

**Qualitative Assessment of Indoor Residual Spray During Kala-
Azar Elimination Program**

**Internship Training
at
Care-India Bihar
(Feb. 1-April 30, 2014)**

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TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Vikash Sharma** student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from Institute of Health Management Research, Jaipur has undergone internship training at **Care-India Bihar** from 1st February to 30th April 2014.

The candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical. The internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

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**Certificate of Completion of dissertation for the duration of
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The certificate is awarded to **Dr. Vikash Sharma** in recognition of having successfully completed his dissertation in the department of **Strengthening of Kala-Azar Elimination Project (SKAEP)** and has successfully completed his project on Qualitative assessment of Indoor Residual Spray during Kala-azar elimination program from 1st February to 1st May at Darbhanga district in Bihar

Date -12 May 2014

Organization – Care India Solutions for Sustainable Development- Bihar

He comes across as a committed, sincere and diligent person who has a strong drive and zeal for learning. We wish him all the best for future endeavors

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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled on **Qualitative assessment of Indoor Residual Spray during Kala-azar elimination program** at Darbhanga district in Bihar and submitted by **Dr. Vikash Sharma**, enrollment no. 1398 under the supervision of **Professor Barun Kanjilal** for award of Post Graduate Diploma in Hospital and Health Management of the Institute carried out during the period **from 1st February to 30th April 2014** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, titles in this or any other Institute or other similar Institution of higher learning


Signature

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Abbreviations

<i>ANM</i>	=	<i>Auxiliary Nursing Midwife</i>
<i>AWC</i>	=	<i>Anganwadi Center</i>
<i>AWW</i>	=	<i>Anganwadi Worker</i>
<i>ASHA</i>	=	<i>Accredited Social Health Activist</i>
<i>APHC</i>	=	<i>Additional Primary Health Center</i>
<i>BCC</i>	=	<i>Behavior change communication</i>
<i>CARE</i>	=	<i>Cooperative for assistance and relief everywhere</i>
<i>DDT</i>	=	<i>Dichloro diphenyl trichloro ethane</i>
<i>FRU</i>	=	<i>First Referral Unit</i>
<i>ICDS</i>	=	<i>Integrated Child Development Scheme</i>
<i>IEC</i>	=	<i>Information Education Communication</i>
<i>IRS</i>	=	<i>Indoor Residual Spray</i>
<i>ICs</i>	=	<i>IRS consultants</i>
<i>TSU</i>	=	<i>Technical Support Unit</i>
<i>LWs</i>	=	<i>Link Workers</i>
<i>LHV</i>	=	<i>Lady Health Visitor</i>
<i>MH</i>	=	<i>Maternal Health</i>
<i>MNCHN</i>	=	<i>Maternal Newborn Child Health and Nutrition</i>
<i>MO/IC</i>	=	<i>Medical Officer In-charge</i>
<i>NGO</i>	=	<i>Non-governmental organization</i>
<i>PHC</i>	=	<i>Primary Health Center</i>
<i>RDT</i>	=	<i>Rapid Diagnostic Tests</i>
<i>SKAEP</i>	=	<i>Scale –up of Kala-azar Elimination Project</i>
<i>NVBDCP</i>	=	<i>National Vector Borne Disease Control Program</i>
<i>VL</i>	=	<i>Visceral Leishmaniasis</i>

DISSERTATION REPORT

Executive Summary

BACKGROUND:

In 1953 and 1970, insecticidal DDT spray under national malaria eradication program resulted in marked decline in disease incidence. Resurgence of kala-azar due to withdrawal of IRS in 1970s, initially affected four districts in Bihar. National kala-azar elimination program was started in 1991 by Government of India after finding high incidence of kala-azar cases and deaths due to it. In 2002, a goal for elimination of kala-azar by 2010 was set in national health policy. It was also found effective due to kala-azar case control but it was ignored later on by the Government and could not be maintained furthermore due to weak supervision of spraying squads, delay in release in funds at State to Districts / PHCs level and very poor advocacy for community awareness. In 2005, a tripartite MoU was signed between India, Bangladesh and Nepal for elimination of Kala-azar by 2015. About 80 % disease burden in country is contributed by Bihar. Presently 33 districts in Bihar are endemic. So indoor residual spray is effective strategy to control kala-azar cases in the state. Real implementation of this strategy at ground level, search camps for detecting Kala-azar patients, follow ups of the patients at PHCs level are helpful indicators to eliminate kala-azar from Bihar.

PURPOSE:

The study aims to assess the quality of IRS spray during Kala-azar elimination program and to identify factors affecting the quality of spray at Darbhanga district of Bihar. It will help the Government officials and program manager to implement best strategy for improving spray coverage in most endemic blocks of the district. The study also focuses on the training need of the spraying squads at the field level

METHODS:

The cross-sectional study included 96 DDT spraying squads from 16 blocks of Darbhanga district in February to April 2014 in Bihar. Spraying squads from all kala-azar endemic blocks were assessed based on their DDT spraying technique at household level. Their knowledge and spraying practices were measured on the basis of structured questionnaire method. Assessment was taken from each block of Darbhanga district by gathering information proportionately. The study is undertaken in the mid time of indoor residual spray. Data analysis is done in SPSS.

RESULTS:

Ninety six squad teams were assessed based on semi-structured questionnaire which was encoded at 16 blocks at Darbhanga district of Bihar. According to the standard guidelines of spraying activity, the study identified factors responsible for compromised spray quality which are as follows:

Forty eight percent teams started the spray after 10 am and completed the spray till 5 pm which lead on to less number of coverage of sprayed households. Eight percent squad teams were not found to have all team members. Personal protective equipment were not being used by 84 percent teams which may lead to harmful effect on field teams.

Twenty eight percent teams were working with single stirrup pump while two pumps are required for effective spray. Buckets availability was also found less in 87 percent teams.

Eight percent teams did not have awareness about quantity of DDT to be mixed while making paste and 15 percent of teams did not have information about quantity of water used in a mixture preparation. Seventeen percent squad teams were found practicing more or less than range of 23- 28 strokes per minute and were not aware about correct plunger movement of 10-15 cm in each time. Speed of spray was found more or less

than 10-20 seconds in 57 percent teams. All squad teams were aware about spraying height inside households. Only eighty one percent teams were practicing to maintain the distance of spraying lance about one hand/one and half feet from the wall.

Ninety seven percent teams were making vertical spray swaths and only 64 percent of all squad teams were found practicing successive swaths overlapping of length of middle finger. Thirty two percent teams were not having awareness about breadth of the spray swath.

Conclusion:

Quality of indoor residual spray was found compromised due to following important identified factors:

Insufficient number of team members, PPE equipment, stirrup pumps, buckets, plastic sheets was directly affecting the per day covered households due to involvement of less workforce at field level. Non-awareness among squad teams about uniform distribution, strokes per minute, plunger movement length, width of spray swath, overlapping of successive swaths, speed of spray and height of spray distance.

Approximately 80 to 90 percent squad teams at block level have enough knowledge about DDT mixture preparation, plunger movement distance, spraying lance distance from wall surface and spraying height inside households but teams have partial knowledge about frequency of strokes per minute, speed of spray and breadth of spray swath.

So training of squad teams needs to be done to make indoor residual spray effective to eliminate kala-azar from Darbhanga district of Bihar. Training without effective implementation plans will not result in long term skill retention.

1. Introduction of kala-azar program and its components:

In 1953 and 1970, insecticidal DDT spray under national malaria eradication program resulted in marked decline in disease incidence. Resurgence of kala-azar due to withdrawal of IRS in 1970s, initially affected four districts in Bihar. National kala-azar elimination program was started in 1991 by Government of India after finding high incidence of kala-azar cases and deaths due to it. In 2002, a goal for elimination of kala-azar by 2010 was set in national health policy. It was also found effective due to kala-azar case control but it was ignored later on by the Government and could not be maintained furthermore due to weak supervision of spraying squads, delay in release in funds at State to Districts / PHCs level and very poor advocacy for community awareness. In 2005, a tripartite MoU was signed between India, Bangladesh and Nepal for elimination of Kala-azar by 2015. About 80 % disease burden in country is contributed by Bihar. Presently 33 districts in Bihar are endemic. So indoor residual spray is effective strategy to control kala-azar cases in the state. Real implementation of this strategy at ground level, search camps for detecting Kala-azar patients, follow ups of the patients at PHCs level are helpful indicators to eliminate kala-azar from Bihar.

Sustainable elimination of VL from all blocks of Bihar by 2016 and reduction in the annual incidence of the disease to less than 1 per 10,000 population at the sub district (block) level can be achieved by following components-

- Enhancing the quality of Indoor Residual Spray through improved methods and techniques.
- Detecting all VL and PKDL cases across all villages.
- Ensuring complete cure of all detected cases.
- Building sufficient capacities within the Government machineries to sustain elimination.

Visceral leishmaniasis, popularly known as kala-azar in Indian subcontinent is a vector-borne disease caused by the parasite *Leishmania donovani* and is transmitted by the bite of the infected female sand fly *Phlebotomus argentipes*, which breeds in peridomestic environments and bites at night. In India, KA is mainly confined to the state of Bihar, which accounts for 90% of the country burden. In Bihar, KA remained an important public health problem affecting poor people living in houses suitable for breeding of sand flies.

Indoor residual spraying with DDT is an important component of the kala-azar (visceral leishmaniasis) control strategy in India which is adopted by programme aimed to break the life-cycle of the parasite and hence eliminating the disease. Monitoring of spraying operation is conducted by the staff of respective PHCs, district officials and also by the staffs of National Vector Borne Disease Control Programme (NVBDCP). During monitoring, spraying operation is checked, DDT suspensions are verified, and houses are visited randomly to assess the quality of spray.

Formation of DDT mixture includes three mugs of DDT and same quantity of water which further mixed up to extent that paste become pinkish color and checked by putting it in water. As DDT is insoluble in water so paste needs to be made and then addition of water lead to preparation of mixture.

1.1. Guidelines/Standards to maintain quality of IRS spray:

1.1.1. Spraying activity should be completed from 9.00 am to 4.00 pm each day.

1.1.2. A squad team consists of one superior field worker (SFW) and five field workers (FW) who complete the spray activity in such a way that SFW lead the team of 5 FWs. Out of 5 team members, one worker makes DDT paste by using available personal protective equipment and remaining four FWs divide into sub squads and spray in such a manner that one person handle the pump with bucket and

other go inside houses/rooms/cattle sheds handling spraying equipment.

1.1.3. Personal protective equipment are used while spraying activity which are as follows:

- | | |
|---------------------|----------------------|
| a) Aprons -5 | d) Masks - 5 |
| b) Spectacles – 5 | e) Rubber Gloves - 2 |
| c) Rubber Gloves– 2 | f) Caps - 5 |

Each squad should use these equipment regularly at the spraying time and mixture preparation time. Absence of these supportive equipment can lead to harmful effects to the body.

1.1.4. A single squad team should have two stirrup pumps, four 15 liter buckets, one 10 liter bucket, one standard DDT measuring mug, one water measuring mug, asbestos threads, one straining cloth, one 2*2 and 3*3 plastic sheet, one stencil and one register to make the quality of spray at household level.

1.1.5. Each squad member should have information about making effective DDT mixture i.e. number of mugs of DDT and water are required to make DDT paste by using rubber gloves and plastic sheets.

1.1.6. Spray from nozzles inside houses should be uniformly distributed. Spray swaths should be parallel, vertical and equal to elbow to tip of middle finger plus 4 fingers wide. Standard spray lance distance from wall is about one and half feet (about one hand).

1.1.7. Overlapping of successive swaths should be equal to length of middle finger.

1.1.8. Spraying is done inside the households up to the height of six feet as sand fly can jump up to this height.

1.1.9. 23-28 strokes per minute and 10-15 cm of plunger movement can be applied by the spraying man to make a standard spray fan.

1.1.10. Speed of spray should be of 10-20 seconds it means that time taken to complete

distance from downside to upside and again upside to downside of 6 feet height.

2. Problem Statement:

Kala-azar is a neglected tropical endemic disease in South Asia. Elimination of Kala-azar from India is not possible until qualitative IRS spray and its close monitoring at the field level. Regarding the social acceptability of IRS program, many people refuse to take spray in their houses due to various misconceptions and cultural beliefs. Population of endemic area is at high risk due to presence of vector species in those areas. Pre-IRS activities may lead to good platform for IRS spray but lack of knowledge about the spray and disease lead to high number of refusal cases in endemic areas. Non-availability of equipment or improper use of equipment and inadequate squad training while spraying directly affect the quality of spray. After a gap of more than one decade, entire endemic districts of North Bihar were covered under DDT spraying operation and efforts were also taken to implement the IEC program prior to spraying operation. Declining trend of kala-azar cases in many districts in Bihar including Darbhanga reflects the vital role of IEC and monitoring of IRS spray in the containment of kala-azar. Further, it is suggested to strengthen the IEC activities to sensitize the community due to mass refusals of the community and thorough monitoring of spraying operation is essential to achieve the desired result in stipulated time. Hence, with proper monitoring and training, two rounds of DDT spray with good house coverage in all the endemic districts up to three years and proper treatment of cases are essential for total elimination of kala-azar in Bihar state.

3. Review of Literature :

The following search items were used;

IRS (Indoor Residual Spray), VL (Visceral Leishmaniasis), Sand Fly, *Leishmania donovani* (L.D.), DDT (Dichloro diphenyl trichloro ethane. This broad search enabled the identification of all IRS related articles and data is extracted from them.

Kala-azar is a sand fly transmitted parasitic illness characterized by prolonged fever, splenomegaly, anorexia and wasting. It is considered to be a major neglected tropical disease in South Asia. Use of DDT indoor spraying for vector elimination purpose has been carried out since the resurgence of the disease in the mid-1970s in Bihar state. Belief in the efficacy of this strategy against kala-azar rests largely on the high susceptibility of the vector, *Phlebotomus argentipes*, to DDT as evidenced by tests carried out using the WHO procedure and the transient disappearance of kala-azar cases from India in the antimalarial sprayed houses in the 1950s and the early 1960s. Current vector control programme in India focuses mainly on spraying the sand-flyinfested dwellings with DDT. The objective of any vector control programme is to manipulate the mean level of vector abundance so as to prevent disease outbreak of transmission. Keeping this objective in mind since 1991 spraying of DDT is being conducted in the endemic districts of Bihar. Between 1960 and 1970 kala-azar cases have apparently disappeared due to collateral benefit of DDT spray under National Malaria Eradication Programme, however, after withdrawal of DDT spraying in mid-sixties resulted in building up of vector sandfly population. Since the foci of kala-azar existed, cases started reappearing in early seventies and lead to outbreak of kala-azar in 1970s. So regular spraying of DDT was undertaken. In 1990 kala-azar was declared as a notified

disease. In 1991 two rounds and in 1992 one round of DDT was sprayed in all the endemic districts of Bihar. Since, then DDT spraying was done on focal basis.

4. Research Question:

What is the quality of IRS spray during Kala-azar elimination program in Darbhanga district of Bihar?

5. Objectives:

6.1. General Objective-

- To assess the quality of indoor residual spray during Kala-azar elimination program in Darbhanga district of Bihar

6.2. Specific Objective-

- To identify the factors affecting the quality (implementation) of indoor residual spray during elimination program
- To assess the training needs of the spraying squads for indoor residual spray round

6. Methodology

- **Type of Study** – Descriptive cross sectional

The study is intended to assess the present quality of indoor residual spray by checking available equipment status and assessing knowledge of squad teams about IRS spray by observing sprayed households.

- **Study Period** – 1st February to 1st May 2014
- **Study Area** – Darbhanga district in Bihar
- **Study Unit** – IRS Squads
- **Sample size** – 96

Selection process – Squads would be monitored once during IRS round in the mid time of IRS round (Total Squads in district = 96)

- **Data collection method** – Questionnaire method

7. Sampling: Purposive sampling

IRS squads working under 16 Primary Health Centers were selected in Darbhanga district of Bihar for study which are as follows:

1. ALINAGAR
2. BAHADURPUR
3. BAHERI
4. BENIPUR
5. BIRAU
6. GHANSHYAMPUR
7. HANUMAN NAGAR
8. HAYAGHAT
9. JALLE
10. K. ASTHAN
11. KEOTY
12. KIRAT PUR
13. MANIGACHHI
14. SADAR
15. SATIGHAT
16. SINGHWARA

All spraying squads of 16 blocks are included in study sampling

8. Data collection Methods:

Data is collected through questionnaire method which was filled up in the field while monitoring the squad team members and observations inside sprayed households. Each squad member is visited once during the mean time of IRS spray in Darbhanga district in Bihar. Their knowledge level and practicing method was checked and assessment of quality of spray is done.

9. Analysis and Results:

9.1. Block-wise distribution of spraying squads in the district:

Table 9.1.1 shows percentage distribution of total number of squads in each block. In Darbhanga district 96 spraying squads were involved in IRS spray during kala-azar elimination programme in Bihar. Training of squads was done by kala-azar technical supervisor, malaria inspector and VBD consultant. Care India link workers played a major role in squad training with Government officials. Number of spraying squads is determined by village population of concerned block. Benipur, Jalle, Keoty and Manigacchi blocks have maximum number of spraying squads and contribute more than 40 percent of all squads due to more population of those blocks.

Sr. No.	Blocks Name	Number of Squads	Percent
1.	ALINAGAR	5	5.2
2.	BAHADURPUR	6	6.2
3.	BAHERI	8	8.3
4.	BENIPUR	11	11.5
5.	BIRAU	8	8.3
6.	GHANSHYAMPUR	1	1.0
7.	H. NAGAR	3	3.1
8.	HAYAGHAT	5	5.2
9.	JALLE	11	11.5
10.	K. ASTHAN	3	3.1
11.	KEOTY	10	10.4

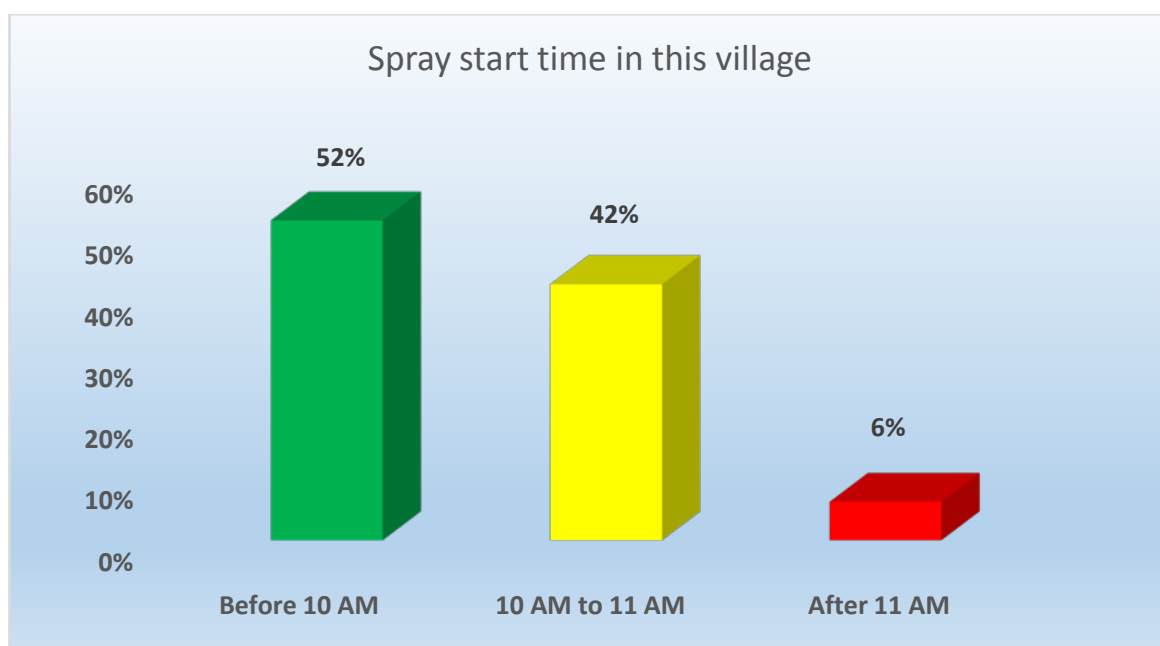
12.	KIRAT PUR	6	6.2
13.	MANIGACHHI	9	9.4
14.	SADAR	2	2.1
15.	SATIGHAT	3	3.1
16.	SINGHWARA	5	5.2
	Total	96	100.0

Table9.1.1. Number of spraying squads working at the field level

9.2. Spray starting time by squads:

Figure 9.2.1 represents presence of field level squads at a specific point of time in percentage. After monitoring 96 spraying squads, it was found that spraying squads started IRS activity before 10 am in 52 percent cases while 42 percent of spray squads started it during the period of 10 am to 11 am. There were only six percent squads who started spray after 11 am. Forty eight percent squads were coming on time. Figure 1 includes color coding with green, yellow and red. Green represents normal timing of squads and rest colors are showing deviation from normal timings.

Figure 9.2.1. Spray start time by squad teams



9.3. Status of Manpower at the field level in squad teams:

As shown in Table 9.3.2, out of 96 spray teams, 92 percent teams have all the workers at the field level. On the other hand, there were 3 field workers and 1 superior field worker in 3 percent teams. Five percent of squads did not have any supervisor but have 4 field workers. In short, field teams were not found complete in 8 percent of teams.

Spray team members presence in the Squad			
Sr. No.	Squad Members	Frequency	Percent
1	5FW and 1SFW	88	91.7
2	4FW and 0 SFW	5	5.2
3	3FW and 1 SFW	3	3.1
	Total	96	100.0

Table 9.3.2. Spray team members in the field

9.4. PPE Usage by spray teams:

Personal protective equipment includes Apron (A), Specs (S), Gloves (G), Masks (M), Rubber Shoes ® and Caps (C) which protect the squad team members from harmful effect of DDT. Usage of personal protective equipment (PPE) by the spraying squad was done only 15 percent at the field level as shown in Table 9.4.3. Eighty four percent teams used nothing for protection purpose while only 1 percent showed usage of half of the equipment. Most of the teams (85%) were not in the habit of using PPE.

Sr. No.	PPE	Frequency	Percent
1	A+S+G+M+R+C	14	14.6
2	G+M+R	1	1.0
3	None	81	84.4
	Total	96	100.0

Table 9.4.3. Percentage of squads using personal protective Equipment (PPE)-

9.5. Availability of stirrup pumps with squad teams:

There were 72 percent of teams who used two stirrup pumps during spraying activity as shown in table 5 while 28 percent squads showed usage of only one stirrup pump at field level. Normally two stirrup pumps per squad is required to maintain quality and coverage of IRS spray in households. Table 9.5.4 also represents percentage distribution of stirrup pumps users. It was observed that there were seven blocks where squad teams were working with single stirrup pumps while 2 pumps were being used by squad teams of remaining 9 blocks. Alinagar, Ghanshympur and Kiratpur block squads of Darbhanga district were not using 2 stirrup pumps hence quality is affected due to lack of equipment.

In total, 27 teams out of 96 teams used single stirrup pump at the field level hence directly affecting the coverage of households per day.

Table 9.5.4. Number of stirrup pumps used per squad at the field

Sr. No.	Stirrup pumps used	Frequency	Percent
1	One	27	28.1
2	Two	69	71.9
	Total	96	100.0

Squad teams of Alinagar, Ghanshyampur, K. Asthan and Kiratpur blocks of Darbhanga district did not use two stirrup pumps for spraying activity hence lack of equipment play an important role in quality of spray. Table 9.5.5 represents that single and double stirrup pumps are being used by squad teams in Keoty, Benipur and Singhwara blocks in Darbhanga district.

Table 9.5.5. Block-wise distribution of stirrup pumps among squad teams

Block Name * Availability of Stirrup Pumps per squad			
Block Name	Available Stirrup Pumps per squad		Total
	One	Two	
ALINAGAR	5	0	5
BAHADURPUR	0	6	6
BAHERI	0	8	8
BENIPUR	9	2	11
BIRAUL	0	8	8
GHANSHYAMPUR	1	0	1
H. NAGAR	0	3	3
HAYAGHAT	0	5	5
JALLE	0	11	11
K. ASTHAN	3	0	3
KEOTY	1	9	10
KIRAT PUR	6	0	6
MANIGACHHI	0	9	9

SADAR	0	2	2
SATIGHAT	0	3	3
SINGHWARA	2	3	5
Total	27	69	96

9.6. Availability of buckets with squad teams:

Table 9.6.6 shows present status of buckets with squad teams. It was highlighted that 53 percent of squad members used 2 or less number of buckets. The percentage of squads using four buckets was found 13 while 34 percent of squads used at three buckets in IRS spray. In short, 41 percent of teams were working with 2 buckets which may lead to disruption of IRS activity in-between due to leakage of buckets.

Table 9.6.6. Number of buckets with squad teams

Sr. No.	Number of Buckets used	Frequency	Percent
1	One	12	12.5
2	Two	39	40.6
3	Three	33	34.4
4	Four	12	12.5
	Total	96	100.0

9.7. Availability of standard DDT & water measuring mugs with squad teams

As shown in table 9.7.7, it was found that 95 percent of teams consist of one DDT measuring mug and 98 percent have one water measuring mug while two DDT and water measuring mugs were being used by 2 percent of squads. Three percent of teams

did not have DDT measuring mug with them. It means that availability of DDT and .water measuring mug is more than 90 percent

Table 9.7.7. Availability of Standard DDT and water measuring mugs with Squads

Sr. No.	Number of DDT measuring mugs	%age	No. of Observations	Number of Water measuring mugs	%age	No. of Observations
1.	One	95%	93	One	98%	94
2	Two	2%	2	Two	2%	2
3	None	3%	3	None	0%	0
	Total	100%	96	Total	100%	96

9.8. Use of DDT and water measuring mugs by squad teams:

Table 9.8.8represents percentage usage of DDT and water measuring mugs by the squad teams during mixture preparation. While monitoring the squads, it was observed that DDT and water measuring mugs were being used by 93 and 94 percent teams respectively while making mixture and rest of the teams either have no mugs or did not used them if available.

Table 9.8.8. Teams using Standard DDT and water measuring mugs while making mixture

Sr. No.	Use of DDT mugs	%age	No. of Observations	Use of Water Mugs	%age	No. of Observations
1.	Yes	93%	89	Yes	94%	90
2	No	7%	7	No	6%	6
		100%	96		100%	96

9.9.Availability of straining cloth and plastic sheets with Squad Teams:

It was found that 85 percent teams have straining cloth for separation of solid sediments which further protect the stirrup pump from blockage as shown in table 9.9.9. More usage of straining cloth and plastic sheets during IRS spray lead to quality of spray. Fifty three percent of spray squads have plastic sheets with them for better mixture preparation. Forty seven percent of squad teams did not have plastic sheets and availability of straining cloth was also found lacking in 15 percent teams.

Table 9.9.9. Availability of straining cloth and plastic sheets with Squad Teams

Sr. No.	Availability of straining cloth	%age	No. of Observations	Availability of plastic sheets	%age	No. of Observations
1	Yes	85%	82	Yes	53%	51
2	No	15%	14	No	47%	45
		100%	96		100%	96

9.10. Use of straining cloth and plastic sheets by squad Teams:

It was observed that 81 percent teams were using straining cloth and 60 percent of them used plastic sheets for making mixture according to table 9.10.10. A huge gap of 36 percent was found between usage of straining cloth and plastic sheets. Usage of plastic sheets was found 20 percent less as compared to straining cloth usage.

Table 9.10.10. Use of straining cloth and 2 x 2 or 3 x 3 size plastic sheets by Teams

Sr. No.	Used straining cloth	%age	No. of Observations	Usage of plastic sheets	%age	No. of Observations
1	Yes	81%	78	Yes	60%	58
2	No	4%	4	No	40%	38
		100%	96		100%	96

9.11. Availability of register and stencil/chalk with SFWs:

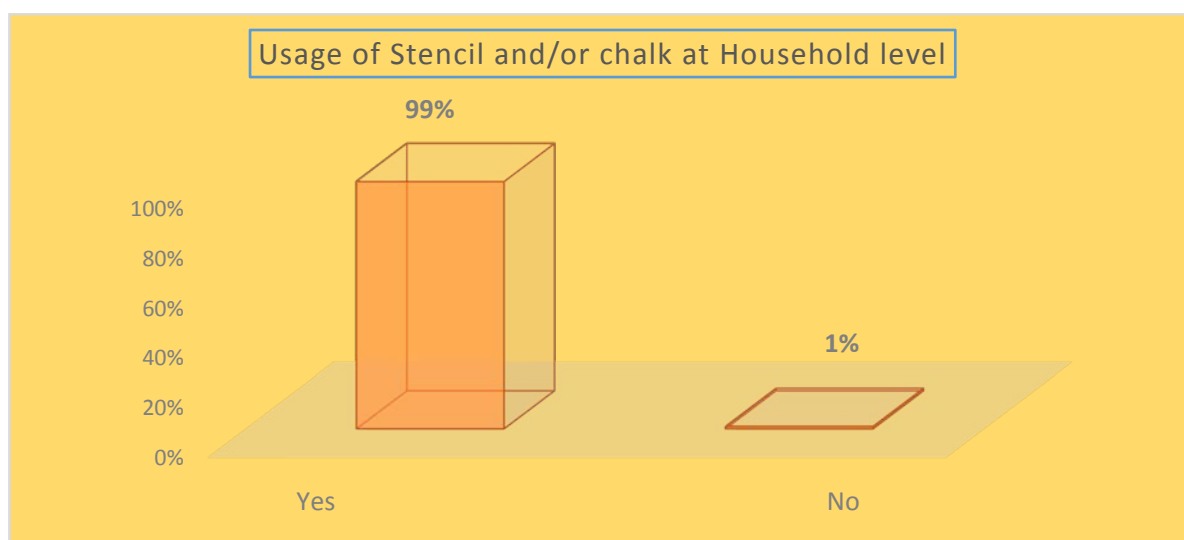
Register availability with superior field workers (SFWs) is necessary to collect data about spraying activity at household level. Stencil is also required by workers for denoting the covered, refusal and locked houses outside the households for identification purpose.

As shown in table 9.11.11, registers were found in 96 percent of teams while 99 percent squads had stencils with them and used by 99 percent teams which can be seen in figure 9.11.2. Most of the teams were using registers and stencil.

Table 9.11.11. Availability of register and stencil/chalk with SFWs

Sr. No.	Availability of registers	Percentage	No. of Observations	Availability of Stencil	Percentage	No. of Observations
1	Yes	100%	96	Yes	99%	95
2	No	0%	0	No	1%	1
		100%	96		100%	96

Figure 9.11.2. Usage of Stencil and/or chalk at Household level

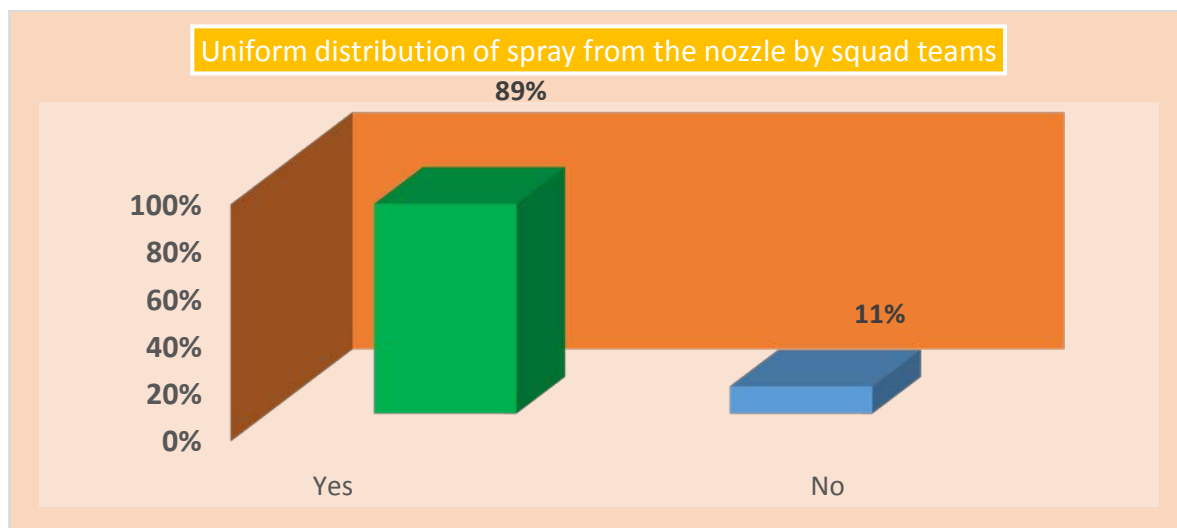


9.12. Uniform distribution of spray from the nozzle by squad teams:

DDT spraying make a thin film over the wall and look like small white dots on drying. Spray uniformity can be checked by rubbing wall with palm and it makes the palm whitish. Non uniform spray can be assessed by observing patchy appearances on the wall in which white dots are far distant than normal. Uniform spray distribution from

the stirrup pumps was found in 89 percent squads as shown in figure 9.12.3. There were 11 percent teams where attention is needed for quality of spray.

Figure 9.12.3. Uniform distribution of spray from the nozzle by squad teams



9.13. Knowledge of squad teams regarding DDT mixture preparation:

It was found that 92 percent of squad teams were aware about the quantity of DDT mug to be mixed while making mixture. On the other hand, 85 percent squads have knowledge regarding water quantity to make the mixture.

Table 9.13.12 represents that eight percent squad teams did not have correct information about the quantity of DDT to be mixed and 15 percent teams need to be aware about quantity of water to be mixed while making an effective mixture. In short, it was that more than 85 percent teams have enough knowledge about quantity of DDT and water mug to be taken to make a good mixture.

Table 9.13.12. Number DDT and water measuring mugs taken to make the mixture

Sr. No.	Number of DDT Mugs	Percentage	No. of Observations	Number of water mugs	Percentage	No. of Observations

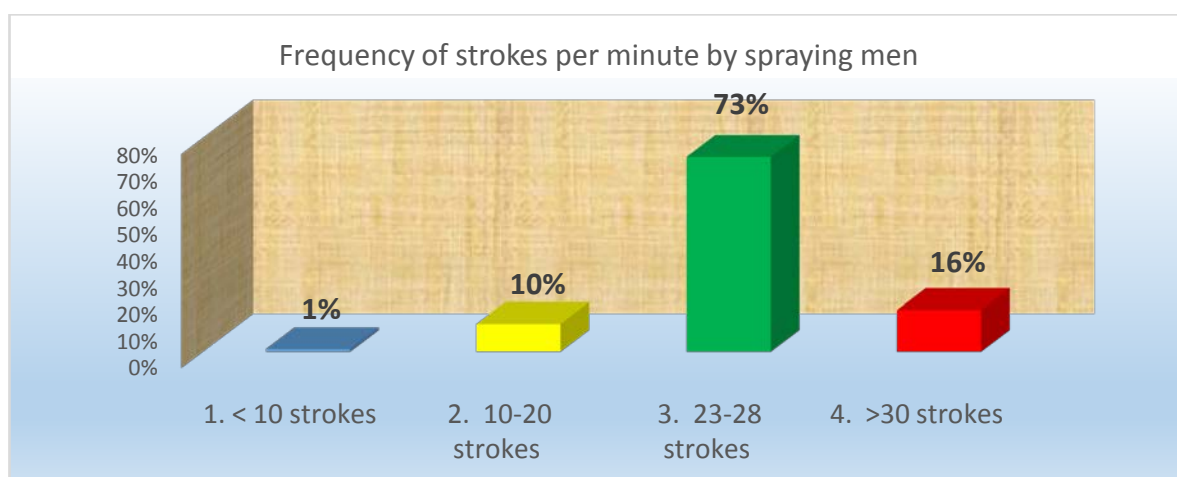
1.	One	1%	1	One	7%	7
2.	Two	1%	1	Two	2%	1
3.	Three	92%	88	Three	85%	82
4.	Four	0%	0	Four	6%	6
5.	Not used	6%	6	Not used	0 %	0
	Total	100%	96	Total	100%	96

9.14. Knowledge of spraying squads regarding pump spray strokes /minute:

For quality of DDT spray in the households, a standard of 23-28 strokes per minute is required to make uniform discharge of solution on the walls.

As shown in figure 9.14.4, seventy three percent of squad teams were spraying the DDT with 23 – 28 strokes per minute while 16 percent spraying persons were doing spray at the rate of more than 30 strokes per minute. Only eleven percent squad teams were spraying with 20 or less strokes per minute.

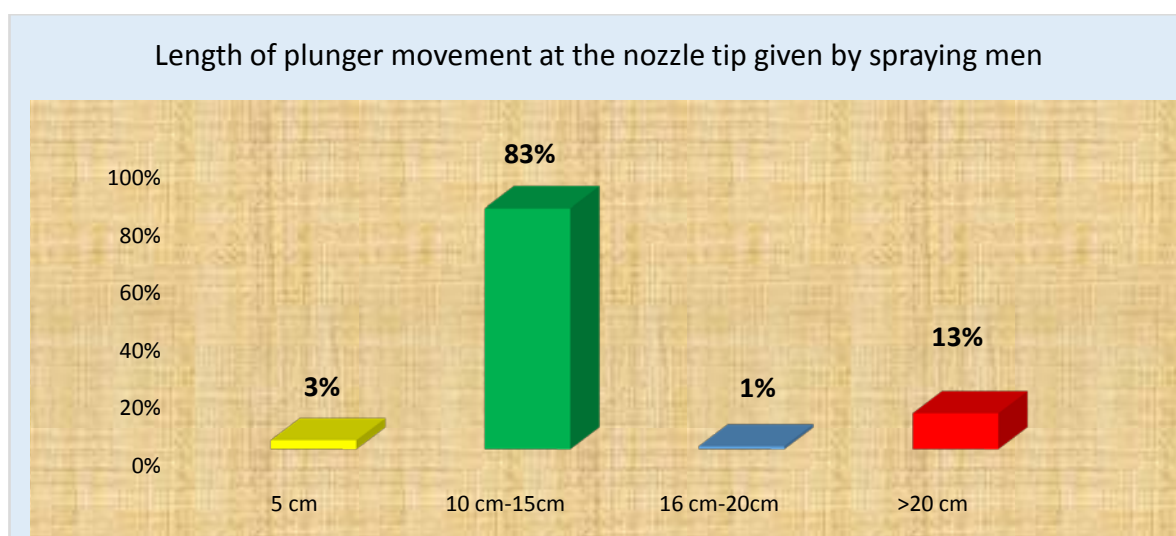
Figure 9.14.4. Frequency of strokes per minute by spraying men



9.15. Knowledge of spraying squads regarding plunger movement during the IRS activity:

For quality of spray, a standard movement of 10-15 cm is required for effective discharge of the spray from the nozzle. Figure 9.15.5 depicts that there were 83 percent squads in which plunger movement of 10-15 cm was observed as compared to 13 percent squads who were practicing more than 20 cm distance of plunger. In short, 17 percent teams were not working with quality standards of spray activity.

Figure 9.15.5. Length of plunger movement at the nozzle tip given by spraying men

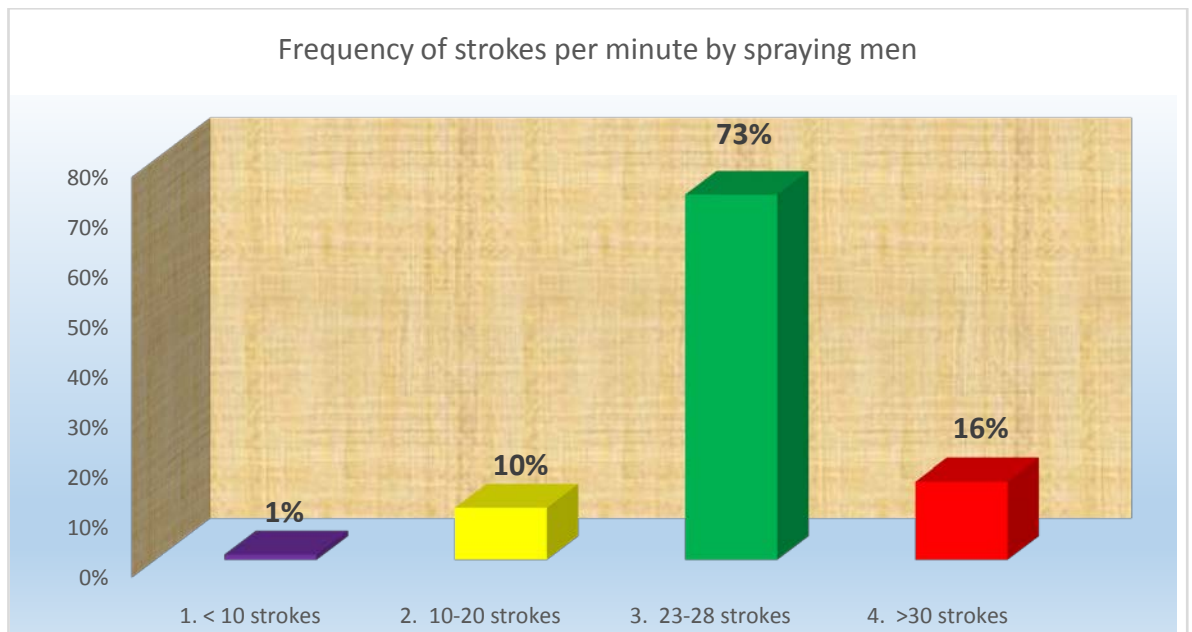


9.16. Knowledge about speed of spray:

A standard time of 10 to 20 seconds is decided for quality of spray. This is the time taken to spray a vertical single strip from upwards to downwards and vice-versa on wall of 6 feet height.

As shown in figure 9.16.6, it was observed at the field that only 43 percent squads were following the spray speed standard of 10-20 seconds. On the other hand, twenty three percent squads were spraying with less than 10 seconds and more than 20 seconds. Eleven percent of field teams were spraying with 5 seconds on the wall. So a major gap of 57 percent was found in practically applying the spraying technique.

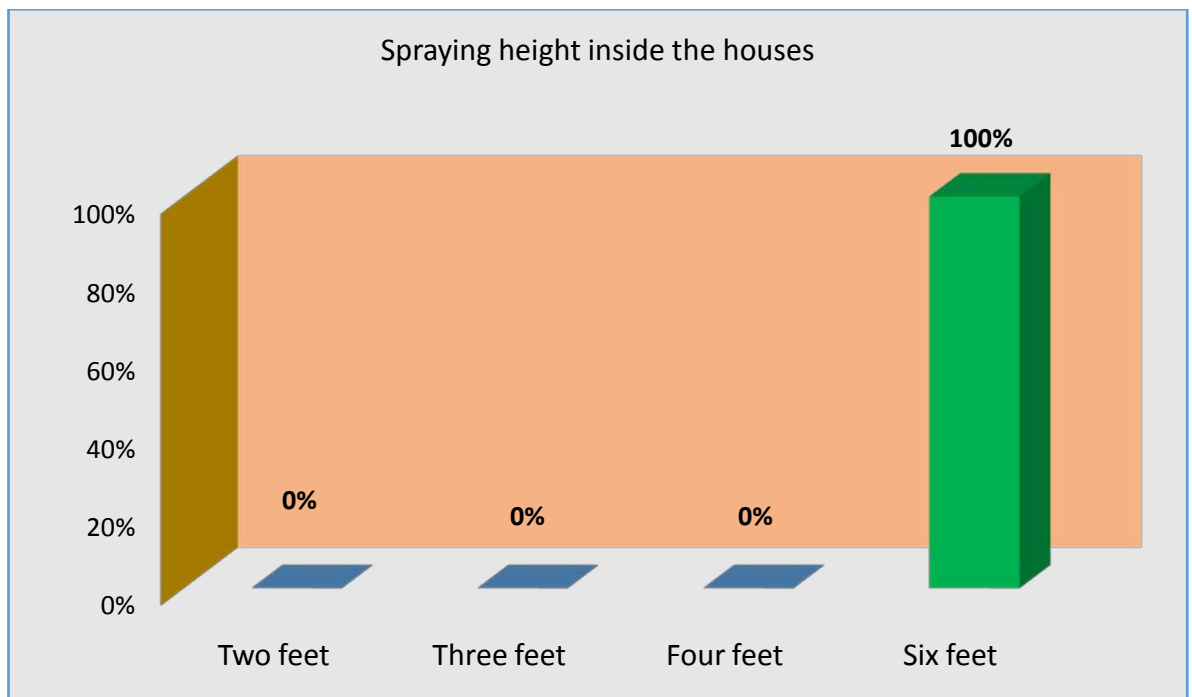
Figure 9.16.6. Knowledge about speed of spray



9.17. Knowledge about spraying Height inside the houses:

It was found that spraying was being done at the height of 6 feet in all the teams according to figure 9.17.7. It means that team squads have enough information about spraying height on the walls.

Figure 9.17.7. Spraying height inside the houses

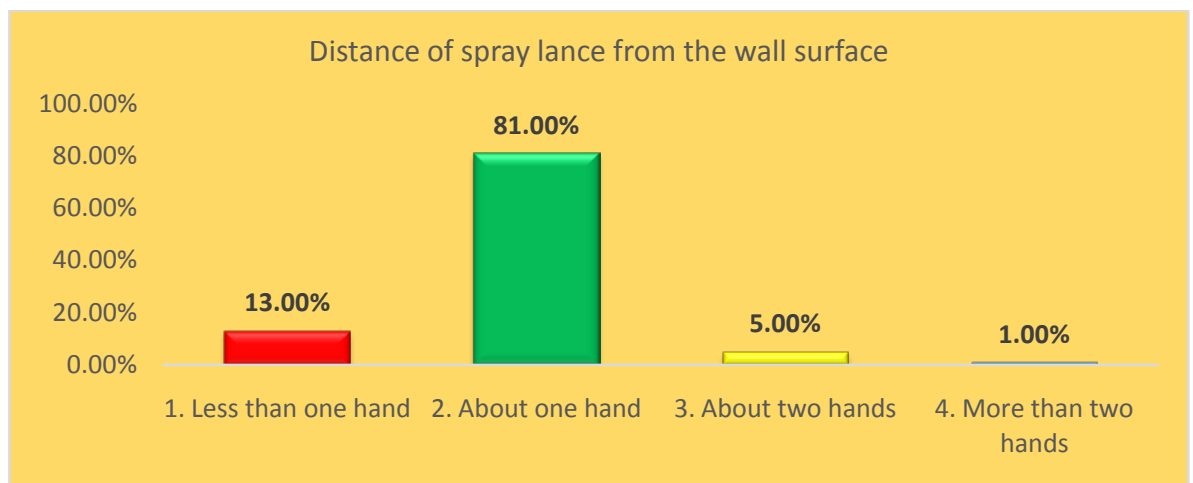


9.18. Knowledge of field teams about spraying lance distance from

wall surface:

As shown in figure 9.18.8, eighty one percent squads were spraying on the walls at lance distance of about one hand and 13 percent were practicing it about less than one hand. Six percent of field teams were maintaining the distance of spraying in the households about two or more hands.

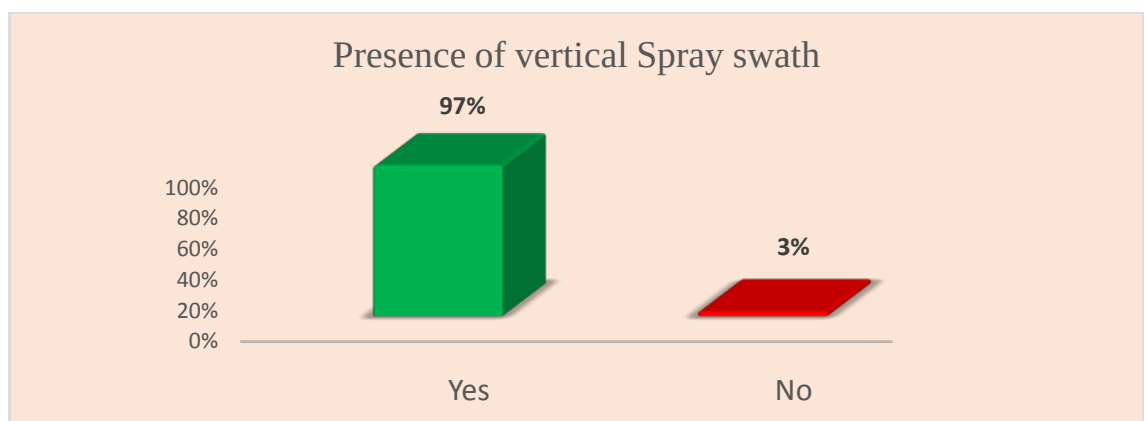
Figure 9.18.8. Spraying lance distance from wall surface



9.19. Availability of vertical spray swath:

As shown in figure 9.19.9, while observing sprayed households, vertical spray swath was found in 97 percent households. On the other hand, spray style was found non-vertical in 3 percent households

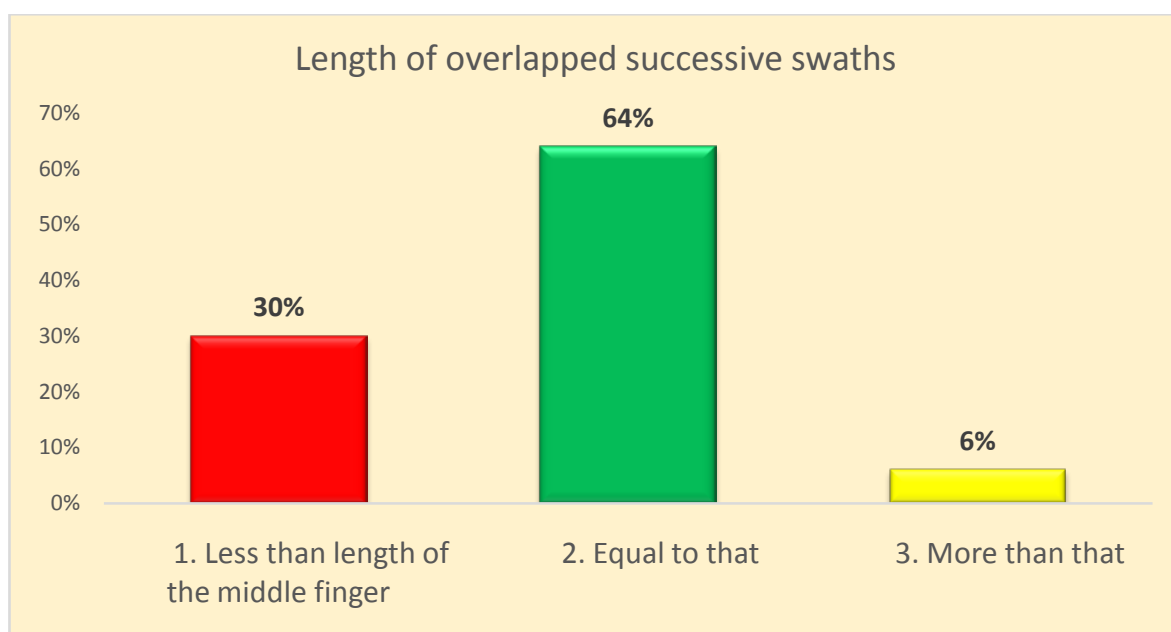
Figure 9.19.9. Presence of vertical spray swath



9.20. Length of overlapped successive swaths inside households:

Figure 9.20.10 depicts on observing DDT sprayed households that successive swaths overlapping was found equal to length of the middle finger in 64 percent houses as compared to 30 percent houses where overlapping was less than above mentioned length. Thirty six percent squad teams were not aware about length of overlapped successive swaths.

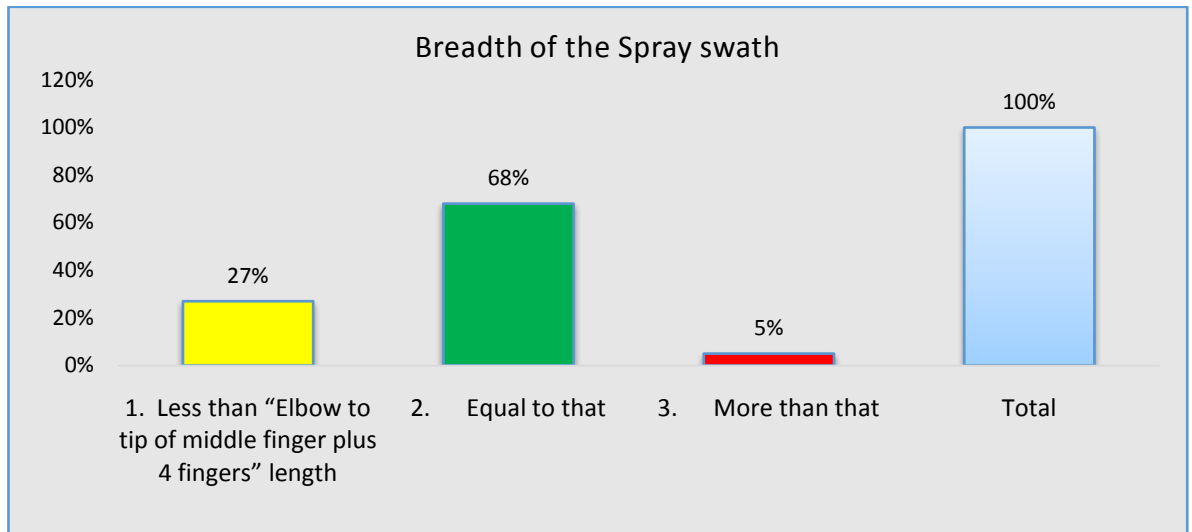
Figure 9.20.10. Households' percentage showing length of successive swaths overlapping



9.21. Knowledge about breadth of spray swath:

Figure 9.21.11 represents that sixty eight percent IRS squads were found to have information that spray swath should be equal to elbow to tip of middle finger plus four fingers length while 27 percent teams were practicing less than that and 5 percent were maintaining the distance more than mentioned length (elbow to tip of middle finger plus four fingers length)

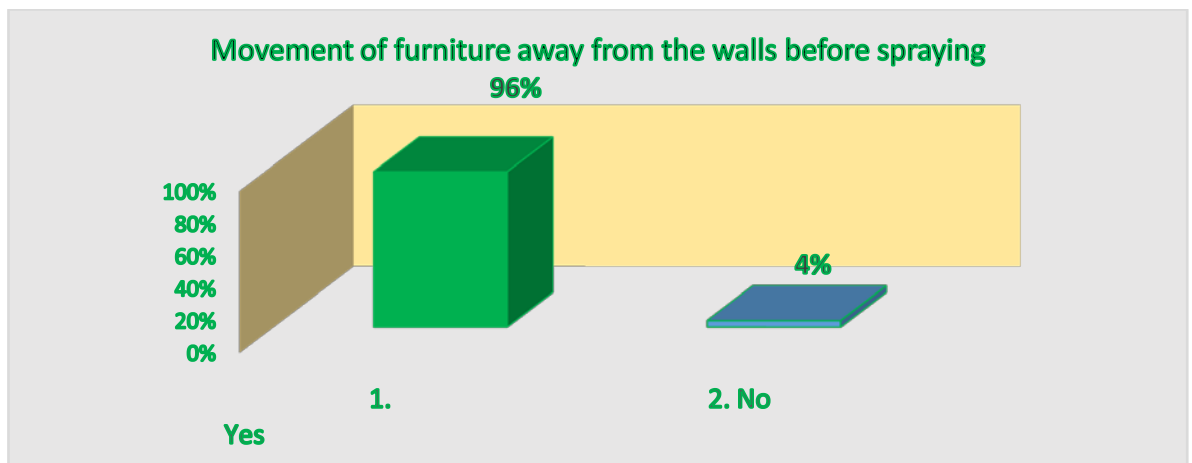
Figure 9.21.11. Breadth of spray swath



9.22. Movement of furniture from walls in households prior to spray activity:

It was observed during spray activity that furniture moved away from the walls inside 96 percent households as shown in figure 9.22.12. Only four percent households were found refused to move furniture in their houses.

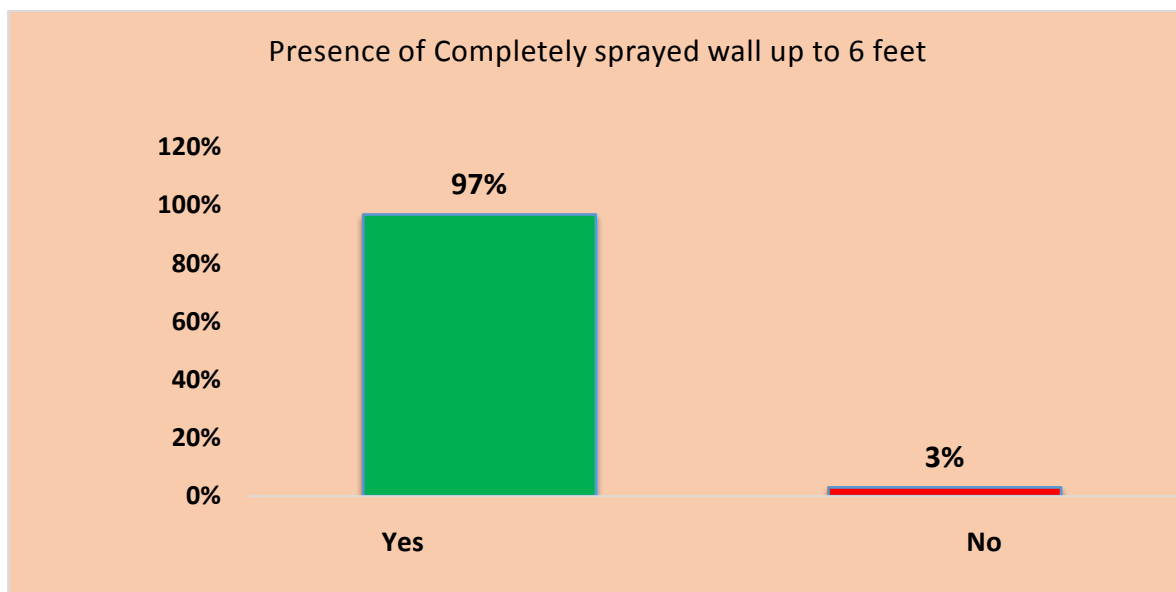
Figure 9.22.12. Households percentage who moved furniture from walls



9.23. Availability of quality of spray upto 6 feet in households:

As shown in figure 9.23.13, it was also observed that 97 percent teams were spraying at 6 feet height as compared to other 3 percent squads who sprayed partially more or less than 6 feet.

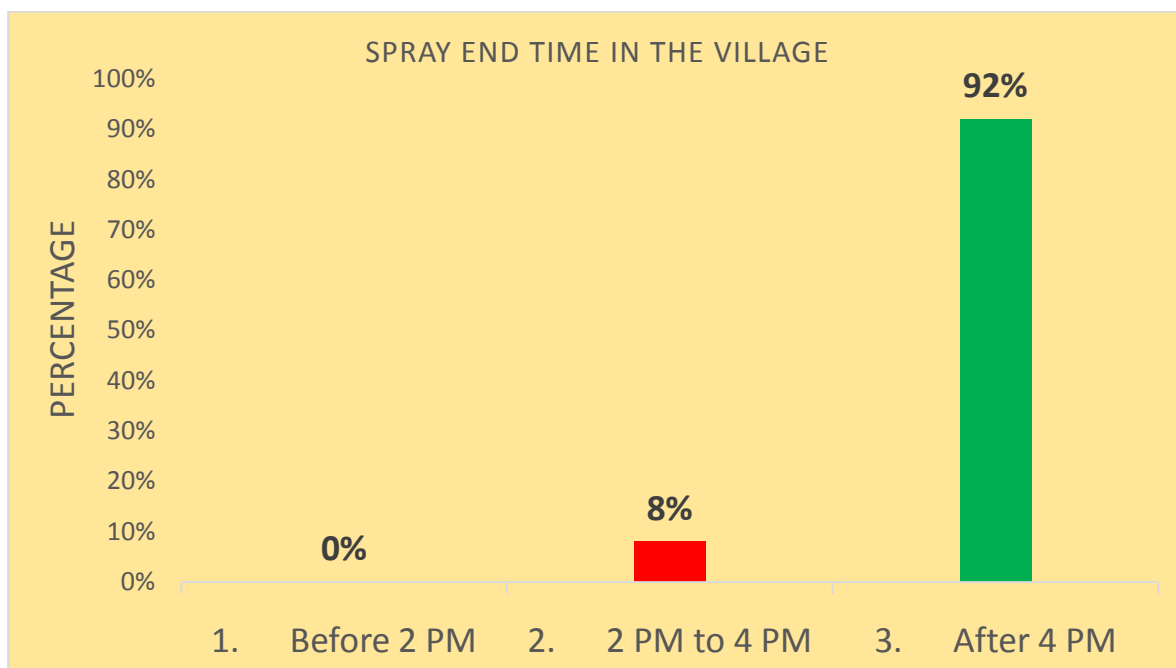
Figure 9.23.13. Presence of Completely sprayed wall up to 6 feet



9.24. Spray end time by squads:

Normal spray end timing is 9 am to 4 -5 pm and it was found that 92 percent of squads were completing the spray activity after 4 pm and only 8 percent were going out of the field between 2 – 4 pm as shown in figure 9.24.14.

Figure 9.24.14. Spray end time of Squad teams



10. Discussion and Results:

Ninety six squad teams were assessed based on structured questionnaire which was encoded at the field level. The study showed block level results regarding availability and gap of required equipment/material with squad teams, knowledge of field team about spraying technique and maintaining quality of spray at Darbhanga district of Bihar.

According to the standard guidelines of spraying activity, the study identified factors responsible for compromised spray quality which are as follows:

Forty eight percent teams started the spray after 10 am and completed the spray till 5 pm which lead on to less number of coverage of sprayed households. Eight percent squad teams were not found to have all team members. Personal protective equipment were not being used by 84 percent teams which may lead to harmful effect on field teams.

Twenty eight percent teams were working with single stirrup pump while two pumps are required for effective spray. Buckets availability was also found less in 87 percent teams. It was found that 95 percent teams have DDT measuring mugs and 93 percent of them were using it for making mixture. On the other hand, water measuring mugs availability with teams was found to be 98 percent and 94 percent of them were using it.

Availability of straining cloth and plastic sheet was found deficient in 15 and 47 percent with squad teams respectively. Four percent teams were not using straining cloth to remove impurities and 40 percent of them were not practicing plastic sheets to cover food items inside households.

All the teams have registers with them. Stencils were found unavailable with 1 percent teams which were unable to use it.

It was found out that uniform spray distribution from nozzle was not accomplished in 11 percent teams. Spray teams members were also found practicing incorrect method of making DDT paste and spraying technique which hampered the quality of spray.

Eight percent teams did not have awareness about quantity of DDT to be mixed while making paste and 15 percent of teams did not have information about quantity of water used in a mixture preparation.

Seventeen percent squad teams were found practicing more or less than range of 23- 28 strokes per minute. Seventeen percent teams were not aware about correct plunger movement of 10-15 cm in each time.

Speed of spray was found more or less than 10-20 seconds in 57 percent teams. All squad teams were aware about spraying height inside households.

Only eighty one percent teams were practicing to maintain the distance of spraying lance about one hand/one and half feet from the wall.

Ninety seven percent teams were making vertical spray swaths and only 64 percent of all squad teams were found practicing successive swaths overlapping of length of middle finger. Thirty two percent teams were not having awareness about breadth of the spray swath.

In ninety six percent teams, it was observed that furniture movement took place inside houses before spraying. On observing households, complete 6 feet sprayed wall was not found out in only 3 percent houses.

The report tried is to summarize some of the most important information regarding factors affecting the quality of spray in Darbhanga district of Bihar. Based on that, this research attempted to broaden our understanding regarding knowledge of spray squad teams about indoor residual spray (IRS) by observing their work inside households.

In addition, attempt was made to gather relevant information about present equipment status during spray activity. These findings can help in developing effective strategies to support implementation of effective kala-azar prevention and control activities.

Although every effort was made to obtain correct assessment of IRS spray by squad teams, the nature of the qualitative study would not allow strict generalization of the study findings to whole timings of the spray activity.

11. Conclusion:

Quality of indoor residual spray was found compromised due to following important identified factors:

Insufficient number of team members, PPE equipment, stirrup pumps, buckets, plastic sheets was directly affecting the per day covered households due to involvement of less workforce at field level. Non-awareness among squad teams about uniform distribution, strokes per minute, plunger movement length, width of spray swath, overlapping of successive swaths, speed of spray and height of spray distance.

Approximately 80 to 90 percent squad teams at block level have enough knowledge about DDT mixture preparation, plunger movement distance, spraying lance distance from wall surface and spraying height inside households but teams have partial knowledge about frequency of strokes per minute, speed of spray and breadth of spray swath.

So training of squad teams needs to be done to make indoor residual spray effective to eliminate kala-azar from Darbhanga district of Bihar. Training without effective implementation plans will not result in long term skill retention.

12. Recommendations:

- To maintain quality of indoor residual spray, it is suggested that identified gap of IRS equipment i.e. spray pumps, buckets, PPE should be fulfilled as soon as possible before the start of spraying activity.
- Close monitoring of each squad is necessary to avoid any negligence from the field workers. Squad teams are also found unaware about spraying techniques of the activity. So capacity building of the squads is needed regarding spraying technique activities to improve quality of the spray.

13. Limitation of the study:

- Data collection at initial and end time of the spraying activity may produce different results as analyzed data was taken in the mid time of IRS activity.
- Some of the respondents that could have given misconstrued results noticed language barrier.

14. Annexure

Questionnaire for Qualitative assessment of Indoor Residual Spray during Kala-azar elimination program at Darbhanga district in Bihar

Observations during IRS Spray

Schedule

Informed consent: I would like to thank you for taking the time to meet me. My name is Vikash Sharma. I would like to talk to you about your spraying practices while Spray round for Kala Azar. There are no direct benefits for you a part of this research, However your contribution will help the kala azar control program and the department of health to to design and develop appropriate information resources to help communities effectively to recognize problems encountered at the field level while spraying. The schedule comprises of observations and your IRS spray practices at household level. The information will be kept confidential. This means that data will be shared only with the research team and we will ensure that any information that we include in our report does not identify you as the respondent. You can stop us if you feel uncomfortable in our presence.

Do you have any questions about what I just explained?

Are you comfortable with us & can we start?

Signature

District Name _____

Block Name _____

Village Name _____

Sr .No.	Questions	Responses / Coding	
A. Assessment of Quality standards			
101.	Spray start time in this village	1. Before 10 AM 2. 10 AM to 11 PM 3. After 11 PM	
102.	How many spray team members are present in the Squad?	1. 5FW and 1SFW 2. 5FW and 0 SFW 3. 4FW and 0 SFW 4. 3FW and 1 SFW 5. 2FW and 1 SFW	
103.	If spray team is using Personal Protective Equipment (PPE) then how many of the equipment are actually in use by the spray team as observed by you? (Apron(A), Specs(S), Gloves(G), Mask(M), Rubber Shoes ®, Cap(C))	1. A+S+G+M+R+C 2. G+M+R 3. G+R+C 4. Only Gloves 5. Only Rubber Shoes 6. None	
104.	How many Stirrup Pumps per squad are being used?	1. One 2. Two 3. More than Two 4. None	
105.	How many Buckets were there with the team?	1. One 2. Two 3. Three 4. Four 5. Five 6. None	

106	How many Standard DDT Measuring mugs were there with team?	1. One 2. Two 3. None	
107.	How many Standard Water Measuring mugs were there with team?	1. One 2. Two 3. None	
108.	Is the Standard DDT Measuring Mug being used to measure DDT by the team while making mixture?	Yes.....1 No.....2	
109.	How many Mugs of DDT was taken to make the mixture?	1. One 2. Two 3. Three 4. Four	
110.	Is the Standard Water Measuring Mug being used to measure water by the team while making mixture?	Yes.....1 No.....2	
111.	How many Mugs of Water was taken to make the mixture?	1. One 2. Two 3. Three 4. Four	
112.	Does the team have Straining cloth with them?	Yes.....1 No.....2	If no, skip to Q114
113.	If yes then is the Straining cloth actually being used?	Yes.....1 No.....2	
114.	Does the team have 2 x 2 or 3 x 3 size	Yes.....1	If no, skip

	plastic sheets?	No.....2	to Q116
115.	If 2 x 2/3 x3 meters Plastic sheet are available then are they actually being used?	Yes.....1 No.....2	
116.	Does the team have register with them?	Yes.....1 No.....2	
117.	Does the team have Stencil and/or chalk (for stenciling) with them?	Yes.....1 No.....2	If no Skip to Q. 119
118.	If stencil available, then stencil and/or chalk actually being used?	Yes.....1 No.....2	
119.	Is the spray from the nozzle uniformly distributed?	Yes.....1 No.....2	
120.	How many strokes per minute is given by the pump man?	1. 10 strokes 2. 20 strokes 3. 23-28 strokes 4. >30 strokes	
121.	How many centimeters of plunger movement at the nozzle tip is being given by the pump man?	1. 5 cm 2. 10 -15 cm 3. 15- 20 cm 4. 20 cm	
122.	How far is the spray lance from the wall surface?	Less than one hand.....1 About one hand.....2 About two hands.....3	

		More than two hands.....4	
123.	Is the Spray swath vertical?	Yes.....1 No.....2	
124.	How wide is the Spray swath?	1. Less than “Elbow to tip of middle finger plus 4 fingers” length..... 1 2. Equal to that/.....2 More than that.....3	
125.	How much are the successive swaths overlapping each other?	1. Less than length of the middle finger.....1 2. Equal to that.....2 3. More than that.....3	
126.	What is the speed of spray?	1. 5 seconds 2. 10 seconds 3. 10- 20 seconds 4. > 20 seconds	
127.	Inside the house, to what height was the spraying done?	1. Two feet 2. Three feet 3. Four feet	

		4. Six feet	
128.	Is furniture moved away from the walls before spraying?	Yes.....1 No.....2	
129.	Is the entire wall up to 6 feet being sprayed?	Yes.....1 No.....2	
130.	Spray end time in this village	1. Before 2 PM 2. 2 PM to 4 PM 3. After 4 PM	
End of Questionnaire			

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