities, individuals contaminate their environment by passing out the parasites while in the water (WHO, 2015). At least 206.4 million people required preventive treatment while more than 89 million people were treated for schistosomiasis in 2016 (WHO, 2018). Its transmission has been reported in 78 countries, a review of disease burden estimated that more than 200

000 deaths per year are due to schistosomiasis in sub-Saharan Africa (WHO, 2018). The estimated total number of people requiring treatment for schistosomiasis in 2014 was 258 875 452, of whom 123 329 536 (47.6%) were school-age children (5–14 years of age). In 2014, 91.4% of those estimated to require treatment for schistosomiasis lived in the African region (WHO, 2016).

Praziquantel is the recommended treatment against all forms of schistosomiasis due to its safety, effectiveness and low-cost making it accessible, and while re-infection may occur after treatment, the risk of developing severe disease is diminished and even reversed when treatment is initiated and repeated in childhood (WHO, 2018). Praziquantel must be administered repeatedly as potent anthelmintic chemotherapy that can reduce schistosomal morbidity and its clinical manifestations associated with exacerbated HIV susceptibility (Hatz, 2005, King et al., 2005). The HIV morbidity arises from post transmission schistosomiasis often persists as clinical symptoms; even for many years after transmission has been interrupted (King and Dangerfield-Cha, 2008).

While Praziquantel was pledged by the private sector and development partners to treat more than 100 million children of school age per year in South Africa, a major limitation to schistosomiasis control has been its limited availability. Data for 2015 shows that 28.2% of people requiring treatment were reached globally, with 42.2% of school-aged children requiring preventive chemotherapy for schistosomiasis being treated (WHO, 2018).

South Africa implemented a mass treatment pilot program in KwaZulu-Natal Province in 1997-2000 however, since then-mass treatment interventions have not been implemented (Appleton et al., 2006). That is why an early intervention through mass treatment of the endemic communities can be vital to prevent the serious impact of the schistosomiasis, and it has been proved to efficiently reduce this disease burden, but only having an effect on the adult worm (Utzinger and Keiser, 2004). Hence, in order to increase the treatment's effectiveness, mass treatment should be carried out during the low transmission season when worms have matured (Anderson et al., 2014).

Studies in Africa and the Middle East establishing the relationship between inflammation resulting from schistosomiasis and squamous cell carcinoma of the bladder have reported that *S. mansoni* is the chief cause of clinical abnormalities, such as hepatomegaly, splenomegaly and periportal fibrosis (Mostafa et al., 1994). A study in northern Ethiopia in the Alamata District revealed an alarming 73.9% prevalence of schistosomal infection, with presentation of 3.7% hepatomegaly, 7.4% splenomegaly, and 12.3% periportal fibrosis (Atalabi et al., 2017). This parasitic disease is responsible for considerable morbidity in the east of the region, where both *S. hematobium* and *S. mansoni* species cause renal disease, while only *S. hematobium* is encountered in certain foci in the western region (Mostafa et al., 1994). *S. haematobium* leads to chronic granulomatous inflammation of the lower urinary tract which ultimately gives rise to fibrosis and calcification, resulting in disorders of bladder motility, ureteric obstruction and occasionally reflux, which lead to back pressure, infection and secondary stone

formation (Atalabi et al., 2017). This kind of scenario is responsible for approximately 7% of renal failure in the Egyptian dialysis population (Barsoum, 2002). Early bladder lesions respond well to anti-schistosomal treatment, late fibrotic lesions of little functional consequence may be left untreated, but significant obstructive cases require operative intervention (Barsoum, 1998). *Schistosoma mansoni* also forms granulomata in the gut mucosa and around the hepatic portal tracts, the latter leading to progressive fibrosis, portal hypertension and splenomegaly (Barsoum, 1993). Impairment of the hepatic macrophage function leads to an escape of antigens into the systemic circulation, generated by the adult worms inhabiting the portal veins. Together with specific antibodies, they form immune complexes that deposit in the glomeruli, leading to a limited proliferative lesion. In approximately 15% of patients, the renal lesions tend to progress into end-stage (Barsoum et al., 2013).

1.2.2. Schistosomiasis co-morbidities and treatment option across South Africa

Schistosomiasis is always linked to other infections when left untreated. Thus, female and male genital schistosomiasis co-exist in areas with endemic *S. haematobium*; as do co-infection with agents of sexually transmitted infections, which are also frequent in both females and males, as shown in a study in Madagascar, where 35% of females and 17% of males with urogenital schistosomiasis had one or more sexually transmitted infections (Leutscher et al., 2008). Adding to its direct morbidities, schistosomiasis can affect immunological and physiological relationships between the host and co-infecting pathogens. Thus, better control of schistosomiasis could provide adjunctive benefits in those areas. The most compelling example might be the effect of schistosomiasis on susceptibility to HIV infection (Downs et al., 2012, Kjetland et al., 2006, Mbabazi et al., 2011).

Among women with genital schistosomiasis, the inflammation, friability, and neovascularization of the genital epithelial tissue can lead to a compromised physical barrier to HIV through sexual activity. In population-based studies, female genital schistosomiasis has been associated with three to four times increased risk of HIV infection (Downs et al., 2012, Kjetland et al., 2006, Mbabazi et al., 2011). Urogenital schistosomiasis is extremely common and a possible risk factor for HIV infection in women. There is a need to prevent urogenital schistosomiasis by purchasing generic Praziquantel, which is cheaper and can be made available for all South Africans, as there are no locally available alternatives to the drug as the treatment of choice of all forms of schistosomiasis (Doenhoff and Pica-Mattocchia, 2006).

Estimations show that at least 206.4 million people required preventive treatment for schistosomiasis, where, more than 89 million people treated for schistosomiasis in 2016 (WHO, 2018). However, despite the effectiveness of Praziquantel, there is a high re-infectivity rate in endemic areas even after mass treatment and the cost of this drug, although reduced, remains prohibitive for many control programmes in schistosomiasis endemic areas (Jones et al., 2018). A holistic approach is therefore necessary, and should not only include reducing the disease burden in infected persons using chemotherapy but also

interfering with the life-cycle of the parasite by eliminating the snail vector. Molluscicides are widely considered to be an important part of schistosomiasis control that can be used at selected sites to achieve immediate results (Tsepe, 2003). Measures such as improved sanitation and health education are likely to take time to reduce the spread and prevalence of the disease, with mollusciciding and traditional medicine, therefore, needing to be considered as of important components of schistosomiasis control (Jones et al., 2018).

More than 80% of the population in developing countries depends on plants for their medicinal needs, and in South Africa, the prescription and use of traditional medicine is not regulated, with the result that when traditional medicine is used concurrently with standard drugs, they impair the activity of the drug (Ekor, 2014).). However, there is also a danger of misadministration, overdose, and the problem of toxicity and incompatibility with the prescribed medication (Ekor, 2014, Cock et al., 2018). Some medicinal plants with possible anti-schistosomal properties are widely used by traditional healers in South Africa, although their effectiveness has not been scientifically evaluated (Cock et al., 2018). Knowingly, traditional medicine is an alternative practice in South Africa where 72% of the Black African population is estimated to be relying on this type of medicine, accounting almost 26.6 million consumers (Mander et al., 2007, Oyedeji, 2018).

1.2.3. Use of traditional medicine for schistosomiasis and comorbidities

Traditional medicine (TM) is part of indigenous knowledge (IK), defined by the WHO ‘diverse health practices, approaches, knowledge and beliefs incorporating plant, animal, and/or mineral based medicine, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illnesses (Kasilo and Nikiema, 2014). IK continues to play an important role in improving and maintaining health in developing countries (Thorsen and Pouliot, 2016). Policies for integrating traditional medicine into public health care systems have been formulated to varying extents in a number of countries (Gureje et al., 2015), with the approximately 40% of the population using traditional medicine in China and 80% in Africa (Kasilo and Nikiema, 2014, Ekor, 2014). As a consequence of the pluralistic nature of health care systems, people’s treatment-seeking behaviour is characterized by the use of different treatment types, either sequentially or simultaneously (Gureje et al., 2015).

Regarding diagnosis, IK through TM is a system that is both an art and a method of seeking to discover the origins of the disease and determine it. The diagnostic process not only seeks answers to the question of how the disease originated (immediate causes), but who or what caused the disease (efficient cause), and why it has affected this particular person at this point in time (ultimate cause). Diagnosis consists of a combination of information, namely observation, patient self-diagnosis and divination (Tabuti et al., 2003).

Although, certain plant extracts can interfere with conventional medicine (Karmakar et al., 2012). In many developing countries, people living in rural settings often exclusively use traditional medicines to treat various ailments including schistosomiasis (Mander et al., 2007, Cock et al., 2018). A range of medicinal plants with possible anti-schistosomal properties has been widely used by traditional healers of different ethnic groups in South Africa. The effectiveness of many of them, however, has not been scientifically evaluated (Cock et al., 2018).

The problem of therapeutic failure and drug resistance is being reported from many developing countries, and while effective and safe drugs for mass chemotherapy are being developed under these circumstances, alternative options must be considered. Plants that have shown molluscicidal and antischistosomal activity are indicated in Table 1.0.

Table 1. Plants effective against schistosomes

Plant name and availability	Biological activity	Authors
<i>Zingiber officinale</i> L. (Zingiberaceae) native to South East Asia but cultivated in many tropical countries, including Nigeria and Sierra Leone	Tested using <i>Biomphalaria glabrata</i> and <i>Schistosoma mansoni</i>	Adewunmi et al., 1990
	Two fractions containing pure compounds gingerol and shogaol resulted in 80% mortality of <i>Biomphalaria glabrata</i> snails at a concentration of 25mg/l the Gingerol (5mg/l) arrested the ability of <i>Schistosoma mansoni</i> miracidia and cercariae to infect both snails and mice, showing its molluscicidal action, supporting use in schistosomiasis control	Adewunmi et al., 1990
<i>Trichilia emetica</i> Vahl (Meliaceae) and <i>Berkheya speciosa</i> O.Hoffm (Compositae)	Extracts were lethal at 6.25mg/ml while <i>Euclea natalensis</i> (Ebenaceae) plant extracts at a concentration of 3.13mg/ml killed 66% of the schistosomules	Sparg et al., 2000
<i>Abrus precatorius</i> L. (Fabaceae) available in South Africa and elsewhere	Extracts were lethal at concentrations of 0.6mg/ml, killing all schistosomules of <i>Schistosoma mansoni</i>	Mølgaard et al., 2001

By studying not only the stock available of antischistosomal medicines included in current government policy in South Africa but rather the variety of treatments practised by the population for schistosomiasis and co-morbidities, this research aimed to improve our understanding of treatment-seeking behaviour and to thereby inform the development of better-targeted health interventions and policies. This study intended establishing the prevalence of the use of traditional medicine and prescribed antischistosomal medicines in communities with high Schistosomiasis infection in ILembe District, KwaZulu-Natal Province, and to establish whether the unavailability of prescribed antischistosomal medicines was a motivating factor in their use.

1.3. Statement of the problem/justification or rationale of the study

The eastern and northern parts of South Africa are endemic for schistosomiasis, with an estimated 2.4 million school-aged children and 3 million adults requiring treatment with Praziquantel yearly or every second year (Baan et al., 2016, WHO., 2013). Urogenital schistosomiasis is a major health problem in South Africa, the country has the highest HIV prevalence in the world; the role of female genital schistosomiasis in driving the HIV epidemic is yet to be explored (Downs et al., 2012, Chitsulo et al., 2004, Doenhoff and Pica-Mattocchia, 2006).

Cross-sectional studies in Zimbabwe and Tanzania revealed that there is a correlation between female genital schistosomiasis and the acquisition of HIV, which have been confirmed elsewhere, and infection with some STH species being associated with increasing HIV loading in sexually active women (Downs et al., 2011).

Praziquantel is the recommended treatment against all forms of schistosomiasis, is effective, safe, and low-cost, even though re-infection may occur after treatment, with the risk of developing severe disease being diminished and even reversed when treatment is initiated and repeated in childhood (WHO, 2018). Despite the effectiveness of Praziquantel, there is a high re-infectivity rate in endemic areas, even after mass treatment, which makes repeated treatment necessary, although it has not been established what a suitable interval between such treatments would be (Appleton et al., 2006, Doenhoff and Pica-Mattocchia, 2006). In addition, soil-transmitted helminth infections associated with schistosomiasis and treated with Albendazole cause a small decrease in HIV load; however, this may not represent a direct effect of worms' removal (Kjetland et al., 2006).

Despite being reduced, the cost of Praziquantel remains prohibitive for many control programs in schistosomiasis endemic areas, highlighting the need for greater commitment to control efforts (Jones et al., 2018). In some countries, traditional medicine has made a contribution to managing schistosomiasis (Bah et al., 2006, Cock et al., 2018). In an ethnopharmacological survey conducted in Niger and Mali, 55 plant species were reported to be used to treat schistosomiasis either alone or in combination, of which *Zea mays* with *Glossonema boveanum* were specific for intestinal schistosomiasis (Bah et al., 2006). *Cissus quadrangularis* and *Stylosanthes erecta* were reported for the first time in Mali to be used against the parasite (Bah et al., 2006).

This research contributed to fill the knowledge gap in exploring the philosophy and IK for treating schistosomiasis by traditional healers and understanding issues related to the treatment-seeking behaviour among individuals affected by schistosomiasis. The findings of this study are presented in the format of manuscripts included in this dissertation in chapters three and four which are targeted for publication in scholarly journals.

This study aimed to evaluate the prevalence of the use of traditional medicine and prescribed antischistosomal medicines in communities having high prevalence schistosomiasis infection in ILembe District, KwaZulu-Natal and to establish whether the unavailability of prescribed antischistosomal medicines leads to the use of traditional medicine.

1.4. Research questions, Aim and objectives

1.4.1. Research questions

For the purpose of this study, one general research question was developed as follows: “What is the prevalence of the use of traditional medicine or/and prescribed antischistosomal medicines for the management of schistosomiasis in ILembe District?”

To answer this general research question, specific research questions were formulated as follows:

1. How do traditional healers diagnose the mentioned diseases and what types of traditional medicines are used to treat them?
2. What is the prevalence of patients consulting THPs and using prescribed schistosomal medicines for urogenital and intestinal schistosomiasis?
3. Does the unavailability of stock of prescribed medicines lead to the use of traditional medicine for schistosomiasis, helminthiasis and HIV/AIDS?
4. How do healthcare workers perceive the use of TM for the management of schistosomiasis, helminthiasis and HIV/AIDS?
5. What are the effects on patients using concurrently both prescribed medicines and traditional medicines for schistosomiasis, helminthiasis and HIV/AIDS?

1.4.2. Aim or purpose of the study

This study aimed to evaluate the prevalence of the use of traditional medicine and prescribed antischistosomal medicines in communities having high prevalence schistosomiasis infection in ILembe District, KwaZulu-Natal and to establish whether the unavailability of prescribed antischistosomal medicines leads to the use of traditional medicine.

1.4.3. Hypothesis

Individuals infected with schistosomiasis also used TM due to unavailability of prescribed medicines.

1.4.4. Objectives

The objectives for conducting this study were as follows:

1. To explore and understand the way THPs diagnosed Schistosomiasis and the types of traditional medicines used to treat the disease.
2. To determine the prevalence of patients consulting THPs and using prescribed antischistosomal medicines for schistosomiasis.
3. To establish to what extent the unavailability of prescribed medicines resulted in the patients' use of traditional medicine for schistosomiasis, helminthiasis and HIV/AIDS.
4. To establish the perceptions of Healthcare workers about the use of TM for managing schistosomiasis, helminthiasis and HIV/AIDS.
5. To describe the effects on patients of using prescribed medicines and traditional medicines for schistosomiasis, helminthiasis and HIV/AIDS.

1.5. General methodology

This is an overview of the methodology of this study. Chapters two, three and four have each a detailed methodology section. This research was a quantitative and qualitative study (mixed method). It used an exploratory survey to obtain facts in an attempt to learn about and describe the perceptions and knowledge in the treatment of schistosomiasis from a perspective of traditional treatment comparing to the conventional one. This survey explored the characteristics of the targeted population and identified what issues were important to their understanding of the topic (Katzenellenbogen, *et al.*, 1999). The chosen methodology generated useful information through the collection and analysis of data on the perceptions about the use of TM and the availability of prescribed antischistosomal medicines in the management of schistosomiasis.

1.5.1. Study design

This study was a cross-sectional descriptive study, using an exploratory mixed-method approach. The study was carried out into two phases as described below:

Phase 1 included both qualitative and quantitative descriptive studies divided into four parts:

Phase 1.A. Qualitative descriptive study: a self-developed questionnaire was administered to understand THPs' experiences about the management of schistosomiasis. This questionnaire probed concepts about different methods used by THPs to diagnose and treat schistosomiasis (see Appendix 6.A).

Phase 1.B. Qualitative descriptive study: patients seen by THPs were interviewed to understand their experiences about the use of traditional medicine in the management of schistosomiasis. The

questionnaire used in this phase was slightly different from the THPs' questionnaire (see Appendix 6.B).

Phase 1.C. Quantitative approach: health care workers (HCWs) were interviewed in their facilities regarding the management of schistosomiasis using antischistosomal prescribed medicines as well as their thoughts on the use of TM. Through a written questionnaire respondents were interviewed on the availability of antischistosomal medicines and the use of TM in the management of schistosomiasis (see Appendix 6.C).

Phase 1D: Qualitative-Quantitative survey: patients seen by HCWs and those who have visited THPs were interviewed on the concurrent use of conventional antischistosomal medicines with TM. A questionnaire was developed to collect respondents' perceptions of the concurrent use of antischistosomal medicines and the use of TM in the management of schistosomiasis (see Appendix 6.D).

Phase 2: Quantitative descriptive: Medical chart records of patients were reviewed to establish the documented use of conventional antischistosomal treatment as well as the use of TM for the management of schistosomiasis and comorbidities. A data collection tool was developed to collect information about conventional medicines prescribed to patients and other relevant information related to the documented use of TM (see Appendix 6.E).

1.5.2. Study area

Located on the eastern coast of KwaZulu–Natal (KZN), ILembe District Municipality was the study area due to its history of schistosomiasis prevalence in KZN (Saathoff et al, 2004). It is bordering the Indian Ocean, surrounded by Umzinyathi in the north, the Indian Ocean in the east, eThekweni in the south (Durban), and Umgungundlovu in the west and Uthungulu in the north- east. It is the smallest municipality in the province, with a population of 630 464 and an area of 3269 km²; it is about 75 km from Durban. The majority of rural areas inland are tribal areas, characterized by subsistence farming. ILembe has four local municipalities between Durban and Richards Bay: Mandeni, KwaDukuza, Maphumulo and Ndwedwe. The town stretches along the Tugela River, the traditional border between the former Colonial Natal and the Kingdom of Zululand, the site of historical and cultural events. The ILembe seat is KwaDukuza (formerly Stanger). The border of the district is the unicity of Durban in the immediate south, connected to Richards Bay in the north by the coastal highway, giving access to both harbours for commercial purposes. It is also a leading tourism industry due to its rich heritage in the Zulu Kingdom, as it was named in recognition of King Shaka. The ILembe district has 90.8% Black African, 9.6% Native English speakers, 3.3% Native Xhosa and 2.4% White people in its population. The majority of people (82 per cent) speaks Zulu. ILembe Health District has four hospitals: District Hospital of Montebello, Provincial Hospital of Stanger, District Hospital of Umphumulo, District

hospital of Untunjambili (<http://www.kznonline.gov.za/index.php/government/2016-08-02-09-42-02/ilembe-district-municipality>).

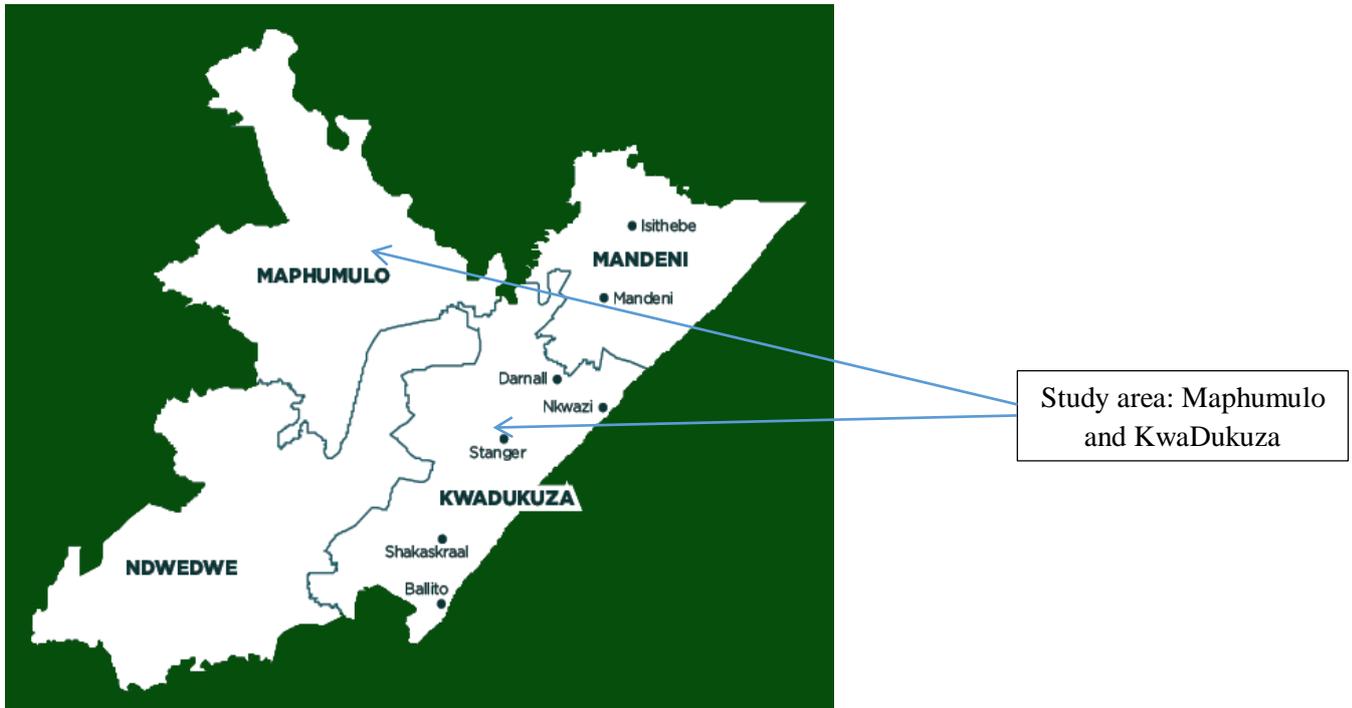


Figure 1. 1: A geographic map showing the study area in Ilembe

([Http://www.kznonline.gov.za/index.php/government/2016-08-02-09-42-02/ilembe-district-municipality](http://www.kznonline.gov.za/index.php/government/2016-08-02-09-42-02/ilembe-district-municipality))

1.5.3. Study population, inclusion and exclusion criteria

1.5.3.1. Study population

The study population consisted of THPs, patients seen by them (THPs), HCWs treating schistosomiasis and patients with schistosomiasis who have visited outpatient departments of healthcare facilities included in this study.

1.5.3.2. Inclusion and exclusion criteria

This study included THPs, HCWs treating schistosomiasis and patients with schistosomiasis, irrespective of gender. Participants were aged 18 years old and above. Participants eligible for inclusion but not available at the time of data collection for face-to-face interviews were excluded from this study. Patients with doubtful information about schistosomiasis were excluded as well from this study.

1.5.3.3. Sampling technique and sample size

Sampling technique

A purposive sampling technique was used to draw participants namely THPs, patients seen by them (THPs), HCWs and patients with schistosomiasis at outpatient departments. The different categories of study participants were purposively sampled from the study area (Fig. 1).

Sample size

Here was the sample size for each phase of this research:

Phase 1A: based on the principle of saturation, this study recruited 22 THPs who treated patients with schistosomiasis in the study area.

Phase 1B: THPs seen in phase 1A referred researchers to patients seen by them. 20 participants were included at this stage.

Phase 1C: 124 HCWs treating schistosomiasis in the public health care facilities under the study area were included. This sample size was divided among the 10 facilities visited in the study area, ILembe district, KwaZulu-Natal.

Phase 1D: 15 patients with schistosomiasis seen by HCWs were recruited from outpatient departments.

Phase 2. The population in the study area was estimated at 657 612 (<https://municipalities.co.za/demographic/117/ilembe-district-municipality>). Thus, the minimum recommended sample size was 139 respondents. The sample size of respondents was determined using the formula as described by Lwanga (1991) and Daniel (1999) (Naing et al., 2006):

$$N = \frac{Z^2P(1 - P)}{2d^2}$$

Where Z statistic as 1.96 for the confidence level of 95%, P is 0.8 as the expected proportion of the characteristics were measured in the study area (Lankford et al., 2010, Jacobs and Viechtbauer, 2017); d is the precision of 0.05 for 95% confidence interval. Since it was a prospective study, attritions were expected for various reasons, unsigned consent and assented forms, the absence of respondents, failure to provide information or not being available during subsequent survey; an increase of 10-20% was added to the minimum sample size of 139 yielding 159 respondents included in the final analysis.

1.5.4. Recruitment and selection of study participants

The recruitment started with THPs seen initially for interviews about schistosomiasis management. Community heads and leaders of THPs associations were contacted for identification of THPs treating

schistosomiasis. THPs were visited during their business hours at their workplaces (Phase 1A). Patients seen and identified by those THPs were contacted and recruited in the next step of the study (Phase 1B). HCWs involved in the management of schistosomiasis were seen and recruited during business hours in public healthcare facilities (Phase 1C) and finally, patients with a history of consulting both THPs identified from phase 1B and who also crossed the mainstream healthcare system for schistosomiasis were included in this step of the study (phase 1D). In phase 2, medical chart records of patients were purposively analyzed.

1.5.5. Data collection techniques and research tools

Research-administered face-to-face interviews were carried out in phase 1 while phase 2 consisted of a medical chart review of patients. In phase 1, questionnaires were used to collect data. In phase 2, a checklist was developed to collect relevant information. Data were collected four days a week over the data collection period from January to April 2018. Questionnaires used in phase 1A, 1B, 1C and 1D were translated into IsiZulu. An expert for content validity tested the translated questionnaire.

1.5.6. Data analysis

Data collected was captured cleanly and accurately in a spreadsheet. Quantitative data were entered into and analyzed statistical package for social sciences (IBM SPSS Statistics) statistical software version 25.0 package for Windows. The phase with the qualitative approach was analyzed using thematic or content analysis while phases with the quantitative approach used descriptive statistics including frequency, percentage, and categorical data represented as tables.

Qualitative data: based on a thematic analysis in which the translated for those in the local language, IsiZulu and transcribed interviews were read and reread entirely. They were summarized; keeping in mind that more than one of them might exist in a set of interviews. If identified, the themes that appeared to be significant and concepts linking substantial portions of the interviews were written down and entered on the computer (Morse and Field, 1995). Each of the selected respondents gave their point of views in the management of schistosomiasis. This approach was used to generate an in-depth understanding of the issue (Pearson et al., 2010).

Quantitative data: An analysis of variables was carried out. Associations between continuous variables were analyzed using Chi-squared tests. A p-value ≤ 0.05 was estimated as statistically significant.

1.5.8. Ethics and permissions

The permission for the study was sought from the University of KwaZulu-Natal Biomedical Research Ethics committee (BREC) under reference number BE477/17 (see Appendix 1). Gatekeeper permission was secured from the KZN Provincial Department of Health reference number HRKM451/17 (see Appendix 2). Letters of support from study sites were secured (see Appendix 3). Eligible participants were given an information letter/sheet about the study (see Appendix 5A). Those willing to participate were requested to give a written consent form before being interviewed (see Appendix 5B). Participation in the study was voluntary. Participants were free to withdraw at any time with no further obligation. The main ethical principles that were considered in conducting this research study were respect for persons, confidentiality and beneficence /non-maleficence. Study aims and procedures were explained to participants in English and the local language, IsiZulu. Anonymity and guaranteed confidentiality about information collected were maintained. No name, no ID of participants were disclosed to the third party or displayed on questionnaires and data collection forms. Questionnaires and data extraction form were coded and codes are known to the team of researchers. Data collected were kept in a locked cupboard in the supervisor's office. Information on the computer used for the study was password protected.

1.6. Layout of the thesis

This thesis is presented in a manuscript format, as per the UKZN requirements, with the Results and Discussion being described in manuscripts that have been prepared for publications. It is structured as follows:

Chapter 1. Introduction: *This chapter gives a background of the study, a brief overview of the literature on schistosomiasis, the statement of the problem/justification or rationale of the study, aim and objectives, hypothesis, general methodology and the layout of the thesis.*

Chapter 2. Manuscript 1- Review Protocol: *“Mapping evidence of the concomitant management of schistosomiasis by Traditional Health Practitioners and Health care Professionals in communities with high prevalent infections: A systematic scoping review protocol”. This is a systematic review protocol on the concomitant management of schistosomiasis by THPs and HCPs in communities with high prevalent schistosomiasis infection. A manuscript was written and submitted to BMC Systematic Reviews.*

Chapter 3. Manuscript 2 - Research article: *“Knowledge, perceptions and experiences of traditional health practitioners about the management of female urogenital schistosomiasis: the Case of ILembe District, KwaZulu-Natal, South Africa”. This chapter provides an original research manuscript on*

perceptions of participants about the management of schistosomiasis using TM. A manuscript was written and submitted to BMC Ethnobiology and Ethnomedicine.

Chapter 4. Manuscript 3 - Research article: *“A Triangulation of information from Healthcare workers and patients about the concurrent use of traditional medicine and conventional prescribed medicines for schistosomiasis in ILembe district, KwaZulu-Natal, South Africa”.* This chapter is an original research manuscript on participants perceptions about the management of schistosomiasis and analyzed information documented in medical chart records of patients with schistosomiasis.

Chapter 5. Synthesis chapter: *This chapter provides general discussions of major findings, general conclusions of the study and recommendations for future studies.*

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Taking into consideration the literature on the use of traditional medicine and the orthodox medicine in schistosomiasis management, this review was entitled: “Mapping evidence of the concomitant management of schistosomiasis by Traditional Health Practitioners and Health care Professionals in communities with high prevalent infections: A systematic scoping review protocol”. It aimed to map publications on the evidence of the concurrent use of orthodox and traditional medicine management of schistosomiasis infection in Low and Middle Income Countries (LMICs). This review was developed following the *BMC Systematic reviews guidelines* and submitted to the same Journal. It is under second review (**Manuscript number SYSR-D-17-00336R1**).

CHAPTER 2: FIRST MANUSCRIPT

Mapping evidence of the concomitant management of schistosomiasis by
Traditional Health Practitioners and Health care Professionals in communities
with high prevalent infections: A systematic scoping review protocol

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Abstract

Background

Schistosomiasis is one of the most prevalent parasitic diseases in low-and-middle-income countries (LMICs), being regarded as a neglected tropical disease in sub-Saharan Africa. Praziquantel is the conventional treatment recommended for schistosomiasis in mainstream healthcare systems. In many poor settings, while many people reportedly use both traditional medicine and public-sector mainstream healthcare systems, little is known if those infected with schistosomiasis use both African traditional and prescribed antischistosomal medicines. This review aims to map evidence of the concomitant management of schistosomiasis by traditional health practitioners (THPs) and health care professionals (HCPs) in communities with a high prevalence schistosomiasis infection in LMICs.

Methods/Design

Guided by Arksey and O'Malley scoping review framework and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), we will map the evidence from relevant studies dating from 2007 to September 2017 published on LMICs. An electronic keyword search of the following databases will be conducted: PubMed; Cochrane Library and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and MEDLINE via EBSCOhost, Google Scholar and WILEY online Library. Peer-reviewed articles, grey literature sources and reference lists will be included to identify for eligible studies. Following title screening, two reviewers will independently screen the abstracts and full-texts. Any study that focuses on managing schistosomiasis will be included. The data will be analysed using thematic analysis with the help of NVIVO software version 11, with the Mixed Method Appraisal Tool (MMAT) being used to assess the quality of the included studies.

Discussion

This review will map the evidence in the literature of the concomitant management of schistosomiasis by THPs and HCPs in communities with a highly prevalent infection in LMICs. The review findings will be important for policymakers across the healthcare continuum and be used to inform stakeholders' consensus process to explore the development of a generic set of patient-centered quality indicators that are applicable to multiple care settings. It will also identify research gaps in schistosomiasis management in LMICs and provide direction for future research. The results will be disseminated through a peer-reviewed publication and presented in relevant conferences.

Systematic review registration: CRD42017078198

(https://www.crd.york.ac.uk/prospero/display_record.asp?ID=CRD42017078198)

Keywords: Schistosomiasis; Neglected tropical diseases; Collaboration; Investigation, Traditional Health Practitioners; Health Care Professionals; Access; Low-and-Middle Income Countries

BACKGROUND

Infectious diseases are both a major public health concern and a socioeconomic problem in tropical regions within most low-and-middle-income countries (LMICs), where neglected tropical diseases (NTDs), such as schistosomiasis, are cause for concern [1]. These NTDs often occur in people who are also infected with human immunodeficiency virus (HIV), malaria or tuberculosis, making the problem even more serious, as co-infections are common [2]. Globally, more than 250 million people are infected with schistosomiasis, with approximately 700 million at risk of infection [3]. Schistosomiasis is a parasitic disease caused by schistosomes, worms that are found in tropical and sub-tropical freshwaters [4]. An estimated 206.4 million people needed preventive treatment for schistosomiasis in Africa in 2016, of whom approximately 89 million (43%) were reportedly treated [5]. More than five million people in South Africa, mainly in rural areas, required treatment in 2014 for urogenital schistosomiasis [6].

Praziquantel, the recommended treatment against all forms of schistosomiasis [7], is inexpensive and regarded as effective and safe, although re-infection may occur after treatment. The risk of developing the severe disease is reduced when treatment is initiated and repeated in childhood [8]. Many countries, such as Mozambique, Zambia, Nigeria and Uganda, have implemented mass treatment campaigns since the 1980s with generic medicines, including Praziquantel, with some having attained countrywide coverage the last few years [9-11]. The cost of Praziquantel in South Africa is 50 times higher than the World Health Organization (WHO) standard treatment that is in use in the rest of Africa, making it costly to provide mass treatment, which cannot be implemented [12]. None of the companies producing generic Praziquantel in other countries has the right to sell them in South Africa, due to the time-consuming, expensive, “scientifically unnecessary” an elaborate registration process [13]. However, the cost of Praziquantel in South Africa, despite having been reduced, remains prohibitive for many control programs in schistosomiasis endemic areas [14].

Alternatively, traditional medicine has demonstrated its contribution to managing schistosomiasis [15]. In an ethnopharmacological survey conducted in Niger and Mali, 55 plant species were reported to be used for treating schistosomiasis either alone or in combination, of which *Zea mays* with *Glossonema boveanum* were specific for intestinal schistosomiasis, while *Cissus quadrangularis* and *Stylosanthes erecta* were reported for the first time in Mali to be used against urogenital schistosomiasis [16]. A range of medicinal plants with anti-schistosomiasis properties has been widely used by traditional healers of different tribes in South Africa, although their effectiveness has not been scientifically evaluated [14]. A study conducted on mice in Zimbabwe showed no significant difference between a herbal preparation (Schitozim) and Praziquantel in managing schistosomiasis. However, the authors warranted further investigation to determine the toxic levels and effective doses of Schitozim in clinical settings [17].

Due to the unavailability of conventional therapy, or the expensive cost of Praziquantel and other antischistosomal medicines, people in rural areas may not have access to modern treatment for schistosomiasis, which results in them using traditional medicine [18, 19]. Collaboration between the two medical traditions can provide appropriate care for diseases management, for example, through mutual referral [20].

This review aims to map the evidence of the concomitant management of schistosomiasis by traditional health practitioners and health care professionals in communities with a high prevalence of schistosomiasis infection in LMICs. Thus, the purpose of this review is to provide evidence to enable the implementation of policies and guidelines to manage schistosomiasis with traditional medicine contributing to primary healthcare.

METHODS/DESIGN

Scoping review framework

This review will be based on the framework originally proposed by Arksey and O'Malley [21] and further improved by Levac *et al.* (2010), which are presented in Table 1 [21-23]. There are six steps involved in the framework, although the last step about consulting experts/stakeholders will not be conducted for this review due to funding constraints. Consulting additional sources of information, perspectives, meaning and applicability will be covered with grey literature. This review follows the six steps outlined by the Arksey and O'Malley framework but will incorporate enhancement suggested by the later authors.

Table 1. 1: Scoping review framework for this review [21-23].

<i>Arksey and O'malley framework</i>	<i>Enhancements proposed by Levac, Colquhoun and O'brien</i>
<i>1. Identify the research Question</i>	Clarify and link the purpose and research question
<i>2. Identify relevant studies</i>	Balance the feasibility with breadth and comprehensiveness of the scoping process
<i>3. Select the study</i>	Use an iterative team approach to select studies and extract data
<i>4. Chart the data</i>	Incorporate a numerical summary and qualitative thematic analysis
<i>5. Collate, summarize and report the results</i>	Identify the implications of the study findings for policy, practice or research
<i>6. Consult experts/stakeholders (optional)</i>	Provide opportunities for consumer and stakeholder involvement to suggest additional references and provide insights beyond those in the literature.

1. Identify the research questions

The following research questions were formulated to guide the review in meeting its aims and objectives. The general research question is: “What is the evidence about the concomitant management of schistosomiasis by THPs and HCPs in communities with a high prevalence schistosomiasis infection?” The specific research questions are as follows:

1. What is the evidence of the healthcare seeking behaviour among individuals in communities with high prevalent infections of schistosomiasis?
2. What is the evidence of the use of traditional, complementary and alternative medicine for managing schistosomiasis?
3. Is there a bidirectional referral of patients between THPs and HCPs for managing schistosomiasis?

Eligibility of research questions

The Population, Intervention, Comparison and Outcomes (PICO) for the research questions has been used to break down the clinical questions into searchable keywords [24].

Table 1. 2: Research questions eligibility (PICO) Framework

Framework	Evidence-based practice
P: Population	THPs and HCPs, aged 18 years old and above regardless of gender.
I: Intervention	Traditional remedies for schistosomiasis management, Praziquantel and LMICs.
C: Comparison	Schistosomiasis management by THPs and HCPs.
O: Outcomes	Access to treatment and improvement of the management of schistosomiasis in communities with high prevalent infection.

2. Identify relevant studies

Relevant literature will be searched from the following databases: PubMed; EBSCOhost (the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and MEDLINE); Google Scholar; Cochrane Library, WILEY online Library and grey literature. Reference lists of included studies will also be searched. The keywords search will include the following: schistosomiasis; neglected tropical diseases; collaboration; investigation, traditional health practitioners; health care professionals; access; low and middle-income countries, schistosomiasis or collaboration or traditional medicine or neglected tropical diseases (NTDs) or natural products or leads. The Boolean search terms (AND and OR) and MeSH terms ("therapy", "therapeutics", "schistosomiasis", "health personnel", "residence characteristics", "infection", ...) will be included in the search. Grey literature will be identified through website source links in references. Peer review studies and grey literature reporting on the evidence of managing schistosomiasis by THPs and HCPs in LMICs published between 2007 and 2019 will be included. Authors of primary studies or reviews will be contacted for further information or to access missing studies where relevant. If the authors do not respond, then their publications will be excluded.

3. Select the study

Inclusion criteria

The following criteria provide a guide to clearly understand what is proposed by the reviewers and, more importantly, a guide for the reviewers themselves upon which to base decisions about the sources to be included in this review [25]. As explained above, regarding the review types, there must be clear congruency between the title, objectives, question/s, and inclusion criteria of a scoping review. They are as follows:

1. Evidence of the population of interest in this review (THPs and HCPs)
2. Evidence of the intervention (Schistosomiasis treatment and co-morbidities)
3. Evidence of the comparison of treatment by THPs and HCPs
4. Evidence on the outcomes of managing schistosomiasis
5. Articles published in English and French will be included.

Exclusion Criteria

1. Articles published before 2007.
2. Articles not addressing the treatment of schistosomiasis and comorbidities.
3. Articles not addressing integration and collaboration between Traditional Medicine and Conventional Medicine.
4. Studies that are not reporting evidence from LMICs

Search strategy

The search strategy for this review aims to be comprehensive to identify both published and unpublished (grey literature) primary studies and reviews [25, 26]. A pilot search was conducted with the database results provided in Appendix 1. A three-step search strategy will be utilized. The first step is an initial limited search of the electronic databases. This initial search will be monitored, exported on Endnote X8 reference manager for abstract and full article screening. The duplicated article will be deleted. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies [25]. For abstract and full article screening, the endnote library will be shared with a second reviewer. Any discrepancies in the results of abstract screening will be resolved through a discussion until a consensus is reached. A third screener will help to resolve discrepancies in full article screening results [26].

Publications duplicated in the research results will be treated as a single study for the review. To maintain transparency in the review selection process, a PRISMA Flow Diagram will be followed in each stage of the selection process. In addition, a list of the studies excluded during the full-text review will be documented as an appendix, with brief reasons for their exclusion [26]. A PRISMA Flow Diagram will be used to report the screening results (see Figure 1). EndNote will help to manage the search results including downloading all results, removing duplicate records, and screening for potentially relevant studies.

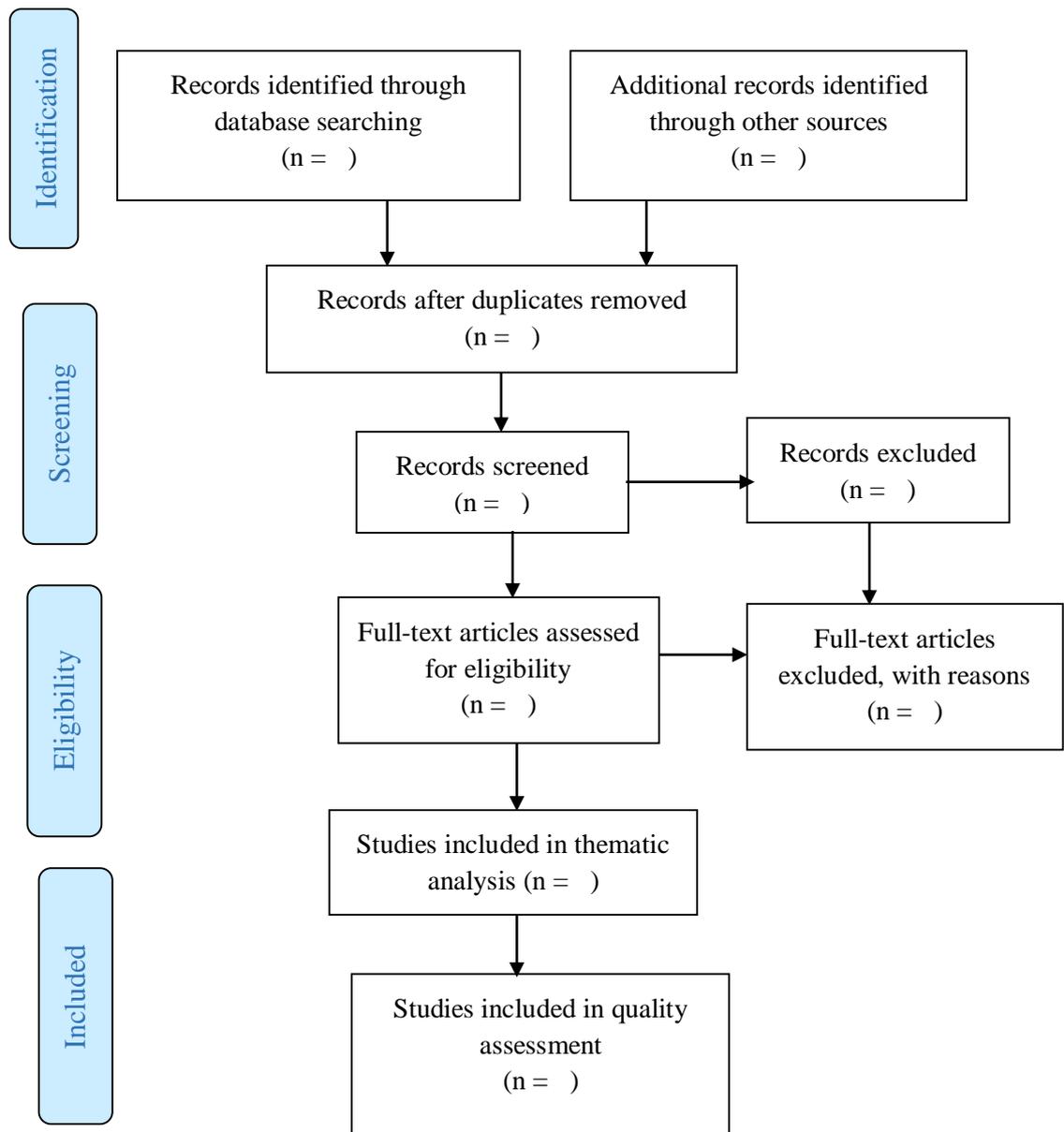


Figure 2. 1: The PRISMA Flow Diagram for a scoping review screening process [25].

Quality appraisal

For the quality appraisal of the included studies, we will use a Mixed Methods Appraisal Tool (MMAT), version 2011[27]. The MMAT will allow us to assess the appropriateness and quality of the research. Studies can be scored following specific criterion using a certain score to describe them from 50% and above.

4. Chart the data

We will conduct data extraction to enable a logical and descriptive summary of the search results (Appendix 1) of our systematic scoping review [25, 26]. A table of characteristics for included studies will be developed at this stage to record the key information of the source, such as author, reference and results or findings relevant to the review question/s (Appendix 3). This may be further refined at the review stage and the sample extraction form updated accordingly. From the key information chart, data in the selected articles will be in data extraction form and synthesized into different themes for interpretation to identify key findings.

5. Collate, summarize and report the results

The results will be presented in a data extraction form or table and will be further refined towards the end of the review when the authors will have the greatest awareness of the contents of their included studies to manage schistosomiasis. The results will be mapped in the existing thematic framework, which will consist of the included papers in a diagrammatic or tabular form, and/or in a descriptive format that aligns with the objective/s and scope of the review related to outcomes. The PICO elements for inclusion criteria will be useful to guide how the data will be mapped most appropriately.

A narrative summary will accompany the tabulated and/or charted results and should describe how they relate to the review objective and question/s according to the management of schistosomiasis and its co-morbidities by THPs and HCPs. The synthesis of important findings across the included studies will be classified by identifying prominent themes under the main conceptual categories, such as: “intervention type”, “review population” (and sample size, if it is the case), “duration of intervention”, “aims”, “methodology adopted”, “key findings” (evidence established), and “gaps in the research”. For each category reported, a clear explanation will be provided.

Synthesis

Throughout this research, we will examine the above-mentioned themes and critically identify their link to the research question. Reviewers will analyze the significance of the findings according to the aim of this research and their implications for future studies, practice and policy.

DISCUSSION

This review is part of larger studies evaluating the management of schistosomiasis by THPs and HCPs in South Africa. There is little evidence to support the current South African policy to manage schistosomiasis. This systematic scoping review aims to build on the work of the existing Cochrane study [20] by further describing the participant inclusion criteria and utilizing a wider range of evidence

on this topic. A key strength is that it can provide a rigorous and transparent method for mapping areas of research according to the treatment of schistosomiasis with comorbidities. We wish to be able to illustrate the field of interest, that being the management of schistosomiasis, in terms of the volume, nature and characteristics of the primary research.

Articles not addressing integration and collaboration between traditional and modern medicine will not be part of this research, as it intends finding a way to manage schistosomiasis via bidirectional referral of patients between THPs and HCPs. Due to the prevalence of schistosomiasis, a collaboration of THPs and HCPs could help to manage the infection, as traditional medicine is available to most people in LMICs, with not less than 80% of people worldwide depending on it [28].

It is anticipated that this review will identify gaps in the current literature on this topic and provide direction for future research in this area of this review. The summary and dissemination of this research findings may be of interest for policymakers and stakeholders (practitioners and consumers) who are involved in the NTDs management, especially those involved in schistosomiasis management using either the mainstream healthcare systems or African traditional medicine.

LIST OF ABBREVIATIONS

THPs: Traditional Healthcare Practitioners, HCPs: Health Care Professionals, PICO: Population Intervention Comparison Outcomes; MMAT: Mixed Methods Appraisal Tool, NTDs: Neglected Tropical Diseases, HIV/AIDS: Human Immunodeficiency Virus/ Acquired immunodeficiency deficiency Syndrome, TM: Traditional Medicine, LMICs: Low-and-Middle Income Countries.

DECLARATIONS

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

All data generated or analyzed during this review will be included in the published scoping review

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

This review protocol was drafted by AGAM. MN and TM revised the draft for its intellectual content and approved the final version of the manuscript for submission to the journal. AM and MN addressed peer reviewers' comments. MN approved the final version of the revised manuscript.

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APPENDICES

Appendix 1. Table 2: Results of the pilot database search

Keyword Search	Date of search	Search Engine used	Number of publications retrieved (Results)
Mapping[All Fields] AND evidence[All Fields] AND concomitant[All Fields] AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields]) AND ("schistosomiasis"[MeSH Terms] OR "schistosomiasis"[All Fields]) AND Traditional[All Fields] AND ("health"[MeSH Terms] OR "health"[All Fields]) AND Practitioners[All Fields] AND ("health personnel"[MeSH Terms] OR ("health"[All Fields] AND "personnel"[All Fields]) OR "health personnel"[All Fields] OR ("health"[All Fields] AND "care"[All Fields] AND "professionals"[All Fields]) OR "health care professionals"[All Fields]) AND ("residence characteristics"[MeSH Terms] OR ("residence"[All Fields] AND "characteristics"[All Fields]) OR "residence characteristics"[All Fields] OR "communities"[All Fields]) AND high[All Fields] AND prevalent[All Fields] AND ("infection"[MeSH Terms] OR "infection"[All Fields] OR "infections"[All Fields]) AND low[All Fields] AND middle[All Fields] AND ("income"[MeSH Terms] OR "income"[All Fields]) AND countries[All Fields]	September 18 th 2017	Google Scholar, PUBMED	8370

*Appendix 2. Table 3: PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol**

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P3
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P1&P14
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P14
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Support					
Sources	5a	Indicate sources of financial or other support for the review	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P14
Sponsor	5b	Provide name for the review funder and/or sponsor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
INTRODUCTION					
Rationale	6	Describe the rationale for the review in the context of what is already known	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P4&P5
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P7
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P7, P8&P9
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P9&P10
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P11&P12
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P8-P10

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P9&P10
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P7&P14
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P12&P13
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P8 – P12
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P12
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2 , Kendall's tau)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P12
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P9

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P11

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2; 349(jan02 1):g7647

Appendix 3. Table 4: Sample extraction form

Key information chart
<i>a. Title</i>
<i>b. Author(s)</i>
<i>c. Year of publication</i>
<i>d. Origin/country of origin (where the study was published or conducted)</i>
<i>e. Aim (s) /purpose(s)</i>
<i>f. Summary of the study results</i>
<i>g. Study population and sample size (if applicable)</i>
<i>h. Methodology/methods (recruitment and sampling)</i>
<i>i. Study design</i>
<i>j. Data collection method</i>
<i>k. Data analysis</i>
<i>l. Intervention type, comparator and details of these (e.g. duration of the intervention) (if applicable)</i>
<i>m. Duration of the intervention (if applicable)</i>
<i>n. Outcomes and details of these (e.g. how measures) (if applicable)</i>
<i>o. Relevant Key findings that relate to the scoping review question/s.</i>
<i>p. Conclusions</i>
<i>q. Comments</i>

Chapter 3 explored the way traditional health practitioners' diagnosed schistosomiasis and types of traditional medicines used to treat this disease in communities with high prevalence infection. Reportedly, THPs are playing a key role in the management of schistosomiasis in individuals in rural settings of ILembe District, KwaZulu-Natal; they consulted individuals with schistosomiasis who did not accept to be treated in the mainstream health care system. Different plants species either alone or in combination were used in the management of schistosomiasis. A manuscript entitled "Knowledge, perceptions and experiences of traditional health practitioners about the management of female urogenital schistosomiasis: The case of ILembe District, KwaZulu-Natal, South Africa" was written following the guidelines of the journal "*BMC Complementary and Alternative medicine.*" This manuscript is actually under review (**Manuscript number BCAM-D-19-00253**).

CHAPTER 3: SECOND MANUSCRIPT

Knowledge, perceptions and experiences of traditional health practitioners
about managing female urogenital schistosomiasis: the Case of ILembe District,
KwaZulu-Natal Province, South Africa

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ABSTRACT

Background: Schistosomiasis is the third most important Neglected Tropical Disease, with more than 4 million South Africans being infected. Cases of re-infection with schistosomiasis after being treated using modern medication has opened ways to seeking alternative treatment modalities using medicinal plants. This study aimed to explore and understand ways traditional healers diagnosed schistosomiasis, the types of traditional medicines used to treat it in communities with a high prevalence of the infection, and established whether the unavailability of prescribed anti-schistosomal medicines led to the use of traditional medicine.

Methods: A qualitative exploratory study was conducted using a questionnaire from December 2017 to March 2018 in the ILembe District, KwaZulu-Natal Province, South Africa. In-depth interviews were carried out among traditional health practitioners (THPs) involved in managing female urogenital schistosomiasis (FUS). Recorded narrative data was transcribed verbatim, read through thoroughly and coded, and analyzed using thematic analysis.

Results: THPs provided services to many women who did not want to be treated in the mainstream healthcare system for their FUS. The disease was perceived and understood the same way by most of the respondents, that being caused by the use of fresh water. Plants species, either alone or in combination, were used to manage schistosomiasis in women. *Senecio serratuloides* (Asteraceae) and *Hypoxis hemerocallidea* (Hypoxidaceae) were prominently used by THPs in FUS management.

Conclusion: Traditional Health Practitioners are playing a key role in managing schistosomiasis in women in rural areas of the ILembe District; this study reported that THPs diagnosed schistosomiasis symptoms based on their knowledge and experiences. Respondents indicated that modern conventional treatment was readily available and free in public sector healthcare facilities; however, they consulted patients suffering from FUS. Traditional herbal medicines were reportedly used by THPs to manage schistosomiasis in the women. Further studies are needed to investigate the views and experiences of clients regarding the success of the treatments used and why they do seek care from THPs.

Keywords: Female urogenital schistosomiasis, Traditional health practitioners, Traditional medicine, Management, South Africa, qualitative study

BACKGROUND

The World Health Organization (WHO) estimated that a minimum of 206.4 million people was in need of treatment for schistosomiasis in 2016, with almost 91.4% living in Africa [1]. Being the third most important Neglected Tropical Disease, schistosomiasis, or Schistosomiasis, is an infectious, water-borne parasitic disease in many tropical settings that is caused by worms falling under the *Schistosoma* genus [1-3]. People engaging in various activities in contact with fresh/untreated water infected by *Schistosoma* during activities such as laundry, plate washing, water fetching for domestic use, bathing, paddling, diving, swimming or drinking as well as fishing and farming, are at risk of contracting the disease. Women and children are the most exposed [4], as they are often involved in activities associated with water. Female urogenital schistosomiasis is presented as inflammation and ulceration of the genital mucosa and is listed by the WHO as a research priority [5-7].

More than four million South Africans are infected with schistosomiasis [6], and while Praziquantel is used effectively to control current infections, often through mass-treatment programs, it may also worsen the symptoms and will not prevent future infections [8-10]. Treatment is also provided by traditional health practitioners (THP) who use traditional medicine (TM) in rural communities of South Africa, with many people using them as their primary healthcare provider of choice [11]. In southern African countries, TM has played a key role in managing schistosomiasis, also known as schistosomiasis, making it important to document to establish its efficacy [12].

Various studies carried out in South Africa have reported that several plants are recognized as having anti-schistosomal activity (Cock et al., 2018, Sparg et al., 2000). The following species have been widely used to manage the disease: *Acacia karroo*, *Maytenus senegalensis*, *Peltophorum africanum* and *Ziziphus mucronata*, *Abrus precatorius*, *Boswellia carteri*, *Cissampelos murconata*, *Euclea natalensis*, *Sclerocarya birrea*, *Rumex nepalensis*, *Protasparagus buchananii*, *Maytenus senegalensis*, *Faurea saligna* [12-16]. Moreover, cases of re-infection with schistosomiasis following the use of modern medication to treat it has opened ways to seeking alternative treatment modalities based on indigenous knowledge (IK) holders through the use of medicinal plants.

There has been little research on THPs knowledge, perceptions and practices regarding the process of traditional healing of schistosomiasis in women in South Africa. To address this gap, this present study was conducted among THPs from the ILembe District in KwaZulu-Natal Province, South Africa. This study aims to explore and gain an understanding of the way THPs diagnose female urogenital schistosomiasis (FUS), identify the types of traditional medicines used to treat it in communities with a high prevalence of infection, and to establish whether the unavailability of prescribed anti-schistosomal medicines in the public health sector leads to the use of traditional medicine.

METHODS

Study settings

The ILembe District Municipality is located on the east coast of KwaZulu-Natal Province north of the city of Durban, and is the smallest of the provincial municipalities, with a population of 630 464 in an area of 3,269 km². Most of the interior rural areas are tribally controlled and characterized by subsistence agriculture. ILembe consists of four sub-districts: Mandeni, KwaDukuza, Maphumulo and Ndwedwe (Figure 1), its main town being Stanger, which lies on the Tugela River [17]. The study area was chosen due to its history of schistosomiasis prevalence in KZN (Saathoff et al, 2004).



Figure 3. 1: The four sub-districts of the ILembe district municipality

Study design

An exploratory qualitative study was undertaken from December 2017 to March 2018 and consisted of eight weeks of fieldwork. A BREC validated semi-structured questionnaire with open questions administered to participants, using face-to-face interviews to obtain qualitative data [18].

Study sample

This study enrolled 22 THPs (saturation in the recruitment) who were recruited from the Traditional Health Organization (THO) in the ILembe District using purposeful sampling, followed by snowball sampling, with referrals being made to identify suitable participants [19]. Male and female THPs who were aged 18 years old and above were included who had managed FUS in women for at least one year.

Procedure for recruiting and selecting study participants

The Biomedical Research Ethics Committee of the University of KwaZulu-Natal under reference BE477/17 approved this study, and informed consents were sought from all participants. They agreed on the findings being published to raise awareness on the contribution of traditional medicine to manage FUS. Contacts were made through the University of KwaZulu-Natal's Centre in Indigenous Knowledge Systems with THO leaders to identify registered THPs. After being introduced by community leaders, the research team approached THPs at their workplace during business hours, with those being willing to participate were interviewed.

Data collection methods

A semi-structured questionnaire with open- and closed-ended questionnaire was administered to participants using face-to-face interviews until saturation was reached [20]. The design of the questionnaire reduced possible bias and misunderstanding between the western and indigenous conception of FUS and its bio-medical definition [21, 22]. THPs were interviewed at their houses or any place of their choice and lasted from 15-60 minutes. Study aims and procedures were explained to participants in English and the local language, IsiZulu. The questionnaire was divided into four sections: demographic data, and their knowledge, perceptions and practices about managing FUS, and is presented in Additional File 1. The interview was recorded with the participant's permission, with notes being taken and observations made throughout.

Data analysis

The statistical package for social sciences (IBM SPSS Statistics) statistical software version 25.0 package for Windows was used for demographic data [23]. The recorded narrative qualitative data were collected using Giorgi's phenomenological framework [24, 25], and transcribed verbatim, read through thoroughly and coded for thematic analysis for step-wideness [19, 26, 27]. The transcripts were cross-checked with the records, and meaning units corresponding to the study objective extracted, coded, grouped in sub-categories and thematic categories following the deductive technique, and substantiated by quotes [28]. The body language, silences and other non-verbal communications are considered in analyzing the data [29].

This study followed the guidelines proposed by Lincoln and Guba [30] for the trustworthiness of the findings, with more than one researcher being involved in the study and the voluntary participation of respondents. The research procedure and design enhanced transparently to provide transferability.

RESULTS

The participants' demographic details are followed by the themes relating to the THPs knowledge, perceptions and practices of managing FUS.

Demographic details

The 22 participants who agreed to be interviewed (Table 1) were aged between 26 and 70 years old, with a mean age of 41.05 ± 13.075 (SD). The majority were females (14/22, 63.6%) and married (14/22, 63.6%) and participants completed their high schooling (10/22, 45.5%). Most respondents practised as diviners (Izangoma) (17/22, 77.2%), were Christians (15/22, 68.2%), and had a mean of 13 years' experience (± 10.170).

Table 2. 1: Respondents' background characteristics

<i>Variables</i>	<i>Category</i>	<i>No.</i>	<i>%</i>	<i>Proportion (95% Confidence interval)</i>
<i>Gender</i>	Female	14	63.6	40.7 – 82.8
	Male	8	36.4	17.2 – 59.3
<i>Marital status</i>	Married	14	63.6	40.7 – 82.8
	Not married	8	36.4	17.2 – 59.3
<i>Level of Education</i>	High School completed	10	45.5	24.4 – 67.8
	None specified	7	31.8	13.9 – 54.9
	Prim. School completed	3	13.6	2.9 -34.9
	Postsecondary certificate	1	4.5	0.1 – 22.8
	Degree	1	4.5	0.12 – 22.8
<i>Profession</i>	Diviner (Sangoma)	17	77.2	54,6 - 92,2
	Both (Sangoma/Inyanga)	3	13.6	2,9 – 34,9
	Herbalist (Inyanga)	2	9.1	1.1 – 29.2
<i>Religion</i>	Christian	15	68.2	45.1 – 86.1
	Traditional religion	5	22.7	7.8 – 45.4
	Hinduism	1	4.5	0.1 – 22.8
	None specified	1	4.5	0.1 – 22.8
Mean years of work experience, SD: 13 (10.170)				
Age (years) Mean age, SD, Range: 41.05 (13.075), 26 – 70				

Traditional health practitioners' perceptions, knowledge and experiences in diagnosing of FUS

A thematic content analysis was carried out that yielded seven major themes: (1) source of knowledge, (2) diagnosing female urogenital schistosomiasis, (3) acceptability and affordability of treatment, (4) locally used plants to manage FUS, (5) availability of TM treatment in FUS management, (6) concurrent use of TM with prescribed conventional antischistosomal medicines, and (7), knowledge of side effects and perceptions of efficacy of treatment provided by THPs.

Theme 1. Source of knowledge

Respondents were questioned about their source of knowledge about healing FUS. They reported that a special calling from ancestors is a requirement of becoming a traditional healer. In most cases, this calling can come in dreams/visions, where trainees are instructed to avail themselves into helping the community by becoming THPs. If they agree, they go through training after verification of the calling. In addition, THPs who train new ones are called to do so as well. They are not only traditional healers but trainers, as with the ancestors giving orientation to the newly called person, sending them to a trainer. When asked about their source of the healing process for FUS, a respondent noted that:

“... I didn't just have knowledge of being sangoma (traditional healer), my ancestor came to me and took me to training of ukuthwasa (which is to accept the calling of becoming a traditional healer).” THP21.

They reported having learnt from old THPs, identified as trainers, in their respective areas. In the learning process, they go through different healing practices for a period of time. When asked about how he learnt the healing process a respondent said:

“... We use to wake up early morning and go to inyanga houses where we had to pass the whole day studying Traditional Medicine and I did it for a year...” THP18.

Theme 2. Diagnosing female urogenital schistosomiasis

THPs mentioned that FUS occurs when engaging in various activities close to fresh water and diagnose the symptoms based on their knowledge and experience, specifically by checking the patient's urine colouration. A Respondent reported the following that:

“... If the person is urinating constantly blood or if their urine changing colour. The same thing happens in women when they have this disease (FUS)...” THP18.

Some respondents indicated that there was a natural process of diagnosing FUS in women. It involved mainly physical symptoms. A respondent reported that:

“... Urine have an unusual temperature, tension on the bladder, prostate feels itchy for man, it is swollen near the bladder, and bladder feels pain for male and female. If the

person is urinating constantly blood or if their urine changing colour and itching when urinating. The same thing happens in women when they have this disease..." THP2.

Some reported that they relied on spiritually diagnosing FUS by consulting their ancestors and that people sometimes had a curse tossed at them that is why they need spiritual assistance. A participant mentioned the following:

"...We perform the practice called Ukumhlola ngoko moya (spiritual divination) to diagnose schistosomiasis in patients..." THP9.

Some used both natural and spiritual ways to diagnose schistosomiasis in women, the one method confirming the other:

"... Ucama igazi (urinating blood) after swimming in rivers then I throw bones to confirm the diagnostic..." THP15.

Theme 3. Acceptability and affordability of treatment

The respondents noted that although modern treatments were readily available and free in public sector healthcare facilities, they consulted many women who did not want to be treated in the mainstream health care system (acceptability), preferring to first consult THPs:

"I treat the patient who comes to me with schistosomiasis (isichenene) because they think that it is only for children. They are feeling bad to tell to the doctors that they are urinating blood (ukucama igazi)..." THP1.

THPs, as IK holders, contended that traditional medicine is affordable and accessible to community members, with no standard price for consultations and payment being done after being treated. The cost of medicine depended on the level of confidence between the healer and his patients and varies from healer to healer as well as being based on the severity of the infection. A respondent reported that:

"... I am not sure of how much it would cost to treat schistosomiasis at the hospital but traditionally I make the price of all my medicines almost similar, for Ischenene its R150 for the complete treatment..." THP18.

In comparing traditional treatment to orthodox treatment, a few participants argued that their treatment price could depend on how and where it was collected from, as well as its price at the Muti market, all of which contribute to the price they charge the patients, which can make some treatment expensive. Participants said:

"... Traditional healers medicine is quite expensive, traditional healers are more expensive than the scientific people..." THP3.

The acceptability and affordability of the treatment depend on whether the infection is severe, or the patient is newly infected. The more medication they take the more money they will have to pay. A respondent said:

“.. Depends on the person sickness and the person intensity to be healed, as well as what the person needs, also on the healer’s payment rate...” THP7.

Some infections can be beyond the THPs knowledge and understanding, including FUS, for which they refer a patient to healthcare facilities. They advanced that it is not about treatment payment but the patient well-being, and reported that:

“... We cannot say a patient has to choose what they afford or what they see cheaper between traditional medicine and modern medicine. Doctors’ medicines have chemicals that reduce pains quicker, that’s why I recommend them if I can’t manage the disease...”

THP 17.

THPs combine practices by executing the spiritual part and leaving the treatment to healthcare workers in a collaborative way:

“There are sicknesses that are based on witchcraft, that’s where a traditional healer is needed. When I see that my patient’s sickness is not of witchcraft I then advise them to go to hospitals...” THP21.

Both western and unorthodox practitioners can collaborate when needed, as they can complement each other, including for FUS management:

“... Modern doctors and traditional doctors should work here hand-in-hand. Modern doctors are very important. The collaborative approach is good for the wellbeing of the patient in managing this disease (FUS)...” THP20.

Traditional healers testified that they discuss their treatment fees with their patients who give them feedback on the efficacy of the treatment before payment.

Theme 4. Locally used plants to manage FUS

The THPs indicated that they used a combination of traditional medicinal plants to treat FUS, which most (n= 12; 54.5%) indicated were not easily accessible. They used various plants to manage FUS in rural areas of KwaZulu-Natal Province, some of which are well-known by community members who used them on their own, only sometimes consulting THPs. They reported that the main sources of treatment were plants. Doses were measured depending on the severity of the disease and the experience of each THP. Most of the respondents were sceptical about sharing knowledge with the researchers. Table 2.2 presents a list of the plants used to manage FUS.

Table 2 2: Traditional treatments used individually or in combination to manage FUS

Botanical name	Family	isiZulu (Z)/isiXhosa (X), Tshivenda (V) vernacular name (s) given by interviewees	Number of times quoted by THPs	Previous report of ethnomedical uses (reference)
<i>Adenostemma caffrum</i> DC.	Asteraceae	Umahogo (Z)	1	Used as a love charm and for influenza. The infusion is taken as an emetic given to children as enemas [13].
<i>Albuca fastigiata</i> Dryand.	Hyacinthaceae	uMaphipha (Z)	1	Traditionally used as emetics for protection against sorcery and as general protective charms [31].
<i>Aloe marlothii</i> A.Berger/ <i>Aloe ferox</i> Mill.	Asphodelaceae	iNhlaba, uMhlaba (Z)	2	Used in southern African for infections, particularly sexually transmitted infections and internal parasites, genito-urinary system, injuries, digestion, pregnancy, skin complaints, sensory system, inflammation, pain, respiratory system, muscular-skeletal system, nutrition [32].
<i>Anemone fanninii</i> Harv. ex Mast.	Ranunculaceae	Emyama/ nManzamnyama (Z)	1	The plant has antitumor, antimicrobial, anti-inflammatory, sedative, analgesic activities, anti-convulsant and anti-histamine effects [33].
<i>Bowiea volubilis</i> Harv. Ex Hook.f. subsp. <i>volubilis</i>	Hyacinthaceae	UGibisisila or uGibisila; iguleni (Z); uMgaqana (X)	2	Plant widely used against numerous ailments including headache, muscular pains, infertility, cystitis and venereal diseases in southern Africa [34].
<i>Callilepis laureola</i> DC.	Asteraceae	Amafuthomhlaba, ihlamvu, impila (Z)	2	Used for stomach problems, tapeworm infestations, impotence, cough, and to induce fertility. <i>Impila</i> is also administered to pregnant women by traditional birth attendants to “ensure the health of the mother and child” and to facilitate labour. It is also taken by young girls in the early stages of menstruation [35].

Botanical name	Family	isiZulu (Z)/isiXhosa (X), Tshivenda (V) vernacular name (s) given by interviewees	Number of times quoted by THPs	Previous report of ethnomedical uses (reference)
<i>Carpobrotus edulis</i> (L.) L. Bolus	Mesembryanthemaceae (Aizoaceae)	mthombozi/Umgong ozi (Z)	1	The plant is used in soothing itching caused by spider and tick bites. It contains astringent antiseptic juice which can be taken orally for treating sore throat and mouth infections. It has an antimicrobial activity [36]
<i>Combretum erythrophyllum</i> (Burch.) Sond.	Combretaceae	Umdubu (Z)	1	Used for the treatment of abdominal pains and venereal diseases due to antibacterial compounds in the leaves [13].
<i>Combretum vendae</i> A.E.van Wyk	Combretaceae	Gopo (gopo-gopo, gopokopo-bani (V).	1	Used for the treatment of bacterial related infections and oxidative related diseases by indigenous people of South Africa [37].
<i>Eucomis autumnalis</i> (Mill.) Chitt.	Hyacinthaceae	uBuhlungu eSimathunzi (X), uMathunga (Z)	4	Greatly valued in traditional medicine for the treatment of a variety of ailments, predominantly those involving pain, fever and inflammation [38].
<i>Gunnera perpensa</i> L.	Gunneraceae	iPhuzi lomlambo, iGhobo (X); uGobhe, uGobho (Z)	4	Used in folk medicine to relieve rheumatoid pain, facilitate childbirth and healing wounds. Zulu traditional healers use it to induce labor, expel the placenta after birth and to relief menstrual pains [39].
<i>Hypoxis hemerocallidea</i> Fisch., C.A.Mey. & Avé-Lall.	Hypoxidaceae	iNkomfe (Z), iLabatheka (Xhosa)	5	Southern African 'wonder' plant medicine being claimed to be an effective remedy against HIV/AIDS-related diseases, arthritis, yuppie flu, hypertension, diabetes mellitus, cancer, psoriasis, gastric and duodenal ulcers, tuberculosis, urinary tract infections, asthma, and some central nervous system (CNS) disorders, especially epilepsy and childhood convulsions [40].

Botanical name	Family	isiZulu (Z)/isiXhosa (X), Tshivenda (V) vernacular name (s) given by interviewees	Number of times quoted by THPs	Previous report of ethnomedical uses (reference)
<i>Knowltonia bracteata</i> Harv. ex J.Zahlbr.	Ranunculaceae	nguthuza or uMvuthuza (Z)	1	Used for sexually transmitted diseases [41].
<i>Maytenus undata</i> (Thunb.) Blakelock	Celastraceae	Undubula /iNdabulaluvalo (Z)	2	Widely used in folk medicine as anti-tumour, anti-asthmatic, analgesic, anti-inflammatory, antimicrobial and anti-ulcer agents, and as a treatment for stomach problems [42].
<i>Myrothamnus flabellifolius</i> Welw.	Myrothamnaceae	uVuka kwa bafile (Z)	2	Used for respiratory ailments, nosebleeds and fainting, alleviate backache, kidney problems, haemorrhoids and menstrual pains, abrasions, dressings for burns and wounds, chest pains and asthma, treat infections and pains in the uterus. In central Africa, it is used as a tonic and to treat breast complaints. Shona healers have used the plant to treat epilepsy, madness and coughs [43].
<i>Nidorella</i> Sp. Schimper, G.W.	Asteraceae	uMhlabelo	2	Useful in embrocation for fractures, sprains and snakebites [13].
<i>Ranunculus multifidus</i> Forssk,	Ranunculaceae	Uxhaphozi (Z)	1	It used for sexually transmitted infections [44]
<i>Rhoicissus</i> sp. Wild & R.B.Drumm),	Vitaceae	iSinwazi (Z)	4	Medicinal plants used to treat burns, swelling and malaria, one can expect that they might possess anti-microbial and anti-inflammatory activities as well [13].

Botanical name	Family	isiZulu (Z)/isiXhosa (X), Tshivenda (V) vernacular name (s) given by interviewees	Number of times quoted by THPs	Previous report of ethnomedical uses (reference)
<i>Sclerocarya birrea</i> (A.Rich.) Hochst.	Anacardiaceae	umGanu (Z)	1	It is used in treating proctitis. The Vhavenda use it to treat fevers, stomach ailments and ulcers and for many purposes including sore eyes in Zimbabwe. In East Africa, it is an ingredient in an alcoholic medicine taken to treat an internal ailment known as <i>kati</i> , it is used for stomach disorders. The Hausas in West Africa use it as a remedy for dysentery. It could show that extracts inhibit diarrhoea in mice [42].
<i>Senecio serratuloides</i> var. <i>gracilis</i> Harv.,	Asteraceae	uNsukumbili (Z)	7	A traditional herbal remedy used to treat skin wounds in South Africa [45].
<i>Solanum aculeastrum</i> Dunal subsp. <i>aculeastrum</i>	Solanaceae	Imbuna/iNtuma and water	1	The plant used in traditional medicine to treat various human and animal diseases, specifically stomach disorders and various cancers, in the Eastern Cape, South Africa [46].
<i>Tylophora flanaganii</i> Schltr.	Apocynaceae	iNhlanhlemhlophe (iNhlanhla) (Z)	4	It is taken in Asia and Africa for allergies, asthma, cancer, congestion, constipation, cough, inflamed skin, diarrhoea, bloody diarrhoea, gas, haemorrhoids, tender joints (gout), yellowed skin (jaundice), joint disorder (rheumatoid arthritis), whooping cough, to make someone vomit, and to cause sweating [47].

*THPs reported that the treatment period might vary from one to three weeks depending on the patient condition

*Botanical names of the following local plants were not found. They are as follows: Igwalagwala, Impizo, Ukuse kukleneke, Isinya, Imbizani, Iqabunga, Impande/Oyimpane, Oyilitshe, Cigunzi, Umopho and Indonye.

Theme 5. Availability of TM treatment in FUS management

To treat their patients, traditional healers have to find the components, including the plants. The availability of plants varies widely, with some being found in the traditional medicine market where they have to buy them, or they need to go into natural areas to find them. There is substantial variability in the availability of plants treating schistosomiasis, depending on the season that they collect them or their availability in the market. A respondent said:

“It is very easy to get these plants. I get them from the forest and I buy some of them from Durban Berea Market...” THP21.

Some participants declared that the ease of finding the plants could be related to the frequency of their use and therefore availability. If they use them regularly, they know where to find them, either in the market or in nature. THPs sometimes share their ideas and knowledge among themselves, this collaboration enabling them to get what they do not have from another healer, in this way contributing to the well-being of the community:

“... Yes, we find them easily, depending on experience on using them or got them from other THPs or go at the market...” THP15.

Some participant said that the treatments could be difficult to find for those who are new to the working area. Some need to go back to where they come from to look for plants to treat schistosomiasis as said the following participant:

“... Some plants are easy to find while others are very hard to find. I find some plants on the other side of the road and to get others I have to travel to far place ...” THP19.

Some plants are seasonal and must be collected at a specific time of year, which may not be easy to if it requires going in the bush to collect them, some of which are in limited supply:

“It’s not easy to get these cures because we have to go and look for them in the forest, especially in winter; it is very hard to find them...” THP18.

Theme 6. Concurrent use of TM with prescribed conventional anti-schistosomal medicines

Two-thirds of the respondents (n=15, 68.2%) reported that their patients did not use TM concurrently with conventional anti-schistosomal medicines. This may suggest that their patients do not always disclose the concurrent use of the two types of medicines. One of the respondents indicated this:

“Patients go to modern doctors most of the time on their own initiative, not mine; they go to medical doctors without telling you...” THP8.

Some THPs indicated that their patients consulted mainstream practitioners if they were not satisfied with the treatment from THPs, as indicated by a respondent:

“... No, concurrent use of traditional and modern medicine unless if TM does not work, the patient himself goes there...” THP16.

THPs in this study had referred patients to modern healthcare facilities for FUS treatment when the infection was beyond their professional capacities and skills. One of the respondents stated:

“... I am aware that my patients use sometimes both modern and traditional medicine for managing FUS. As traditional healers, it is important for us to work with modern doctors because we are not after money, but we want to see our patients better. There is a stage of the FUS infection that we cannot treat and there are diseases that modern doctors cannot treat, so I send my patients there if they need to use both medicines...” THP21.

The THPs mentioned that they have sent patients to healthcare facilities for a medical examination if they were not experienced in schistosomiasis management. A respondent said:

“... I usually send them to hospitals for checking up if the cure that I used worked or not. Sometimes I send them to the hospital when I don't know how to treat certain diseases...”
THP18.

Another group of THPs reported that they did not get help from biomedically trained healthcare professionals and did not initiate any collaboration with them. They advanced reasons such as the absence of motivation in communication and collaboration with these professionals and vice versa due to cultural basis and people's beliefs.

“... No, I do not mix or allow both uses, but they can rather start with one, if it does not work, the patient takes another one. I can do for lab test but not the treatment because I trust it... Patients use both, but I don't easily send them to hospitals due to cultural base...”
THP12.

In addition to the above statement, another respondent reported:

“... Medical doctors ease the pain but do not permanently remove the problem of FUS...”
THP10.

THPs showed confidence in their treatment and indicated that they were of the opinion that western medicine does not heal the infection, while their treatment has shown its success in managing FUS. A respondent reported that:

“... They do use modern medicine, although doctors do not really get rid of this infection in women. Only traditional medicine can help get rid of schistosomiasis ...” THP20.

They do believe that concurrent use of Western medicine (WM) and TM is not wise to avoid uncontrollable side effects.

Theme 7. Knowledge of side effects and perceptions of the efficacy of treatment provided by THPs

The THPs were asked if they knew anything about side-effects experienced by women seeking treatment from them for FUS. They indicated that the treatment for FUS was helpful even though side effects could occur sometimes, depending on different factors and dosages. Half of the respondents (11/22; 50.0%) argued that there were side effects when using TM, while the other half (11/22; 50.0%)

indicated the absence of significant side effects, which they contended were due to the non-respect of the prescribed dose. Some patients need to have quick results to stop ongoing bleeding. Patients said that it relieved the pain and took more medication than was indicated, or they used it concurrently with conventional prescribed medicines. A respondent said:

“... Yes, there can be some side effects sometimes. It depends on the patient’s health. Some of my treatments can be dangerous if a patient is suffering severely from schistosomiasis, big quantities cause that, but we lower the dosage to avoid those effects...” THP15.

The respondents reported that side effects could result from patients having diseases other than FUS that was also being treated by THPs. In the provision of care for FUS, they also treated other diseases to make sure that patients recovered fully, with a respondent reporting:

“.. It happens that when a person has schistosomiasis, he is also having other diseases, but if they manifest after a person has been treated and then I must deal with them too. So, my medicine does not give side effects...” THP20.

Regarding the referral system, a respondent argued that in case of complications, he referred patients to healthcare facilities for follow-up when they were difficult to manage with his traditional treatment. He further stated that:

“... There is no side effect so far. But if there are side effects arising, I would treat them too. If I fail to do so I would take my patient to clinic...” THP22.

With regards to side effects, other respondents argued that they have not had side effects appearing after giving treatment to women with FUS. From their experience, some of the side effects appearing in the course of the traditional treatment, such as constipation, were beneficial to the wellbeing of the women with FUS. One respondent stated that:

“... There are no side effects after taking the medicine of treating Ischenene. The patient does not go to the toilet a lot and the urine changes back to its normal colour...” THP18.

THPs said that it happened that patients were scared, that led them to try different healing processes from different THPs to fasten their wellbeing, which could affect negatively on their treatment. A respondent stated:

: “... Yes, sometimes due to people having different spiritual lives (behaviour of using weather TM or WM with TM combined)...” THP7.

DISCUSSION

This exploratory study was an investigation on the knowledge, practices and experiences of THPs in managing one of the neglected tropical diseases, specifically female urogenital schistosomiasis, in women in the ILembe District, KwaZulu-Natal Province, South Africa. Little is known about the prevalence of schistosomiasis in this district over the last 20 years, with few studies having been conducted since the 1980s [10, 48].

Theme 1. Source of Knowledge

The findings revealed that THPs received a call from their ancestors to join the healing practice, leading them to the initiation (*Ukuthwasa*), which is the training to become a THP. This has been documented in another study, which reported training to be a lengthy process of months to years' duration [49]. Peek [50] reported that in African traditional healing, this training depended on the trainee's learning skills.

Theme 2. Diagnostic of female urogenital schistosomiasis

Findings on the diagnostic of FUS showed that the THPs were not limited to cultural practices in this process, with symptoms widely known. They are as follows: change in the colour of urine to red, locally called urinate blood (*ucama igazi*), or the presence of blood in the urine (hematuria), change of urine temperature, painful bladder and itching when urinating being reported as the main symptoms by THPs. Some relied on spiritual practices to confirm the diagnostic of the disease which occurred by throwing bones for spiritual divination (*ukumhlola ngoko moya*). The findings are consistent with other studies carried out with THPs in Mali, which reported that hematuria was the main symptom in urogenital schistosomiasis [51, 52]. However, Cock et al. [12] reported that the FUS signs and symptoms can be unspecific and might be confused with other inflammatory diseases of the urinal tract.

Theme 3. Acceptability and affordability of treatment

The study showed that the THPs felt that traditional medicine was affordable and effective for whoever needed it, depending on the patients' possibility and level of FUS infection. The THPs reported that they did not have a standard price for treatment and patients did not pay anything until after they had received their formulation. The finding on the cost of TM was supported by another study arguing that there was a need for regulation regarding appropriate costing of TM [53]. The price varied from one healer to another, depending on the availability of the treatment and how it was collected or obtained by the THP. Treatment cost depended on where (distance, place) the medicinal products were collected and the ease of finding them. In their study, Mander et al. [54] found that the pricing of traditional product depended on the fact that several species were extinct in the wild due to their over-collection, which resulted in their being inaccessible to the TM industry. The THPs emphasized that they looked after their clients until the healing process had finished, and were open to easing the treatment process (confidence). In contrast, a study conducted in South Africa by Nxumalo et al. [55] showed that three-quarters of the poorest quintile spent more than 10% of their income on traditional medicine due to the lack of any regulations regarding the availability and costs medicinal plants. A policy protecting the community from excessive out-of-payments needs to be implemented from the parallel healthcare systems perspective.

Theme 4. Locally treatment used to manage FUS

Our findings reported medicinal plants were the main source of treatment for FUS in rural areas of the ILembe District and were used alone or in combination. The THPs felt that they had adequate knowledge about FUS symptoms as has been reported in other studies on managing schistosomiasis across Africa [12, 13, 51, 52, 56-59]. The twenty-two plant species cited in this study belonged to fourteen families, with the Asteraceae and Hyacinthaceae being often cited. These findings are in line with a study conducted by Sparg et al. and Yineger et al. [60, 61] on the anti-schistosomal activity of Hyacinthaceae and Asteraceae species.

In this study, more than two plant species were commonly combined in herbal treatment preparations, as such combined treatments worked better when taken according to THPs requirements. These findings are aligned with a study conducted in Pakistan by Adnan et al. [62], which showed that the combination of herbal medicine can enhance their effect. Where plants were given in combination, *Senecio serratuloides* (Asteraceae) and *Hypoxis hemerocallidea* (Hypoxidaceae) were the two most frequently used species, as was reported by Naidoo et al. [63], their use for urinary tract infections being due to their antimicrobial properties.

THPs outlined that the length of the management of FUS varied from one to three weeks, depending on whether or not the patients had taken the treatment as prescribed and not mixed it with other formulations without letting them know what they were taking. The successfulness of the treatment also depended on the THPs experience in managing FUS, these findings being consistent with a study by Zuma et al. [11], which reported that THPs as knowledge holders played a key role in diseases management in rural South Africa. Details regarding the specifics of the treatment were not revealed by the THPs, the secrecy issue being a consequence of their fear that orthodox scientists or people not related to them would take their ideas, modifying and use them for commercial gain [49], hence the need to protect their knowledge [64]. Plants species reported in this study were documented previously in other studies [13, 32, 34, 35, 38-40, 45, 47] for being used in folk medicine to treat ailments.

Theme 5. Availability of TM treatment

It was reported that TM plants were widely used in FUS management, their treatment were obtained in “muti” market or collected in nature, depending on the THP experience and the plant's availability. A study conducted by Chinsamy et al. [65] found that medicinal plants used to manage diseases, including schistosomiasis, were traded on markets in different areas of South Africa. Some of them were bought from neighbouring countries, such as Mozambique and Swaziland [54]. A study conducted by Cock et al. [12] gave an overview of various medicinal plants that were available and used for managing schistosomiasis in the southern African region.

Theme 6. Concurrent use of TM with conventional orthodox medicine

This study found that the THPs were certain about the efficacy of TM used in FUS management in rural South Africa. However, some did acknowledge that inputs from HCPs might be useful to treat severe cases that they were unable to cure. Thus, a collaboration between THPs and HCPs should be a reality for saving people lives. In their study, Zuma et al., [11] showed that traditional medicine was known as the common treatment of people in rural areas of South Africa. The authors suggested further that it was important to identify the role played by THPs and HCPs in diseases management to improve the quality information on the disease and its management. This is in relation to the findings of a study by Stanifer et al. [66], which reported the importance of sharing information to improve patients' quality of healthcare, avoid reports of medical non-compliance and adverse medical outcomes, and prevent poorer individual disease understanding. Reportedly, patients were treated first with TM and could only be sent in healthcare facilities when complications occurred, or where they could collect medication to complete the TM treatment. Studies conducted by Peltzer [67] and Nlooto and Naidoo [68] showed that the use of TM was prevalent even though the medication was free in the South African public health care system. The concurrent use of conventional orthodox and traditional medicine could have an impact on treatment adherence, drug interaction and disease management outcomes, with the integration of TM and WM systems possibly improving the outcomes of managing neglected diseases.

Theme 7. Side effects and assessment of the efficacy of medicines by THPs

This study finding reported that some side effects were perceived to be a good result of the treatment given to patients. These findings were similar to a study conducted in Limpopo Province in South Africa by Semanya and Potgieter [69], which showed that side effects could be results of the TM effectiveness. However, comorbidities could lead to the appearance of other symptoms that were also being managed by THPs. In their study, Van Wyk et al. [43] reported that experienced THPs had remedies to manage the side effects of TM. This study found that feedback from a patient not urinating blood but experiencing constipation were some signs of healing, while some patients were sent to modern facilities to establish if the disease had been cured. This correlates with Semanya and Potgieter [69], who reported that the validity of efficacy relied on reported positive feedback from the patient.

In line with our findings, THPs self-assessment of their TM efficacy was not taken seriously as a potential health issue within low- and middle-income countries, but could be very beneficial to local communities that relied on traditional treatment to manage infectious diseases [12]. It was reported that side effects also depended on the dosage being respected as prescribed, or by consulting various people instead of taking one treatment. Very little is known about the side effects of the use of medicinal plants for managing FUS, with Kamsu-Foguem and Foguem [70] reporting that adverse drugs reactions of TM were a consequence of an inappropriate preparation or use. In their study, Aremu et al. [56] suggested that there was a need to undertake further evaluation of the plant's toxicity to determine their safety.

Limitations of the study

In light of the results findings, this study should be seen within its methodological context of THPs' perceptions, knowledge and practices in managing FUS. In their study, Cock et al. [12] found that THPs played a key role in managing various infectious diseases in women. The purposive sampling method was used for this study whereby respondents were selected in regard to the fact that they have treated or were currently treating patients with schistosomiasis condition. The sampling methods may have introduced a risk of bias, with purposive and snowball sampling being used due to the problems of identifying THPs who have managed FUS in women through the official organization. The study was also conducted in one District in KZN, with the results possibly not being generalizable to other areas in the province or in the country, due to the variations in plant types across the affected areas. The occurrence of schistosomiasis is restricted to low lying areas along the eastern seaboard with eastward flowing rivers. The small sample size may have limited the variations in responses, but in the absence of other studies on the topic in South Africa, forms a base for future research, the qualitative nature of the study providing sufficient details on which to build further qualitative and quantitative research.

CONCLUSION

THPs are playing a key role in managing FUS in rural areas of the ILembe district and can diagnose FUS symptoms based on their knowledge and experience. Respondents indicated that while conventional treatment was readily available and free in public sector healthcare facilities, many women wanted to be treated with traditional remedies. Traditional herbal medicines were reportedly used by THPs to manage FUS in women and included *Senecio serratuloides* (Asteraceae), *Hypoxis hemerocallidea* (Hypoxidaceae), *Tylophora flanaganii* (Apocynaceae), *Rhoicissus digitata* (Vitaceae), *Gunnera perpensa* (Gunneraceae) and *Eucomis autumnalis* (Hyacinthaceae). The Asteraceae and Hyacinthaceae were the most cited by THPs as a source of TM treatment. Very little is known by THPs about the side effects of using medicinal plants to manage FUS. However, more research is needed, specifically as some women may take them concurrently with western medication. Further studies are needed to investigate the views and experiences of clients seen by THPs to establish their opinions about the effectiveness of the treatments used for FUS, and to thereby contribute to the larger body of research on the role of traditional medicines in the pursuit of keeping communities health.

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DECLARATIONS

List of Abbreviations

ATM (African Traditional Medicine), FUS (Female Urogenital Schistosomiasis), HCP (Healthcare Professional), SD (Standard deviation), THP (Traditional Health Practitioner), TM (Traditional medicine), WHO (World Health Organization), WM (Western Medicine)

Ethics approval and consent to participate

The Biomedical Research Ethics of the University of KwaZulu-Natal under reference BE477/17 approved this study and informed consents was sought from all participants. They agreed on the findings to be published to raise awareness on the contribution of traditional medicine in the management of FUS.

Consent for publication

Consents were sought from all participants to publish the outcome of the study in a peer-reviewed journal.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AGAM conceptualized and drafted the initial manuscript. MN contributed to the conceptualization of the study and revised the initial draft for its intellectual content. All authors read and approved the final manuscript.

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Chapter 4 is a manuscript, which assessed Healthcare workers (HCWs), and patients' perceptions about the concurrent use of African traditional medicine and conventional prescribed medicines for the management of schistosomiasis in Ilembe district, KwaZulu-Natal. Results presented focused not only on perceptions of participants but medical chart records of patients were analyzed for a triangulation of information about the management of schistosomiasis. A manuscript entitled "A Triangulation of information from Healthcare workers and patients about the concurrent use of traditional medicine and conventional prescribed medicines for schistosomiasis in Ilembe district, KwaZulu-Natal, South Africa" was written following the guidelines of the journal "*BMC Complementary and Alternative medicine.*" This manuscript is actually under review (**Manuscript number: BCAM-S-18-02495**)

CHAPTER 4: THIRD MANUSCRIPT

A Triangulation of information from Healthcare workers and patients about the concurrent use of traditional medicine and conventional prescribed medicines for schistosomiasis in Ilembe district, KwaZulu-Natal, South Africa

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ABSTRACT

Background

Praziquantel is the commonly used conventional treatment recommended for schistosomiasis in the mainstream healthcare system. Although Praziquantel may be free in healthcare facilities, many individuals may resort to the use of traditional medicine. This study aimed to assess perceptions of participants on the availability of Praziquantel and to ascertain whether individuals infected with schistosomiasis used concurrently African traditional medicines with this treatment.

Methods

A cross-sectional descriptive study, using face-to-face interviews, was conducted from January to April 2018 among healthcare workers (HCWs) and patients. A review of medical chart records of patients was further carried out to triangulate the information from interviews. Descriptive statistics including frequency and percentage were used; categorical data were represented as tables. Chi-squared tests were performed for the association between continuous variables. A p-value ≤ 0.05 was estimated as statistically significant.

Results

Most of HCWs (114/124; 91.9%) reported that Praziquantel was available in healthcare facilities. Majority of HCWs (76/124; 61.3%) did not know whether patients seen by them used concurrently traditional medicine and Praziquantel for schistosomiasis. There was no significant relationship between the availability of Praziquantel and the concurrent use of TM by patients for schistosomiasis ($X^2 = 3.042$, $p = 0.551$).

Patients seen by THPs (8/20, 40%) did not use Praziquantel for schistosomiasis. Those patients (8/15, 53.3%) who crossed from TM to the mainstream healthcare system did not disclose their use of TM to HCWs. Their main reason was that concurrent use of TM and Praziquantel could destroy organs or make Praziquantel not to work properly. None of the medical chart records analyzed documented the concurrent use of TM and Praziquantel.

Conclusion

Most of the HCWs were not aware of the concurrent use of TM and Praziquantel by patients for the treatment of schistosomiasis. Patients seen by THPs relied solely on TM for schistosomiasis. Although patients indicated crossing from TM to the mainstream healthcare system, there was no evidence of documented use of TM in medical chart records of patients. Further studies are needed to contribute to the knowledge of medicinal plants used by THPs for schistosomiasis.

Keywords: Schistosomiasis, Praziquantel, Conventional Medicine, Traditional Medicine, Healthcare workers, Patients

BACKGROUND

Schistosomiasis also is known as bilharzia remain a public health threat. The disease co-morbidities including HIV and other STIs are common in poor settings [1-3]. The control of schistosomiasis remains a public health issue with a global estimate of 200,000 annual death rate [4]. About 25% of people with HIV are reported to be co-infected with helminths including schistosomiasis [5]. Praziquantel treatment has shown great progress for urinary schistosomiasis into the therapeutic arsenal [6]. The benefits of this drug are its easy administration, low toxic effects and low side effect intensity [7]. These significant factors have contributed to the tolerance of individualized and mass treatments and their easy application. However, the failure of various proportions of Praziquantel treatment was reported [8-10]. Traditional medicine (TM) has been widely used for schistosomiasis in Africa [11]. People living in low and middle-income countries (LMICs) tend to use traditional medicine in complementary and alternative medicines (CAMs), including schistosomiasis and comorbidities according to their attitudes and beliefs [12, 13]. This study aimed to assess perceptions of participants on the availability of Praziquantel and to ascertain whether individuals infected with schistosomiasis used concurrently African traditional medicines with this treatment.

An increase in the incidence of non-communicable diseases contributes greatly to the burden of schistosomiasis and adds burden to already strained health systems due to the high prevalence of infectious diseases [14]. For mass treatment to prevent co-morbidities in schistosomiasis management, the World Health Organization (WHO) suggested preventive chemotherapy in primary healthcare systems for elimination of the infection [15, 16]. Traditional medicine has played an important role in rural areas where many plants are alternatively used to treat infectious diseases including schistosomiasis but not well documented [17]. About 70 and 80 per cent of South Africans are estimated to use traditional medicine [18].

South Africa, like many developing countries, has a pluralistic health care system where a modernized healthcare system coexists with a variety of non- conventional medical systems, including traditional practices and beliefs [19]. TM has demonstrated its contribution to the management of schistosomiasis, the reason for the increased use of TM, including dissatisfaction with the effectiveness of Praziquantel, with certain concerns about adverse effects and misconceptions that TM is seen as natural and therefore safer, even if used with prescription drugs or, in particular, when used [20]. Therefore, it is assumed that the referral system will play a crucial role in health and well-being through cooperation between health professionals and traditional health Practitioners [21, 22]. The role of CAM in the provision of primary health care is recognized in the health policy documents of some Sub- Saharan African countries in the context of limited access to essential health services, especially in poor settings [23]. The concurrent use of conventional treatment with medicinal plants is not well documented. The documentation through patients personal medical records (PMR) should allow people to track their

medical information. Preserving a PMR promotes greater personal involvement in healthcare and emphasizes communication between individuals and clinicians [24].

The perceptions of the concurrent use of Praziquantel with herbal medicine in the management of schistosomiasis is not well documented. This study assessed respondents' views and perceptions in the use of Praziquantel and traditional medicine to treat schistosomiasis. The collected data will serve as a reference for evaluating the impact of the concurrent use of traditional and modern medicine in the management of schistosomiasis.

METHODS

Ethical considerations

The Biomedical Research Ethics of the University of KwaZulu-Natal under reference BE477/17 and the KwaZulu-Natal Department of Health under reference number HRKM451/17 approved this study and informed consents was sought from all respondents.

Study design

This study was a cross-sectional descriptive study, using an exploratory approach. This approach was used to bring additional insights in understanding the management of schistosomiasis in rural communities of KwaZulu-Natal. Three sources of data were used citing HCPs, Patients seen by THPs and patients who might have crossed the conventional and traditional treatment.

Study sites

ILembe District Municipality is situated on the east coast of KwaZulu-Natal bordering the Indian Ocean, it is surrounded by Umzinyathi to the north, the Indian Ocean to the east, eThekweni to the south (Durban), Umgungundlovu to the west and Uthungulu to the north-east. ILembe consists of four local municipalities located between Durban and Richards Bay: Mandeni, KwaDukuza, Maphumulo and Ndwedwe. The town straddles the Tugela River [25]. This study was conducted in areas surrounding Kwadukuza and Mamphumulo municipalities where healthcare facilities visited citing Primary Healthcare Centre (PHC): Amandlalathi, Mpise, Otimati, Oqaqeni, Mpumelelo and Shakaskraal Clinics, one Community Healthcare centre (CHC): Kwadukuza Clinic, Level one of Healthcare: Umphumulo and Untunjambili Hospitals, Level two of healthcare: Stanger Hospital. A previous study in ILembe district reported that schistosomiasis was prevalent over the past years [26].

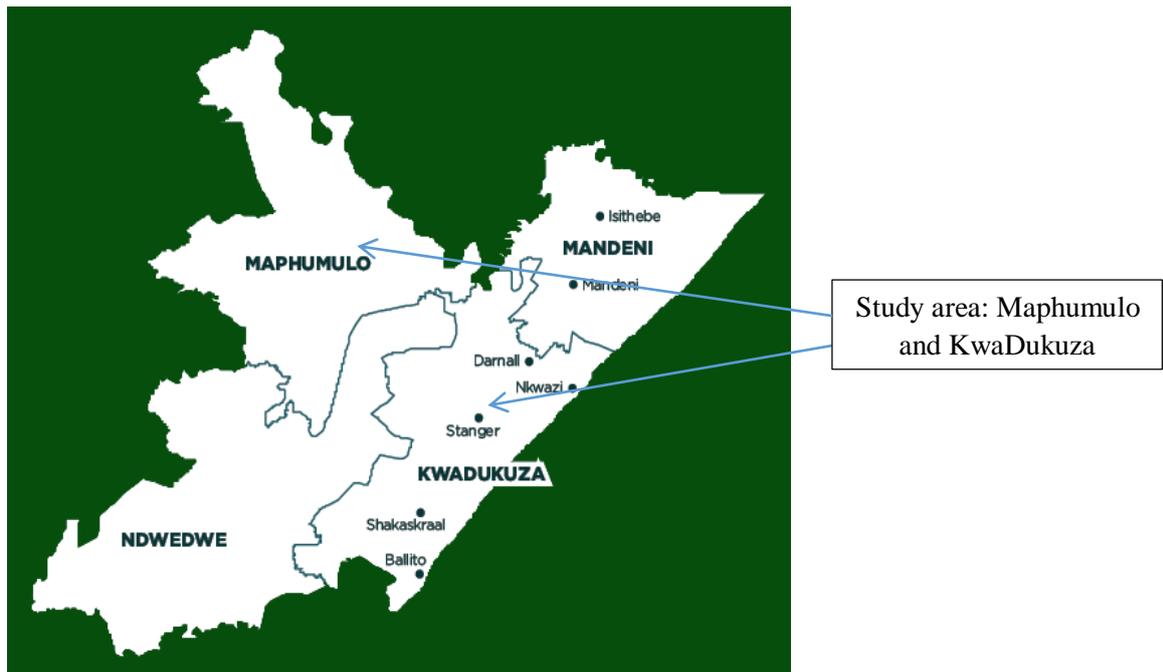


Figure 4. 1. A geographic map of the in I Lembe district

Study population, inclusion and exclusion criteria

Study population

This study recruited healthcare workers including medical doctors, pharmacists, nurses and pharmacist assistants from 10 healthcare facilities. Traditional health practitioners interviewed in a previous study, as well as patients recruited from the five different facilities during the data collection period from January to April 2018, referred patients included in this study to the researchers.

Inclusion criteria

Respondents who have had the infection between 2016 and early 2018 were included to generate key findings [27, 28]. Ten patients who had the disease outside the study period (2016 to early 2018) were included to gather their perceptions about the concurrent use of traditional medicine and conventional prescribed antischistosomal medicines. Male and female respondents aged 18 years old and above with schistosomiasis history were included.

Exclusion criteria

Healthcare workers managing schistosomiasis and patients who had the disease but not available at the time of data collection were excluded from this study. Patients with doubtful information about schistosomiasis were excluded as well from this study.

Sampling technique and study size calculation

A purposeful sampling method was used to gather data from respondents who have treated, either managed or suffered from schistosomiasis during the study period.

This study aimed to detect at least 10% difference in the concurrent use of traditional medicine and conventional antischistosomal treatment, thus the sample size calculation was based on an expected prevalence of 10% considered as a response distribution, a margin of error of 5% and 95% confidence intervals [29]. The population in the study area was estimated at 657 612 (<https://municipalities.co.za/demographic/117/ilembe-district-municipality>). Thus, the minimum recommended sample size was 139 respondents. The sample size of respondents was determined using the formula as described by Lwanga (1991) and Daniel (1999) [29]:

$$N = \frac{Z^2 P(1 - P)}{2d^2}$$

Where Z statistic as 1.96 for the confidence level of 95%, P is 0.8 as the expected proportion of the characteristics were measured in the study area [30]; d is the precision of 0.05 for 95% confidence interval. Since it was a prospective study, attritions were expected for various reasons, unsigned consent and assented forms, the absence of respondents, failure to provide information or not being available during subsequent survey; an increase of 10-20% was added to the minimum sample size of 139 yielding 159 respondents included in the final analysis.

Procedure for recruitment and selection of respondents

Three categories of respondents were recruited in this study. THPs from the previous study directed the researchers to their patients in their different locations in the study area. The researchers approached them during the day, for those not available interviews were done via phone calls. An isiZulu speaking person assisted with translation for those respondents who could not express themselves in English. Healthcare workers who have treated schistosomiasis were recruited in the 10 facilities and were interviewed at their workplace during business hours. HCWs directed the researchers to patients who had a history of schistosomiasis in the outpatient department. Researchers went to check the patients' medical records as per healthcare workers' directions.

Data collection methods and tools

Information was gathered using an open-ended and closed questionnaire using purposeful sampling [31]. Questions were on the impact and treatment seeking behaviour in schistosomiasis management. THPs and those who have visited the mainstream healthcare system divided this study into two phases whereby phase one consisted of interviews with respondents including healthcare workers and patients seen. The study enrolled 20 patients referred to researchers by THPs in the previous study, 124 HCWs in healthcare facilities selected in the study as well as 15 patients who have been using the conventional

treatment for the management of schistosomiasis. Among those 15 respondents, two of them have used concurrently conventional and traditional treatment for schistosomiasis following reports of HCWs. In phase two, medical records of patients with schistosomiasis were purposively assessed and analyzed for the potential use of conventional and traditional treatment. Thirty-nine patients medical record were retrieved. A special note concerns the fact that the disease being part of neglected ones, patients files could not be traced due to the use of registry system where they just reported cases and notification of medical conditions (NMC) forms for patients seen in phase one. Two patients out of 39 were specifically identified by HCWs in phase one of the study following concurrent use of traditional and conventional treatment for schistosomiasis management. However, no mention of the use of traditional medicine was found in their medical records.

Data analysis

All data were first entered twice in an Excel spreadsheet, cross-checked and then transferred to data were entered into and analyzed by the statistical package for social sciences (IBM SPSS Statistics) statistical software version 25.0 package for Windows. Descriptive statistics were used including frequency, percentage, and categorical data represented as tables. Analysis of associations between continuous variable used Chi-squared tests. A p-value ≤ 0.05 was estimated as statistically significant. Each of the selected respondents gave their point of views in the management of schistosomiasis. This approach was used to generate an in-depth understanding of the issue [28]. Data were reviewed, individual components were analyzed and compared to other cases as a requirement of collective case studies [32].

RESULTS

Demographic assessments of respondents

Socio-demographic characteristics of respondents showed that the majority were recruited in Stanger Hospital (46/159 (28.9%) [22 – 36.6]). Most of them were females (120/159 (75.5%) [68 – 81.9]), and where not married (98/159 (61.6%) [53.6 – 69.2]), 56/159 (35.2%) [27.8 – 43.2] had a degree as the highest study level. On respondents' profession 93/159 (58.5%) [50.4 – 66.2] were nurses. The majority (104 (65.4%) [57.5 -72.8]) were christians. See Table 3.1 below for details.

Table 3. 1. Background characteristics of respondents (n=159)

<i>Category (variables)</i>		<i>HCPs, n=124</i>	<i>Patients seen only by THPs, n=20</i>	<i>Patients seen by both THPs and HCPs, n=15</i>	<i>Frequency, Total, N= 159 N (%) [CI 95%]</i>
Facility	Amandlalathi / Mpise/Otimati/Oqaqeni/ Mpumelelo Clinics	17	Nil	4	21 (13.2%) [8.4 – 19.5]
	Kwadukuza Community Health Clinic	5	Nil	5	10 (6.3%) [3.1 – 11.3]
	Mobile Clinics 1&2/ KwaDukuza Health Dpt	15	Nil	5	20 (12.6%) [7.9 – 18.8]
	Stanger Hospital	46	Nil	Nil	46 (28.9%) [22 – 36.6]
	Umphumulo and Untunjambili Hospitals	41	Nil	1	42 (26.4%) [19.7 - 34]
Sex	Female	93	15	12	120 (75.5%) [68 – 81.9]
	Male	31	5	3	39 (24.5%) [18.1 - 32]
Marital status	Married	52	5	4	61 (38.4%) [30.8 – 46.4]
	Not married	72	15	11	98 (61.6%) [53.6 – 69.2]
Study level /Degree	Primary	Nil	1	1	2 (1.3%) [0.2 – 4.5]
	Matric	Nil	3	4	7 (4.4%) [1.8 – 8.9]
	Certificate/Diploma	27	6	Nil	33 (20.8%) [14.7 – 27.9]
	Degree	55	1	Nil	56 (35.2%) [27.8 – 43.2]
	None	Nil	9	10	19 (11.9%) [7.4 - 18]
Occupation /Profession	Nurses	93	Nil	Nil	93 (58.5%) [50.4 – 66.2]
	Medical Doctors	16	Nil	Nil	16 (10.1%) [5.9-15.8]
	Pharmacists	12	Nil	Nil	12 (7.5%) [4 – 12.8]
	Pharmacist assistants	3	Nil	Nil	3 (1.9%) [0.4-5.4]
	Traditional healer	Nil	Nil	1	1 (0.6%) [0-3.5]
	Little business	Nil	5	2	7 (4.4%) [1.8 – 8.9]
	Cashier	Nil	2	Nil	2 (1.3%) [0.2 – 4.5]
	Counsellor	Nil	1	Nil	1 (0.6%) [0-3.5]
Packer	Nil	1	Nil	1 (0.6%) [0-3.5]	

	Social worker	Nil	1	Nil	1 (0.6%) [0-3.5]
	Student	Nil	3	Nil	3 (1.9%) [0.4-5.4]
	None	Nil	7	12	19 (11.9%) [7.4 - 18]
Religion	Christian	85	15	4	104 (65.4%) [57.5 -72.8]
	Hinduism	12	Nil	1	13 (8.8%) [4.4-13.6]
	Traditional religion	10	5	3	18 (11.3%) [6.8-17.3]
	Others	17	Nil	7	24 (15.1%) [9.9-21.6]

*This study enrolled 124 HCWs recruited as follows: Level 2 healthcare (46/124, 37.1%), Level 1 healthcare (41/124; 33.1%), community healthcare clinics (CHC) (7/124, 5.6%) and primary healthcare clinics (PHC) (30/124; 24.2%).

Phase 1: Assessment of healthcare professionals and patients' perception towards the use of TM and orthodox medicine for the treatment of Schistosomiasis with co-morbidities

The phase one enrolled 20 patients referred to researchers by THPs in the previous study, 124 HCWs in healthcare facilities selected in the study as well as 15 patients who have been using the mainstream healthcare system for the management of schistosomiasis.

Self-reports of HCWs on the availability of Praziquantel (Biltricide®)

The comparison of the availability of Praziquantel (Biltricide®) and the level of healthcare facilities shows that out of the 124 respondents, the majority (106/124; 85.5%) indicated that Praziquantel (Biltricide®) was available in the facilities. Most of the respondents (114/124; 91.9%) reported that medicines were purchased directly by the facilities for free distribution to patients. Although, about (10/124; 8.1%) of the respondents mentioned that they did not know if medicines were purchased directly by the facilities for distribution to patients. More so, out of the 91.9% of the respondents that stated that medicines were purchased directly by the facilities for distribution to patients, 49.2% of them worked in rural areas and 42.7% of them worked in semi-urban areas.

A correlation has been found with a p-value set at < 0.05 , suggesting that there is a strong relationship between the level of healthcare facilities and the availability of Praziquantel (Biltricide®). The level of healthcare facilities is a key factor that determines the availability of Praziquantel (Biltricide®) in rural area facilities ($p = 0.006$). Refer to table 3.2 below for details.

Table 3. 2. Assessment of HCWs perception on Praziquantel (Biltricide®) availability

<i>Healthcare Facilities/ Number of facilities (10)</i>	<i>Praziquantel (Biltricide®) Availability by respondents(n)</i>			
	<i>Yes</i>	<i>No</i>	<i>Don't Know</i>	<i>Total, n= 124, N,(%), [CI 95%]</i>
PHC (6)	29	Nil	1	30 (24.2%) [17 – 32.7]
CHC (1)	7	Nil	Nil	11 (5.6%) [2.3 – 11.3]
Level 1 (2)	28	4	9	41 (33.1%) [24.9 – 42.1]
Level 2 (1)	42	Nil	4	46 (37.1%) [28.6-46.2]
Total	106	4	14	124 (100.0%)

*PHC (Amandlalathi, Mpise, Otimati, Oqaqeni, Mpumelelo, Shakaskraal Clinics), CHC (Kwadukuza Clinic), Level1 of Healthcare (Umphumulo and Untunjambili Hospitals), Level 2 of healthcare (Stanger Hospital)

When testing the relationship between the Praziquantel (Biltricide®) availability perception and the concurrent use of TM and conventional treatment (CT) perception for the treatment of Schistosomiasis,

there was no significant relationship between the concurrent use of TM and CT by patients for the treatment of schistosomiasis in the study area ($X^2 = 3.042$, $p = 0.551$).

Self-reports by HCWs about patients' record keeping and visits to healthcare facilities for schistosomiasis

It is indicated that all respondents working in the different level of healthcare facilities kept a record of patients suffering from schistosomiasis using patients' files in most cases (105/124; 84.7%). Most of the 124 respondents (111/124; 89.5%) always retrieved and consulted patients' files to follow up each time they visit facilities. See table 3.3 below for details.

Table 3. 3. Assessment of record keeping and visits to healthcare facilities for schistosomiasis

<i>Facilities</i>	<i>Types of Record Keeping</i>				<i>Total N, (%), [CI 95%]</i>
	<i>Filing System</i>	<i>Registry System</i>	<i>Notification form (NMC)</i>	<i>Others</i>	
PHC	18	Nil	12	Nil	30 (24.2%) [17– 32.7]
CHC	7	Nil	Nil	Nil	7 (5.6%) [2.3 – 11.3]
Level 1	36	Nil	Nil	5	41 (33.1%) [24.9 – 42.1]
Level 2	44	2	Nil	Nil	46 (37.1%) [28.6 – 46.2]
Total	105	2	12	5	124 (100.0%)

*PHC (Amandlalathi, Mpise, Otimati, Oqaqeni, Mpumelelo, Shakaskraal Clinics and Mobile clinics 1 and 2), CHC (Kwadukuza Clinic), Level1 of Healthcare (Umphumulo and Untunjambili Hospitals), Level 2 of healthcare (Stanger Hospital)

Perceptions of HCWs about the concurrent use of traditional medicine and conventional prescribed medicines

Majority of healthcare professionals (76/124; 61.3%) reported that they did not know whether their patients used concurrently TM and CT for the treatment of Schistosomiasis. In comparing the availability of Praziquantel (Biltricide®) in facilities with its concurrent use with TM, showed that most of the respondents (62/124; 50.0%) argued positively on the availability of the Praziquantel (Biltricide®) in the facility reported that their patient did not concurrently use TM and CT for the treatment of schistosomiasis.

Knowledge and prevalence of schistosomiasis among patients seen by both THPs and HCWs

On views and experiences of respondents on the treatment of schistosomiasis, 12 respondents out of 15 who visited healthcare facilities and met THPs were women. The maximum duration of the disease reported was a month as reported the majority of respondents using TM and those using CT. A treatment, which consisted of antibiotics (15 days prescription) and Praziquantel (Biltricide®) (single dose), was reported by respondents. Patients referred by THPs to the researchers indicated the use of

medicinal plants in the management of schistosomiasis. They all reported that they did not use conventional treatment for schistosomiasis. Respondents (8/20, 40%) seen by THPs used TM occasionally while the ones who crossed the two systems used TM only once.

On the other side, patients seen by HCPs reported that schistosomiasis was frequent in women (10/15, 66.7%), they reported as well that the disease duration was a month (11/15, 73.3%). It is reported that 8/15, 53.3% have crossed CT and TM but they used the mainstream healthcare facility to be examined as asked by the THPs to find out if the disease was treated well. The majority of respondents reported having been on Biltricide®, single dose and Antibiotics (12/15, 80%). Results showed that 10/15, 66.7% agreed to have used TM for schistosomiasis not on a regular basis but only once. Refer to table 3.4 below for details.

Table 3. 4. Knowledge and prevalence of schistosomiasis among patients

<i>Category (variables)</i>		<i>Patients seen by only by THPs, n=20</i>	<i>Patients seen by HCPs, n=15</i>	<i>Total, N= 35 N (%) [CI 95%]</i>
Type of Schistosomiasis	Bilharzia in women	Nil	12	12 (34.3%) [19.1-52.2]
	Bilharzia in man	Nil	3	3 (8.6%) [1.8-23.1]
Disease duration	Two weeks	Nil	2	2 (5.7%) [0.7-19.2]
	Almost month	Nil	1	1 (2.9%) [0.1-14.9]
	A month	14	11	25 (71.4%) [53.7-85.4]
	Two months	6	1	7 (20%) [8.4-36.9]
Treatment duration	No modern treatment, I went to the facility to be examined as asked me the THP to find out if the disease was treated well	Nil	8	8 (22.9%) [10.4-40.1]
	15 days	10	Nil	10 (28.6%) [14.6-46.3]
	One day	10	1	11 (31.4%) [16.9-49.3]
Types of treatment received in the past for this disease	Biltricide	Nil	3	3 (8.6%) [1.8-23.1]
	Imbiza	Nil	12	12 (34.3%) [19.1-52.2]
Current treatment for the disease	Imbiza (Herbal medicine mixture)	18	15	33 (94.3%) [80.8-99.3]
	Modern medicine (didn't use TM after consulting the THP)	2	Nil	2 (5.7%) [0.7-19.7]
Other treatment used than conventional medicines for schistosomiasis	Yes	Nil	12	12 (34.3%) [19.1-52.2]
	No	Nil	3	3 (8.6%) [1.8-23.1]
Conventional medicine used for schistosomiasis	Biltricide, single dose	Nil	2	2(5.7%) [0.7-19.7]
	Biltricide, single dose and Antibiotics	Nil	12	12(34.3%) [19.1-52.2]
	None	Nil	1	1(2.9%) [0.1-14.9]
Frequency of use of TM/ CT for schistosomiasis	Occasionally	8	5	13(37.1%) [21.5-55.1]
	Only once	5	10	15 (42.9%) [26.3-60.6]
	Weekly	7	Nil	7 (20%) [8.4-36.9]

Perceptions about the use of TM either alone or in combination with conventional medicines among patients seen by both THPs and HCWs

Respondents reported that they used TM only when they had stopped the use of modern medicine for those who have crossed the two healthcare systems (9/15, 60%), they were motivated by their curiosity and belief on the choice of the use of traditional medicines (12/15, 80%). They reported having used TM because it stopped the bleeding for those who visited healthcare facilities and used TM (12/15, 80%).

The majority (12/15, 80%) of respondents reported that TM can be recommended to be used widely against schistosomiasis. Patients (8/15, 53.3%) who crossed the two systems mentioned that they did not disclose to HCPs that they used TM because they usually tell them to avoid the use of TM because it destroys organs or makes the modern treatment not work properly when using conventional treatment with traditional herbs. The overall yearly cost for TM used was R1000 or 84.75\$ (Rate 1\$=11.8R at the time of data collection) reported by the majority (8/15, 53.3%) of patients who have used CT and TM. Respondents who consulted THPs self-reported a particular perceived benefit obtained from the use of TM including a good treatment of the disease and relief of its symptoms (18/20, 90%). Few respondents (8/20, 40%) reported experiencing unwanted effects after the use of TM such as running stomach (diarrhoea), vomiting and nausea; however, they were satisfied on the performance of TM used for schistosomiasis. The majority of respondents seen by THPS (18/20, 90%) reported that TM can be recommended to be used widely against schistosomiasis. See table 3.5 below for details.

Table 3. 5. Perceptions on the use of TM either alone or in combination with conventional medicines

Category (variables)		Patients seen only by THPs, n=20	Patients seen by HCPs, n=15	Total, N= 35 N (%) [CI 95%]
Explanation of the use of conventional and Traditional medicine	The respondent started using TM only and stopped the use of modern medicine	Nil	9	9 (25.7%) [12.5-43.3]
	Was using conventional medicine during the same period as he was using TM so that both will work together	Nil	6	6 (17.1%) [6.6-33.6]
Motivation/ perceptions of the choice of the use of traditional medicines	Curiosity and belief	Nil	12	12 (34.2%) [19.1-52.2]
	MM disappoint	Nil	3	3 (8.6%) [1.8-23.1]
Particular benefit obtained from the use of TM	Yes, no more bleeding, nor blood and itching when urinating	Nil	12	12 (34.3%) [19.1-52.2]
	None	Nil	3	3 (8.6%) [1.8-23.1]
	Disease treatment and relieved symptoms	18	Nil	18 (51.4%) [34-68.6]
	It didn't work well	2	Nil	2 (2.7%) [0.7-19.7]
Any unwanted effect from the used of any medicines either alone or in combination (CT and/or T) for Schistosomiasis	Yes	8	Nil	8 (22.9%) [10.4-40.1]
	No	12	15	27 (77.1%) [59.9-89.6]
Experience on any unwanted effect from the TM use (specification)	Running stomach (diarrhoea), vomiting and Nausea	9	Nil	9 (25.7%) [12.5-43.3]
	None	11	Nil	11 (31.4%) [16.9-49.3]
Satisfaction on the performance of TM/CT used for Schistosomiasis	Satisfied	18	12	30 (85.7%) [69.7-95.2]
	No idea	2	3	5 (14.2%) [4.8-30.3]

<i>Category (variables)</i>		<i>Patients seen only by THPs, n=20</i>	<i>Patients seen by HCPs, n=15</i>	<i>Total, N= 35 N (%) [CI 95%]</i>
Use of either TM/both against Schistosomiasis or recommend it for someone with Schistosomiasis	Yes	18	12	30 (85.7%) [69.7-95.2]
	Not sure	2	3	5 (14.2%) [4.8-30.3]
Choice of TM over CT	Yes, Just went to Hospital for exam not treatment	Nil	5	5 (14.2%) [4.8-30.3]
	Yes, Solution and no coming back of the infection	Nil	7	7 (20%) [8.4-36.9]
	No	Nil	3	3 (8.6%) [1.8-23.1]
Mention to the HCPs of TM use for Schistosomiasis management	Yes	Nil	3	3 (8.6%) [1.8-23.1]
	No	Nil	12	12 (34.3%) [19.1-52.2]
Patient disclosure to Doctor on TM use	He said it doesn't work and might not be helpful	Nil	1	1 (2.9%) [0.1-14.9]
	He said that traditional medicines can have side effects that won't be controlled if used together with traditional herbs	Nil	6	6 (17.1%) [6.6-33.6]
	The HCP said that it destroyed organs or make the modern treatment not work properly	Nil	8	8 (22.9%) [10.4-40.1]
Traditional medicine supply	From the market of traditional herbs	Nil	5	5 (14.2%) [4.8-30.3]
	From the relations	Nil	2	2 (2.7%) [0.7-19.7]
	From the TM practitioner	Nil	8	8 (22.9%) [10.4-40.1]
Cost of TM for a year	Almost R 1000 (84.75\$)	Nil	8	8 (22.9%) [10.4-40.1]
	Almost R 1500(127.11\$)	Nil	5	5 (14.2%) [4.8-30.3]
	Almost R 2000 (169.49\$)	Nil	2	2 (2.7%) [0.7-19.7]

*Note: 1\$=11.8R at the time of data collection

Phase 2: Assessment of medical chart records of patients with a history of schistosomiasis

Evidence of documentation of the use of TM for schistosomiasis and comorbidities among patients

In phase two, medical chart records of patients with schistosomiasis were analyzed. Overall, 39 medical chart records were analyzed and none documented the use of TM. Out of 39 files retrieved, two medical records were from patients seen in phase one. The information given verbally to researchers on the use of traditional treatment was not reported in their medical chart records. These two above patients fell among seven cases of patients with a history of schistosomiasis and other comorbidities including HIV and other STIs. Refer to table 3.6 below for details.

Table 3. 6. Schistosomiasis with other associated conditions

Categories	The frequency of associated disease conditions to schistosomiasis		Total	N (%) 95% CI
	Frequency of schistosomiasis	Sub-categories		
schistosomiasis alone	11	None	11	(8.5%) [4.3-14.6]
schistosomiasis associated with HIV	5	Diarrhoea (3), Genital ulcers or itching(1) and other (5)	9	(10.8%) [6-17.4]
	7	STI & TB(7) and other (31)	38	(34.6%) [26.5– 43.5]
	3	other non-infectious diseases: Hypertension(3) and other (5)	8	(8.5%) [4.3-14.6]
	5	Hematuria (5), respiratory problem (2) and other (5)	12	(13.1%) [7.8-20.1]
schistosomiasis associated with other diseases conditions	2	Hypertension (2), Blood in urine (1), Genital ulcers or itching(1) and other (9)	13	(11.5%) [6.6 – 18.3]
	6	Hematuria (6), STI & TB (1) and other (4)	11	(13.1%) [7.8 – 20.1]
Total	39	91	130	

*NB: More than one disease was documented per patients beside the 11 with schistosomiasis alone

Assessment of prescribed conventional medicines for schistosomiasis and comorbidities

Table 7 below presents the most commonly prescribed medicines for patients with a history of schistosomiasis and comorbidities. The most frequent documented medicine for schistosomiasis was Praziquantel (Biltricide®). For infectious comorbidities, antiretroviral medicines (60/219, 27.39%) and antibiotics (44/219, 20.1%) were the most commonly prescribed medicines with Praziquantel (Biltricide®). See table 3.6 below for details.

Table 3. 7. Conventional medicines prescribed to patients with a history of schistosomiasis and comorbidities

<i>The main treatment of schistosomiasis and comorbidities</i>	<i>Sub-category</i>	<i>Frequency N (%) 95% CI</i>
Praziquantel (Biltricide®) alone	None	11 (5.02%) [2.5-8.8]
Praziquantel (Biltricide®) associated with ARVs	Tenofovir (19), Efavirenz (19), Emtricitabine (19) and others (3)	60 (27.39%) [21.6-33.8]
Praziquantel (Biltricide®) associated with ATBs (TB/STI/other infection)	Hydrochlorothiazide (7), Ceftriaxone (6), Azithromycin (6), Flagyl (Metronidazole) (5), Augmentin (3), Amoxicillin (3), Isoniazid (2), Doxycycline (2), Flucloxacillin (2), Fluconazole (2) and others (6)	44 (20.1 %) [15.0-26.0]
Praziquantel (Biltricide®) associated with other medicines	Paracetamol /Panado (13), B-Complex /Zincplex (12), Buscopan (Hyoscine butylbromide) (12), Multivitamin (10), Brufen (Ibuprofen) (8), FeSO ₄ (7), Folic Acid (6), Petogen (5), Pyridoxine (3), Calcium (3), Diphenhydramine (3), Illiadin nose drops (Oxymetazoline) (2), Epillim (Sodium valproate) (2) and others (18)	104 (47.5%) [40.7-54.3]
Total		219

DISCUSSION

A cross-sectional study was conducted in the community, three hospitals, one community health clinic and six primary health clinics in the ILembe District in KwaZulu-Natal, South Africa.

This study found that at least sixty per cent of the HCPs (76/124; 61.3%) reported that they did not know whether their patients used concurrently TM and CT for the treatment of schistosomiasis. In the light of this study finding, a similar study stated that patients who crossed the two healthcare systems did not fully disclose their use of TM to HCWs [33]. In addition, another study in Western Cape, South Africa reported that HCWs were stigmatizing the concurrent use of TM and CT in health conditions [34].

This study found that there was no relationship between the availability of Praziquantel (Biltricide®) in healthcare facilities and the concurrent use of TM and CT for the treatment of Schistosomiasis ($X^2 = 3.042$, $p = 0.551$). Thus, the availability of Praziquantel (Biltricide®) in the facilities does not imply the concurrent use of TM and CT by patients for the treatment of schistosomiasis in the study areas due to the belief on the use of TM. This finding is in agreement with another study which demonstrated that Praziquantel was available in endemic areas of South Africa including KwaZulu-Natal [35]. Another study argued that patients crossed from the mainstream healthcare system to traditional medicine, despite the availability of conventional treatment [36]. The same authors further indicated that HCWs in charge had to be increased in endemic areas for follow-ups to avoid the risk of reinfection and which might be the reason why patients use to cross the two healthcare systems. These viewpoints above may justify the concurrent use of CT and TM in the management of schistosomiasis. Many studies have suggested that the treatment of NTDs has to be extended to the entire community considering socio-cultural beliefs and accessibility [37, 38].

This study found that the maximum treatment duration and follow up for schistosomiasis was a month as reported the majority of respondents seen by THPs. Not much is known about the treatment duration for those crossing the two healthcare systems. This finding met the length of treatment duration of schistosomiasis using TM as reported in a study conducted in Mali where the treatment duration was reported to be 1 to 30 days for schistosomiasis to be treated depending on the plant used [39].

Some respondents seen by THPs in this study used medicinal plants for the management of schistosomiasis; they did not use orthodox conventional medicines while some respondents crossed the two systems. The use of TM was previously reported for their anthelmintic activity for the management of schistosomiasis in Zimbabwe [40]. This was also supported by another study conducted in Cameroon on the antischistosomal activity of African medicinal plants [41].

Another finding from this study was a perceived credit to be given to traditional healers for the management of schistosomiasis. Traditional medicine representing a parallel healthcare system to orthodox medicine, the researchers in this study hold a view that collaboration between HCWs and

THPs should be improved. This is in line with another study which indicated that collaboration of THPs and HCWs was an important component of controlling the concurrent misuse of TM and conventional medicine by patients to avoid uncontrollable side effects [42].

A minority of patients seen by THPs in this study (8/20, 40%) reported unwanted effects citing running stomach (diarrhoea), vomiting and nausea after the use of TM for schistosomiasis. A study conducted in South Africa showed that the use of TM came with unwanted effects due to the way plants were used including their preparation and dosage[43]. The same authors also recommended that communication between users and prescribers was an important component in the healing process where people relied on TM as primary healthcare.

This study reported that community clients consulting THPs collected their medicinal treatment mostly from THPs and the overall yearly cost reported was R1000 (84.75\$). This finding is in agreement with another study conducted in South Africa showing that TM was not a cheaper alternative easily accessible but expensive compared to local public healthcare facilities where treatment is free of charge sometime [44].

Findings of this study revealed that schistosomiasis was associated mainly with sexually transmitted infections, mostly HIV. It is also suggested in a study that *Schistosoma* infection might have an active role in HIV transmission and disease progression within low and middle-income settings [45]. A study showed that the co-infection of schistosomiasis with HIV had immunological consequences [46]. Another study conducted in Tanzania reported that co-infections of HIV and Schistosomiasis had an effect on the patient immune system [47].

Strengths and limitations of this study

This study investigated the traceability on the concurrent use of CT and TM in the management of schistosomiasis with comorbidities. It could be of interest for the improvement of the collaboration of THPs and HCWs in the management schistosomiasis. However, a few limitations were due to relatively small sample size, the results possibly cannot be generalized to the entire population of patients with a history of schistosomiasis and comorbidities in South Africa. Therefore, similar studies are warranted in other endemic areas of South Africa to ascertain that patients are concurrently using TM and CT in the management of schistosomiasis known as a neglected tropical disease in the general population.

CONCLUSION

In this study, HCWs reported that they were not aware of whether their patients concurrently used TM and CT for the treatment of schistosomiasis. Furthermore, patients seen by THPs in this study relied on medicinal plants for the management of schistosomiasis; they did not use orthodox conventional medicines while a few of them crossed the two systems. This study found that respondents believed that credit could be given to traditional healers for the management of schistosomiasis. Future investigations

in endemic areas of South Africa should contribute to the knowledge of other medicinal plants used by THPs for schistosomiasis.

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DECLARATIONS

List of Abbreviations

THP (Traditional Health Practitioner), TM (Traditional medicine), CT (Conventional Treatment), WHO (World Health Organization), HCP (Healthcare Professional), HIV (Human Immunodeficiency Virus), ATBs (Antibiotics)

Ethics approval and consent to participate

The Biomedical Research Ethics of the University of KwaZulu-Natal under reference BE477/17 and the KwaZulu-Natal Department of Health under reference number HRKM451/17 approved this study and informed consents was sought from all respondents.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AGAM drafted the initial manuscript. MN contributed to the conceptualization of the study and revised the initial draft for its intellectual content. MK assisted in data analysis and interpretation of the results. All authors read and approved the final manuscript.

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CHAPTER 5: SYNTHESIS CHAPTER - GENERAL DISCUSSION

5.1. Synthesis & Discussion – the significance of major findings

This chapter concludes this research followed by recommendations for future research.

This study investigated the use of traditional medicine and prescribed antischistosomal medicines in communities with a high prevalence of schistosomiasis infections. Perspectives from traditional healers (22), patients seen by THPs (20), patients who have visited healthcare facilities with possible use of TM (15) and healthcare workers (124) were assessed through interviews in the first phase of the study. Medical chart records were reviewed and analyzed in the second phase of the study.

A systematic scoping review protocol was drawn up to map research areas in line with the treatment of schistosomiasis with comorbidities. This review protocol assessed the management of schistosomiasis in terms of volume, nature, and characteristics of existing data, with a view of identifying gaps in the current literature on this topic. This review protocol was in line with review studies reporting on the importance of mapping evidence on the use TM and CT in order to report the extent of knowledge about the appropriateness and potential interactions on patients (Agbabiaka et al., 2016, Agbabiaka et al., 2017).

5.1.1. Knowledge, perceptions and experiences of traditional health practitioners about managing female urogenital schistosomiasis

- a. This study found that THPs played a key role in the management of schistosomiasis in rural areas of the district of I Lembe where they diagnosed symptoms of schistosomiasis based on their knowledge and experience. Another study in South Africa highlighted that THPs played a key role in the management schistosomiasis in rural endemic areas (Lothe et al., 2018). Although conventional treatment in public healthcare facilities was readily available and free, many female respondents, consulted by THPs, did not use treatment in the mainstream healthcare system. Studies conducted in schistosomiasis endemic areas have shown that the disease was perceived as a shameful disease for children (Koffi et al., 2018, Lothe et al., 2018). This perception and other cultural beliefs posed an obstacle to the elimination of the disease through the mainstream healthcare systems (Mwanga et al., 2015). This may suggest that health education initiatives should be developed to combat such beliefs in local communities.
- b. THPs indicated that TM was used in the study area for the management of schistosomiasis. Overall, 22 plant species belonging to 14 families were mentioned in this study to be used against schistosomiasis. Various studies have supported the potential activity of medicinal plants in schistosomiasis management (Maroyi, 2017, Muema et al., 2015). A study conducted in East Africa reported that about 19 medicinal plants were traditionally used in the management of schistosomiasis among which 5 were found to be used in Kenya citing: *Dissotis*

rotundifolia (Melistomataceae), *Iboza multiflora* (Labiatae), *Macaranga kilimandscharia* (Euphorbiaceae), *Ozoroa mucronata* (Amatanthaceae) and *Rhynchosia hirta* (Leguminosae) (Kokwaro, 1993). However, due to secrecy, THPs did not reveal their traditional recipes in this study.

This study found that more than two plant species were widely combined in herbal treatment preparations administered by THPs who believed that combined treatments worked better when taken as per requirements. Synergistic strengths in antischistosomal activity were shown when medicinal plants extracts were combined in other studies (Ghareeb et al., 2018, Kyere-Davies et al., 2018). On the same note, this study recommends further investigations for biological evaluation of some of the remedies [*Senecio serratuloides* (Asteraceae), *Hypoxis hemerocallidea* (Hypoxidaceae), *Tylophora flanaganii* (Apocynaceae), *Rhoicissus digitata* (Vitaceae)] used by THPs in the study area.

- c. This study found that THPs perceived some side effects after administration of traditional recipes as a good result for patients' treatment. They believed that those symptoms experienced by patients such as constipation and stomach-aches were beneficial. The study showed that feedback from a patient who did not urinate blood but experienced constipation were signs of healing while for other THPs, patients were sent to modern facilities to determine if the disease had been cured. Studies conducted in South Africa indicated that while people were aware of the potential consequences using TM alone or with other treatments of health issues, they believed they could be manageable (De Wet et al., 2016, Marais et al., 2015).

5.1.2. A triangulation of information from healthcare workers and patients about the concurrent use of traditional medicine and conventional prescribed medicines for schistosomiasis.

- a. This study found that at least 60% of HCWs (76/124; 61.3%) reported not knowing if their patients used TM and CT to treat schistosomiasis at the same time. However, the availability of Praziquantel (Biltricide ®) in healthcare facilities and the concurrent use of TM and CT in the treatment of schistosomiasis are not related ($X^2 = 3.042$, $p = 0.551$). These findings are in line with the finding of another study conducted in rural KwaZulu-Natal showing that Praziquantel was available in healthcare facilities but was not administered properly to patients in fighting schistosomiasis (Kabuyaya et al., 2017). Consequently, the availability of Praziquantel (Biltricide ®) in the facilities did not imply the simultaneous use of TM and CT by patients in the treatment of schistosomiasis in the study areas because of their belief in the use of TM. A study conducted in Ghana showed that cultural beliefs play a key role in patients' health-seeking behaviour in Africa explaining the concomitant use of CT and TM (Gyasi et al., 2016). The complex socio-cultural orientation and belief paradigm depends on health-seeking behaviour. It was

suggested that to improve the provision of health services, it is wise to customize and assess the role of people's traditional structure and cultural beliefs in local communities (Gyasi et al., 2016).

- b. Another finding of this study indicated that THPs were credited by patients seen by them for the management of schistosomiasis. Traditional medicine, which represents a parallel health care system with orthodox medicine, believes that cooperation between HCWs and THPs should be improved. Various studies conducted in Africa have supported the collaborative engagement between THPs and HCWs in the management of various illnesses (Maimela et al., 2015, Moshabela et al., 2016, Musyimi et al., 2016).
- c. Another finding of this study showed that patients who crossed the two healthcare systems did not disclose such infection to HCWs. A study on culture and clinical care found that some patients always felt that some illnesses were not well defined within the biomedical paradigm due to the folk beliefs of patients (Pachter, 1994). Good communication between THPs and HCWs might have a positive impact on the treatment –seeking behaviour and perceptions of sicknesses as well as the clinical care and physician-patient communication (Mwanga et al., 2004, Mwanga et al., 2015). The effectiveness of the collaboration between traditional practitioners and primary health care professionals in diseases management (Campbell-Hall et al., 2010).
- d. Findings from this study revealed that schistosomiasis was associated with sexually transmitted infections, mainly HIV and other STIs. In addition to antiretroviral therapy for patients consulted, antibiotics were prescribed. Schistosomiasis and HIV/AIDS is one of the biggest health problems in South Africa today, with the biggest and most high profile HIV epidemic in the world, an estimated 7 million people living with HIV in 2016 (UNAIDS, 2017). The finding of this study was in line with a study reporting that the incidence of urogenital schistosomiasis and STIs infections was positively correlated which increased *S. Haematobium* infection prevalence with associated STIs (Molvik et al., 2017).

5.2. General conclusion

The present study shows that traditional medicine is a resource contributing to the management of schistosomiasis in rural areas of KwaZulu-Natal. Despite the challenge faced by the use of medicinal plants in the management of schistosomiasis, its implementation and integration in fighting the disease burden can have a positive effect as well as the collaboration of THPs and HCWs. However, healthcare workers are not informed whether their patients use concurrently TM and CT for the treatment of schistosomiasis. South Africa still has much to achieve in order to successfully control and decrease the prevalence of schistosomiasis in endemic areas. A well-structured schistosomiasis control program, therefore, has the potential to contribute to a reduction in the prevalence of HIV amongst women. TM

can be part of the curriculum for healthcare professionals in the management of schistosomiasis infection. Future investigations within the endemic areas of South Africa shall contribute to the knowledge of medicinal plants used by THPs for schistosomiasis.

5.3. Recommendations for future research

Traditional medicine has contributed to the management of schistosomiasis in rural settings of South Africa. This investigation was in line with other various studies highlighting the contribution of traditional medicine managing schistosomiasis in the primary healthcare system of rural areas. Not much is known on the properties of plants used, further studies on investigations are recommended on biological evaluation of some of the remedies used by THPs in the study area. On another note, due to the credit given by patients to THPs collaboration between THPS and HCWs to explore reasons for use, potential benefits or risks of the concurrent use of modern and traditional medicine in schistosomiasis management should be launched. Further studies are needed to investigate the effectiveness of African traditional medicine in the management of schistosomiasis. Furthermore, there is a need of conducting studies with bigger sample size on the acceptability, affordability, availability and accessibility of the concurrent use of modern and traditional medicine at the national level in endemic settings to investigate on its impact in the management of schistosomiasis.

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ANNEXES / APPENDICES

ANNEXES/APPENDICES

APPENDIX 1: BIOMEDICAL RESEARCH ETHICS COMMITTEE APPROVAL LETTERS



Mr GA Mushebenge (217080760)
School of Health Sciences
College of Health Sciences
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Dear Mr GA Mushebenge

PROTOCOL: Triangulation study on the use of Traditional Medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: Perspectives from traditional healers, patients and healthcare workers.
Degree: Master in Pharmacy
BREC Ref No: BE477/17

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 25 July 2017.

The study was provisionally approved pending appropriate responses to queries raised. Your response received on 29 November 2017 to BREC correspondence dated 29 November 2017 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 30 November 2017.

This approval is valid for one year from 30 November 2017. To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be RATIFIED by a full Committee at its next meeting taking place on 12 December 2017.

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely


Prof VR Rambiritch
Deputy Chair: Biomedical Research Ethics Committee

cc supervisor: nlooto@ukzn.ac.za nenep1@ukzn.ac.za

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25 January 2018

Mr GA Mushebenge (217080760)
School of Health Sciences
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Dear Mr GA Mushebenge

PROTOCOL: Triangulation study on the use of Traditional Medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: Perspectives from traditional healers, patients and healthcare workers. Degree: Master in Pharmacy
BREC Ref No: BE477/17

We wish to advise you that your letter received on 17 January 2018 submitting notification of additional site **Umphumulo Hospital** for the above-mentioned study has been noted and approved by a sub-committee of the Biomedical Research Ethics Committee.

Umphumulo Hospital and DoH permissions noted.

The above approval will be ratified by the full committee at its next meeting to be held on 13 February 2018.

Yours sincerely

Mrs A Marimuthu
Senior Administrator: Biomedical Research Ethics

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cc postgraduate administrator: nenep1@ukzn.ac.za

APPENDIX 2: SUPPORT LETTERS FROM THE DEPARTMENT OF HEALTH



health

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DIRECTORATE:

Health Research & Knowledge
Management (HKRM)

Reference: HRKM451/17
KZ_201711_002

20 November 2017

Dear Mr G Agenze Mushebenge
(University of KwaZulu-Natal)

Subject: Approval of a Research Proposal

1. The research proposal titled '**A triangulation study of the use of traditional medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: Perspectives from traditional healers, patients and healthcare workers**' was reviewed by the KwaZulu-Natal Department of Health (KZN-DoH).

The proposal is hereby **approved** for research to be undertaken at Stanger and Ntunjambili Hospitals.

2. You are requested to take note of the following:
 - a. Make the necessary arrangement with the identified facilities before commencing with your research project.
 - b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Ms G Khumalo on 033-395 3189.

Yours Sincerely



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

330 Langalibalele street,
Private Bag X9051 PMB, 3200
Tel: 033 395 2806/3189/3123 Fax: 033 394 3782
Email: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

DIRECTORATE:

Health Research & Knowledge
Management (HKRM)

Reference: HRKM451/17
KZ_201711_002

16 January 2018

Dear Aganze Mushebenge
(University of KwaZulu-Natal)

Subject: Approval of a Research Proposal

1. The research proposal titled '**A triangulation study of the use of traditional medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: Perspectives from traditional healers, patients and healthcare workers**' was reviewed by the KwaZulu-Natal Department of Health (KZN-DoH).

The proposal is hereby **approved** for research to be undertaken at Umphumulo Hospital

2. You are requested to take note of the following:
 - a. Make the necessary arrangement with the identified facilities before commencing with your research project.
 - b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Ms G Khumalo on 033-395 3189.

Yours Sincerely



Dr E Lutge

Chairperson, Health Research Committee

Date: 17/01/18

Fighting Disease, Fighting Poverty, Giving Hope

APPENDIX 3: ACCESS LETTER OF PERMISSION AND SUPPORT TO CONDUCT RESEARCH

To the facility Manager

.....

ILembe Health District

Private Bag

Dear Sir / Madam

RE: Application for support to conduct a study in your Facility

I am a registered Master's student in the Discipline of Pharmaceutical Sciences at the University of KwaZulu-Natal. My supervisor is Dr MANIMBULU NLOOTO. The title of my research proposal is *“A triangulation study of the use of traditional medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: perspectives from traditional healers, patients and healthcare workers”*.

I am hereby seeking your consent and support to successfully conduct my research project in the facility, under your responsibility and management. The survey will be conducted among Health care workers and patients in your facility. To assist you in reaching a decision, I have attached to this letter an information sheet and my full proposal.

This study will be fully approved by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal. This research study is registered with the postgraduate office of the School of Health Sciences, University of KwaZulu-Natal, Westville Campus.

Should you require any further information, please do not hesitate to contact the Department or me. Contact details are as follows: Ms Phindile Nene, Research office (Telephone: 031 260 82 80, E-mail: Nene1@ukzn.ac.za), Dr Manimbulu Nlooto, Supervisor (Telephone: 031 260 70 30, Email: Nlooto@ukzn.ac.za), Mr Aganze Mushebenge, student (060 311 97 54, E-mail: aganzedar@Gmail.com).

Your permission to conduct this study will be greatly appreciated.

Yours sincerely,

Mr. Aganze Gloire-Aimé Mushebenge (Student number: 217080760)

APPENDIX 4: FACILITIES APPROVAL LETTERS TO CONDUCT RESEARCH



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

NAME OF INSTITUTION/DISTRICT/COMPONENT
Postal Address: Private Bag x10609, Stanger 4450

Tel: 0324376015 Fax: 0867567812
Email: gustavo.lopez@kznhealth.gov.za
www.kznhealth.gov.za

OFFICE OF THE SENIOR MANAGER: MEDICAL SERVICES

Enquiries: Dr. G. Lopez
EXT: 6015
DATE: 19/10/2017

Mr. Aganze Gloire-Aimé Mushebenge

RE: PERMISSION TO CONDUCT RESEARCH AT STANGER HOSPITAL.

Dear Mr. Aganze Gloire-Aimé Mushebenge

I have pleasure in informing you that permission has been granted to you by Stanger Hospital to conduct research on: "A triangulation study of the use of traditional medicine and prescribed antischistosomal medicines in communities with high prevalence schistosomiasis infections: perspectives from traditional healers, patients and healthcare workers".

Please note the following:

1. Please ensure that you adhere to all 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. Stanger Hospital will not provide any resources for this research.
5. You will be expected to provide feedback on your findings to Stanger Hospital.

Thanking you;

Senior Manager: Medical Services
Stanger Hospital

uMnyango Wezempilo . Departement van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Untunjambili Hospital
Private Bag X216, Kranskop, 3268
Tel. 033-4440818, Fax 033-4440987, Email phctnive.xongwana@kznhealth.gov.za
www.kznhealth.gov.za

Directorate
Acting Chief Executive Officer

16.10.2017

To: Mr Aganze Mushebenge (STUDENT NO. 217080760)

RE: REQUEST FOR RESEARCH STUDY SUPPORT LETTER

1. Your letter dated 09 October 2017 refers.
2. The request to conduct research at Untunjambili Hospital is noted.
3. Please request for approval from Dr E. Lutge at Head Office Natalia Office 10-120 Epidemiology 033 395 2046/ 033 395 2102.

Wishing you well in your studies.

Kind Regards

Dr A. Subrati
**ACTING MEDICAL MANAGER
UNTUNJAMBILI HOSPITAL**



health
 Department:
 Health
 PROVINCE OF KWAZULU-NATAL

UMPHUMULO HOSPITAL
 R74 Greytown Road
 Private Bag X9219
 MAPHUMULO, 4470
 Tel: 032 481 4198 Fax: 032 481 4166 Email: nomzamo.gumede@kznhealth.gov.za
 www.kznhealth.gov.za

DIRECTORATE:
 MANAGEMENT

04/01/2018

TO: DARRELL AGANZE
 UNIVERSITY OF KWAZULU NATAL

FROM: DR N N GUMEDE
 CEO UMPHUMULO HOSPITAL

RE: PERMISSION TO CONDUCT RESEARCH STUDY

Good morning

Following your request to conduct a study in our facility , kindly note that permission is hereby granted to perform this study in the institution. Kindly notify us timeously when you will be coming for the research. Kindly adhere to all the principles and ethics of conducting research as set out by the University of Kwazulu Natal and the Kwazulu Natal Department of Health.

Always happy to be of assistance

Regards
 Dr N N GUMEDE
 CEO

1

UMNYANGO WEZEMPILLO
 UMPHUMULO HOSPITAL
 DEPARTMENT OF HEALTH
 04 JAN 2018
 PRIVATE BAG X 9219
 MAPHUMULO 4470

APPENDIX 5: INFORMED CONSENT FORMS TO PARTICIPATE IN RESEARCH

UKZN BIOMEDICAL RESEARCH ETHICS COMMITTEE

APPLICATION FOR ETHICS APPROVAL

For research with human participants (Biomedical)

A. INFORMATION SHEET

Date:

Greetings,

My name is GLOIRE-AIME AGANZE MUSHEBENGE (217080760), Master's student in UKZN, aganzedar@gmail.com (060 311 9754), under the supervision of Dr MANIMBULU NLOOTO, nlooto@ukzn.ac.za (076 091 1427), University of KwaZulu-Natal, School of Health Sciences, Discipline of Pharmaceutical Sciences.

You are being invited to consider participating in a Master's research that involves *a triangulation study of the use of traditional medicine and prescribed antischistosomal medicines in communities with a high attempt to schistosomiasis infections: perspectives from traditional healers, patients and healthcare workers*. The aim and purpose of this research are to *evaluate the proportion of the use of traditional medicine and prescribed antischistosomal medicines in communities having a high proportion of Schistosomiasis infection in ILembe District, KwaZulu-Natal and to establish whether the unavailability of prescribed antischistosomal medicines leads to the use of traditional medicine*. The study is expected to enrol 534 participants in total composed by 50 Traditional Healers Practitioners (THPs), 50-384 Patients (theirs), 384 Health care Professionals (HCPs) and 50-384 Patients in different facilities in KwaZulu-Natal. It will involve the following procedures: research-administered face-to-face interviews will be carried out in phase 1 of this study while phase 2 will consist of a medical chart review as a data collection technique method. Data will be collected five to six days a week over the data collection period. The duration of your participation, if you choose to participate and remain in the study, is expected to be (Maximum of 30 minutes). The study is funded by CHS scholarship.

The study may not involve risks and/or discomforts. It will not provide direct benefits to participants but feedback to community members can be given on the management of schistosomiasis. Findings of the research will be written in a final thesis and peer-reviewed publications related to our specific objectives. Anonymity will be maintained and participants will be guaranteed confidentiality. No name, no ID of participants will be disclosed to the third party or displayed on questionnaires and data collection forms.

This study has been ethically reviewed and approved by the UKZN Biomedical Research Ethics Committee (approval number: **Brec ref No: 477/17**).

In the event of any problems or concerns/questions you may contact the researcher at aganzedar@gmail.com (060 311 9754) or the UKZN Biomedical Research Ethics Committee, contact details as follows:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

B. CONSENT FORM

I (Name) have been informed about the study entitled (provide details) by (provide the name of researcher/fieldworker).

I understand the purpose and procedures of the study (add these again if appropriate).

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

I have been informed about any available compensation or medical treatment if an injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at (provide details).

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban 4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Signature of Participant

Date

Signature of Witness

Date

(Where applicable)

Signature of Translator

Date

(Where applicable)

APPENDIX 6: QUESTIONNAIRE

This questionnaire is designed to find out the treatment of schistosomiasis in employing alternative and complementary remedies in the treatment of it. The answers you give to the questions here will in no way influence how you are treated as an individual. The findings of this research will help us to understand the treatment of Schistosomiasis better and therefore help us to improve the care that we render to them. We implore you to give us as honest an answer to each question as possible. You may choose not to respond to any of the questions you are not comfortable with. We guarantee your confidentiality.

Lemibuzo yakhelwe ukuthola ikhambi le-*schistosomiasis* ekusebenziseni nasekuqhakambiseni ukwelashwa kwaso lesisifo. Izimpendulo zakho kulemibuzo angeke zibe nomthelela ekulashweni kwakho. Okutholakele kulolucwaningo kuzosisiza siqonde ukwelashwa okungcono kwe-*Schistosomiasis* futhi kuzosisiza ekuthuthukiseni ukunakekela. Siyanxusa ukuba uphendule umbuzo ngamunye ngokwethembeka. Uvumelekile ukuba ungayiphenduli eminye imibuzo ongakhululekile ngayo. Siyakuqinisekisa ngemfihlo yakho.

PHASE 1.A: INTERVIEWS WITH THPs

A. DEMOGRAPHIC DATA

1. Age: -----

2. Sex: Male-----

Female-----

3. Marital status:

(A) Married (B) Not married (C) Widow (D) Divorced/Separated

4. The highest level of education attained:

(A) None

(B) Primary

(C) Post-primary/Secondary

(D) University/Polytechnic/College of education

5. Profession/Occupation: -----

7. Religion: (A) Traditional religion (B) Catholic (C) Pentecostal

(D) Anglican (E) Moslem (F) others (specify) –

B. RESPONDENT'S PERCEPTION TOWARDS SCHISTOSOMIASIS TREATMENT

Source of traditional healing knowledge:

.....

How long have you been healing people?

.....

How do you diagnose Schistosomiasis?

.....

Ailments treated and used remedies (used plant parts, methods of preparation and administration)

.....

Do you use a combination of plants? [Yes] [No] (Healer) If yes, please mention some of them:

Are these plants easy to find? [Yes] [No] If not, why?

.....

Side effects and assessment of the efficacy of medicine

.....

What season do you receive more patients suffering from schistosomiasis? If any, please explain why?.....

Are Traditional medicine treatments affordable comparing to modern ones?

.....

Do your patients use concurrently traditional and modern medicines for the treatment of Schistosomiasis?

ISIGABA 1.A: UKUXOXISANA NAMA- THPs

A. IDATHA YEMINININGWANE

1. Iminyaka... 2. Ubulili •Ungowesilisa... ungowesifazane...

3. Isimo sakho somshado

(A) Ushadile. (B) Awushadile. (C) Ungumfelokazi (widow)/ ungumfelwa (Widower).

(D) Wahlukanisa

4. Izinga eliphakeme lemfundo owafinyelela kuyo

(A) Alikho (B) Amabanga aphansi (C)Imfundo yesibili (D) Imfundo ephakeme

5. Umsebenzi wakho:.....

6. Inkolo: (A.) Inkolo yendabuko. (B) ungumKatolika. (C) UngumPentekoste.

(D) UmSheshi. (E) Moslemu. (F) enye (cacisa)

B. IMIBONO YOPHENDULAYO MAYELANA NGOKWELASHWA KWE-SCHISTOSOMIASIS

Umthombo wolwazi lapho kuvela khona ulwazi lokwelapha ngokwesintu.

Usunesikhathi eside kangakanani ulapha abantu?

Uthola kanjani ukuthi umuntu uphethwe i-*Schistosomiasis*?

Ukwelashwa kwezifo nemithi esetshenziwe (izingxenye noma izicubu zezitshalo ezisetshenziwe, indlela zokulungisa imithi).

Ingabe usebenzisa ingxube yezitshalo ezihlukene? [yebo] [chabo] Uma uthi yebo, ngicela uzisho lezozitshalo:

Ingabe kulula ukuthola lezozitshalo? [yebo] [chabo] Uma uthi chabo, usho ngani?

Imiphi imiphumela emibi eqhamukayo uma usebenzisa lamakhambi okulapha no kuhlolwa kwawo?---

Iyiphi inkathi othola kuyo iziguli eziningi eziguliswa i-*Schistosomiasis*?

Ingabe imithi yokwelashwa yendabuko ingabizi ngokulinganisa nanamuhla?

Ingabe iziguli zakho zisebenzisa imithi yendabuko nemanje yokwelashwa kweSchistomiasis?

PHASE 1B: INTERVIEWS WITH PATIENTS SEEN BY THPs

A. DEMOGRAPHIC DATA

1. Age: -----

2. Sex: Male-----

Female-----

3. Marital status:

(A) Married (B) Not married (C) Widow (D) Divorced/Separated

4. The highest level of education attained:

(A) Non (B) Primary (C) Post-primary/Secondary

(D) University/Polytechnic/College of education

5. Profession/Occupation: -----

6. Religion: (A) Traditional religion (B) Catholic (C) Pentecostal

(D) Anglican (E) Moslem (F) others (specify) –

B. RESPONDENT'S PERCEPTION TOWARDS SCHISTOSOMIASIS TREATMENT

7. How long have you had this disease? -----

8. How long have you been on treatment for this disease? -----

9. What type of treatment are you currently receiving for this disease? -----

10. How frequently have you been using TM in this Schistosomiasis?

(A) Daily (B) weekly (C) Occasionally (D) Only once

11. What benefits were you hoping to get from the TM you used in this? (You can choose more than one)

(A) It will directly treat/cure your disease

(B) It will relieve the symptoms of the Schistosomiasis

(C) Others (specify)

12. Have you obtained any particular benefit from the TM you used?

(A) Yes (specify) -----

(B) No

13. Did you experience any unwanted effect from the TM you used?

(A) Yes (specify) -----

(B) No

14. How satisfied are you with the performance of the TM you used in this Schistosomiasis?

(A) Very satisfied (B) Satisfied (C) Disappointed

15. Would you use TM against Schistosomiasis or recommend it for someone with Schistosomiasis?

(A) Yes (B) No

ISIGABA 1.B: UKUXOXISANA NESIGULI ESIBONWA I-THPs

A. IDATHA YEMINININGWANE

Iminyaka... 2. Ubulili •Ungowesilisa... ungowesifazane...

3. Isimo sakho somshado

(A) Ushadile. (B) Awushadile. (C) Ungumfelokazi (widow)/ ungumfelwa (Widower). (D) Wahlukanisa

4. Izinga eliphakeme lemfundo owafinyelela kuyo

(A) Alikho (B) Amabanga aphansi (C)Imfundo yesibili (D) Imfundo ephakeme

5. Umsebenzi wakho:

6. Inkolo: (A.) Inkolo yendabuko. (B) ungumKatolika. (C) UngumPentekoste.

(D) UmSheshi. (E) Moslemu. (F) enye (cacisa)

B. IMIBONO YOPHENDULAYO MAYELANA NGOKWELASHWA KWE-SCHISTOSOMIASIS

Sewunesikhathi esingakanani unalesisifo? -----

Sewunesikhathi eside kangakanani usebenzisa lokhwelashwa? -----

Iyiphi indlela yokwelashwa oyitholayo okwamanje? -----

Ubuwasebenzisa kangakanani amakhambi okwelapha i-Schistosomiasis?

(A) ngosuku _ (B) ngesonto_ (C) Kanye

Bewulindlele ukuzuzani kulokhu ukwelashwa? (ungakhetha kube kuningi)

Kuzokwelapha isifo sakho ngqo

Kuzodambisa izimpawu ze-Schistosomiasis

Okunye (awukusho)

Kukhona oke wakuzuza kulokhu ukwelapha?

.....

Uke waba nemiphumela emibi oyithole kulokhu kwelashwa?

.....

Waneliseke kangakanani ngomsebenzi waluluhlobo lokwelashwa olusetshenziwe kwi-Schistosomiasis?

Waneliseke kakhulu B. Wanelisekile C. Awanelisekanga / udumele

15. Ungakusebenzisa yini lokhu ukwelapha okumelene ne- *Schistosomiasis* noma ukuncome kumuntu one- *Schistosomiasis*? A) yebo B) Cha

PHASE 1C: INTERVIEW WITH HEALTH CARE WORKERS

A. DEMOGRAPHIC DATA

1. Age: -----

2. Sex: Male-----

Female-----

3. Marital status:

(A) Married (B) Not married (C) Widow (D) Divorced/Separated

4. The highest level of education attained:

(A) Non (B) Primary (C) Post-primary/Secondary

(D) University/Polytechnic/College of education

5. Profession/Occupation: -----

7. Religion: (A) Traditional religion (B) Catholic (C) Pentecostal

(D) Anglican (E) Moslem (F) others (specify) –

8. Facility name and mailing address of the facility:

9. Classification of the facility: ■ publicly ■ Private ■ NonGovernmental organization (NGO)

10. Setting type: ■ Rural-Urban ■ Semi-urban

B. RESPONDENT'S PERCEPTION TOWARDS SCHISTOSOMIASIS TREATMENT

Is Praziquantel Available in the facility?

.....

Are medicines purchased directly by the facility for distribution to patients? If “Yes”, are medicine purchases subsidized by the government?

.....

What is the total number of visits to the health facility for outpatient services last month?

.....

What is the total number of visits to the health facility for outpatient services yesterday?

.....

How many of the patient visits made yesterday were for:

.....

Where do you refer patients in the event of resistance to the treatment?

.....

Does the facility keep a record of patient visits?

.....

How are records kept?

■ Patient files ■ Registry system ■ Other (specify:

Are patient files retrieved and consulted each time they visit the facility?

■ Yes, patient files usually/always consulted

■ Yes, patient files consulted, but only when necessary

■ No, patient files not consulted

Do your patients use concurrently traditional and modern medicines for the treatment of Schistosomiasis? If yes, what do you think about this use?

.....

ISIGABA 1.C: UKUXOXISANA NABASEBENZI BEZEMPILO

A. IDATHA YEMINININGWANE

Iminyaka... 2. Ubulili •Ungowesilisa... ungowesifazane...

3. Isimo sakho somshado

(A) Ushadile. (B) Awushadile. (C) Ungumfelokazi (widow)/ ungumfelwa (Widower). (D) Wahlukanisa

4. Izinga eliphakeme lemfundo owafinyelela kuyo

(A) Alikho (B) Amabanga aphansi (C)Imfundo yesibili (D) Imfundo ephakeme

5. Umsebenzi wakho:

6. Inkolo: (A.) Inkolo yendabuko. (B) ungumKatolika. (C) UngumPentekoste.

(D) UmSheshi. (E) Moslemu. (F) enye (cacisa)

Igama lesikhungo nekheli laso.

.ukwahlukaniswa kwesikhungo •esomphakathi • esizimele • akusona esikahulumeni

Indawo ekuso. • emakhaya •edolobheni

B. IMIBONO YABAPHENDULAYO MAYELANA NGOKWELASHWA KWE-SCHISTOSOMIASIS

Kungabe i- *Praziquantel* iyatholakala yini kulesisikhungo?

.....

Kungabe imithi ithengwa isikhungo ukuze inikwe iziguli? Uma uthi yebo; kungabe uhulumeni uyayikhipha yini imali yokuxhasa ukuthengwa kwemithi?

.....

Ngenyanga edlule belingakanani inani lokufika kweziguli emakhaya kulesisikhungo sezempilo?

.....

Izolo belingakanani inani lokufika kweziguli emakhaya lapha kulesisikhungo sezempilo?

.....

Bangaki ukuvakashelwa kwesiguli okwenziwe izolo kwaba:

.....

Nizidlulisela kuphi iziguli uma kwenzeka zingelapheki?

.....

Kungabe lesisikhungo siyawagcina amarekhodi okuvakasha kweziguli?

.....

Amarekhodi agcinwa kanjani?

Ifayela yeziguli

Uhlelo lokubhalisa

Okunye (cacisa)

Kungabe lamafayela eziguli ayabuyiswa njalo uma zivakasha kulesisikhungo?

Yebo, amafayela eziguli ahlezi ebhekwa

Yebo, amafayela eziguli ayabuyiswa sikhona isidingo

Chabo, amafayela awabuyiswa

Kungabe iziguli zenu zisebenzisa imithi yendabuko nemithi yesimanje ngesikhathi esisodwa ekulashweni kwe-Schistosomiasis? Uma kunjalo, ucabangani ngalokhu ukusetshenziswa?

.....

PHASE 1D: INTERVIEWS WITH PATIENTS SEEN BY BOTH THPs AND HEALTHCARE WORKERS

A. DEMOGRAPHIC DATA

1. Age: ----- 2. Sex: Male----- Female-----

3. Marital status:

(A) Married (B) Not married (C) Widow (D) Divorced/Separated

4. The highest level of education attained:

(A) Non (B) Primary (C) Post-primary/Secondary

(D) University/Polytechnic/College of education

5. Profession/Occupation: -----

6. Religion: (A) Traditional religion (B) Catholic (C) Pentecostal

(D) Anglican (E) Moslem (F) others (specify) –

B. RESPONDENT'S PERCEPTION TOWARDS SCHISTOSOMIASIS TREATMENT

7. Type of Schistosomiasis? ----- (Please confirm from case note)

8. How long have you had this disease? -----

9. How long have you been on treatment for this disease? -----

10. What types of treatment have you received in the past for this disease?
 (A) Praziquantel (B) Others (specify)
11. What type of treatment are you currently receiving for this disease? -----

12. Have you used anything other than that given to you by a medical doctor /Pharmacist or nurses to treat schistosomiasis?
 (A)Yes (B) No
13. If you have used any Conventional Medicine (CM) in this Schistosomiasis, for how long have you used it? -----
14. How frequently have you been using Conventional Medicine in this Schistosomiasis?
 (A) Daily (B) weekly (C) Occasionally (D) Only once
15. Which of the following sentences explains how you have been using Conventional and M and Traditional medicine (TM)?
 (A). You started TM only when you stopped CM
 (B) You started CM only when you finished TM
 (C) You were using CM during the same period as you were using TM so that both will work to help each other
16. What are your reasons for deciding to use TM (you can choose more than one)
 (A). You were disappointed that conventional treatment is not working
 (B). Conventional treatment is too toxic or too mutilating
 (C). You think TM is more in keeping with your beliefs and your inner self
 (D). you want to take control of your treatment and your faith in your own hands
 (E). Conventional treatment is too mechanistic/technological and lacks the human touch
 (F) You are just trying everything that can help
 (G) Others (specify please)
17. Have you obtained any particular benefit from the TM you used?
 (A) Yes (specify) -----
 (B) No
18. Did you experience any unwanted effect from the CM and TM you used in this Schistosomiasis?
 (A) Yes (specify) -----
 (B) No
19. How satisfied are you with the performance of the CM you used in this Schistosomiasis?
 (A) Very satisfied (B) Satisfied (C) Disappointed

20. Would you use both against Schistosomiasis or recommend it for someone with Schistosomiasis?

(A) Yes (B) No

21. Have you had to abandon CM since you started using TM?

(A) Yes (B) NO

22. Did you mention to the doctor in charge of this your Schistosomiasis management that you have used/are using TM? (A) Yes (B) No

23. If your doctor is not aware that you have used/are using TM, what is it that makes you feel unwilling to discuss it with him/her? -----

24. How do you get your supply of TM?

(A) From friends (B) From relations

(C) From TM practitioner

(D) You buy from the market

(E) From your church

(F) Others (specify) -----

25. How much do you estimate that you have spent on TM in the last one year? -----

ISIGABA 1D. UKUXOXA NEZIGULI EZIBONWA AMA-THPs NABASEBENZI BEZEMPILO.

A. IDATHA YEMINININGWANE

Iminyaka... 2. Ubulili •Ungowesilisa... ungowesifazane...

3. Isimo sakho somshado

(A) Ushadile. (B) Awushadile. (C) Ungumfelokazi (widow)/ungumfelwa (Widower). (D) Wahlukanisa

4. Izinga eliphakeme lemfundo owafinyelela kuyo

(A) Alikho (B) Amabanga aphansi (C)Imfundo yesibili (D) Imfundo ephakeme

5. Umsebenzi wakho:

6. Inkolo: (A.) Inkolo yendabuko. (B) ungumKatolika. (C) UngumPentekoste.

(D) UmSheshi. (E) Moslemu. (F) enye (cacisa)

B. IMIBONO YOPHENDULAYO MAYELANA NGOKWELASHWA KWE-SCHISTOSOMIASIS

7. Uhlobo lweSchistosomiasis? ----- (Sicela uqinisekise kusuka kwesaziso senkantolo)

8. Kuze kube nini usulele lesi sifo?

9. Kuze kube nini uye waba ukwelashwa kwalesi sifo?.....

10. Yiziphi izinhlobo zokwelashwa ozitholile esikhathini esidlule ukuze lokhu kukhishwe?

(A) Praziquantel

(B) Abanye (chaza)

11. Yiluphi uhlobo lwezokwelapha okwamanje oluthola lesi sifo? -----

12. Ingabe usetshenzisile noma yini enye ngaphandle kokunikezwa udokotela wezeMpilo / Uchwepheshe wezeMpilo noma abahlengikazi ukuphatha i-schistosomiasis?

(A) Yebo (B) Cha

13. Uma ususebenzise noma yimaphi ama-Medicinal Conventional (CM) kule Schistosomiasis, usebenzise isikhathi eside kangakanani?
.....

14. Sekuyisikhathi esingakanani usebenzise iMedicalal Medicine kule Schistosomiasis?

(A) Nsuku zonke (B) masonto onke (C) Ngezinye izikhathi (D) Kanye kuphela

15. Yimiphi eminye imisho elandelayo echaza ukuthi usebentise kanjani imithi ejwayelekile kanye neyomuthi wendabuko (TM)?

(A). Uqale i-TM kuphela uma umise i-CM

(B) Uqale i-CM kuphela uma uqedile i-TM

(C) Usebenzisa i-CM ngesikhathi esifanayo njengoba usebenzisa i-TM ukuze bobabili basebenze ukusizana

16. Yiziphi izizathu zakho zokunquma ukusebenzisa i-TM (ungakhetha okungaphezu kweyodwa)

(A). Wadumala ukuthi ukwelashwa okuvamile akusebenzi

(B). Ukwelashwa okuvamile kuyingozi kakhulu noma kudubula kakhulu

(C). Ucabanga ukuthi i-TM ihamba ngokuvumelana nezinkolelo zakho kanye nomuntu ongaphakathi

(D). Ufuna ukulawula ukwelashwa kwakho nokholo lwakho ezandleni zakho

(E). Ukwelashwa okuvamile kuyindlela enkulu yokusebenza / ezobuchwepheshe futhi ayinakho ukuthintwa kwabantu

(F) Uzama nje konke okungasiza

(G) Abanye (chaza ngenhla)

17. Uke wathola yini inzuzo ethile evela TM oyisebenzisayo?

(A) Yebo (chaza) -----

(B) Cha

18. Uke wahlangabezana nanoma iyiphi impendulo engadingeki evela ku-CM no-TM oyisebenzisayo kule Schistosomiasis?

(A) Yebo (chaza) -----

(B) Cha

19. Waneliseke kangakanani ngokusebenza kwe-CM oyisebenzisayo kule Schistosomiasis?

(A) Inelisekile kakhulu (B) Inelisekile (C) Inqatshiwe

20. Ungayisebenzisa kokubili ngokumelene neSchistosomiasis noma uyincoma kumuntu onamaSchistosomiasis?

(A) Yebo (B) Cha

21. Ingabe kufanele ulahle i-CM kusukela uqale ukusebenzisa i-TM?

(A) Yebo (B) Cha

22. Ingabe ukhulume nodokotela ophethe lokhu ukuphathwa kweSchistosomiasis yakho oyisebenzisayo / usebenzisa i-TM? (A) Yebo (B) Cha

23. Uma udokotela wakho engazi ukuthi usetshenzisile / usebenzisa i-TM, yini eyenza uzizwe ungafuni ukuxoxa naye? -----

24. Uthola kanjani uhlelo lwakho lwe-TM?

(A) Kusuka kubangani

(B) Kusuka ebuhlotsheni

(C) kusuka kumsebenzi we-TM

(D) Uthenga emakethe

(E) Kusuka esontweni lakho

(F) Abanye (chaza) -----

25. Ulinganisela kangakanani ukuthi uchithe ku-TM ngonyaka owodwa wokugcina? -----

APPENDIX 7: MEDICAL CHART REVIEW BASED ON TM/CM MEDICATION THERAPY IN THE MANAGEMENT OF SCHISTOSOMIASIS

A. DEMOGRAPHIC DATA

Age:

Ethnicity:

Sex:

Marital status:

Brief medical history (when relevant):

SCHISTOSOMIASIS TREATMENT

Therapeutic claims and the corresponding level of evidence (Reliability)

Yes No

Quality medication therapies

(A) Very satisfied (B) Satisfied (C) Disappointed

Precautions: risks associated with the use of TM/CM medication therapies

Yes No

All other medicines used (including self-medication) with administration details.

.....

Adverse events and their causality. Date of onset (or duration from first administration to the onset of the event), description with symptoms and signs, severity and seriousness, results of clinical investigations and tests, course and outcome; and, if appropriate, consider challenge/rechallenge with the same product.

.....

Potent and/or toxic TM/CM medication therapies

.....

Interactions and contraindications (The combination of several TM/CM medication therapies and/or the concurrent use of conventional drugs may magnify or oppose the effect of the treatments)

.....

Posology of TM/CM medication therapies

.....

Methods of administration of TM/CM medication therapies

.....

Self-medication of TM/CM medication therapies Yes No

Therapeutic claims of the use of concurrent use of conventional drugs TM/CM medication therapies

.....

UHLO LOKUHLOLA EKULASHWENI KWE-SCHISTOSOMIASIS

A. IDATHA YEMINININGWANE

Iminyaka: uhlanga:

Ubulili: isimo sakho somshado:

Umlando wokwelashwa (uma kuhambelana):

B. NGOKWELASHWA KWE-SCHISTOSOMIASIS.

Izimangalo zokwelapha kanye nezinga elihambiselana nobufakazi

Yebo

Chabo

Izinga lemithi yokwelapha

A) Nganelisekile kakhulu. (B)Nganelisekile (C) Anganelisekanga

Izinyathelo zokuphepha: izingozi ezihambisana nokusetshenziswa kwemithi yokwelapha.

Yebo

Cha

Yonke eminye imithi esetshenzisiwe (nokuzelapha) neminingwane ekuphathweni kwayo

.....

Izigameko ezingezinhle ezavela. Usuku kuqala, incazelo kanye nezimpawu, ubukhulu kanye nobunzima, imiphumela yophenyo lwasemtholampilo kanye nokuhlolwa, indlela nomphumela, futhi, uma kufaneleka, cabanga ngeRechallenge ne Dechallenge ngomkhiqizo ofanayo.

.....

Imithi yokwelapha enamandla noma inobuthi

.....

Ukuxhumana (ingxube yemithi yokwelapha eminingi noma ukusebenzisa kanyekanye lemishanguzo kungenzeka kukhulise noma kuphikise imiphumela yokwelapha.)

.....

Iposology yokwelapha

.....

Izindlela zokuphatha imithi yokwelapha

.....

Imithi yokuzelapha

Yebo

Cha

Izimangalo ekusebenziseni kanyekanye imithi evamile yokwelapha

.....

APPENDIX 8: CERTIFICATE OF ETHICS TRAINING



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APPENDIX 9: CONFERENCE PRESENTATION



(CIC-PEPMT)/ <http://JIC-PEPTM2018.org/>

30 November – 02 December, 2018

VENUE: Dakar, Senegal

Conference Theme

"Natural product-based drug discovery and development: Basic research and clinical applications of recent research findings for sustainable development with special emphasis on Africa"

Thème de la Conférence

"Découverte et développement des médicaments à base de produits naturels : Recherche fondamentale et applications cliniques des résultats récents de la recherche pour un développement durable"

CONFERENCE INTEGRATED IN THE 1st Centenary of FMPOS of the UCAD

	<p>Combination against Plasmodium berghei Infection *Orabueze, Celestina I, Adesegun, Sunday A; Oluwasina, Oluwabusayo B., Ota, Duncan A and Coker, Herbert A. Anti-malarial, anti-trypanosomal, anti-sickling and anti-bacterial activities of an aqueous crude extract from Manniophyton fulvum Müll. Arg EP Bonebe, NK Nseka and *GL Mvumbi Use of Traditional Alternative Medicine in chronic kidney disease patients in Senegal: a cross-sectional study Seck SM, Dahaba M, Gueye-Dia D, Faye G</p>	<p>Traditional Medicine and Primary Health Care in Africa Merlin Willcox Triterpénoïdes isolés des feuilles de Combretum Glutinosum Perr. Ex DC (Combretaceae): étude d'activité antipaludique et antiinflammatoire A Gassama, D. N'Diaye, A Thiame, G.Y. Sy, S Cojean,, C Cavé</p>
3:30pm	<p>Management of diabetes and hypertension among Zulu Traditional Health Practitioners: A study of focus group interviews. Ebenezer Frimpong and Manimbulu Nlooto Hepatoprotective effects of Moringa oleifera leaf extracts in streptozotocin-induced diabetes. Muzumbukilwa W.T., Nlooto M., Owira P.M.O.</p>	<p>Etude phytochimique et évaluation de l'activité antihyperglycémiant de Psathyrella tuberculata (Psathyrellaceae) NBY Fofie, KJA Maiga, AE Odoh, FNMP Doumbia, R Sanogo et D Koné-Bamba Knowledge, perceptions and experiences of traditional health practitioners about the management of female urogenital schistosomiasis: the case of I Lembe District, KwaZulu-Natal, South Africa, a qualitative study Aganze Gloire-Aimé Mushebenge, Manimbulu Nlooto</p>
4:00	<p>PATHWAY C <u>Harnessing indigenous plants for drug discovery and health</u> Sch. Botanical characterization and quality control of a medicinal plant cultivated in Mali: Vernonia kotschyana Beep. ex Walp. Diarra Mamadou Lamine Harnessing indigenous plants for drug discovery and health Samuel Adjei Isolement, Identification et tests antibactériens des métabolites secondaires des plantes médicinales : Morinda geminata DC (Rubiaceae) et Icacina oliviformis (Poiret) Raynal (Icacinaceae) Oumar sambou, Abdoulaye Gassama, Moussa Karé, Dame Gambe, Michael Rivard, Thierry Martens and Isabelle Lachaise Phytochemical composition and antioxidant activity of ethanol leaf and trunk bark extracts of Cordyla pinnata (Lepr. Ex A. Rich.) Milne-Redh. (Caesalpinaceae)</p>	<p>PATHWAY D <u>Natural products in health and disease</u> Anti-inflammatory and cicatrization effects of aqueous extract of stem barks of combretum glutinosum perr. ex dc (combretaceae) *Madièye Sene, Firmin S. Barboza1, Yacine Ndione, Abdou Sarr, Guata Yoro Sy Galactogenic propriety of tiger nut Cyperus esculentus Bou Ndiaye*, Nicolas Cyrille Ayessou, Samba balde, Marame Niang, Raquelle White, Mady Cisse, Codou Mar Diop and Mama Sakho CYP1A2, CYP2D6 and GSTM1 Induction by a Benign Prostatic Hyperplasia (BPH) xenobiotic, Croton membranaceus in Rat Models Ongong'A Royronald Ochieng'a, George A. Asarea*, Harry R. Asmaha, Habibur Rahmanb Caractérisation et contrôle de qualité botaniques d'une plante Médicinale mise en culture au Mali : Vernonia kotschyana Sch. Bip. ex Walp</p>