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Research Article

Post-MDA assessment for filariasis in urban and rural areas of Balasore District, Odisha

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I N F O

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A B S T R A C T

Background: Lymphatic filariasis (LF), an illness caused by *Wuchereria bancrofti* and *Brugia malayi*, is a significant health and socio-economic challenge, particularly in under-resourced countries. The illness induces chronic diseases such as lymphoedema and elephantiasis, significantly impairing patients' quality of life. The research evaluates the reach and efficacy of the Mass Medication Administration (MDA) programme in Balasore district, Odisha, in assessing medication intake and adherence rates.

Materials & Methods: An analytical cross-sectional study was conducted in Balasore district from March to April 2023. A multistage selection method selected 300 families (100 urban and 200 rural) for a door-to-door survey utilising a structured questionnaire. Key metrics such as medication coverage, effective coverage, and compliance were assessed. Statistical analysis was conducted with SPSS version 21.

Results: The MDA program achieved a total medication coverage of 93.6%, above the WHO-recommended threshold of 80%. Urban coverage was 97.4%, while rural coverage was 98.6%. The effective coverage was 92%, while the effective monitored coverage was 68.28%. Non-consumption resulted from apprehension regarding medicines (32.5%) and the perception of non-infection (25%). Minor adverse effects were observed in 6.2% of the subjects. Conclusions: The MDA campaign in Balasore district exhibited elevated medication coverage and efficacy, surpassing international benchmarks. Myths around non-consumption, notwithstanding progress, necessitate additional community education to ensure the continuing elimination of LF.

Keywords: Compliance, Effective coverage, Lymphatic filariasis, Mass drug administration, Drug coverage, Supervised coverage

Introduction

Lymphatic filariasis (LF), often known as elephantiasis, is a devastating parasite illness that poses a considerable worldwide public health and socio-economic challenge, especially in poor and resource-constrained nations.[1] The condition is induced by an infection with nematode worms that predominantly reside in the subcutaneous tissues and lymphatic system of the human host. Eight species of filarial worms may infect people, with *Wuchereria bancrofti, Brugia malayi, Onchocerca volvulus,* and *Loa loa* being the principal causal agents of the most severe illness manifestations.[2] Parasitic diseases are primarily transmitted by the bite of infected mosquitoes, allowing larvae to enter the human body and migrate to the lymphatic system, where they mature into adult worms. Adult worms can inhabit the lymphatic arteries or lymph nodes for several years, resulting in chronic and increasing damage over time.

LF is frequently classified as a chronic illness owing to the enduring nature of its symptoms.[3] Although certain individuals may not display explicit symptoms of sickness, the condition can result in several clinical presentations, including silent microfilaremia, hydrocele, acute adenolymphangitis, and chronic lymphatic disease. In certain instances, the condition may induce significant inflammation of the male reproductive organs, resulting in consequences such as orchitis, funiculitis, and epididymitis. As the condition advances, it may cause lymphatic damage resulting in lymphoedema, or fluid retention, which can become permanent if ignored, significantly hindering physical performance. Chronic lymphatic obstruction can result in severe deformity, exemplified by the distinctive swelling of the limbs or genitals, a disorder referred to as elephantiasis.[4]

LF constitutes not just a physical ailment but also a considerable cause of enduring impairment globally. The condition impacts not only the physical health of individuals but also results in significant social, emotional, and economic difficulties. Individuals afflicted with LF frequently encounter social stigma, isolation, and prejudice because of the disease's conspicuous and disfiguring characteristics.[5] This may lead to a cycle of poverty and marginalization, since individuals could be unable to work or engage in social activities, worsening their situation. The emotional burden of living with LF frequently results in mental health disorders, including depression and anxiety, rendering it a multifaceted public health challenge that needs holistic approaches to both manage the disease and mitigate its wider social and economic repercussions. The research evaluates the reach and efficacy of the Mass drug Administration (MDA) programme in Balasore district, Odisha, in assessing medication intake and adherence rates.

Materials and Methods

Study Design

The study follows an analytical cross-sectional design, aiming to assess the coverage and effectiveness of the MDA (Mass Drug Administration) campaign in Balasore district, Odisha.

Study Period

The data collection took place over a period of one month, specifically from March to April 2023.

Study Area

This study was conducted in the Balasore district of Odisha, which covers a total population of 2,317,419 over an area of 3,806 sq. km. The district is geographically situated between 20.48 and 21.59 degrees North Latitude and 86.16 and 87.29 degrees East Longitude. It comprises 3049 villages, 12 tehsils, 3 municipalities, and 2 NACs. MDA activities in the district were conducted between the 10th and 19th of February 2023, with drug coverage reported by district authorities.

Inclusion criteria: People giving consent to participate

Exclusion Criteria: Children less than 2 years, pregnant women and seriously ill individuals were not eligible to participate. Households refusing to participate or having any chronic illness or mentally illness were excluded from the study.

ıple size was calculated

$$n = \frac{[Z(1-\alpha/2)]^2 \times p \times q}{d^2}$$

where p=0.92 (drug coverage from the 2021 study in Balasore),

q = (1-p) = 0.08

With these values, the estimated sample size was 268, which was adjusted for a non-response rate of 10%, leading to a total sample size of 300 households.

Sampling Method: A multistage sampling method was employed to select households from both urban and rural areas:

- **Urban Area:** Two wards were chosen, with 50 households surveyed from each ward, totaling 100 urban households.

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- **Rural Area:** Two rural blocks were randomly selected. Two sub-centres in each block were chosen, and five villages per sub-centre were selected. In each village, 10 households were surveyed, yielding 200 rural households.
- **Total Sample:** 300 households (100 from urban and 200 from rural areas).

Data Collection Method

A questionnaire was developed to gather detailed information on family demographics, MDA drug distribution, consumption rates, reasons for non-consumption, and sources of information regarding MDA. The instrument was designed in both Odia and English and validated by public health experts and language professionals at the Community Medicine Department, FM Medical College & Hospital, Balasore. A door-to-door survey was conducted by a team comprising five members, including faculty and senior residents from the Community Medicine Department, FMMCH, Balasore. The purpose of the study was explained to the head of household (HOH) or any responsible adult member. Verbal consent was obtained from each member participating in the study.

Statistical Analysis: The collected data was coded, entered into a Microsoft Excel sheet and analysed using Epi nfo software version 7.2.6.0. Data was interpreted as frequencies and percentages. The association was tested by the chi-square test and f-test, wherever applicable. A p-value less than 0.05 was considered as statistically significant.

Ethical considerations

The Institutional Ethics Committee clearance was obtained, and the study was conducted as per Indian Council of Medical Research (ICMR) ethical guidelines for conducting biomedical research. Written informed consent was obtained from all the study participants after explaining to them about the purpose of the study. Confidentiality was maintained throughout the study. They were explained prior that they can skip any of the questions they are not interested in answering.

Results

This study demonstrates that the MDA program in Balasore district had significant success in coverage, with drug coverage substantially exceeding WHO criteria. Despite the high coverage rates, the research recognized challenges such as medication fear and misunderstandings about the condition as areas necessitating ongoing community outreach and education to improve the programme's success. Out of the total 1,363, 692 (50.8%) are male and 671 (49.2%) are female. Out of the male population, 161 (23.2%) are below 15 years, and 531 (76.8%) are above 15 years. Likewise, out of the female population, 117 (17.4%) are below 15 years, and 554 (82.6%) are above 15 years. Together, 278 individuals (20.3%) are below 15 years, and the rest, 1,085 individuals (79.7%), are above 15 years. Figure 1 shows that there is a greater percentage of the population above 15 years, with a slightly higher of adult females than males.

Figure 2 illustrates the age-specific MDA coverage in different blocks and urban areas. The highest drug coverage among the under-15 years population was in Bhograi at 96.70%, followed by Jaleswar NAC at 92.10% and Baliapal at 90.00%, with an average of 94.90% among the under-15 years population. Among the population of more than 15 years, Bhograi recorded the highest coverage of 98.60%, followed by Baliapal at 98.20% and Jaleswar NAC at 97.40%, with an average of 98.10%. This suggests high MDA coverage in all the areas, with a slightly higher coverage among the adult population compared to the under-15 population.

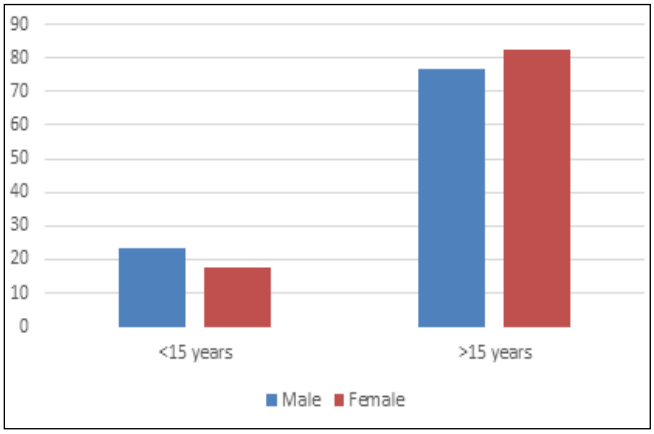

Figure 1.Age and Gender Distribution of the Eligible Population

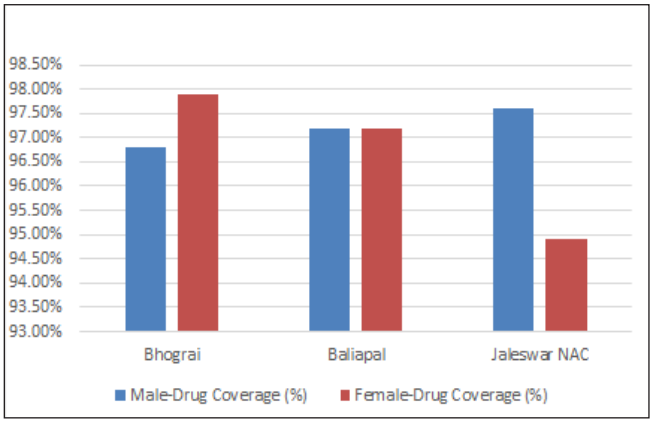

Figure 2.Gender-wise MDA Coverage

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Table 1 depicts gender-specific drug coverage by blocks and urban areas. In Bhograi, drug coverage was 96.80% (216 out of 223 males) and a little higher among females at 97.90% (235 out of 240 females). In Baliapal, drug coverage was the same among males and females at 97.20%, with 250 out of 257 males and 247 out of 254 females on the drugs. In Jaleswar NAC, drug coverage among males was 97.60% (207 out of 212 males), and among females was lower at 94.90% (168 out of 177 females). Overall drug coverage was higher among males at 97.20% and lower among females at 96.80%.

Table 2 shows the drug received and drug coverage in various blocks and urban areas. In Bhograi, 98.50% (490 out of 497) of the eligible took the drug, and 97.50% (485 out of 497) consumed it. In Baliapal, the drug received percentage was 99.40% (519 out of 522), and drug consumption percentage was 96.90% (506 out of 522). In Jaleswar Urban, 98.80% (340 out of 344) took the drug, and 96.50% (332 out of 344) consumed it. Overall, 98.90% of the total eligible population (1,349 out of 1,363) took the drug, and 97.00% (1,323 out of 1,363) consumed it. It shows high drug coverage and drug consumption percentages in all areas, and Baliapal has the highest drug receipt percentage and Bhograi has the highest drug consumption percentage.

Table 3 shows the epidemiological drug coverage and effective supervised coverage across various blocks and urban areas. In Bhograi, drug coverage was 90.40% (485 out of 536), and 68.40% of the population had consumed the drug prior to the availability of a drug distributor (DD), reflecting effective supervised coverage. In Baliapal, drug coverage was 93.80% (506 out of 539), with 75.50% having consumed the drug under supervision. Jaleswar Urban had drug coverage at 93.50% (332 out of 355), with 67.60% having consumed the drug prior to the availability of a DD. Overall, 92.50% of the total population (1,323 out of 1,430) had been covered with the drug, and 70.90% of the population had consumed the drug under supervision. This reflects relatively high drug coverage and supervised consumption, with Baliapal reflecting the highest effective supervised coverage.

Table 4 shows that 1,363 individuals administered the medicine across three locations—Bhograi, Baliapal, and Jaleswar (Urban)—with 42 reporting adverse effects, resulting in an overall side effect rate of 3.08%. Bhograi had the lowest percentage of individuals having adverse effects at 2%, closely followed by Baliapal at 2.4%. The highest proportion was recorded in Jaleswar (Urban) at 3.6%. This suggests that the incidence of side effects marginally improved from rural areas (Bhograi and Baliapal) to urban areas (Jaleswar), indicating a potential variation in the prevalence of side effects based on geography or other regional characteristics.

Table 5 illustrates the association among several demographic characteristics (rural/urban location, age, and gender) and medication coverage and adherence. It was noted that there was no statistically significant link between medication coverage and either rural/urban status or gender, with p-values of 0.481 for urban versus rural and 0.674 for gender. Age has shown a strong link with drug coverage, as individuals under 15 years had a greater prevalence of non-consumption ($p < 0.05$). Compliance with medication had a strong link with geographic location, revealing higher adherence in rural regions compared to urban areas ($p < 0.05$). Conversely, neither age nor gender showed a significant effect on compliance, evidenced by a p-value of 0.737 for age and 0.349 for gender. The data indicate that age and rural/urban location influence medication coverage and compliance; however, gender does not affect these factors.

Table 1.Gender-wise Drug Coverage

Block/Urban Area	Male			Female		
	Eligible Population	Drug Consumed	Drug Coverage (%)	Eligible Population	Drug Consumed	Drug Coverage (%)
Bhograi	223	216	96.80%	240	235	97.90%
Baliapal	257	250	97.20%	254	247	97.20%
Jaleswar NAC	212	207	97.60%	177	168	94.90%
Total	692	673	97.20%	671	650	96.80%

Table 2.Block/Urban Area Wise Drug Received and Drug Coverage

Block/Urban Area	Eligible Population (A)	Drug Received (B)	Population Received in % (B/A%)	Drug Consumed (C)	Drug Coverage (C/A%)
Bhograi	497	490	98.50%	485	97.50%
Baliapal	522	519	99.40%	506	96.90%

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Jaleswar Urban	344	340	98.80%	332	96.50%
Total	1363	1349	98.90%	1323	97.00%

Table 3.Block/Urban Area Wise Epidemiological Drug Coverage and Effective Supervised Coverage

Block/Urban Area	Eligible Population (A)	Drug Consumed (C)	Drug Coverage (C/A%)	Drug Consumed Before DD (D)	Effective Supervised Coverage (D/A%)
Bhograi	536	485	90.40%	367	68.40%
Baliapal	539	506	93.80%	407	75.50%
Jaleswar Urban	355	332	93.50%	240	67.60%
Total	1430	1323	92.50%	1014	70.90%

Table 4.Area Wise Side effect reported by people

Block/Urban	No. of Persons that Consumed Drug	No. of Persons Having Side Effects	Percentage of Individuals Reporting Side Effects (%)
Bhograi	497	10	2
Baliapal	522	13	2.4
Jaleswar (Urban)	344	19	3.6
Total	1363	42	3.08

Table 5.Association of variables with Drug Coverage and Compliance to Drugs

Category	Subcategory	Consumed Drug (N)	Didn't Consume Drug (N)	Test Statistics	p-value
Drug Coverage	Rural	991	28	$\chi^2 = 0.49$, df = 1	p = 0.481
	Urban	332	12		
	Age < 15 years	258	20	$\chi^2 = 22.2$, df = 1	p < 0.05
	Age ≥ 15 years	1065	20		
	Male	673	19	$\chi^2 = 0.17$, df = 1	p = 0.674
	Female	650	21		
Compliance to Drugs	Rural	991	10	$\chi^2 = 30.8$, df = 1	p < 0.05
	Urban	332	22		
	Age < 15 years	258	7	$\chi^2 = 0.11$, df = 1	p = 0.737
	Age ≥ 15 years	1065	25		
	Male	673	19	$\chi^2 = 0.90$, df = 1	p = 0.349
	Female	650	13		

Discussion

The post-MDA evaluation performed in Balasore district during the 2022-23 cycle by the Department of Community Medicine at FM Medical College on March 30th and 31st, 2023, provides valuable data on the efficacy of the MDA (Mass Drug Administration) program in the state. Drug coverage is a critical metric for assessing the efficacy of the MDA programme, and our present analysis revealed it to be 93.6%, far exceeding the 80% threshold deemed sufficient. The elevated medication coverage seen in the present research aligns with the findings of Satapathy et al., (2016) in the Jharsuguda district of Odisha, which reported a coverage rate of 93.55%, therefore affirming the consistency of effective drug delivery within the state.[6] However, Marathe et al., (2010) observed a discrepancy, with drug coverage reaching 78.84% in the Chhatrapur area of Madhya Pradesh.[7] Fred Kleinsinger's research (2018) highlighted numerous potential barriers to drug adherence in the community, emphasizing that patient-related barriers must be effectively addressed to achieve optimal treatment coverage.[8] Their study emphasized that treating physicians are largely unaware of this issue and that doctors at the community level can play a role in educating and motivating patients.

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Drug coverage was shown to be highly equivalent in both rural (98.6%) and urban (97.4%) regions in the present investigation. The diminishing urban-rural disparity in medication coverage is attributable to the enhanced involvement of Accredited Social Health Activists (ASHA) within the urban healthcare framework, which has optimised drug distribution efforts in both urban and rural locales.

It is widely accepted that a minimum of 5 cycles of MDA is necessary for effective suppression of filariasis transmission. The WHO and further research corroborate that effective eradication needs consistent rounds of mass drug administration with sufficiently high coverage. Jambulingam et al. (2016) confirmed that the required number of treatment rounds for elimination increased with higher baseline endemicity and decreased treatment coverage.[9] The present study, with an effective coverage of 92%, significantly exceeds this minimum threshold. In comparison, Banerjee et al., (2019) reported a 28.9% effective coverage in urban Nagpur, indicating that achieving greater effective coverage rates remains a struggle in Central India.[10] Proportion of the population that used medications under the oversight of a distributor is a crucial metric for MDA programmes. The coverage compliance gap (CCG), defined as the percentage of persons who did not adhere to their medication regimen, was 2% in the present research. This is quite modest in contrast to the 23.48% disparity reported by Marathe et al., (2010) in Madhya Pradesh, where the CCG identified significant barriers to real medication usage despite coverage.[7]

The primary reasons for the non-consumption of medications in the present study were fear of drugs (32.5%), the perception that recipients were not afflicted by LF (25%), and concerns over drug adverse effects (23%). Gouda P (2007) similarly observed in Bidar, Karnataka, that the predominant causes for non-consumption were worries of negative effects.[11] These observations indicate that misunderstandings must be rectified and the population informed about the safety and necessity of MDA medications.

The current study noted a 6.2% incidence of adverse effects, which were minor, temporary (lasting a few hours), and manageable at home through rest and oral rehydration solutions (ORS). The incidence is comparatively lower than the 4.4% reported by Marathe et al. (2010) in Madhya Pradesh, suggesting that the adverse effects of the MDA medicines in Balasore did not significantly hinder programme success.[7]

The Balasore district exhibited substantial coverage and monitored drug intake; nonetheless, issues of non-consumption stemming from fear and misunderstandings remain prevalent. These issues must be resolved via targeted education and communication to guarantee the sustained effectiveness of the LF eradication campaign in the district.

Conclusion

The post-MDA evaluation in Balasore district for the 2022-23 cycle highlights the notable advancement in the district's Mass Drug Administration (MDA) campaign, with a drug coverage of 93.6%, significantly above the 80% acceptable coverage benchmark. The research revealed outstanding coverage in urban (97.4%) and rural (98.6%) environments, indicating improved medication delivery may be bolstered by the increased involvement of Accredited Social Health Activists (ASHA). The district successfully implemented the MDA programme, achieving an effective coverage of 92%, significantly above the minimal criteria of 65%, along with a high effective supervised coverage of 68.28%. The non-consumption of the medication due to fear and the perception that it is unnecessary highlight the need for increased community education to address misconceptions. These findings underscore the importance of continuous education and monitoring to improve the effectiveness of LF elimination efforts in the region.

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Author's Contribution: Conceptualization, methodology/ design, investigations –TRB; Acquiring Data and data curation- SCD, KCP, AKS, writing original draft-; Data analysis and interpretation- SCD, KCP; Reviewing and editing- BR, Revising the manuscript critically for important intellectual content- TRB, SCD, KCP

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

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