Towards elimination of lymphatic filariasis: social mobilization issues and challenges in mass drug administration with anti-filarial drugs in Tamil Nadu, South India

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Abstract
India is a signatory to World Health Assembly resolution for elimination of lymphatic filariasis (LF) and National Health Policy has set the goal of LF elimination by 2015. Annual mass drug administration (MDA) is ongoing in endemic districts since 1996–97. Compliance rate is a crucial factor in achieving elimination and was assessed in three districts of Tamil Nadu for 10th and 11th treatment rounds (TRs). An in-depth study assessed the impact of social mobilization by drug distributors (DDs) in two areas from each of the three districts. Overall coverage and compliance for assessed TRs were 76.3 and 67.7% which is below the optimum level to achieve LF elimination. Modifiable determinants continue to be the reason for non-consumption even in the 11th TR and 20.8% were systematic non-compliers. In 76.4% of the cases, DDs failed to adhere to three mandatory visits as per the guidelines. Number of visits by DDs in relation to low and high MDA coverage areas showed a significant relationship ($P \leq 0.000$). MDA is limited to drug distribution alone and efforts by DDs in preparing the community were inadequate. Probable means to meet the challenges in preparation of the community is discussed.

Introduction
Lymphatic filariasis (LF) is a mosquito-borne disease that is endemic in 72 countries [1] with more than 1 billion people at risk of infection and 120 million infected. The Global Programme to Eliminate Lymphatic Filariasis (GPELF) was launched in 2000 with the aim of eliminating LF as a public health problem globally by the year 2020 [2]. The current strategy for elimination of LF is to interrupt transmission by drastically reducing microfilaria prevalence levels through mass drug administration (MDA) with annual single-dose co-administration of two drugs [either diethyl-carbamazine citrate (DEC) or ivermectin with albendazole] or cooking salt fortified with DEC for 1–2 years and alleviation of disabilities in the affected. Social mobilization (SM) has been a strategic component of the GPELF. India contributes to about 40% of the global burden [3, 4] of LF and achieving elimination in India will accelerate the process of elimination of LF globally. India launched the national programme to eliminate LF in 2002 to achieve National Health Policy of LF elimination as a public health problem by 2015 [5] and the programme is in operation in 250 districts with a population of 554 million. The first MDA in India with DEC alone took place in 1996 [6] and subsequently all the endemic districts were brought
under the elimination programme with annual treatments. Tamil Nadu, with 32 revenue districts, was the first state in India to initiate the MDA in 1996. So far, 11 rounds have been completed in 13 endemic districts and 12 rounds in one district where it was first initiated. Gaps in annual rounds occurred in 1997, 2005 and 2006 in Tamil Nadu. In 2001, the co-administration of albendazole was introduced in six districts and has been up-scaled to all the endemic districts in the 11th round.

Rate of drug consumption is the most crucial factor in the success of MDA programme as the effectiveness of MDA in reducing the microfilaria load in the community is directly related to the proportion of population that ingests the anti-filarial drugs during every treatment round (TR) [7]. The major challenge with the currently available drugs and their regimens is that the interruption of transmission requires very high treatment coverage (probably >85% of the total population) to achieve elimination [8]. Although coverage of drug distribution indicates drug delivery efficiency, compliance can be considered as an indicator to assess the impact of SM efforts and preparation of the community for MDA. The drug compliance is the best measure of how well the MDA was implemented and an adequate level of drug compliance is estimated to be 80% [9, 10]. Although the MDA programme in India has scaled up the distribution of tablets over the rounds, problems have remained with achieving sufficient levels of adherence to the drugs in many regions of India [11–16]. The community-level factors for non-compliance have been researched and fear of side reaction persists to be one of the major reasons for non-compliance [12, 14, 17, 18]. Successful outcome is dependent on operational effectiveness of the MDA programme in terms of interaction of the drug distributor (DD) with the community for SM, outreach and monitoring. The implementation of the MDA at district level followed a national guideline [19].

Interpersonal communication by the DDs at the time of enumeration of the household and during drug distribution is the most important activity in preparing the community for compliance to MDA. The Tamil Nadu MDA programme has demonstrated suboptimal compliance rates in the various TRs. High rates of non-compliance maintain a reservoir of infection, which drives LF transmission [20]. It is therefore important to identify the gaps in delivery performance to attain the goal of elimination. This article addresses the two TRs (10th and 11th) in three endemic districts in Tamil Nadu with reference to preparation of the community for MDA programme.

Materials and methods

The Directorate of Public Health and Preventive Medicine of Tamil Nadu implemented MDA through door-to-door drug delivery strategy. A standard dose of DEC (6 mg/kg body weight) has been followed. The DDs constituted health staff, anganwadi workers (AWW) and trained volunteers. Tablets were distributed to all the eligible population, excluding children <2 years of age, pregnant women and ailing chronic patients. SM campaign was set up before every round of MDA. The DDs in each locality were trained by medical officers of the concerned Primary Health Centres (PHCs) on enumeration of the households and drug distribution.

MDA was assessed independently for the 10th (2009) and 11th (2010) TRs in Villupuram, Cuddalore and Tanjavur districts in Tamil Nadu by the Vector Control Research Centre (VCRC) in response to the request from the Directorate of Public Health and Preventive Medicine, Chennai. The surveys were conducted within 15 days of the MDA to avoid recall bias. All the PHCs in the selected revenue districts were listed based on the reported coverage of drug distribution. Using 33 percentile method, three PHCs were selected at random. All the villages in each of the selected PHCs were listed and three villages from rural area and one ward from urban area were randomly selected and designated as cluster. From each village/ward, 30 households were selected randomly with a minimum of 150 individuals. At least 600 individuals were thus interviewed from each district using a semi-structured questionnaire. All the individuals in the selected houses constituted the
samples. Information was collected directly from the individuals who were available at the time of visit. Information for children below 15 years was collected from the head of the family or any other elderly person in the selected household. In the place of locked houses, adjoining household was selected for the survey. The questionnaire included questions on outreach, consumption details, reasons if any for non-consumption of the drug and side reactions. The results are reported in terms of proportion of people who received tablets out of sampled (=coverage of drug distribution), consumed the drugs (=consumption out of sampled population) and compliance (=consumption out of those who received tablets).

Further, an in-depth study using a detailed questionnaire was conducted in the same districts in six of the areas selected (one area each with low and high coverage from each district) for the coverage–consumption study to assess the performance in delivering the drug and preparation of the community. The gap between the coverage of drug distribution and consumption in the 11th TR was considered as the indicator for grouping three of the areas under high consumption and three as low consumption. The sample size was estimated using the expected consumption rate of 30%, and from each area 53 respondents from randomly selected households amounting to a total of 318 were interviewed. Variables for this study were identified from the results of independent assessment surveys on coverage and consumption carried out after every round of MDA in the selected endemic districts by the VCRC (annual report 2008). Variables were also identified from the reports of earlier studies on MDA coverage in India [17, 18, 21]. The questionnaire was administered by trained social scientists and it took 30 min to interview a single respondent. The questions included knowledge on MDA, number of times complied, reason for non-compliance, number of times the DD visited the respondent, DD’s message dissemination on MDA, source of information on MDA, what they understood from the message conveyed, their opinion on the drug distribution strategy in terms of time of distribution, quality of the drug, who is the most preferred DD, etc. The data obtained were coded and computerized separately for the coverage and consumption assessment and in-depth study. Database was organized using excel spreadsheet and analysis was done using SPSS version 13. Mantel–Haenszel proportion test was carried out for significance.

Results

Coverage consumption assessment

From the three districts under study, a total of nine villages and three urban wards were selected for the assessment survey. As many as 1634 and 1583 people were assessed in the 10th and 11th TRs, respectively. The overall average for the two TRs from three districts was 76.3% (coverage of distribution) 51.7% (consumption) and 67.7% (compliance). The coverage of distribution for the three districts for 10th and 11th TRs was 71.7 and 81.1%, consumption 41.9 and 61.7% and compliance 58.4 and 76.1%, respectively. The gap between coverage of drug distribution and consumption in 10th TR was 29.8% and narrowed down to 19.4% in 11th TR. The overall coverage for urban area was 54.2 and 83.0%, consumption 32.2 and 57.3% and compliance 59.4 and 69.1% for the two TRs, respectively. In the rural areas, the same was reported to be 77.5 and 80.5%, 45.1 and 63.1% and 58.2 and 78.4%. The district-wise coverage and consumption are given in Fig. 1. Among the three districts, Cuddalore reported highest estimated coverage (84.3%) and maximum compliance (83.8%) in 11th TR showing that only 16.2% of those who received the drug failed to consume it. Significant increase in coverage, consumption and compliance of the drug was observed in Cuddalore in the 11th TR, and in Villupuram consumption and compliance significantly improved. A total of 41.6 and 23.9% of the respondents received but did not consume the drugs in 10th and 11th TRs, respectively. Analysis of reasons for non-consumption showed that fear of side reaction was the major reason in different districts ranging between 24.1% and 48.6% in 10th TR and between 18.0% and 94.5% in 11th TR. Though the household received
the tablets, 18.9% of the respondents in the two TRs of MDA were not aware of the drug distribution as there was a communication gap between the household members. Above 60% of the respondents came to know about the programme only at the time of drug distribution from the DD. The other channels of information reported by the respondents were FM radio, television and newspapers and were minimal.

**In-depth assessment of operational effectiveness**

Among the respondents of the in-depth assessment, 94% were aware of the annual MDA programme and 78.9% were aware of the adult dosage as three small tablets (DEC) and one big tablet (albendazole). The actual purpose of drug distribution was known only to 21.1% and 11.9% were aware of the possible side effects of the drug. In both the TRs, the six areas included in the study had received DEC and albendazole tablets. Compliance with at least one round of MDA among the respondents of the in-depth assessment was reported by 79.2% and 20.8% are systematic non-compliers (Fig. 2). Those who complied with three TRs were the maximum (23.3%) and the lowest was compliance with seven and eight rounds (0.6%). The respondents complied with the current round of MDA were found to be 63.5%. The reasons for systematic non-compliance are given in Table I. Out of the 66 (20.8%) systematic non-compliers, 18.9% reported

![Fig. 1. Compliance to MDA in different districts and TRs.](image1)

![Fig. 2. Compliance with the number of annual rounds of MDA.](image2)

| Table I. Reason for systematic non-compliance |
|---|---|---|
| SI no. | Reasons | No. | Out of systematic non-compliers (%) (n = 66) |
| 1 | Fear of side reaction | 33 | 10.4 |
| 2 | No disease, why take medicine | 11 | 3.5 |
| 3 | Out of station | 6 | 1.9 |
| 4 | Current chronic disease | 6 | 1.9 |
| 5 | No faith in the tablet | 4 | 1.3 |
| 6 | Not received tablet | 3 | 0.9 |
| 7 | Do not like taking medicine | 2 | 0.6 |
| 8 | Not aware of the programme | 1 | 0.3 |
| Total | 66 | | 20.8 |
reasons that can be modified. Merely 12% were aware of the reasons for the possible side effect as informed by the DD.

The DD has made only one visit at the time of drug distribution as reported by 76.4% of the respondents, 17.0% two visits, 0.9% three visits and did not make any visit in 7.5% of the households under study. When this was analysed in relation to the low and high coverage areas, it was found that in the high coverage areas 1.9, 33.8 and 58.7% of the respondents reported to have had three, two and one visits by the DDs, respectively. In low coverage areas, the DD had made only one visit according to 93.7% of the respondents. The number of visits by the DD in relation to low and high MDA coverage areas showed a significant relationship ($P \leq 0.0000$). Respondents in the low coverage areas who complied at least once with the MDA TRs were 74.7% compared with high coverage areas (81.9%) and were not significant. Compliance with more than one round was found to be significantly higher ($P \leq 0.0000$) in the high coverage villages. The number of visits by DDs in relation to the compliance to the current round of MDA was analysed between the low and high coverage areas and was found to be significantly higher ($P \leq 0.0000$) in the high coverage areas where the DD has made two to three visits.

During the current round, almost 47% of the respondents received the drug during the forenoon, 24.3% during noon and 28.7% in the evening hours. Among those who have not consumed the drug (36.5%), almost 70.7% reported to have received the tablets in the forenoon and a significant relationship was observed. Tablets were distributed in loose form to 62.6%, whereas 37.4% received the tablets in intact strips and were convinced with the quality of the drug. Those who received loose tablets constituted 68.1% of those who have not complied with the current round and was found to be significant ($P \leq 0.000$).

The first information received on MDA was through television for 25.5% of the respondents followed by DDs (36.8%) at the time of drug distribution. From the message conveyed by the DD on MDA, 64.8% have understood as ‘consume the tablet at night’. The percentage of respondents satisfied with the explanation given by the DD was only 16%. Other means of community mobilization included propaganda through newspapers (12.8%), posters (3.1%), radio (2.2%), mike announcement (1.3%), village health nurse (2.2%) and AWW (2.2%), and 34% had no information at all. The DD of choice for 43.6 and 40.5% of the respondents were the AWW and health workers, respectively.

**Discussion**

Review of the impact of MDA implementation in eight countries including India to understand why some national programmes were more successful than the others has shown that compliance with treatment was the most important programmatic challenge [21]. There is a growing appreciation among policy makers and researchers of the potential role of SM in enhancing the compliance in MDA programmes towards achieving elimination of LF. Questions, however, arise about how best to utilize the SM techniques to accomplish an optimum level of drug consumption by the beneficiaries. In a country like India, annual MDA is an economic option [22] and the existing health care system is capable of operating the programme [11, 12]. In Tamil Nadu state, 11 rounds of MDA have been administered with missed rounds in 1997, 2005 and 2006. Despite 11 TRs, the MDA programme still encounters challenges.

In the assessed TRs, MDA was administered to 76.3% of the population, and the overall compliance rate of 67.7% after 11 TRs is a moderate achievement compared with 80% required to achieve LF elimination [9]. Cuddalore and Villupuram showed significant increase in compliance in the 11th TR, and to maintain the improvement achieved, further inputs are necessary. Compliance to MDA has been extensively researched and the outcome of the works provides scanty information on the role of the DD in mobilizing the community towards achieving the optimum compliance. The focus of non-compliance was mainly addressed from the angle of the community behaviour and seldom
attended from the angle of the role of the DD. Operational effectiveness of MDA largely depends on the DDs following prescribed national guidelines in preparing the community. As per the guideline, the enumeration by DD included two visits, with the first visit 15 days before the MDA to record the details of the household members, brief them on MDA, clarify their doubts if any and emphasize the need for drug consumption by everyone. The second visit is to be made 1 or 2 days before MDA for interpersonal contact and explaining the importance of MDA, possible side effects, all family members to be present on the day of drug distribution and distribute Information, Education and Communication materials. The activities during MDA include drug distribution as per the prescribed dosage, supervision, mopping up on the subsequent days to cover all the left out population and management of side reaction to the drug. The major responsibility of coverage and compliance is finally vested with the DD who assumes an important link between the programme and the community with regards to MDA. This study points towards the performance of the DDs in preparing the community, allaying the modifiable determinants of non-consumption and addressing the issue of systematic non-compliance towards achieving optimum compliance to MDA.

A range of 38.7–43.5% and 16.2–38.3% of those received the drug in the three districts reported not to have consumed the drug due to various reasons in the 10th and 11th TRs, respectively. Reasons for non-compliance, such as fear of side effects, without disease why consume tablet and do not like medicine, offer clear justifications on the part of the community but the fact that the same reasons have been attributed to non-compliance in all the 11 TRs in spite of an in-built SM remains to be a matter of concern. Inadequate information on the programme’s benefit to the population was evident from the fact that fear of side reaction continues to be the major reason for non-compliance even in the 11th TR. Programme guidelines recommend planning and training at PHC level prior to each round of MDA and review of the performance while consolidating the report. Adherence to this directive will give an opportunity to re-plan and revise SM strategy to clear certain barriers to compliance.

The results of the in-depth study suggest that a consistent proportion (20.8% systematic non-compliers) of the eligible population has not been mobilized to participate in MDA. Sporadic as well as systematic non-compliance indicate the shortcoming in the programme’s performance. An earlier community-based drug trial study in Tamil Nadu showed that 30% of the respondents complied with all the rounds of MDA [23]. Our study under operational programme settings showed that only 0.6% complied with eight rounds of MDA. To tackle the problem of systematic non-compliance, it is essential to deliver appropriate health information designed specifically to address people’s concerns and fears about the intervention [14].

The electronic and print media were not very effective in propagating the message on MDA as only 29.2% has come across them. The information on MDA programme was communicated by the DD to 36.8% of the respondents only at the time of distribution of the drug. Those who could not get any firsthand information as they have neither come across any propaganda materials nor were present at the time of drug distribution constituted 34%. Hence, educational and motivational activities need to be planned to cover all the target population.

In the case of 79% of the respondents, the DD had visited the house only once at the time of drug distribution against the guideline instruction of three visits including the day of drug distribution. The DDs failed to strictly adhere to the national guidelines for programme implementation. Enumeration of households can be considered as an opportunity to interact with the people with regards to MDA and ought to be carried out before every annual TR. It is evident from the significantly high compliance in high coverage areas where a DD had made two to three visits during the current round of MDA. Earlier studies have showed that the compliance rates in Tamil Nadu were consistently low (ranging between 46% and 64%) [12, 13]. Though the compliance of MDA was poor in urban areas [11,12], the delivery of drug and health information through the trained
AWW of the Integrated Child Development Scheme could achieve relatively higher compliance than that reported in other urban areas [14]. In the present study, the desire on the part of 84% of respondents to involve AWW and village health nurse in the drug distribution is worth taking into consideration in this context. Time of drug distribution was found to be a factor influencing non-compliance as many of the inhabitants will be out for work during the forenoon hours. The drug for the whole family is left behind with the member present at the time of distribution and was one of the reasons for non-compliance in Karnataka [24]. Blister packed drugs are preferred over loose tablets and need to be taken into consideration in future rounds of MDA. Moreover, there was limited knowledge on the purpose of MDA and also about the possible side effects as reported in Madhya Pradesh [25]. The DDs need to be oriented to address these issues to strengthen our endeavour to eliminate LF. Redefining the current training curriculum and incentives for DDs would be ideal for better performance of the DDs.

The preparation of the community for MDA is of paramount importance to achieve elimination of LF by the planned year 2015 in India. Compliance, an indicator of programme performance, was found to be below the optimum levels to achieve LF elimination in spite of implementing MDA for 11 TRs with SM component in Tamil Nadu state. The insight into the programme performance provides opportunities to adopt successful strategies. Poor adherence may be attributed to poor understanding of the programme objectives with respect to the necessity for everyone to take part in the programme to facilitate elimination of LF. Orientation of DDs with reframed curriculum will enhance their effectiveness in preparation of the community paving way to our efforts to achieve the goal of elimination of LF as a public health problem.

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Conflict of interest statement

None declared.

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