Coverage Validation survey for lymphatic filariasis treatment in Itang special district of Gambella regional state of Ethiopia; Cross sectional study

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Abstract
Background Coverage validation survey provides a more precise estimate of preventive chemotherapy coverage and avoids the biases, as well as some of the errors that can affect reported coverage. This coverage validation survey was done to know the difference between the reported coverage from district of Itang special for Ivermectin and Albendazole given for Lymphatic Filariasis with the actual coverage in the selected district. Methods Itang special district from Gambella region was purposively selected for lymphatic filariasis treatment coverage survey. The survey was done by using segments from each district whereby 30 segments were selected from the district. The name of the kebeles and the segments where the survey was carried out were selected by using random selection method. After getting the total number of households in each selected kebele from the village chief the number of segments to be visited was computed by dividing the number of households to 50 and 16 households were visited from each segment and eligible individuals aged 5 and above were interviewed. Data for variables related to coverage of the IVM plus ALB were collected using Survey CTO software. Location of each household and the kebele chief office was recorded by using Global positioning system. Information about the kebele including population size, number of households in the kebele, last dates of mass drug administration were gathered primarily from village chiefs when available and headmasters and health extension workers when unavailable. Results The coverage validation survey result shows that the coverage for lymphatic Filariasis treatment was 81.5% in Itang special district of Gambella regional state. From 825 individuals that reported that they were offered the treatment 823(99.6%) swallowed the drug. The main reason for not being offered ivermectin and Albendazole during the mass drug administration campaigns because they were missing class during those dates (37.2%). Conclusion The data collected from Itang special woreda of Gambella Region shows that the treatment coverage is higher than the recommended coverage of 65% of the target population should be treated. Different factors play a role for this achievement including using different treatment sites such as schools, community centers and home to home by using health development armies for those children not attending schools and for nomadic communities such as the one in Gambella Regional state. Keywords
Lymphatic Filariasis, Ivermectin, Albendazole, Coverage

Background

Lymphatic filariasis (LF) is a vector-borne parasitic disease endemic in several countries in Africa, Asia and the Americas. Currently 856 million people in 52 countries around the world live in areas where they are at risk of LF of which 499.4 million no longer require treatment to prevent the disease (1).

It is a neglected tropical disease (NTD) caused by three species of filarial worm: *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. LF is prevalent in 73 tropical and sub-tropical countries, and is transmitted via the bite of an infected mosquito. Whilst infection can be acquired during childhood, the overt chronic manifestations of the disease may occur in later life. Those clinical manifestations of greatest public health significance are lymphoedema of the limbs, genital disease (most commonly hydrocoele) and recurrent acute attacks. Estimates suggest that 19.4 million men worldwide suffer from hydrocoele and almost 16.7 million individuals, mostly women, have lymphoedema of the leg; although these estimates probably do not reflect the true magnitude of the global burden from this infection (2).

Lymphatic filariasis is endemic in Africa, Asia, the Indian subcontinent, the western Pacific Islands, focal areas of Latin America, and the Caribbean – particularly Haiti and the Dominican Republic. Approximately 65% of those at risk reside in south and Southeast Asia, 30% in sub-Saharan Africa and the remainder in other parts of the tropical world (3).

According to recent mapping based on 11,685 individuals living in 125 villages (112 districts) of western Ethiopia, the prevalence was 3.7%, but high geographical clustering and variation in prevalence (ranging from 0% to more than 50%) was found. LF is one of the most debilitating and disfiguring diseases common in Ethiopia and in this country is caused by *Wuchereria bancrofti* (4). Anopheles species of mosquitoes are the main vectors for LF transmission in Ethiopia (5).

In Ethiopia, 30 million people have been estimated to be at risk of LF, which would make Ethiopia the 4th highest burden country in SSA, bearing 7.8% of the burden of LF in SSA (6).
western Ethiopia, the prevalence was 3.7%, but high geographical clustering and variation in prevalence (ranging from 0% to more than 50%) was found (4).

Endemic districts were identified in the following regions: Gambella Region (seven districts), Beneshangul-Gumuz Region (thirteen districts), and Southern Nations, Nationalities and Peoples’ Region (SNNPR) (nine districts). The other five districts were from Amhara (two districts) and Oromia (three districts) regions (7).

In line with the global strategy, the government initiated the implementation of the national LF elimination program in 2009, integrated with the onchocerciasis control program, to undertake programs aimed at controlling and eliminating lymphatic filariasis as a public health problem in Ethiopia by 2020 (2).

To achieve this goal MDA for lymphatic filariasis has been given for individuals living in lymphatic filariasis endemic regions once or twice a year based on their endemic status accompanied by morbidity management and vector control. Even though there appears to be a considerable geographical coverage change since its inception in 2009 G.C all eligible individuals for lymphatic filariasis preventive chemotherapy did not receive Ivermectin and Albendazole in the previous consecutive mass drug administration campaigns.

The primary objective of this coverage validation survey was to evaluate the validated treatment coverage of Ivermectin and Albendazole in Itang special district. This study aims to measure validated treatment coverage of IVM plus ALB in the population aged 5 and above, relative to coverage targets, Assess coverage in SAC disaggregated by gender, collect information on why targeted eligible individuals did not receive treatment, Collect information of where the targeted eligible individuals received treatments.

Methods
The name of kebeles to be involved and the number of segments selected for the survey from each kebele were predetermined by using random selection methods before going to the field for data collection. Moreover, the number of households to be involved from each segment was determined before the actual data collection in the field. Data collectors were trained on the methods of data
collection of the survey which was given for three days by expert of SCI. In the field, data collectors visited the kebeles to assess the total households in each kebele and the total population in the selected kebeles. The data collectors divided the total households in each kebele to 50 to determine the number of segments in each kebele.

From the total segments, the number of segments to be included in the survey was determined by coverage survey builder and the numbers of segments to be surveyed were randomly selected. From each selected segment, at least 16 randomly selected households were included in the survey. In Itang special district treatment was given for those aged five and above so they were the ones interviewed about the preventive chemotherapy in the last round of MDA.

Results

**Ivermectin plus Albendazole mass drug administration coverage for Lymphatic Filariasis (LF) in Ethiopia**

The treatment coverage validation survey data of Lymphatic Filariasis was collected only from Itang special district in Gambella regional state. A total of 2125 individuals were eligible for interview, out of which 2082 were interviewed which gives a response rate of 98%. Of the 2082 individuals, 81.5% were offered treatment while 17.8% and 0.7% were not offered the drug or unknown respectively.

From those who were offered treatment against lymphatic Filariasis 99.8% swallowed the drug offered and the rest did not swallow the drug. **Table 1** shows the proportion of individuals offered Ivermectin plus Albendazole to treat Lymphatic filariasis in Itang special district (Gambella) which was 81.5%.

From the perspective of gender, the percentage of offered among males and females were 81.7% and 81.3%, respectively. A chi-square test showed no significant difference in treatment offered between males and females (p-value, 0.884).

**Table 1**: MDA offered against LF and its association with gender, age and school attendance (5-14) among individuals 5 years and above in Itang special woreda of Gambella (integrated approach), Ethiopia 2019
The percentage of individuals who swallowed IVM & ALB among respondents that were offered the drugs was 99.8% and 99.9% for males and females respectively (Table 2).

Table 2: Drugs swallowed against LF disaggregated by gender, age and school attendance (5-14) among individuals 5 years and above in Itang special woreda of Gambella (integrated approach), Ethiopia 2019

| Characteristics     | Category       | Frequency | IVM plus ALB offered (LF) | Swallowed IVM plus ALB |
|---------------------|----------------|-----------|---------------------------|------------------------|
|                     |                |           | Yes N (%)      | No N (%)   | Unknown N (%) | Pearson Chi-Square |
| Gender              | Male           | 1010      | 825(81.7)     | 177(17.5)  | 8(0.8)       | 0.25               |
|                     | Female         | 1072      | 871(81.25)    | 194(18.1)  | 7(0.65)      |                    |
| Age cat             | 5-14           | 687       | 569(82.8)     | 106(15.4)  | 12(1.8)      | 18.5               |
|                     | >=15           | 1395      | 1127(80.8)    | 265(19)    | 3(0.2)       |                    |
| SAC attendance      | Yes            | 616       | 537(87.2)     | 72(11.7)   | 7(1.1)       | 80.4               |
|                     | No             | 71        | 32(45.1)      | 34(47.9)   | 5(7)         |                    |

The treatment coverage of IVM plus Albendazole for lymphatic filariasis in Itang district was 81.7%.

Table 3 Treatment coverage of IVM plus ALB against LF in Itang Special District

| Characteristics     | Category       | Interviewed | Treated with IVM plus ALB | Treatment coverage (%) |
|---------------------|----------------|-------------|---------------------------|------------------------|
| Gender              | Male           | 1010        | 823                       | 81.5                   |
|                     | Female         | 1072        | 870                       | 81.2                   |
| Age category        | 5-14           | 687         | 567                       | 82.5                   |
|                     | >=15           | 1395        | 1126                      | 80.7                   |
| SAC School attendance | Yes          | 616         | 535                       | 86.9                   |
|                     | No             | 71          | 32                        | 45.1                   |

Reasons for not being offered LF MDA in Gambella regional state

The main reasons for not being offered IVM plus ALB were being absent 138(37.2%) and didn’t know 113 (30.46%). A total of 16 individuals replied other reasons such as not being interested (1), not
being around (1), change of living area (2), fear of side effect(1), drug given only for under 40 years old(1), unable to move (1), do not attend school (1), forgot (2) and not given for adults (6). The reported reasons for not swallowing the drugs for LF were fear of side effect, bad taste and no information.

Discussion

Annual MDA with a combination of Ivermectin and Albendazole is recommended for the control of LF in African countries which are co-endemic for onchocerciasis (8).

Successful elimination of LF based on the MDA strategy relies on maintaining a high treatment coverage to reduce the worm burden in humans and hence the onwards transmission (9). However, attaining and maintaining high treatment coverage has been a challenge in many LF control programmes globally (10).

Given that the required duration of MDA is based on the estimated reproductive lifespan of the adult worm, at least five rounds of MDA with a minimum coverage of 65% of the total population is considered to be adequate in order to reduce microfilariae to a level at which transmission will end without further interventions(11).

Elimination of LF as a public health problem is operationally defined as reducing infection to levels at which transmission is no longer sustainable and ensuring the availability of a WHO-recommended basic package of care to manage lymphoedema and hydrocele. The following measurable elimination thresholds must be demonstrated before stopping MDA: (i) microfilaraemia prevalence of less than 1% or antigenaemia prevalence of less than 2% in sentinel and spot-check surveys; and (ii) incident infection below 1% or 2% measured during the transmission assessment survey (12).

At the turn of the 20th century, it was estimated that 120 million people were infected with L globally and more than one billion were at risk of infection. A strategy of MDA, following the 1997 World Health Assembly resolution to eliminate LF, has led to one of the most ambitious and successful interventions against a neglected tropical disease. Under sufficient level of intervention coverage, transmission of LF can be interrupted within five years (13).

Based on WHO guideline an “effective MDA round” or reaching “effective coverage” during an MDA
round is defined by epidemiological coverage of at least 65% in an implementation unit (12) and the current validation survey in the Itang special district was higher than the percentage set by the WHO as the coverage was 81.5% in the indicated region.

An integrated coverage validation survey in Togo showed that more than 86% of the respondents reported that they took the drugs of lymphatic filariasis which is higher than the reported coverage in this survey (14).

A median reported treatment coverage in Ghana over a period of a decade from 2000-2010 reported the coverage to be 77-80% in the above indicated period (15) and another coverage validation survey in Togo showed >88% of persons in each survey conducted 1, 6 and 12 months after the MDA indicated they were offered medication during the MDA and essentially the same proportion reported swallowing all the MDA medications they were offered (16). A lymphatic filariasis treatment validation survey in Kenya which uses a strategy of community directed with health system involvement showed coverage of 88%(17).

Treatment coverage and community compliance are important factors for successful LF elimination through the MDA strategy. It has been shown that in areas with high pre-MDA levels of infection, maintaining high drug intake during MDA is crucial in order to reach the elimination goal within a reasonable time frame (18).

A study conducted in Southeast Asia showed that the number of people requiring mass drug administration fell from 1.41 billion in 2011 to 856 million in 2016. It is expected that mass administration will no longer be required when the prevalence of infection has been reduced to low levels, such as microfilariae in <1% of the population or antigenaemia in <2% of the population (19). Integrated delivery of community-based public health services demonstrated a high absolute post-intervention coverage. Programs and governments are increasingly integrating service distribution to streamline delivery of a variety of services and reduce costs (20) and the mass drug administration survey in Ethiopia has been given in integrated manner since its inception in 2013 and showed an improvement in coverage.

When comparing the coverage of Ivermectin and Albendazole for lymphatic filariasis treatment the
drugs offered was significantly higher in children attending school than those not attending school (p<0.001) as the treatment strategy all over the country is mainly in primary schools while integrated MDAs together with STH and SCH also takes place in the community, but enrolled children have better information about the MDA and have high probability of taking the drugs during the mass drug administrations as non-enrolled children are highly likely for not being around the drug distribution sites during MDA dates.

The coverage in school age children (5-14) shows significant difference with treatment coverage in individuals aged 15 and above (p<0.001) in the last mass drug administration campaign and this fact can be explained by the fact that most of the respondents were school age children and that there was a wrong assumption that the treatment is not given for adults while the treatment strategy include all individuals aged 5 and above and other reasons were also considered such as change of living area and not being around during the mass drug administration.

The main reason given for not taking the drugs was not being around during the campaigns with a percentage value of 37.2 and a similar study in Tanzania showed that this is the main reason for not taking the preventive chemotherapy (8) and the same study showed the coverage of lymphatic filariasis treatment to be 51.6% and 57.4% for two separate coverage validation survey conducted in 2011 and 2015 G.C which is considerably lower than our finding.

Another study in Nigeria showed that among the very few that refused treatment, most did so because of fear or worry rather than personal experience of adverse events (21). There were some limitations for this study such as missing some respondents in the household as the survey sites were remote kebeles and the main source of income for the household is farming and the members of the house may not be around during the data collection as they were in the field whereby the field may be farther from their living area. Another limitation of the study was that it included only a single district that distribute drugs in integrated treatment strategy and it would have been better if more districts were included to compare the coverage in different districts of the country and better understand the geographical coverage of the country.

Conclusion
Even though only a single district in Gambella regional state was included in this validation survey, Ethiopia is on the right track to achieve elimination of Lymphatic filariasis as witnessed by its consistent high coverage of the target population which is greater than the minimum percentage set by WHO. Geographically remote areas are also well covered by the drug distribution campaigns and using more than one hub for preventive chemotherapy proved effective as teachers, HEWs and HDAs play a significant role in seeing through the drug distributions. There still appears to be a room for improvement as the coverage can reach 100% by improving the community sensitization and mobilization activities, providing a better training for the participants and better management of side effects because the community may resist the treatment if there are many individuals suffering from side effects.

List Of Abbreviations
ALB- Albendazole
GC- Gregorian Calendar
HAD- Health Development Army
HEWs- Health Extension Worker
IVM- Ivermectin
LF- Lymphatic Filariasis
MDA- Mass Drug Administration
NTD- Neglected Tropical Diseases
SCH- Schistosomiasis
SCI- Schistosomiasis Control Initiative
SSA- Sub Saharan Africa
STH- Soil Transmitted Helminthes
TAS- Transmission assessment Survey
WHO- World Health Organization

Declarations

Ethical clearance
This coverage validation survey is part of a national program to eliminate lymphatic filariasis from the country and before collecting data on the household status and individual status of the study participants the information sheet was read for all respondents and the interview took place only if they agreed to sign the digital consent on the data collection tablet.

**Consent for publication**

Consent for publication of this article was gained from Ethiopian federal ministry of health and collaborative research and training center for neglected tropical diseases

**Availability of supporting data**

The supporting data submitted with this manuscript is not available to be used for other purposes

**Competing interest**

The authors declare that they have no competing interests.

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The fund for collection of the data including costs for vehicle rent, allowance for data collectors and other contingencies were covered by SCI and FMOH

**Authors’ contributions**

Mr. Abinet Teshome- Participated in cleaning of data, analysis of data and preparation of the manuscript  
Mr. Zerihun Zerdo- Participated in cleaning of data, analysis of data and preparation of the manuscript  
Mr. Mekuria Asnakew- Participated in cleaning of data and analysis of data  
Mr. Chuchu Yirko- Participated in data collection and cleaning of data and data analysis  
Mr. Manaye Yihune- Participated in cleaning of data and analysis  
Mr. Yilma Chisha- Participated in cleaning of data and data analysis  
Mr. Birhanu Getachew-Participated in preparation of data collection tool  
Mr. Nebiyu Nigussu- Coordinated the data collection process  
Mr. Fikre Seife- Coordinated the data collection process

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Authors' information

Not applicable

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Figures

Figure 1

Reasons for not being offered LF MDA in Itang special district, Gambella regional state, Ethiopia, 2019, N=371
Figure 1

Reasons for not being offered LF MDA in Itang special district, Gambella regional state, Ethiopia, 2019, N=371

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