Original Article

Coverage of mass drug administration for elimination of lymphatic filariasis in urban Nagpur, Central India: A mixed method study

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ABSTRACT

Background and Aims: Mass Drug Administration (MDA) coverage remains an important indicator in elimination of Lymphatic Filariasis (LF), especially in context of recent changes in programme strategies in India, such as incorporation of Ivermectin and involvement of urban Accredited Social Health Activists (ASHAs). This study aimed at assessing the coverage and compliance with MDA of Filariasis as well as exploring perspective of beneficiaries for non-consumption in selected slum area of Nagpur city. **Methods:** Mixed-method study design comprising of quantitative assessment of MDA coverage, followed by qualitative method to explore the reasons of non-compliance was used in selected slum areas of Nagpur city. Using cluster sampling, 240 households were selected and house-to-house visits were made to interview the eligible participants. In-depth interviews were conducted among selected non-compliant participants. **Statistical Analysis:** Multivariable logistic regression analysis to identify the factors associated with non-consumption. Thematic analysis was done to obtain the reasons of non-consumption as perceived by the beneficiaries. **Results:** Among the 1096 individuals studied, distribution and consumption coverage were 55.2% and 48.5%, respectively. Effective supervised consumption was further low (28.9%). Coverage compliance gap (CCG) was 12.1%. Male sex and younger age (2-5 years) were significant socio-demographic determinants of non-consumption. No repeat visit to houses left in first round, fear of side effects, pill burden, poor understanding about the need were important reasons as revealed by qualitative inquiry. **Conclusion:** Effective pre-campaign awareness, incorporation of context specific drug delivery strategies and strengthening monitoring system are essential for successful MDA implementation.

Keywords: Ivermectin, lymphatic filariasis, mass drug administration, mixed-method, non-consumption

Introduction

Lymphatic Filariasis (LF) persists as a public health problem in India, which homes one third of global burden of LF infection.[1] Indigenous cases of filariasis have been reported from 256 districts across the country with about 630 million people are at risk of LF in India.[2] Although the disease usually does not cause fatality, it has serious impact on well-being due to physical disability and social stigma. The socio-economic burden can be perceived by an older estimate of DALY (disability adjusted life years) loss due to this disease in India as around 2.06 million, resulting in an annual wage loss of US $811 million.[3]

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The World Health Organization (WHO) Neglected Tropical Disease (NTD) roadmap targets global elimination of LF by 2020.[4] In accordance with the global commitment, elimination of LF in India has been prioritised in several national and international strategy documents including the recent national health policy in 2017.[5,6] Mass Drug Administration (MDA) is a key strategy for eliminating the disease by effectively reducing the density of microfilariae in the bloodstream and preventing the spread of parasites to mosquitoes.[7] The Government of India launched nationwide annual MDA in 2004 in endemic areas. However, the country is still fighting to eliminate the disease from the endemic pockets. In line with the recent WHO recommendation in 2017 Ivermectin was included along with the existing combination of diethylcarbamazine citrate and albendazole.[8,9] Previous studies identified that drug distribution and administration approaches, pre-campaign information education and communication (IEC) drive and monitoring and supervision were key factors determining programme success.[10]

As per WHO guidelines 2011, the districts having observed minimum five rounds of MDA with more than 65% coverage against total population at risk are to be subjected for Transmission Assessment Survey (TAS). So MDA coverage has been an important criteria for initiating TAS in that area, thereby increasing the need of Post-MDA coverage evaluation.[11] It was felt that combination of in-depth interviews from beneficiaries with standard quantitative coverage evaluation can identify not only the performance of that area, but also the context-specific obstacles. Moreover, the inclusion of Ivermectin is expected to increase the perception of pill burden, which may affect compliance. With this background this current study was undertaken to assess the coverage and compliance with Mass Drug Administration of Filariasis and to explore perspective of beneficiaries for non-consumption in selected slum area of Nagpur city.

Materials and Methods

Study settings and design

This community-based study was conducted in selected slum areas catered by one Urban Primary Heath Centre (UPHC) of Nagpur city. Mixed method study design comprising of quantitative assessment of MDA coverage, followed by qualitative method to explore the reasons of non-compliance was used. MDA drive was held between January and February, 2019 in the study area utilising the existing urban primary healthcare system. During this drive urban Accredited Social Health Activists (ASHAs) were engaged for community mobilisation and drug distribution. As independent external evaluation, this study commenced 15 days after the drive and the data were collected during months of February-March, 2019.

Sampling design and sample size

Considering the anticipated consumption coverage of MDA in the study setting as 50%, 5% alpha error, allowable relative error 20% and design effect 2 (to account for clustering), the sample size obtained was 194. With a non-response rate of 10%, the final sample size was 214.

The routine Maternal and Child Health (MCH) services of the UPHC are delivered through forty (40) outreach units each catering a defined population. Population catered by each unit were considered as one cluster. Therefore from each cluster 6 households were selected, (214/40 = 5.35) and a total of 240 (40*6) households were covered.

Data collection

For each cluster, the centre of the cluster was approached preferably at the junction of multiple lanes. One lane was randomly selected and consecutive 6 households were selected on that lane. If any household found locked or the participants refused then next household was approached till 6 households are covered. All eligible individuals (excluding <2 years of age, pregnant women and severely ill persons) in the sampled households who gave informed consent were included.

At the household, head of the household (HOH) or any other adult responsible family member was interviewed. Spot observation of non-consumed medicine was done to assess the consumption of drugs (if available). For the qualitative part, participants who did not consume the medicine were considered and In-depth interviews (IDI) were conducted among those who were willing and vocal. Sample size was decided based on data saturation (no new information was obtained even after continuing interview). Following the principle, a total of 12 IDIs were conducted. Participants were interviewed at a suitable place inside their residences after ensuring confidentiality. Audio recording of the sessions were done.

A pre-designed structured schedule was used for quantitative data collection and in depth-interview guide for qualitative exploration. The structured interview schedule included data related to demography, economic status as assessed by possessing APL/BPL line card and various items related to implementation of MDA. Working definitions used for calculation of various indicators for drug coverage and compliance were as per NVBDCP guidelines.[9] The data collection tool was first prepared in English then translated into local languages (Marathi and Hindi). After pre-testing, back translation was done to ensure accuracy.

Ethical consideration

Written informed consent was obtained from each participant. Confidentiality of the opinion and information were maintained. This study was conducted after getting approval from institution's ethics committee.

Statistical analysis

Data were entered into EpiData entry V3.1. Measures of descriptive statistics including number and percentages were used to calculate coverage of MDA distribution

and consumption. The association of socio-demographic variables with MDA non-consumption was studied using Chi-square test. Full logistic regression model for determinants of non-consumption was built using SPSS software, version 19.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA), where all the socio-demographic variables included in the study were entered into a multivariable logistic regression model (binary logistic).

Audio tapes from IDIs were transcribed in English as soon as the interviews were over. The transcripts were read several times to increase familiarity with it. Two investigators read the transcripts in order to reduce subjectivity in interpretation. Thematic Analysis was done manually to identify patterns of meaning across a dataset through a rigorous process of reading and re-reading the transcripts, data familiarisation, inductive data coding, theme development and revision.

Results

Background information

A total of 1096 participants out of 240 households were recruited into the study. Median (IQR) age of the participants was 30 (18-45) years. Males constituted nearly 51.5% of the study population. Median (IQR) years of schooling was 9 (4-10) years. Among males, predominant occupation was manual labour (17%), whereas most of the females were home makers (38%). Among the 240 household surveyed, majority belonged to OBC caste (67, 57.9%); nearly one-third (74, 31%) households were from below poverty line (BPL) social class. Individual level distribution of background variables are shown in Table 3 along with regression analysis.

Distribution and consumption coverage

A total of 28 out of 240 households (11.7%) were not visited at all during the campaign and they had no idea about this campaign. Even in many households visited by a health personnel, drugs were not distributed to all the family members. Among 1096 study participants, drugs were distributed to 605 (55.2%) participants; among whom 531 (87.9%) reported consumption of the drug thus indicating 'compliance to MDA; 31 (2.8%) participants refused to take the medicines. Thus, the coverage compliance gap (CCG) was 12.1%. The effective coverage (among eligible population) thus obtained was only 48.5%. Effective supervised consumption was further low, to only 28.9%. The details of age-stratified distribution and consumption pattern have been depicted in Table 1.

Among the 531 participants who consumed medicine, 49 (9.21%) experienced any type of side effect. Most commonly reported side effects were dizziness (28, 5.3%) and nausea (13, 2.4%).

Among the 1096 study participants, 49.1% (n = 538) were present at home when health staff came to provide drugs. It was reported by the head of the households that in only 67 (27.9%) households, at least one of the member had prior information regarding the home visit. Other key household level service delivery parameters are described in Table 2.

Non-consumption and associated factors

In unadjusted analysis, non-consumption was found to be more common among males compared to females (55.0% vs 47.7%); Children aged 2-5 years compared to the next age category (6-14 years), (66.7% vs 38.4%); those who are engaged in gainful profession compared to students (54.5% vs 45.4%); those who belong to unreserved caste compared to Scheduled Caste/Tribe (58.6% vs 48.5%) and those who are educated more than secondary level compared to those who completed primary education (55.6% vs 47.5%). All these differences were found to be statistically significant. Multivariable logistic regression model was significant as revealed by the omnibus Chi-square statistic (χ2 = 39.74, P < 0.01). This model was a good fit as evident from non-significant Hosmer-Lemeshow statistic (P = 0.91). Variables like younger age group (2 to 5 years) [AOR (95% CI) = 2.71 (1.2-6.1)] and male sex [AOR (CI) = 1.35 (1.02-1.78)] were found to be significant predictors of non-consumption of MDA after adjusting for potential confounders. [Table 3].

The reasons for non-consumption of drugs (non-compliant and refused, n = 104) were: Fear of side effects (39, 37.5%), no faith in the drugs (16, 15.3%) and forgot to consume (11, 10.5%).

For better understanding of beneficiaries' perspectives about non-consumption of drugs, IDIs were done which revealed the following themes: No repeat visit to houses, fear of side effects, too many tablets, poor understanding about the need of such campaign, lack of trust on existing public health system and personal judgement.

'No repeat visit'

The absence of family members during the visits made by field staffs was one of the important reasons felt by the participants. Those who were present, medicines were distributed to them in majority of cases. They came to know from their neighbours and friends that health staff came to distribute tablets in their area when they were not present at home. They did not have prior

Table 1: Distribution and consumption of MDA drugs						
Age in years	Eligible Population A	Drug Received B, (B/A%)	Refused to take (X, X/A%)	Drug Consumed C	Compliance (C/B%)	Effective coverage (C/A%)	Effective Supervised Consumption (D, D/A%)
2-5	54	22 (40.7)	0	18	81.8	33.3	8 (14.8)
6-14	146	93 (63.7)	5 (3.4)	90	96.8	61.6	60 (41.1)
≥15	896	490 (54.7)	26 (2.9)	424	86.5	47.3	249 (27.8)
Total	1096	605 (55.2)	31 (2.8)	532	87.9	48.5	317 (28.9)

information regarding the visit date or timing. No announcement or public address activity covering the entire area was done. Some mentioned that only a few households that are adjacent to main road were informed. Repeat visit for drug distribution was not made. For some areas, medicines were distributed from outreach camp but that too was in limited areas.

'Fear of side effect' and 'too many tablets'

Next important reason was fear of side effects. Those who received medicines felt symptoms like nausea, dizziness etc., over the period of next few hours. Observing side effects among family members and neighbours few participants even refused to receive the pills. Many of those who received eventually did not consume it. Few participants, who are suffering from chronic ailments like hypertensive and diabetes; or underwent any surgery recently, refused to receive drugs fearing any untoward incident that might arise due to adding more drugs to the regular ones they were consuming. Lactating woman refused fearing side effect

to her new-born. Number of medicines was another factor that made them apprehensive. 'Too many tablets to consume' was a common response. One of the responded elaborated:

"The health staff handed over to me total 23 tablets (for the entire family). I was confused. Did not understand how many too take…and that too at the same time. What would happen if anything (side effect) occurred? That was why we did not consume"

This statement also uncovered the obvious consequence of handing over medicines for the entire family to one member. All of the participants mentioned that loose tablets were wrapped in ordinary paper and were distributed for beneficiaries absent during the visit as well as those who declined supervised consumption due to reasons like empty stomach; have to go out immediately etc., The wrappers did not have any label or instruction. As a result many got confused later on. Many of them forgot to take medicines too.

Lack of perceived need

Not realizing the need of such programme was another aspect stated by nearly one third of the respondents.

"I do not have any problem, why should I take"

It was also reported that health workers, in most of the cases, did not explain well the reason why should one take those medicines. They only told that such a programme is going on in their area therefore one must comply with this. One of the participants stated that his family members were forced to take medicine. Misconceptions were not addressed too.

Table 2: Household level service delivery parameters

Variables	Number (%)
Informed about the MDA drive before visit (*n*=240)	67 (27.9)
Predominant source of information (*n*=67)	
Health workers	41 (61.2)
Neighbour	14 (20.9)
Media	12 (17.9)
Home visit made (*n*=240)	212 (88.3)
IEC materials shown during visit (*n*=212)	109 (51.4)
Asked to consume medicine in front of provider (*n*=212)	131 (61.8)
Information regarding adverse effects provided	101 (47.6)
Height measurement done [for Ivermectin]	107 (50.5)

Table 3: Bivariate and Multi-variable analysis for factors associated with non-consumption: (*n*=1096)

Factors	Total participants	Non-consumption Number (%)	OR (95% CI)	AOR (95% CI)
Age (years):				
2-5	54 (04.9)	36 (66.7)	3.21 (1.67-6.19)*	2.71 (1.2-6.1)*
6-14	146 (13.3)	56 (38.4)	Ref	Ref
≥15	896 (81.8)	472 (52.7)	1.79 (1.25-2.56)*	1.59 (0.94-2.69)
Sex				
Male	564 (51.5)	310 (55.0)	1.34 (1.05-1.69)*	1.35 (1.02-1.78)*
Female	532 (48.5)	254 (47.7)	Ref	Ref
Caste				
UR	220 (20.1)	129 (58.6)	1.51 (1.04-2.19)*	1.42 (0.97-2.09)
OBC	647 (59.0)	324 (50.1)	1.07 (0.79-1.44)	1.06 (0.78-1.45)
SC & ST	229 (20.9)	111 (48.5)	Ref	Ref
Educational status				
Secondary and above	367 (33.5)	204 (55.6)	1.38 (1.05-1.82)*	1.26 (0.94-1.69)
Primary	459 (41.9)	218 (47.5)	Ref	Ref
Below primary	270 (24.6)	142 (52.6)	1.23 (0.96-1.66)	1.17 (0.84-1.63)
Occupation				
Engaged in gainful profession	424 (38.7)	231 (54.5)	1.44 (1.06-1.95)*	1.08 (0.69-1.68)
Homemakers/at home/unemployed	390 (35.6)	205 (52.6)	1.33 (0.98-1.81)	1.06 (0.71-1.58)
Students	282 (25.7)	128 (45.4)	Ref	Ref
Socio-economic Class				
APL	783 (71.4)	412 (52.6)	1.19 (0.91-1.56)	1.13 (0.86-1.49)
BPL	313 (28.6)	152 (48.6)	Ref	Ref

*Statistically significant

"Just see there is a man (in the neighbourhood) who has Hathirog (Elephantiasis). He took medicine last year. Did that help him?

Some of them stated that they do not take any medicine unless advised by the doctor they usually visit. One homemaker told,

"I took myself but did not give to my children. I never give my children any medicine without doctor's permission. If anything happened nobody will take responsibility and I will be scolded by my family members"

Another woman stated,

"My doctor did not tell us to give the drugs (MD for filariasis) to my kid. Had it been so important, he must have informed us"

Miscellaneous

Lack of trust on drugs supplied by government was mentioned. The belief that freely available medicines are of substandard quality was underpinned.

Choosing not to consume medicines based on personal judgement was found too. Young members usually don't like to take any medicine, expressed by the head of the household. Two participants who had some connection with health sector (one pharmacist and one staff nurse) stated that they knew what was right for their family therefore decided not to consume the medicines.

Discussion

MDA aims at interrupting the MF transmission and eliminating disease from India through high coverage (>85%). The present study revealed that distribution and consumption coverage among study population were 55.2% and 48.5% respectively, supervised consumption being 28.9%; which were much below than desired. Similar finding was obtained by Jadhao *et al*.[12] in a recent community based study at Kamptee area of Nagpur city, where distribution and consumption coverage were 57.32% and 50.31% respectively. Parande *et al*. observed coverage of MDA as low as 23% in slum areas of Solapur district of Mahatashtra.[13] Other researchers from Karnataka, Madhya Pradesh and West Bengal also reported the coverage below the required level.[14-16] Trend analysis of MDA coverage showed a decline from 80.3% to 77% in the 5 year time interval.[17] Probable reason behind low coverage in present study was that in urban slum setting, dense population with difficult to reach pockets impeded effective communication between providers and beneficiaries. A study from Odisha reported coverage of 48.8% and 77.8% from urban and rural areas, respectively.[18] MDA compliance was found to be 87.9% in our study. Few other recent studies across India revealed varied compliance of MDA ranging from 75.5% to 87.7%.[12,13,15,16] Coverage compliance gap (CCG), the proportion of people who did not consume the drug among whom drug was distributed, was 12.1% in present study; which is in line with that observed by Jadhao *et al*. (12.23%)[12] and Kumar *et al*. (12.2%)[19] in similar settings.

According to the existing guidelines, drug distributors should revisit the households where one or more beneficiaries were absent during first visit, based on a timing suitable to the participant.[20] This activity was found to be neglected, which can explain poor drug distribution.

We attempted to capture the factors responsible for non-consumption through quantitative as well as qualitative approaches that revealed corroborative findings. The adjusted analysis showed male sex and younger age (2-5 years) were significant determinants of non-consumption. It was experienced that usually males were engaged in gainful profession and therefore stays outdoor, and thus they were not encountered by the drug distributers. Secondly, for the younger children, caregivers were apprehensive of adverse reaction and chosen not to give medicines. On the other hand, children aged 6-14 years were predominately students and some of them got drug from schools, thereby increasing proportion of consumption among them. In-depth interviews of non-compliant individuals revealed issues pertaining to both programme implementation (no repeat visit to households left, no public address activities) and personal (fear of side effects, especially seeing number of tablets; non-realisation of need and lack of trust on free-of-cost drugs) factors. Similar result was also obtained by Nujum *et al*. in Kerala who pointed out factors such as non-acceptance of drug providers (trusting on drugs prescribed by doctors only), fear of side effects as important reasons behind non-compliance.[21]

Conclusion

The result of this study entails for more urban specific drug delivery strategies like scheduling the home visits as per convenience of the majority of beneficiaries. In addition to schools, drug distribution at workplaces and arranging outreach booths can be such strategies which will also ensure supervised consumption. Combination of house-to-house and static point medicines distribution has been suggested elsewhere.[22] Monitoring system should be strengthened with emphasis on ensuring revisit by health personnel to those household where one or more members were absent during 1st visit. Less attention was given on pre-campaign IEC. Coordinated widespread awareness programme involving community members should be undertaken. Drugs should preferably be distributed in blister packs to increase acceptance.

This is one of the few studies which assessed the coverage evaluation after the inclusion of Ivermectin in the MDA. This is the first study which documents MDA coverage being administered through urban ASHAs in current settings. Use of qualitative method helped to have an in-depth understanding of beneficiaries' perspective of non-consumption, which is of utmost importance for successful implementation of this campaign. However, the findings of the study should be generalized with caution, as only slum area of Nagpur city was covered here. Healthcare providers' perspective of non-consumption was not taken into consideration, which could

have contributed for documenting the health system related barriers.

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Conflicts of interest

There are no conflicts of interest.

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