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Assessment of the burden of soil-transmitted helminthiasis after five years of mass drug administration for Onchocerciasis and Lymphatic filariasis in Kebbi State, Nigeria

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ABSTRACT

There is a hypothesis that Mass drug administration (MDA) of ivermectin and albendazole for the treatment of onchocerciasis and lymphatic filariasis could have an impact on the burden of soil-transmitted helminthiasis (STH) in MDA communities. We, therefore, assessed the burden of STH (*Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm) infections in nine communities from 3 LGAs (two MDA local government areas (LGAs) and one control LGA) in Kebbi State, Nigeria after 5-years (2010–2015) of MDA for onchocerciasis and/or lymphatic filariasis. We also administered questionnaire to obtain demographic information and history of MDA in the past five years. The three LGAs are Bagudo (Ivermectin MDA); Zuru (Ivermectin/Albendazole MDA) and Dandi (No MDA). The study was a cross sectional survey. The total number of people that complied with provision of stool samples and questionnaire were 1357 persons; stool samples collected were examined for STH infections in the three LGAs. Zuru LGA had the highest prevalence of STH (41.89, 95% CI: 37.08–46.81) followed by Dandi LGA (24.66, 95% CI: 20.69–28.97) and Bagudo LGA (3.36, 95% CI: 1.97–5.32). Prevalence of STH infection was not significantly different among age group and sex. Geometric mean intensity per gram of infection for both *A. lumbricoides* and Hookworm were highest in Zuru LGA with (1.16 GMI, 95% CI: 0.97–1.36) and (1.49 GMI, 95% CI: 1.29–1.70) respectively. Treatment coverage was less than 65% from 2010 to 2013 in the intervention LGAs. The study shows that STH is still a public health problem in Zuru LGA (IVM + ALB) and requires MDA of albendazole for STH control to continue, while Dandi LGA (No MDA history) requires MDA with albendazole to scale up treatment for STH control.

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1. Introduction

The soil transmitted helminthiasis (STH), caused by *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms (*Necator americanus*, and *Ancyclostoma duodenale*), are endemic in Nigeria (Hotez and Kamath, 2009; Hotez et al., 2012; Oluwole et al., 2015). These infections are common where there are poor hygiene practices, including limited environmental sanitation, unsafe water sources, inadequate toilet facilities, and poor faecal disposal methods, coupled with poverty and low household income (Ekpo et al., 2008; Strunz et al., 2014). The recent global commitment to control or eliminate NTDs by 2020 (Bergquist et al., 2015) has necessitated the mobilization of resources and funding for NTDs such as the Preventive Chemotherapy and Transmission control (PCT) NTDs in all endemic countries including Nigeria (Seddoh et al., 2013; Lenk et al., 2016). In Nigeria, these include Onchocerciasis, Lymphatic Filariasis (LF), Schistosomiasis, STH, and Trachoma (FMOH, 2012). Implementation of Mass drug administration for the control of onchocerciasis and lymphatic filariasis (LF) has been on going in the country since 2000. However, nationwide implementation of control activities for STH has been limited. MDA for soil transmitted helminths has not commenced in all endemic communities in Nigeria. In a bit to scale up MDA for soil transmitted helminths in all endemic countries, a programmatic question was asked; "is there a need to establish MDA for STH in communities where MDA for onchocerciasis or Lymphatic filariasis(LF) is currently ongoing?" This question was since ivermectin, a drug given for the control of onchocerciasis has been shown to be effective against STH parasites (Moncayo et al., 2008) and albendazole which is provided in combination with ivermectin for the control of LF is a World Health Organization recommended drug for the control of STH(WHO, 2016). Therefore, expectation is that communities, where MDA for onchocerciasis or LF is ongoing, should enjoy a reduction in morbidity effect resulting from STH burden (Tchuem Tchuenté, 2011). The impact of several years MDA of ivermectin and albendazole for the control of LF on the dynamics and decrease of STH infections has been reported in several countries (De Rochars et al., 2004; Ndyomugyenyi et al., 2008; Montresor et al., 2008; Stothard et al., 2009) and in Eastern Nigeria (Gutman et al., 2010). However, conducting assessments in the likelihood of scaling up STH control is not available in Nigeria. To this end, we have conducted a preliminary assessment of the burden of STH in three purposefully selected LGAs in Kebbi state, Northern Nigeria where MDA for onchocerciasis or LF has been ongoing for at least 5 consecutive years in two of the LGAs and while MDA for STH is about to commence in the third LGA.

2. Methodology

2.1. Study area

Kebbi State is in North-Western Nigeria (Fig. 1). It is endemic for both onchocerciasis and LF with a prevalence range of 1–30% and 2–58% respectively (FMoH, 2012). There are twenty-two LGAs in the State; nine of them are endemic for both onchocerciasis and LF, while eleven are endemic for LF only. Mass Drug Administration (MDA) of Ivermectin for the control of onchocerciasis in Kebbi State started in 1997. In 2010, Ivermectin and Albendazole were administered for the treatment of LF in 7 LGAs where it co-exists with onchocerciasis. Therefore, MDA for both diseases has been ongoing for 5 years where the two diseases co-exist in Kebbi (Fig. 1). Treatment data shows that many communities had received up to ten rounds of treatment with Ivermectin only and up to five rounds of treatment with Ivermectin + Albendazole. Bagudo, Dandi, and Zuru LGAs where selected for the study.

2.2. Study design and population

The study was a retrospective randomized controlled trial coupled with a cross-sectional survey. The LGAs in Kebbi state were grouped into three based on their history and type of MDA. One LGA was randomly selected from each MDA group. We randomly selected three communities from each LGA as shown below in Table 1.

All community members with residency of 2 years and above who are willing to participate and able to provide a stool sample were included in the study. Children less than two years' old, sick individuals, pregnant, nursing mothers within seven days of delivery and individuals whose residency in the communities were less than two years were excluded from the study.

2.3. Sampling size determination

The sample size was calculated using estimated LGA population of 5000, with an expected prevalence of STH to be 20% (FMOH, 2015), the desired precision of ±5% and a design effect for 1 for random sampling. Thus, a sample size of 370 persons was computed and adjusted to 400. The sample size was determined using the method of Yamane (1967) as follows

$n = N/1 + Ne^2$

N: total population

n: require a sample size

e: the error at 95% CI

However, to cater for non-compliance, we set our sample size at 500 samples per LGA.