

Impact of Targeted Treatment on the Prevalence and Intensity of Schistosomiasis in Primary School Children in Africa: A Scoping Review

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Protocol

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Abstract

Background

Schistosomiasis one of the major neglected tropical diseases that cause considerable public health problems in more than 78 tropical and subtropical countries. The disease is most prevalent among children who carry a disproportionately high worm load. Various interventions such as, Mass Drug Administration, snail control, safe water provision and health education on schistosomiasis have been implemented independently or jointly in an effort to control, reduce and ultimately eliminate this parasitic disease. The proposed review will quantify and evaluate the impact of these targeted interventions on the prevalence and intensity of schistosomiasis infection in African primary schools.

Methodology

The Arksey and O'Malley framework for scoping reviews will be used to conduct the study. We will systematically search for eligible literature from peer-reviewed articles and grey literature. Databases such as Google Scholar, Medline, PubMed and EBSCO host will be searched. In addition, websites like the World Health Organization and government websites will also be searched for articles on the impact of targeted treatment on the prevalence and intensity of schistosomiasis in African primary schools. The scoping review will be conducted on studies that were published from 2000 to 2020. The Population Intervention, Comparison and Outcome (PICO) framework will be implemented to evaluate the eligibility of the research question. The results of the search will be reported utilizing the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) flow diagram. Furthermore, quality assessment for the selected primary studies will be conducted using the Mixed Methods Appraisal Tool (MMAT) Version 2018.

Discussion

We expect to gather research articles on various interventions and treatment modalities that have been implemented to reduce the prevalence and intensity of schistosomiasis infection in African primary schools. This will allow us to quantify and evaluate the overall impact of the targeted treatment to reduce morbidity due to schistosomiasis. Findings from this scoping review will be disseminated in print and electronic to policy makers, researchers and academics through publication in accredited journals and at conferences or congresses.

Background

Schistosomiasis is one of the neglected tropical diseases that causes considerable public health problems in 78 tropical and subtropical countries (1). It is caused by five species of the genus schistosoma; namely *S. haematobium*, *S. mansoni*, *S. japonicum*, *S. mekongi* and *S. intercalatum* (2). Globally, approximately 700 million people are at risk of being infected with schistosoma (3) and more than 240 million people are estimated to be infected with schistosomiasis (4). More than 90% of the schistosoma cases are in Sub-Saharan Africa where the mortality rate is estimated to be 200 000 deaths per annum. However, these deaths from schistosoma are preventable by availing simple and ease to administer medications such as the praziquantel. Praziquantel is one of the main pillars of the global strategy to control schistosomiasis (5).

In 2001, World Health Assembly (WHA) resolution 54.4 formally recognized the global burden of schistosomiasis infection and emphasized the reduction of schistosomiasis-associated morbidity and mortality through treatment of schoolchildren. World Health Organization recommended the mass drug administration with praziquantel to reduce morbidity in endemic areas (6). The program for mass drug administration constitutes of a combination of praziquantel for treating schistosomiasis and albendazole for treatment of soil-transmitted helminth (STH). According to WHO, in areas of high schistosomiasis endemicity (prevalence \geq 50%), all school-aged children and adult people at risk of contracting the infection should be treated annually (6). In areas of moderate endemicity (prevalence 10 – 50%), treatment should be given to school children once in two years (3). In areas of low endemicity (prevalence \leq 10%), treatment is done at least twice during the period of primary education; first at school entry and second when they are in their final year of primary education (7).

The impact and success of this form of targeted treatment or mass drug administration is evaluated through measuring the change in prevalence and intensity of the infection and also the treatment coverage. WHO guidelines also take into consideration the prevalence of heavy intensity after the treatment to evaluate the effectiveness of the intervention (8). The aim of this scoping review is to evaluate the impact of targeted treatment on the prevalence and intensity of schistosomiasis (*S. haematobium* and *S. mansoni*) infection in primary school aged children in Africa. In this study we will identify, select, appraise and synthesize results from articles that published primary research studies showing the impact of mass drug administration programs done in school-aged children in Africa from 2000 to 2019. The information from the review paper will be used to harness the understanding of how and to what extent targeted treatment affect the prevalence and intensity of schistosomiasis in school-aged children. This is part of fulfilling the WHO millennium goals of eliminating schistosomiasis and interrupting its transmission by 2025 (7).

Methods

Scoping review

This protocol is registered with the open science framework database. Open science framework was also searched to determine if there is no registered similar protocol. No similar study to the one we propose is currently registered. In this proposed scoping review, we will use resources that enhance methodological transparency and allow the reproducibility of the results and synthesis. To achieve this, the study protocol will be produced according to the framework on scoping reviews by Arksey and O'Malley (9). The following stages for scoping reviews are listed in this framework;

1. Identifying the research question.
2. Identifying relevant studies
3. Study selection
4. Charting the data
5. Collating, summary and reporting the results.

To further improve the study, there will be quality appraisal of all the individual studies selected into the scoping review as recommended by Levac et al(10).

Identifying the research question.

What is the impact of targeted treatment on the prevalence and intensity of schistosomiasis infection in primary school children (5 -15 years) in Africa?

Eligibility of the research question.

The Population, Intervention, Comparison, Outcome framework (PICO) will be employed to determine the eligibility of the research question as illustrated in table 1.(11)

Table 1
Pico framework.

Population	Primary school children
Intervention	Targeted treatment / Mass Drug Administration
Comparison	Before and after treatment
Outcome	Prevalence and Intensity

Identification of relevant studies

This study will utilize evidence published by primary research studies and grey literature. Both qualitative and quantitative studies will be reviewed. Articles will be retrieved from the following databases, Google Scholar, PubMed/Medline, EBSCO host and websites such as WHO and governmental websites. In order to get a clear reflection of the impact of the targeted treatment of schistosomiasis. Literature search from the past 20 years will be conducted from 2000 to 2020. All study designs will be included. Furthermore citations in retrieved articles will be screened and relevant articles found through the citations will be included in the study. The search will be restricted to articles published in English. Two researchers (Nathan Chanhanga - NC and PisiraiNdarukwa - PN) will conduct the search independently. The bibliography software Zotero will be used to store, organize and manage all references and ensure a systematic and comprehensive search. Initially, the search key words will include, schistosomiasis, prevalence, intensity, targeted treatment, mass drug administration, primary school children, Africa. Boolean terms "AND" and "OR" will be used in advanced search to restrict search to the area of interest. In addition Medical Subject Headings (MeSH) and free texts will be used to guide and indexing article records. We have already done a pretest of the search strategy in PubMed, for articles from January 2000 to February 2020, to determine if the search strategy is appropriate and presented the results in Table 2.

Table 2
Pilot data base keyword search.

Keyword search	Date of search	Search engine used	Number of articles retrieved
"Schistosomiasis OR Bilharzia" AND "Targeted treatment OR Mass Drug Administration" AND Prevalence OR Burden OR Intensity AND "Primary schools AND Africa"	10/05/20	PubMed	1800

Study selection

The eligibility criteria was designed to limit the study to focus on articles that address the research question; What is the impact of targeted treatment on the prevalence and intensity of schistosomiasis infection in primary school children in Africa. The articles do not necessarily have to address a national project – it can be at project level. The PICO strategy guided this process.

Table 3
Inclusion and exclusion criteria

PICOS Strategy	Inclusion criteria	Exclusion criteria
P- Population	Primary school children aged 5 to 15 years in Africa in from 2000 to 2020	Children below 5 years or adults and out of Africa
I-Intervention	Mass drug administration , Health education on schistosomiasis infection	No intervention employed to fight schistosomiasis infection
C- Comparison	With baseline prevalence and intensity for schistosomiasis infection	Studies without baseline results for prevalence and intensity of schistosomiasis
O- Output	Impact on the prevalence and Intensity of schistosomiasis	No results on the impact on prevalence or intensity
Other factors	In English language	Not in English language

Eligible articles from the title search will be exported to Zotero Version 7 library specifically created for this study. Further to that, a comprehensive screening of article titles from the data bases listed above will be conducted by two researchers. In addition all studies meeting the inclusion criteria will be checked for duplication and all duplicates will be removed. This is done before abstract screening is conducted. Thereafter full article will be screened. Moreover, the screening of abstracts and the full articles will be done by two independent reviewers guided by the eligibility criteria. Database searching and article retrieval will be done with assistance of the University of KwaZulu-Natal Librarian. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) flow diagram (Figure 1) will be utilized to illustrate the screening of the search.(12)

Charting Data

Aa Data Charting table will be used to guide the extraction of relevant information from each article included in the study. The data charting form will be continuously updated with the latest information. This tool will have the following four main domains;

1. Identification of study.

- Title, Author and date, Journal full reference,
- Research questions or aims, study population, study design, sample size, geographic settings, intervention and duration.
- Impact on prevalence or intensity of schistosomiasis infection, treatment/intervention coverage.

Two independent researchers will summarize data from selected articles using the Microsoft Excel spread sheets. The two spread sheets will be merged into one report and if there are disagreement a third independent researcher will be involved for resolve.

Collating, summarizing and reporting results.

Content analysis and coding of extracted data will be done by two researchers. The nature, extent and distribution of the selected studies will be reviewed. Furthermore, to understand the context and the impact of targeted treatment or mass drug administration on the prevalence and intensity of schistosomiasis infection, a template with tables and charts will be developed. Furthermore, a template with a table summarizing basic characteristics of all the selected studies will be designed and reviewers (NC and NP) will make comments and notes on the following headlines, population, intervention, sample size, impact on prevalence and intensity of schistosomiasis, intervention coverage. This meticulous and consistent approach will allow us to make comparisons across all the interventions, identify contradictory evidence regarding specific interventions and identify research gaps. It will also allow us to quantify the effect of targeted treatment or MDA on the prevalence or intensity of schistosomiasis.

Quality appraisal

For quality assessment of chosen articles, a Mixed Method Appraisal Tool will be adopted and piloted by two independent researchers (NC and NP). We propose to use the MMAT because it clarifies the important aspects of this study(13) It will be used on all the selected articles since they are all primary research studies. We will appraise descriptive statistics, randomized control studies and cross-sectional studies.

MMAT will also be used to scrutinize the relevance of the aim of selected articles, adequacy and methodology, study design, data collection, data analysis, presentation of findings, discussion and conclusions. In addition, grey literature will be appraised with the guide of the Authority, Accuracy, Coverage, Objectivity, Date, Significates (AACODS) check list form.(14)

The risk of bias for each outcome across individual studies will be summarized as a descriptive statement supported by a risk bias table. A review-level narrative summary of risk of bias will be provided. For each study retained, the overall quality of score will be calculated using the above tools. Since there are

a few criteria in each domain the score can be represented as percentages. For qualitative and qualitative studies, the score will be the number of criteria met divided by 4 and multiplied by 100% hence (scores vary from 25% =1 criteria met to 100% = all criteria met). For mixed methods the proposition is that the overall score of the combination cannot be higher than the score of the weakest component, hence the weakest component score is the overall score.(13)

Participants and the public.

This is will be a systematic scoping review and hence its design does not include direct contact or recruitment of study participants.

Discussion

Most primary interventional studies aim at reducing the burden of schistosomiasis infection are done in primary school children, with school based mass drug administration being the main mode of action.(6)This is consistent with the WHO guidelines on interventions in high endemic areas. Most schistosomiasis interventional studies have been conducted in endemic areas with fewer being done in areas of low endemicity(15).In line with the WHO's goals of eliminating NTD by 2025, the proposed study will focus on all the published primary research studies on the impact of targeted treatment on the prevalence and intensity of schistosomiasis in primary school children in Africa. (6)

The study will include published articles from 2000 to 2020 because that is the period when most mass drug administration programs were enrolled(6).The proposed study will inform public health policy makers on the benefits of the intervention, gaps in the methods that have been used and suggest other possibilities that can contribute towards elimination of schistosomiasis.

Abbreviations

PICO= Population, Intervention, Comparison, Outcome. MMAT=Mixed Methods Appraisal Tool, MDA=Mass Drug Administration, AACODS= Authority, Accuracy, Coverage, Objectivity, Dates, Significance. PRISMA= Preferred Items for Systematic Reviews and Meta-Analysis.

Declarations

Dissemination.

The findings of the proposed systematic scoping review will be disseminated through open access journalstargeting for students, researchers and academics. We will also use various media such as conferences, symposia, seminars or congresses.

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Disclaimer

Opinions expressed in this paper are from the authors and do not reflect the views of the respective institution.

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Author's contributions.

NC, PN and MJC conceived the review ideas. NC with assistance of PN designed the search strategy and revisions were done by MJC. NC designed the protocol, wrote the first draft of the manuscript and all the authors (NC, PN and MJC) reviewed the changes. All the authors read and approved the manuscript for submission to the journal.

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Figures

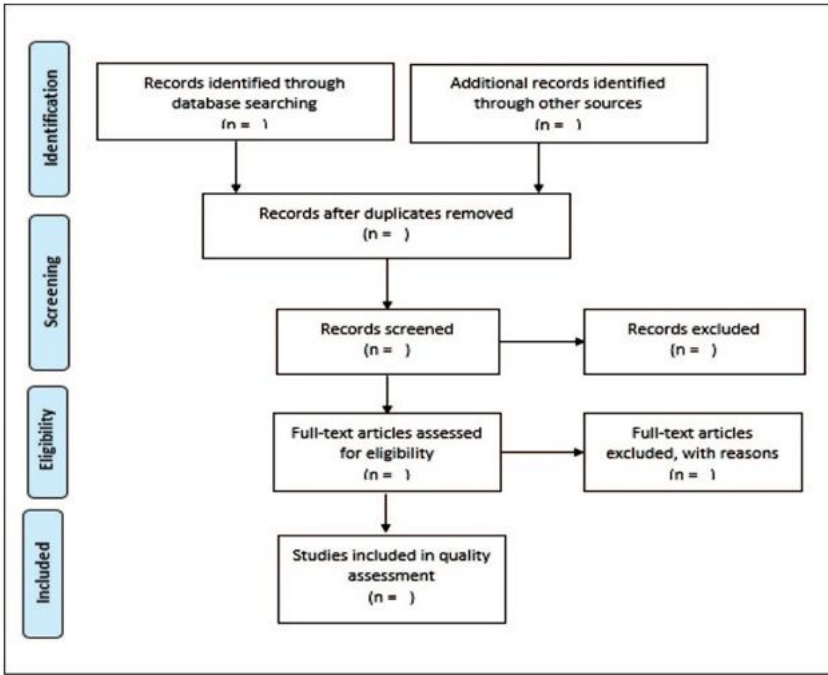


Figure 1

Prisma diagram flow diagram