

## The Ethiopian SORT IT Course 2022

# Ivermectin mass drug administration for onchocerciasis elimination: can it reduce the prevalence of scabies in Ethiopia?

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### Abstract

**Introduction:** While ivermectin mass drug administration (MDA) has been implemented since long for onchocerciasis elimination, there is doubt whether this would also be effective for scabies control. If effective, this would allow integration of both programs. We compared scabies prevalence in districts implementing ivermectin MDA for the onchocerciasis elimination program and those not implementing the intervention in Amhara region, Ethiopia.

**Methodology:** We conducted a cross-sectional study comparing the scabies prevalence in 14 districts implementing ivermectin MDA for onchocerciasis elimination program between 2013-2018 and in 28 districts without this intervention in Amhara region Ethiopia. We used 2018 scabies survey data to determine scabies prevalence. All individuals screened for scabies during the survey were included. We collected data on risk factors from the districts database and annual reports. Multivariate linear regression analysis was used to account for potential confounding factors.

**Results:** We included data on 4,319,064 subjects across 42 districts. Except the differences in temperature and population density, districts in both groups were comparable. A total of 371,780 scabies cases were detected in the 2018 survey. The median scabies prevalence was 6% (IQR 2.6-11.9) in the intervention districts and 5.2% (1.8-10.4) in the control districts ( $p$ -value 0.77). In adjusted analysis, the difference remained statistically non-significant (coefficient 0.37 (95% confidence interval (-0.93-1.67);  $p$ -value 0.554).

**Conclusions:** The implementation of ivermectin MDA for onchocerciasis control was not associated with reduced scabies prevalence. Consequently, standard scabies MDA should be deployed for scabies control.

**Key words:** scabies elimination; integrated MDA; SORT IT; operational research; Amhara Public Health Institution.

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### Introduction

Scabies is a skin disease caused by infestation of *Sarcoptes scabiei* [1,2]. Globally the point prevalence and annual incidence of scabies is about 455 million and 147 million cases respectively [1,2]. The disease causes severe itching, social stigmatization and can lead to secondary bacterial infection with complications such as septicemia, glomerulonephritis and chronic rheumatic heart disease [2,3].

In Ethiopia, a scabies outbreak was detected in 2015, with 1.2 million cases reported in 2016 [4]. In response to this outbreak, a surveillance and control guideline was developed and ivermectin based Mass

Drug Administration (MDA) was launched [5] An impact assessment survey of the 2016 intervention showed a decrease in scabies prevalence from 33.5% to 2% [4,6]. However, a resurgence of the outbreak was reported in 2018 [6].

For the effective control of scabies experts have expressed the need for regular ivermectin-based MDA plus program integration with other NTDs [1]. For scabies, integration with lymphatic filariasis/onchocerciasis programs is most straightforward, as the intervention for both relies on ivermectin. However, in the lymphatic filariasis/onchocerciasis programs, children < 5 years

old do not receive ivermectin, while this is recommended in the scabies MDA program in Ethiopia [5,7]. Another important gap in the integration of scabies with lymphatic filariasis/onchocerciasis is whether a single dose of ivermectin is sufficient to treat scabies. Studies on the effect of lymphatic filariasis and onchocerciasis elimination programs on scabies control are conflicting. While a study from Zanzibar found a decline in scabies prevalence in areas implementing ivermectin administration for lymphatic filariasis control, this was not found in a study from Tanzania [8,9]. Additional studies from a range of countries would help to define the effectiveness of single dose ivermectin for scabies control.

In the Amhara region in Ethiopia, a scabies survey was conducted six months after onchocerciasis MDA was implemented in April 2018. This provided a unique opportunity to evaluate the effectiveness of regular ivermectin administration in onchocerciasis-endemic areas for the control of scabies. In this study, we compared the scabies prevalence between districts implementing regular ivermectin MDA for

onchocerciasis elimination and districts without this intervention.

## Methodology

### Setting

Ethiopia is a country in the horn of Africa with a population of 117 million [10]. The country is a federal state with ten regional and two special administrations. The Amhara regional administration is located in the northwest of the country and it is the second most populous region (22.8 million inhabitants) [10]. In the region there are 13 administrative zones, which contain 161 districts.

### Study population

We included all individuals screened for scabies during the pre-scabies MDA campaign in 2018 from 14 districts implementing ivermectin-MDA for the onchocerciasis elimination program and 28 districts not implementing ivermectin-MDA (Figure 1). Scabies screening was implemented for all people in both the onchocerciasis intervention and non-intervention districts.

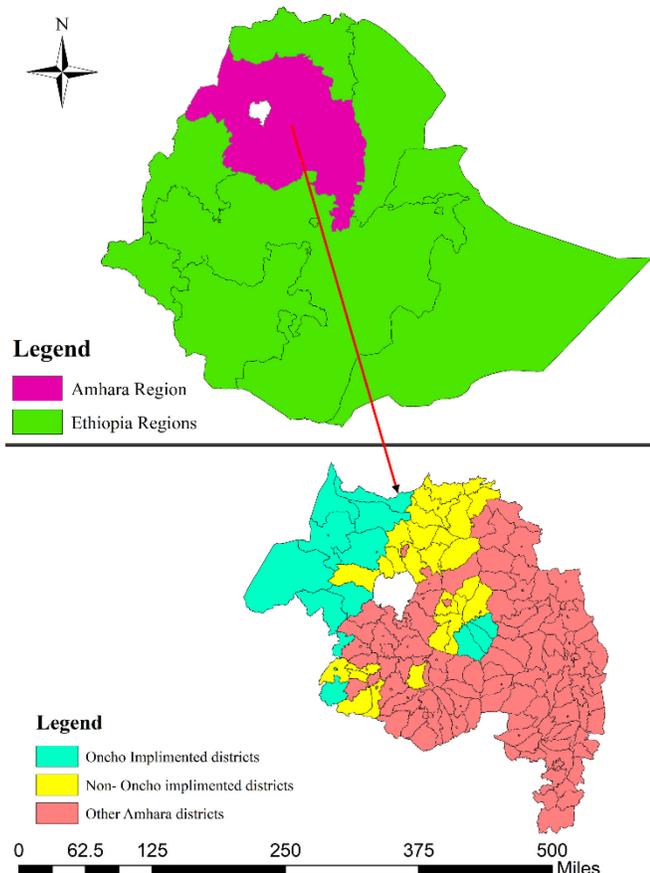
### Study design and period

A comparative cross-sectional study comparing the prevalence of scabies in 2018 in districts implementing ivermectin MDA for the onchocerciasis elimination program and those not implementing this intervention was conducted (Figure 2).

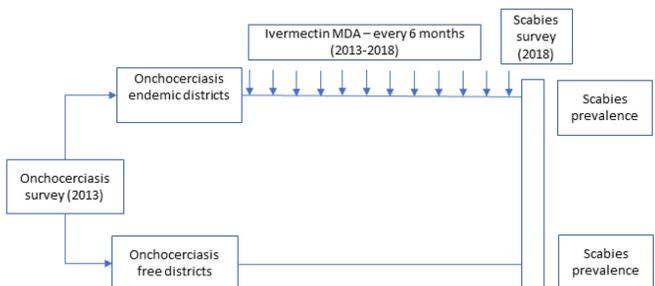
### Operational definition

Scabies case: a person who has itching with typical lesions on hands, inter-digital, and/or genitalia and/or

**Figure 1.** Map depicting an overview of the districts with or without ivermectin MDA in the Amhara region between 2013 and 2018.



**Figure 2.** Overview of the study design on ivermectin MDA for onchocerciasis elimination on scabies prevalence in the Amhara region, Ethiopia between 2013 and 2018.



In onchocerciasis-endemic districts, ivermectin based mass drug administration (MDA) was done every six months between 2013 and 2018. No such intervention was done in the onchocerciasis-free districts. In 2018, a scabies survey was done in all districts, allowing the comparison of scabies prevalence in the intervention and control districts.

itching and close contact with an individual who has itching or typical lesions in a typical distribution [5].

**Intervention district:** districts implementing ivermectin based MDA twice per year to control onchocerciasis before the scabies survey was conducted.

**Control district:** districts that are not onchocerciasis endemic area and that did not implement ivermectin based MDA before the scabies survey was conducted.

**The onchocerciasis elimination program:** In onchocerciasis endemic districts, all individuals above 5 years old (excluding pregnant women and lactating mothers) received a single dose of ivermectin two times per year. In all districts, the MDA campaign has been ongoing since 2013 without interruption.

**Scabies survey:** This survey was conducted in 2018. It was organized by the regional public health emergency management team and conducted by trained health extension workers (HEWs). After training by dermatologist, HEWs diagnosed scabies clinically using the regional scabies surveillance and control

guideline [5]. Parasitological examination was not done. All community-members were examined.

#### Data collection

Orientation was given for all HEWs on data collection and supervised by district and zone staffs. The HEWs screened scabies and collected data on households using a standard data collection format. Data were compiled at district level, entered into a data base, and subsequently transferred to the zone and to the region. From the regional database, we extracted data aggregated at the district level on the overall population and the prevalence of scabies, stratified by age-group (< 5 years; 5-14 years; ≥ 15 years) and sex.

Risk factor data was sourced from the district database and annual reports of 2018. MDA coverage data prior to the survey were extracted from the onchocerciasis MDA campaign monitoring database. We collected data (extracted from the database) between April 2020 and July 2020.

**Table 1.** Comparison of key characteristics between districts with and without ivermectin based MDA for onchocerciasis elimination, Amhara region, Ethiopia, 2008.

Variable (district level)	Ivermectin MDA (Implemented districts)	No ivermectin MDA (Implemented districts)	<i>p</i> value
<b>Number</b>	14	28	
<b>Population (n)</b>	1337129	2981935	
<b>Population density, person/km, median (IQR)</b>	29 (18-75)	117 (78-224)	0.002
< 95	9 (82)	8 (35)	0.01
≥ 95	2 (18)	15 (65)	
<b>Gender (% , IQR)</b>			
Males	51.0(50.9-51.0)	51.0 (50.9-51.0)	0.42
<b>Age, years (% , IQR)</b>			
< 5	13.5 (13.5-13.5)	13.5 (13.5-13.5)	0.48
5-14	29.0 (29.0-29.0)	29.0 (29.0-29.0)	0.92
≥ 15	57.4 (57.4-57.4)	57.4 (57.4-57.4)	0.68
<b>House hold size, median, Inhabitants (IQR)</b>	4.3 (3.1-4.3)	3.4 (2.3-4.2)	0.09
< 4; n (%)	6 (46)	17 (633)	0.31
≥ 4; n (%)	7 (54)	10 (37)	
<b>Temperature, °C, median (IQR)</b>	31 (221-38)	25 (20-27)	0.02
< 28; n (%)	4 (33)	21 (78)	0.008
≥ 28; n (%)	8 (67)	6 (22)	
<b>Water coverage, median (IQR)</b>	57 (49-69)	67 (57-72)	0.22
< 80%; n (%)	11 (855)	25 (93)	0.25
≥ 80%; n (%)	2 (25)	15 (93)	
<b>Altitude, median (IQR)</b>	1500(850-1800)	22505 (1700-2400)	0.002
< 2000m; n (%)	10 (77)	8 (305)	0.005
≥ 2000m; n (%)	3 (23)	19 (70)	
<b>Health professional to population ratio/1000 population, median (IQR)</b>	1.3 (1.0-1.7)	1.6 (1.1-1.9)	0.39
< 1.5; n (%)	7 (54)	11 (41)	0.43
≥ 1.5; n (%)	6 (46)	16(59)	
<b>Health facility to population ratio/100 population, median (IQR)</b>	2.1 (2-2.6)	2.05 (2-3)	0.73
< 2; n (%)	11(79)	23 (82)	0.78
≥ 2; n (%)	3(21)	5 (18)	

IQR: interquartile range; MDA: mass drug administration.

### Data analysis and statistics

Scabies prevalence was calculated by dividing the number of scabies cases over the number of inhabitants, overall and by age-group and sex. Differences between groups were assessed using the Chi-square test for binary/categorical data and the rank-sum test for continuous data (prevalences). To account for potential confounding factors multivariate linear regression was done. Besides the intervention (ivermectin MDA), we included all variables associated with the intervention or the outcome (scabies prevalence). Statistical analysis was performed using Stata.

### Ethics considerations

Permission to conduct the study and Ethics approval was obtained from the Amhara Public Health Institute, Bahir Dar, Ethiopia. The study was also approved by the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France. As this was a study using aggregated data without patient identifiers, the issue of informed patient consent did not apply.

## Results

### Characteristics of the intervention and control districts

We included data on 4,319,064 subjects across 42 districts (14 with the intervention and 28 without the intervention). Temperature and population density were lower in the intervention group. There were no statically significant differences in age, gender, household density, water coverage and health care provision (Table 1).

### Prevalence of scabies in the intervention and control districts

In the 2018 survey, 371,780 scabies cases were detected in both intervention and control districts. The district scabies prevalence ranged from 0.01% to 35%, with a median of 6.1% (IQR 1.8-11.7). The median scabies prevalence in the intervention districts was 6% (IQR 2.6-11.9) and 5.2% (1.8-10.4) in the control districts but this difference was not statistically significant (Table 2). The only significant association found was with age group, with lower scabies prevalence in the 5-14 years age group (Table 2).

**Table 2.** Factors associated with the prevalence of scabies cases, Amhara region Ethiopia, 2018.

Variable	District scabies prevalence Median % (IQR)	p-value (Rank-sum test)
<b>Ivermectin MDA implemented</b>		<b>0.77</b>
No	6 (2.6-11.9)	
Yes	5.2 (1.8-10.4)	
<b>Age, years</b>		<b>0.20</b>
0-5	7.6 (2.1-10.7)	
5-14	4.4 (1.8-7.9)	
≥ 15	6.6 (1.9-14.0)	
<b>Gender</b>		<b>0.84</b>
Male	6.1 (2.1-11.4)	
Female	6.1 (1.7-12.0)	
<b>House hold size, median inhabitants (IQR)</b>		<b>0.50</b>
< 4	5 (1.3-10.4)	
≥ 4	6.5 (5-12.7)	
<b>Population density, median (IQR)</b>		<b>0.64</b>
< 95	5.1 (3.8-11.4)	
≥ 95	6.2 (1.3-10.7)	
<b>Temperature, median (IQR)</b>		<b>0.32</b>
< 28	6.0 (1.6-10.4)	
≥ 28	7.4 (3.9-11.8)	
<b>Water coverage, median (IQR)</b>		<b>0.65</b>
< 80%	4.0 (1.0-11.6)	
≥ 80%	6.0(3.5-11.5)	
<b>Altitude, median (IQR)</b>		<b>0.51</b>
< 2000m	4.6 (3.9-17)	
≥ 2000m	6.4 (4.4-11.4)	
<b>Health professional to population ratio/1000 population, median (IQR)</b>		<b>0.35</b>
< 1.5	4.8 (1.6-10.7)	
≥ 1.5	6.3 (4.9-11.7)	
<b>Health facility to population ratio/100 population, median (IQR)</b>		<b>0.46</b>
< 2	3.5 (1.2-10.5)	
≥ 2	6. (4.2-11.7)	

IQR: interquartile range; MDA: mass drug administration

In multivariate analysis, no statistically significant association was found between the intervention and scabies prevalence (coefficient 0.37 (95% confidence interval (-0.93-1.67); *p*-value 0.55).

## Discussion

In this study, we found no statistically significant differences in scabies prevalence between districts implementing ivermectin MDA and those not implementing this intervention.

Our findings are in contradiction with a study from a setting with a high scabies prevalence in Zanzibar, reporting a clear reduction in scabies prevalence in areas implementing ivermectin MDA for control of lymphatic filariasis [8] and a study conducted in Solomon Islands showing a decrease in a scabies prevalence 12 months after ivermectin and azithromycin MDA [11]. However, our results are in line with another study from a low scabies prevalence area in Tanzania, reporting that ivermectin administration for control of lymphatic filariasis had no to minimal effects [9].

Ivermectin MDA for scabies control has generally yielded clear reductions in scabies prevalence but the effect of ivermectin administration on scabies control as used in onchocerciasis/lymphatic filariasis control programs is not consistent [8,9]. Potential reasons are that children and pregnant/lactating women are not targeted in the onchocerciasis/lymphatic filariasis programs and consequently these could be the source of scabies re-infestation in the family. Additionally, in these programs, scabies cases did not get a repeat dose after 7-14 days. In a study in Tanzania, the prevalence decreased after one round of ivermectin based MDA but increased after a year [9]. Finally, crusted scabies, a highly infectious form that does not respond to the regular regimen is not uncommon in our study area [4].

Nonetheless, we cannot fully rule out the effect of ivermectin MDA for onchocerciasis elimination on scabies prevalence in our study. It remains possible that baseline scabies prevalence could have been higher in the intervention districts and that ivermectin MDA could have reduced it initially to a level comparable to the control districts in the 2018 scabies survey. However, even if baseline prevalence would have been higher in the intervention districts, one would expect a lower scabies prevalence after six years of MDA, if the intervention would have been effective. Moreover, we only had aggregated district data to adjust for confounding. An individual or village level data could have allowed more refined analysis.

The use of aggregated district data could also explain that we did not find an association between well-established risk factors such as household size, temperature and altitude and scabies prevalence. Another unexpected finding was the lower scabies prevalence in the 5-14 years age group, while other studies conducted in Ethiopia, Solomon Islands and Nigeria have reported a high prevalence of scabies in the <15 years age groups [4,11,12]. We do not have a clear explanation for this finding.

One of the strengths of the study is that we could rely on the data from the onchocerciasis program implementing ivermectin MDA without interruption for a six years period. Additionally, intervention and control districts were fairly comparable. The third strength is that as the study has looked into the effect of the routine MDA interventions, the findings can be generalized to other co-endemic areas. There are a number of limitations to this study. Firstly, the diagnosis of scabies was done by lower-level health care workers (HEW) clinically and secondly the study controls were selected purposively. Finally there were missing data in the campaign database.

In conclusion, the implementation of ivermectin MDA for onchocerciasis control in our study was not associated with reduced scabies prevalence. Combined with other studies, our findings argue against the use of the current ivermectin regimen as used in the MDA for onchocerciasis (or filariasis) control programs for scabies control. Nevertheless, because MDA campaign demands huge resources, integration of both programs remains to be further explored as: this is expected to reduce the cost significantly by sharing of resources and can maximize community participation [2,12].

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