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**Original Research Article**

# Acceptance and determinants of indoor residual spraying in two blocks of Tripura: using LQAS technique

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## ABSTRACT

**Background:** Indoor Residual Spray (IRS) with insecticide (DDT) is one of the most important component of integrated vector management for malaria prevention. Though, NVBDCP targets at least 80% coverage at high risk malaria zone by effective protective measures (eg. IRS) by 2017, but the real coverage is however limited, due to low community acceptance and several other factors. Objectives were to assess the IRS coverage in two blocks of Tripura and to study the factors influencing IRS acceptance.
**Methods:** A cross sectional study was conducted among 600 households of all 30 sub centres of two blocks of Sepahijala district of Tripura 2015 to 2017 using LQAS technique. Head of the families were interviewed to collect information regarding IRS. Data analysis was done in SPSS 20.0. Statistical analysis used Chi square test was applied to assess the association between different variables. P-value (<0.05) was considered as statistically significant.
**Results:** IRS coverage and acceptance were 61.7% and 75.05% respectively. The factors influencing IRS acceptance were Age of the Head of the family p 0.015, Religion p 0.011, Education p 0.04, Occupation p 0.018, type of Community p.0.000, House type p 0.000, By LQAS analysis, 9 out of 30 lots were accepted for having target coverage of IRS (80%).
**Conclusions:** IRS coverage was lower than the NVBDCP target of 80 % coverage. Sound programmatic management strategy along with IEC, BCC is needed to scale up the coverage.

**Keywords:** Indoor residual spray, LQAS, Malaria

## INTRODUCTION

Integrated Vector Management with Indoor Residual Spray (IRS) is an important strategy for malaria control in India under National Vector Borne Disease Control Programme (NVBDCP) with a target of at least 80% coverage in high risk areas.[1] NVBDCP has suggested LQAS surveys to be carried out in high-risk district to track IRS coverage at health institution level.[2-6]

The North-Eastern state Tripura being endemic for malaria, control measures like IRS are of utmost importance. But the acceptance has been limited over the years and there is least information on the factors responsible for it. Hence, the present study was conducted to assess the IRS coverage and the factors affecting the acceptence in two blocks of Sepahijala district, Tripura, so that future strategies can be formulated for up scaling the coverage of IRS.

## METHODS

This cross sectional study was conducted in 2 high risk endemic blocks namely Kathalia and Mohanbhog Rural Development Block and Sepahijala district, Tripura from November 2015 to October 2017. All the 30 subcentres

under 2 blocks were selected in the study and LQAS (Lot Quality Assurance Sampling) technique was applied for sampling purpose.

Each sub centre (Health care delivery unit) was considered as a LOT for sampling purpose. As per NVBDCP the district authority aims at covering 80% of the houses with IRS in high risk areas (upper threshold).[1] Sample size was calculated with the hypothesis for sample size estimates using LQAS technique that the proportion of houses covered was at least 50% (Lower threshold) or more, at the 5% level of significance. Thus the number of households in each lot was calculated to be 20 using the formula.[2]

$N=[Z_{1-\alpha}\sqrt{PoQo}+Z_{1-\beta}\sqrt{PaQa}]^2\div[Po-Pa]^2$ at $Z_{1-\alpha}=1.645$ and $Z_{1-\beta}=1.282$

The decision value d was calculated to be 6 ($d=nPo-Z1-\alpha\sqrt{NPoQo}$), if more than 6 houses were found without IRS coverage in any lot, that lot will be rejected or considered underperforming from target coverage point. The calculated 20 houses from each lot were selected by simple random sampling from the registers available in Panchayet. Proportion of houses with IRS coverage was calculated amongst the all 600 houses. Acceptance of IRS was calculated as the proportion of houses allowing it among the houses where, IRS team visited. IRS rejection was estimated as the proportion of houses not allowing IRS workers in spite of visit.

Calculation of estimated lot coverage of IRS was performed by multiplying weight of each lot (lot population/total target population of all lots) with proportion of house hold covered (number of houses having protective measures / lot sample size, ie 20) by IRS for that lot.

Standard Error of weighted coverage of $IRS=1.96x\sqrt{\Sigma\{(WtxWt)xPQ/N\}}$

(Where, P=Proportion of houses with IRS coverage in lot,N=20 (Lot size) Q=1-P,Wt=Weightage factor (population of the lot/Total population of the 2 blocks))

Families residing in the study area for more than one year were included in the study. After obtaining informed written consent, head of the family of each selected household was interviewed using a the schedule to collect information regarding individual and socio-demographic characteristics of the household, knowledge and behaviour regarding prevention of malaria with respect to IRS and presence of IRS coverage were physically verified during home visit. Data analysis was done in SPSS Version 20.0. Chi square test was applied to assess the association between different variables. P-value(<0.05) was considered as statistically significant. The study was approved by the Institutional Ethics Committee, AGMC, Agartala, Tripura Ref. No. F.4 (5-192)/AGMC/Academic/IRC and IEC Meeting/2015 dated:-16th October 2015.

## RESULTS

The study was conducted among 600 households in the study area. Mean age of the study respondents (Head of the family) was found to be 49.02±12.164 SD years.

**Table 1: Socio demographic profile of the study participants**

| Socio demographic variables | | Frequency (N) | % |
|---|---|---|---|
| **Gender of the head of family** | Male | 553 | 92.2 |
| | Female | 47 | 7.8 |
| **Age (Years)** | <20 | 4 | 0.7 |
| | 21-40 | 172 | 28.7 |
| | 41-60 | 340 | 56.7 |
| | 61-80 | 79 | 13.2 |
| | >81 | 5 | 0.8 |
| **Religion** | Hindu | 406 | 67.7 |
| | Muslim | 194 | 32.3 |
| **Community** | General | 260 | 43.3 |
| | ST | 258 | 43 |
| | SC | 55 | 9.2 |
| | OBC | 27 | 4.5 |
| **Education** | Illiterate | 222 | 37 |
| | Saakshar | 104 | 17.3 |
| | Primary education | 154 | 25.7 |
| | Secondary education | 109 | 18.2 |
| | Higher secondary | 7 | 1.2 |
| | Graduate and above | 4 | 0.7 |
| | Unemployed | 58 | 9.7 |
| | Unskilled worker | 190 | 31.7 |
| | Skilled worker | 24 | 4 |
| **Occupation** | Farmer | 217 | 36.2 |
| | Jhum cultivator | 10 | 1.7 |
| | Business man | 55 | 9.2 |
| | Service | 46 | 7.7 |
| **Type of family** | Nuclear | 329 | 54.8 |
| | Joint | 271 | 45.2 |
| **Socio-economic status (Modified BG Prasad Scale)** | Class I Upper | 2 | 0.3 |
| | Class II Upper middle | 56 | 9.3 |
| | Class III: Middle | 132 | 22 |
| | Class IV: Lower Middle | 235 | 39.2 |
| | Class V: Lower | 175 | 29.2 |
| **Type of House** | Semi pakka | 102 | 17 |
| | Pakka | 8 | 1.3 |
| | Kaccha | 490 | 81.7 |

**Table 2: Distribution of the rooms where IRS was done.**

| Distribution of the rooms | | Frequency (N) | % |
|---|---|---|---|
| **IRS coverage** | IRS activity performed | 370 | 61.67 |
| | IRS Not done as workers were not allowed by the family | 123 | 20.5 |
| | IRS not performed as workers did not visit | 107 | 17.83 |
| **IRS acceptance (among the houses visited by workers) N=493** | | 370 | 75.05 |
| **Households where IRS activity was performed** | Living room only | 96 | 25.95 |
| | Cattle shade only | 68 | 18.38 |
| | Living room and kitchen | 150 | 40.54 |
| | Living room and cattle shade | 22 | 5.95 |
| | Living room ,kitchen and cattle shade | 31 | 8.38 |
| | Only around the house, number of rooms | 3 | 0.8 |

**Table 3: Factors influencing IRS acceptance among study population.**

| Socio demographic factors | | IRS acceptance | | Significance (P value) |
|---|---|---|---|---|
| | | Yes N (%) | No N (%) | |
| **Age of the study participants (Years)** | Up to 40 years | 104 (78.2) | 29 (21.8) | |
| | 41-60 | 221 (77.0) | 66 (23. ) | 0.015 |
| | 61 and above | 45 (61.64) | 28 (38.36) | |
| **Gender of the study participants** | Male | 344 (75.4) | 112 (24.6) | 0.553 |
| | Female | 26 (70.3) | 11 (29.7) | |
| **Religion** | Hindu | 261 (78.6) | 71 (21.4) | 0.011 |
| | Muslim | 109 (67.7) | 52 (32.3) | |
| **Community** | ST | 17 (88.1) | 24 (11.9) | 0.000 |
| | SC | 28 (58.3) | 20 (52.2) | |
| | OBC | 11 (47.8) | 12 (52.2) | |
| | UR | 153 (69.7) | 67 (30.5) | |
| **Education of the study participants (HOF)** | Illiterate | 138 (77.1) | 41 (22.9) | |
| | Saakshar | 65 (68.4) | 30 (31.6) | 0.016 |
| | Primary education | 89 (69.5) | 39 (30.5) | |
| | Secondary education & above | 78 (85.7) | 13 (14.3) | |
| **Occupation of the HOF** | Unemployed | 38 (65.5) | 20 (34.5) | |
| | Unskilled worker | 110 (74.8) | 37 (25.2) | 0.018 |
| | Skilled worker | 11 (61.1) | 7 (38.9) | |
| | Businessman | 34 (81.0) | 8 (19.9) | |
| | Service holder | 34 (94.4) | 2 (5.6) | |
| | Farmer | 136 (73.3) | 49 (26.5) | |
| | Jhum cultivator | 7 (100) | 0 (0) | |
| **Socio economic class of the family** | Upper | 2 (100) | 0 (0) | |
| | Upper middle | 35 (77.8) | 10 (22.2) | |
| | Middle | 83 (69.7) | 36 (30.3) | 0.147 |
| | Lower middle | 133 (72.3) | 51 (27.7) | |
| | Lower | 117 (81.8) | 26 (18.2) | |
| **Type of the family** | Nuclear | 204 (77.9) | 58 (11.8) | 0.144 |
| | Joint | 166 (33.7) | 65 (28.1) | |
| **Type of house** | Kaccha | 307 (62.7) | 80 (16.2) | |
| | Pakka | 4 (50) | 4 (50) | |
| | Semi pakka | 59 (60.2) | 39 (39.8) | 0.000 |

Majority of the study respondents belonged to the category group of 41 to 60 years (56.7%). Most of them were Hindu (67.7%) by religion, general category (43.3%), farmer (36.2%) by occupation and educated up to primary standard (25.7%). Majority of them were from Lower middle socio economic class (29.2%), nuclear family (54.2%) residing in Kaccha house (81.7%) (Table 1).

The IRS acceptance among the houses where IRS workers visited was 75.05% (370/493). Among the 370 households where IRS activity performed in 299 households living room received IRS either alone or in combination with others followed by 121 houses where IRS performed in cattle shade either alone or in combination. 60.54 % of the living room received IRS in both inner surface and outer surface. 121 houses (32.7%) was coverage of cattle shed. Though as per guidelines cattle shed should not cover under IRS guideline.

Figure 1 is a Pie chart showing the reason non acceptance (N=123) of IRS among the houses where IRS workers visited (N=493). The main reason of refusal was experience of biting by mosquito in spite of IRS (N=42, 34.15%) followed by other reasons like white spot and acrid smell.

In the present study, identified factors that affected or influenced IRS acceptance or the factors with statistically significant association with IRS acceptance were Age of the Head of the family (p=0.015),Religion of the family (p=0.011), Education of the head of the family (p=0.04),Occupation of the head of the family (p=0.018) Community (p=0.000), House type (p=0.000), Frequency of IRS in previous year (p=0.000) (Table 3).

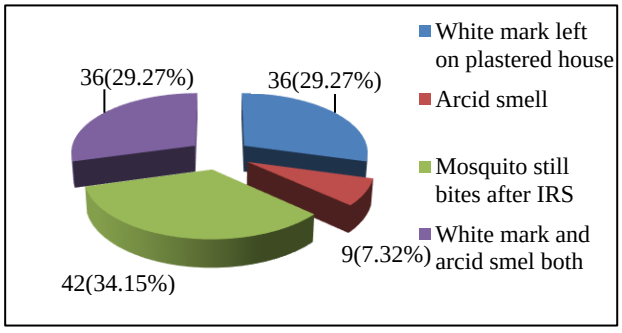


**Figure 1: The reason non acceptance of IRS among the houses where IRS workers visited.**

Assessment of IRS coverage among the study participants using LQAS technique based on the decision rule, d=6 (prefixed criteria according to the lower threshold of coverage IRS 50% for a particular lot which implies that, if in any lot, it is found that number of houses where IRS was performed not exceeds 6, that lot will be rejected) showed that, 9 out of 30 lots (30% of the lots) were accepted as in those lots the number of houses where IRS activity was performed were sufficient to meet the criteria (80% coverage). Out of 600 household, the worker's visited 493 house hold, and 107(18%) household reported not visited by workers. Out of visited 493, only 370(75.05%) allowed to do IRS activity. So overall IRS coverage among the whole study population was 61.7%. The main reason of non coverage was refusal by the family in spite of visit by the workers (20.5%), and IRS workers didn't visit in 17.8% houses for the spray (Table 2).

## DISCUSSION

In the present study out of 600 households, IRS activity was undertaken in 370 houses coverage was 61.7% where as in 20.5% IRS was not allowed and workers did not came for spray in 107 of 17.83% houses. IRS acceptance in the present study was found 75.05%. In a similar study conducted by Ronghangpi et al in Karbi Anglong district of Assam, IRS coverage was 47.81 % which is lower than the present study as well as the target coverage by NVBDCP.[3] In their study 38.75% houses refused IRS which is higher compared to the present study.

The low coverage was due to the similar reason of refusal and unavailability of the IRS workers as found in the present study also. Aderaw et al in their study conducted in Amahara National Regional State ,Ethiopia found that IRS coverage among the study population was 42.7% which is quite lower compared to the present study.[4] Again in a cross sectional study conducted by Sakeni et al in South East Iran revealed that IRS coverage and acceptance were 96.5% and 94%, respectively which is higher than the present study.[5] The wide variation in the coverage and acceptance was due to refusal by head of the family due to bad smell, white spot, and still biting of mosquito which points towards the lack of insecticidal effect or inappropriate spraying and the unavailability of IRS workers which is probably due to the lack of programmatic management. Similar reasons of refusal were also reported by Ronghangpi et al and Mazigo et al in their study in Assam and Rural North East Tanzania.[3,6]

In the present study, identified factors that affected or influenced IRS acceptance were Age of the Head of the family (p=0.015), religion of the family (p=0.011), Education of the head of the family (p=0.016), occupation of the head of the family (p=0.018), community (p=0.000), house type (p=0.000), frequency of IRS in previous year (p=0.000).

A similar study conducted by Sakeni et al in South East Iran identified level of education (p=0.006), Households occupation (p=0.001), house type or building material (p=0.001) as significant influencing factor for IRS acceptance which are also common in the present study.[5]Age of the head of the family (OR 2, 95% CI (1.2-3.5) P=0.001) was identified as a significant influencing factor by Janada in Nigeria ,which is also similar factor in the present study.[7]

The wide variation of the factors influencing the IRS acceptance in the present study and other studies is

possibly due to the different geographical setting, different study design and variables, different demographic profile of the study participants and different delivery mechanism of IRS. Some common identified factors that influenced IRS acceptance were age, education, occupation, house type. As an influencing factor, religion and community probably points towards the cultural attribute for IRS acceptance in the present study.

Though NVBDCP recommended LQAS as an effective monitoring and evaluation tool for service delivery of the vector control measures like IRS, this is the first community based study using LQAS in Tripura which identified poor performing lots (21 out of 30) according to the IRS coverage. No study prior to this was conducted in the state to identify the reasons of as well as factors influencing poor IRS coverage and acceptance.

### *Limitations*

It assessed only a single round IRS coverage. Other components like interviewing IRS workers or district programme managers were also lacking in the present study which might have been revealed other factors also.

## CONCLUSION

In spite of sustained efforts of NVBDCP to achieve 80% coverage by effective vector control measures for peoples living in high risk areas, the IRS coverage in two high risk blocks of Tripura was found to be lower than the target. Majority of the lots or sub centres were under performing from service point of view which is a matter of concern.

### *Recommendations*

The identified factors for poor coverage and poor acceptance need to be addressed in the form of IEC, BCC, or quality control of the operating procedure of programme for better implementation.

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