

## ORIGINAL ARTICLE

# Awareness About Mosquito Borne Diseases in Community and Stakeholders in Urban Slums of Agra district

Viresh Kunver Singh<sup>1</sup>, Renu Agrawal<sup>2</sup>, Geetu Singh<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Social and Preventive Medicine, Sarojini Naidu Medical College, Agra, Uttar Pradesh; <sup>2</sup>Professor, Department of Social and Preventive Medicine, Sarojini Naidu Medical College, Agra, Uttar Pradesh; <sup>3</sup>Assistant Professor, Department of Social and Preventive Medicine, Sarojini Naidu Medical College, Agra, Uttar Pradesh.

<a href="#">Abstract</a>	<a href="#">Introduction</a>	<a href="#">Methodology</a>	<a href="#">Results</a>	<a href="#">Conclusion</a>	<a href="#">References</a>	<a href="#">Citation</a>	<a href="#">Tables / Figures</a>
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## Corresponding Author

Dr. Renu Agrawal, Professor, Department of Social and Preventive Medicine, Sarojini Naidu Medical College, Agra, Uttar Pradesh, 282002  
E Mail ID: [renuagrasm@gmail.com](mailto:renuagrasm@gmail.com)



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## Abstract

**Background:** Mosquito borne diseases of public health importance are complex. These diseases are important causes of morbidity and mortality. **Objective:** To determine the knowledge and determinants about MBDs in community and stakeholders among slum dwellers of Agra. **Materials and Methods:** A community based cross sectional study was conducted in urban slums of Agra city. A sample size of 400 participants and 100 stakeholders from Municipal Corporation, health department, community leaders and community representatives were interviewed. **Results:** Maximum participants were of age group 26-35 years (23.5%) followed by 36-45 years (21.5%), of those 57.25% and 42.75% were men and women respectively. Most of participants (96.75%) did not have any knowledge about types or names of mosquitoes (Aedes, Anopheles and Culex). More than 50% of participants reported that MBDs spreads through bite of infected mosquitoes followed by poor environmental hygiene (34.75%). Almost all stakeholders (98.0%) had knowledge about name of mosquitoes. 80% of stakeholders perceived their responsibility towards MBD prevention and control. **Conclusion:** Knowledge about mosquito borne diseases ranged from only 3% aware about types of mosquito, around 50% aware of breeding and habitats of mosquitoes with poor knowledge of larvae. Stakeholders had better awareness than community.

## Keywords

Mosquito-borne Diseases; Knowledge; Slum; Community; Stakeholders

## Introduction

Mosquito-borne diseases (MBDs) of public health importance are complex, and their occurrence depends on various biological, ecological, socio-economic factors. These diseases like malaria, dengue, chikungunya, lymphatic filariasis and Japanese encephalitis accounts for considerable morbidity and mortality. Prevalence of Mosquito-

borne diseases is more in areas with poor environmental condition.(1) Mosquito-borne diseases is a growing urban problem because of unplanned urbanization, industrialization and excessive population growth coupled with rural to urban migration. In 2017, an estimated 219 million cases of malaria occurred worldwide. Fifteen countries in sub-Saharan Africa and South East Asia

carried almost 80% of global malaria burden. In 2017, India reported 3 million fewer cases, a 24% decrease compared with 2016.(2) About 91% of malaria cases and 99% of death due to malaria is reported from Northeastern states, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Andhra Pradesh, Maharashtra, Gujarat, Rajasthan, West-Bengal and Karnataka.(3,4)

Community participation is essential for the prevention and control of mosquito borne disease outbreak.(5) In spite of mass communication and educational approaches, community participation is far below expectation. Community participation in turn depends upon awareness and practices of community towards the disease.(6) Program implementers need to understand the disease related knowledge, attitude and practice of the community, because these are the important determinate of community participation.(7)

### Aims & Objectives

1. To determine awareness of community and various stakeholders
2. To assess determinants of their awareness on mosquito borne diseases.

### Material & Methods

**Study Type:** This was a community based, cross sectional study

**Study Population:** This study was conducted among urban slum population and stakeholders of Agra district of Uttar Pradesh

**Study Area:** Urban slum in Agra city of Uttar Pradesh state in India.

**Study Duration:** Study was conducted in Agra city from October 2017 to August 2018.

**Sample Size Calculation:** According to Municipal Corporation of Agra, Agra is divided into four zones (Lohamandi, Tajganj, Chhatta and Hariparvat). Each zone is further subdivided into wards (Total 90 wards). Each ward consisted of a certain number of slums and mohallas. Sample size was calculated on the basis of results of a previous study where awareness regarding preventive measures for malaria is found to be 80.9%.(8) Thus, considering the prevalence of 80.9% and allowable error 5% of prevalence, the sample size was fixed to 371. On adding approximately 10% non-respondents and incomplete forms, the sample size has been increased to a round figure of 400. Thus, a sample size of 400 is taken for this study.

**Inclusion Criteria:** The study includes: 1) Head of families, or any other adult member of the household present at the time of interview. 2) Person from households residing in selected communities for more than six months.

**Exclusion Criteria:**1) Migrant population of less than six months duration. 2) Persons not willing/giving consent to participate in the study.

**Strategy for collection:** Multistage sampling procedure is followed to select households and participants from four zones of Agra city. From each zone, one ward was selected by simple random sampling method. From each ward one slum was chosen by simple random sampling method. From each slum 100 households were randomly selected thus, a total of 400 households were selected for the study. For selection of households, a visit was made to each slum for understanding the geographical limit and distribution of houses. For random selection of houses, centre of the slum was identified and one of the lanes was randomly selected; in the selected lane house to house visit was made following left hand rule till the required sample of hundred houses is achieved. In case the required sample was not achieved another lane was randomly selected. From each household one adult person preferably the head of the household (M/F) was interviewed after taking informed written consent from him/her to participate in the study. A sample 100 stakeholders were taken including personnels from Municipal Corporation, health department, community leaders and community representatives and interviewed. Data collection was done by door to door survey method. Data was collected using pretested, semi-structured questionnaire. The questionnaire consisted of items on socio-economic and demographic profile of study subjects, knowledge about mosquito borne diseases and their responsibility towards mosquito borne diseases (MBDs).

**Working Definition:** Stakeholder: Anyone who is or can be affected by an organization, strategy or on-going malaria elimination program. In this study, stakeholders comprises of various personnel's from Municipal Corporation, health department, community leaders and community representatives.

**Ethical Approval:** The ethical clearance for the study was taken from Institutional Ethical Clearance Committee, SN Medical College, Agra. The study was not funded and has no-conflict of interests.

**Consent:** The participants were informed about the study and a written consent was taken for their participation.

**Data analysis:** Data analysis was done, the results were presented accordingly and appropriate statistical test were applied to draw valid inferences from data.

## Results

The present study in urban slums of Agra includes 400 participants from community and 100 stakeholders. Maximum participants were of age group 26-35 years (23.5%) followed by 36-45 years (21.5%), of those 57.25% and 42.75% were men and women respectively. 38.0% participants were illiterate while only 10% were postgraduate and professionally qualified. Most participants were semiskilled worker (39.75%) and unskilled worker/laborers (35.25%) and belonged to upper lower socioeconomic class (Kuppuswamy scale) (74%). Data of stakeholders shows that 30% belonged to age group of 36-45 years followed by 26-35 years (28.0%). Male (74.0%) stakeholders were more than females (26.0%). 83% of stakeholders were educated above 8th standard and were graduate, being employed in cleric job/shop-owner (26.0%) or semi-professional job (25.0%). Majority of the stakeholders belonged to upper middle class (60.0%).

(Table 1) shows knowledge regarding mosquitoes among community participants and stakeholders. Most of participants (96.75%) did not have any knowledge about types or names of mosquitoes (*Aedes*, *Anopheles* and *Culex*). When asked about diseases caused by mosquitoes, most of them replied malaria and dengue. About 30% have knowledge regarding simultaneous occurrence of multiple MBDs. 57.0% of participants stated that the MBDs occur more in rainy season followed by summers (32.0%). 71.25% reported that mosquito density is more in night and 25.5% said it is more in evening. Only 9.25% knew about mosquito larvae; among them 43.2% and 16.2% participants said that it breeds in dirty and clean water respectively. Almost all stakeholders (98.0%) had knowledge about name of mosquitoes. 56.0% of stakeholders were aware that multiple MBDs might occur simultaneously. Majority (93.0%) stakeholders knew that MBDs occur in and around rainy season. Regarding diurnal variation 74.0% of stakeholders reported that mosquito density is more in evening,

followed by night 52.0%. 63.0% of stakeholders knew about the mosquito larvae in contrast to community (9.25%). Among those who knew about mosquito larvae, 66.7% and 50.8% knew that larvae breed in dirty and clean water respectively.

(Table 2) highlights that more than 50% of participants reported that MBDs spreads through bite of infected mosquitoes followed by poor environmental hygiene (34.75%). 61.5% of participants got this information from T.V/radio and 56.75% from family/friends/neighbors. 80% of participants were aware of fever and chills as main symptoms of MBDs, while 61.25% stated body/joint pain followed by headache (24.50%) and vomiting (24.25%). Regarding the severity of MBDs, 80% knew that MBDs could lead to death. 88.75% of participants had knowledge of mosquito repellents and 28.5% said mosquito nets, as PPMs. 12.75% and 13.75% of study participants knew about indoor spraying and outdoor fogging respectively.

Almost all of the participants knew that treatment for MBDs is available. Regarding knowledge of stakeholders, 86% said MBDs spread by bite of infected mosquitoes while 44.0% believed that it's via bad environment hygiene/dirt. Most of stakeholders (74%) got this information from radio/TV. 92.0% of stakeholders knew fever with chills as symptoms of MBDs followed by body and joint pain (85.0%) and headache (56.0%). 95.0% stated that MBDs can cause death. Almost all of stakeholders (98.0%) knew mosquito repellents as a mode of PPMs, followed by mosquito net (96.0%) and outdoor fogging (64.0%). All stakeholders (100%) knew that treatment of MBD is available. Majority of the participants (59.75%) perceived their own responsibility towards MBD prevention and control, whereas 31.0% participants held the government responsible for it (Table 3). 80% of stakeholders perceived their responsibility towards MBD prevention and control.

54.15% of male participants stated that bite of infected mosquito was the principal source of spread of mosquito borne diseases while 6.99% had no knowledge; 43.86% of females had knowledge that MBDs are spread by bite of infected mosquito while 16% had no knowledge and this difference was found statistically significant. Education plays a very important role in awareness; significant difference was found regarding name of mosquitoes, species, spread of mosquito borne diseases and availability of MBDs treatment. (Table 4) & (Table 5)

## Discussion

Mosquito borne diseases are major public health problems globally and remains a cause of huge burden of diseases in India. Awareness regarding MBDs in community and stakeholders is imperative for successful implementation of community -based programs. Present study conducted in four slums of Agra district included study participants from community and various stakeholders; out of the 400 participants 57.25% were males and 42.75% were females similar to Gupta RK et al. and Sharma A et al.(9,10) while in study of Kumar V et al. and Diaz-Quijano et al. from Colombia female preponderance was found. (11,12) Majority of participants were illiterate (38.0%) followed primary and middle schooling, comparable to results of Gupta RK et al.(9) while more educated participants were found in study by Sharma A et al. from urban Rajasthan.(10) Most participants in present study were daily wage workers in consensus with Sahoo SK et al. but in Sharma A et al. most participants were salaried followed by students.(8,10) Stakeholders in our study belonged to age group of 36-45 years, (30%) followed by 25-35 years (28.0%) among them 74.0% and 26% were men and women respectively; about 50% were graduate and above (48.0%). Data on stakeholders is very limited. A study done on school teachers in Delhi showed that most of them were of age group 20 and 39 years of age. The majority were females (57.5%), followed by males (42.5%). Half of the respondents (50%) were graduates, followed by postgraduates (41.5%) and intermediates (8.5%). (11)

Knowledge regarding mosquitoes, diseases caused and their breeding habits, place of breeding is important, in this regard it was found that only 3.25% participants could name any one type of mosquito, similarly Sahoo SK et al. from Kolkata found that none of the study participants were able to name any type of mosquito. (8) while the awareness about name of mosquito among stakeholders was high (98.0%). When participants were asked about diseases caused by mosquitoes, most replied malaria, dengue and chikungunya in line with Sahoo SK et al., Sharma A et al, Dhaduk KM et al., Khanal VK et al. and Vala M et al. (8,10,13,14,15) A study on school teachers in New Delhi found that 75% knew that it is female anopheles mosquito who transmits malaria 73.6% knew that the vector for dengue is Aedes. (11)

57.0% of participants stated that the MBDs occur more in rainy season followed by summers (32.0%), findings were same as studies conducted by Shidaraddi K et al., Kohli C et al. and Anand T et al. (16,17,18) 71.25% reported in our study that mosquito density is more in night and 25.5% said it is more in evening. In other study, it was found that majority participants said mosquito's bite only at evening (6-8 pm) and most participants from study on dengue said mosquito, stated that mosquito bites during day time followed by some response regarding night time. (18,10) Only 9.25% knew about mosquito larvae; among them 43.2% and 16.2% participants said that it breeds in dirty and clean water respectively. Higher awareness regarding larvae and its breeding place was found in studies of Dhaduk KM et al. in Jamnagar (76%), Shinde L et al. in Maharashtra (88%) and Nanjesh KS et al. in Karnataka (76%) probably due to higher literacy rate. (13,19,20) Study on teachers found that more than 90% of respondents knew that dengue causing mosquito breeds in clean water and bites usually during daytime. (11)

More than 50% of participants reported that MBDs spreads through bite of infected mosquitoes followed by poor environmental hygiene (34.75%). About mode of transmission Sharma A et al. and Dhaduk KM et al. in Jamnagar found that all-most all participants had knowledge. (10,13) Kumar V et al. showed that among total 212 participants, 99.1% knew that mosquito bite causes malaria and 3/4th of them knew that female anopheles mosquito transmits it. 73.6% knew that vector for dengue is Aedes. (11) Regarding knowledge of stakeholders, about spread of MBDs 86.0% was of the opinion that spread is by bite of infected mosquitoes while 44.0% believed to spread via bad environment hygiene/dirt. Study on school teachers involved in VBDs activities; all had knowledge regarding spread of malaria via mosquito bite. (11)

61.5% of participants got these information from T.V/radio and 56.75% from family/friends/neighbors comparable to results of Sharma A et al, Khanal VK et al. and Kohli C et al.(10,14,17) While two studies from Kolkata and Karnataka found health personnel and friends/relatives respectively as most common source of information (8,13) Knowledge about symptoms is important for early health seeking behavior, 80% of participants were aware of fever and chills as main symptoms of MBDs, while 61.25% stated body/joint pain followed by headache

(24.50%) and vomiting (24.25%), finding of fever as symptom was in line with Kumar V et al. and Dhaduk KM et al. studies.(11,13) Findings about awareness (80%) about MBDs can cause death/mortality was similar to study results of Gupta RK et al. and Kumar V et al.[9,11] Study on school teachers revealed that 75% of them were aware of common symptoms of dengue (headache, muscle and joint pain, and pain behind eyes) and malaria (high-grade fever with chills and rigors).(11)

88.75% of participants had knowledge of mosquito repellents and 28.5% said mosquito nets, as PPMs. 12.75% and 13.75% of study participants knew about indoor spraying and outdoor fogging respectively. Sharma et al. reported similar results about PPMs while Kohli C et al. in Delhi showed prevention of stagnation of water, covering water containers and, cleaning of coolers as some of measures.(10,17) Almost all of the participants knew that treatment for MBDs is available. Majority of the participants (59.75%) perceived their own responsibility towards MBD prevention and control, whereas 31.0% participants held the government responsible for it. Our findings were consistence with study of Patel AB et al. and Virk A et al. where participants stated that mosquito control was the responsibility of Government.(21,22)

Education plays a very important role in awareness; significant difference was found regarding name of mosquitoes, species, spread of mosquito borne diseases and availability of MBDs treatment. According to study conducted in Delhi on effect of educational interventions on community awareness of MBDs it was found that the community participation increased after interventions on educating community. Hence to improve knowledge and behaviour of community health education programs are essential.(23)

### Conclusion

Knowledge about mosquito borne diseases ranged from only 3% aware about types of mosquito, around 50% aware of breeding and habitats of mosquitoes with poor knowledge of larvae. Good knowledge (92%) about symptoms of diseases caused by MBDs was reported. Stakeholders had better awareness than community. Regarding knowledge of stakeholders, 86% said MBDs spread by bite of infected mosquitoes. Education plays a very important role in awareness; significant difference was found regarding name of mosquitoes,

species, spread of mosquito borne diseases and availability of MBDs treatment. Health education should be essential pillar for prevention and control of MBDs.

### Recommendation

Mosquitoes are one of biggest killer of humans; In National framework for malaria elimination (2016-2020), it is emphasized in cross-cutting interventions that IEC/BCC Strategy is important. Thus awareness about MBDs and health education is essential with stress on BCC for better community participation. Engagement of all stakeholders is also imperative as better planning and implementation of various activities in prevention and control of MBDs. Qualitative research can give detailed analysis of community and stakeholders perception regarding MBDs.

### Limitation of the study

Sample of stakeholders was limited in terms of number and various type of stakeholders. Knowledge in context of planning and implementation of program for MBDs was not taken. Study was restricted to slums only.

### Relevance of the study

As community participation is essential for the prevention and control of outbreak of mosquito borne disease. The present study was an attempt to find out the current awareness regarding different vector borne diseases among community and stakeholders in urban slum of Agra district, these findings may be helpful in designing further community based, evidence-based effective prevention and control strategies. In spite of mass communication and various educational approaches, community participation is far below expectation. Program implementers need to understand the disease related knowledge, attitude and practice of the community, because these are the important determinate of community participation.

### Authors Contribution

All authors have contributed equally.

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**Tables**

**TABLE 1 KNOWLEDGE REGARDING MOSQUITO NAMES, CAUSED AND THEIR HABITATS AMONG STUDY PARTICIPANTS AND STAKEHOLDERS**

Variables	Participants (N=400)	Stakeholders (N=100)
	n(%)	n(%)
<b>Name of mosquitoes*</b>		
Aedes	9(2.25)	54(54.0)
Culex	4(1.0)	35(35.0)
Anopheles	8(2.0)	45(45.0)
Mansonia	1(0.25)	5 (5.0)
Don't know	387(96.75)	2 (2.0)
<b>Mosquito borne diseases*</b>		
Malaria	243(60.75)	89(89.0)

Dengue	198(49.5)	88(88.0)
Chikungunya	73(18.25)	68(68.0)
JE / Filaria	14(3.50)	47(47.0)
Do not know	138(34.5)	6 (6.0)
<b>Diseases heard*</b>		
Malaria	389(97.25)	100(100.0)
Dengue	364(91.0)	100(100.0)
Chikungunya	228(57.0)	86(86.0)
JE/Filaria	43(10.75)	56(56.0)
<b>Knowledge regarding simultaneous occurrence of multiple MBDs</b>		
Yes	119(29.75)	56(56.0)
Don't know	381(70.25)	10(10.0)
<b>Seasonal variation in MBDs*</b>		
In summer	128(32.0)	9(9.0)
In winter	27(6.5)	4(4.0)
In rainy season	228(57.0)	93(93.0)
Always/no seasonal preference	37(9.25)	2(2.0)
Don't know	8(2.0)	2(2.0)
<b>Diurnal variation in mosquito density*</b>		
In the morning	10(2.5)	7(7.0)
In the evening	102(25.5)	74(74.0)
In the night	285(71.25)	52(52.0)
Throughout the day	23(5.75)	1(1.0)
<b>Mosquitoes larvae seen</b>		
Yes	37(9.25)	63(63.0)
No	363(90.75)	37(37.0)
<b>Breeding of Larvae*(if seen mosquito larva)</b>		
	<b>(N=37)</b>	<b>(N=63)</b>
In clean water	6(16.2)	32(50.8)
In dirty water	16(43.2)	42(66.7)
Don't know	16(43.2)	5(7.9)

\*multiple response answer

**TABLE 2 KNOWLEDGE REGARDING SPREAD, SYMPTOMS, PREVENTION AND CONTROL**

Variables	Participants (N=400)	Stakeholders (N=100)
	n(%)	n(%)
<b>Spreads MBDs*</b>		
Bite of infected mosquito	201(52.0)	86(86.0)
Polluted water/ air	112(28.0)	35(35.0)
Poor environment hygiene/ dirt	139(34.75)	44(44.0)
Don't know	43(10.75)	4(4.0)
<b>Source of information*</b>		
Family/friends/neighbours	227(56.75)	37(37.0)
T.V./radio	246(61.5)	74(74.0)
Newspaper/posters	78(19.5)	47(47.0)
Doctor/health professional	117(29.25)	53(53.0)
From school/college/work place	12(3.0)	54(54.0)
Don't know	4(1.0)	0(0.0)
<b>Symptoms of MBDs*</b>		
Fever with chills	319(79.75)	92(92.0)
Body / joint pain	245(61.25)	85(85.0)
Vomiting	97(24.25)	47(47.0)
Dizziness	35(8.75)	36(36.0)
Headache	98(24.50)	56(56.0)
Cold	43(10.75)	33(33.0)

Coughing/itching/red spots	63(15.75)	35(35.0)
Don't know	38(9.5)	2(2.0)
<b>Death by MBDs</b>		
Yes	319(79.75)	95(95.0)
No	81(20.25)	5(5.0)
<b>Prevention of MBDs*</b>		
Mosquito net	114(28.5)	96(96.0)
Repellent (Liquid vaporizer, Mosquito coil /mats, cream/lotion, Fast card/spray/other)	355(88.75)	98(98.0)
Animal dung / leaves smoke	47(11.75)	36(36.0)
Stop reproduction of mosquitoes	10(2.5)	40(40.0)
Use larvicide fishes	2 (0.5)	26(26.0)
Indoor spraying	51(12.75)	42(42.0)
Outdoor fogging	55(13.75)	64(64.0)
Don't know	23(5.75)	0(0.0)
<b>Availability of MBDs treatment</b>		
Yes	398(99.5)	100(100.0)
No	2 (0.5)	0(0.0)

*\*multiple response answers*

**TABLE 3 KNOWLEDGE OF PARTICIPANTS AND STAKEHOLDERS**

Variables	Participants (N=400)	Stakeholders (N=100)
	n(%)	n(%)
<b>Responsible persons/Institutions*</b>		
Our self/individual	239(59.75)	79(79.0)
Government	125(31.0)	29(29.0)
No one	17(4.25)	1(1.0)
Government and others	51(12.75)	27(27.0)
Don't know	13(3.25)	2 (2.0)
<b>Preventing MBDs is priority of government</b>		
Yes	375(93.75)	97(97.0)
No	25(6.25)	3(3.0)

*\*multiple response answers*

**TABLE 4 KNOWLEDGE ABOUT MOSQUITO BORNE DISEASES**

Variables	SEX		Test of significance
	Male(229)	Female(171)	(Chi square test)
<b>Name of mosquitoes*</b>			
Aedes	6(2.62)	3(1.75)	$\chi^2= 0.0636$
Culex	1(0.43)	3(1.75)	<b>df = 1</b>
Anophelese	3(1.31)	5(2.92)	<b>P = 0.8009</b>
Mansonia	1(0.43)	0(0.00)	
Don't know	222(96.94)	165(96.49)	
<b>Spreads of MBDs*</b>			
Bite of infected mosquito	124(54.15)	75(43.86)	$\chi^2=10.5965$
Polluted water/ air	60(26.20)	52(30.41)	<b>df = 3</b>
Bad environment hygiene/ dirt	85(37.12)	54(31.58)	<b>P = 0.014</b>
Don't know	16(6.99)	27(15.79)	
<b>Availability of MBDs treatment</b>			$\chi^2= 0.0431$
Yes	228(99.56)	170(99.42)	<b>df = 1</b>
No	1(0.44)	1(0.58)	<b>P = 0.8354</b>

*\*multiple response answers*



**TABLE 5 ASSOCIATION OF KNOWLEDGE ABOUT MOSQUITO BORNE DISEASES WITH EDUCATION IN COMMUNITY PARTICIPATION**

Variables	Education				Test of significance (Chi square test)
	Illiterate (152)	Up to 8 <sup>th</sup> (129)	9-12 <sup>th</sup> (79)	Graduate and above (40)	
<b>Name of mosquitoes*</b>					
Aedes	1(0.66)	2(1.55)	0(0.00)	6(15.0)	$\chi^2= 30.0781$
Culex	1(0.66)	1(0.77)	1(1.27)	1(2.5)	<b>df = 3</b>
Anophelese	0(0.00)	1(0.77)	1(1.27)	4(10.0)	<b>P = 0.0000</b>
Mansonia	0(0.00)	1(0.77)	0(0.00)	0(0.0)	
Don't know	151(99.3)	125(96.9)	78(98.7)	33(82.5)	
<b>Spreads of MBDs*</b>					
Bite of infected mosquito	36(23.68)	58(44.96)	37(46.8)	32(80.0)	$\chi^2= 32.4033$
Polluted water/ air	42(27.63)	39(30.23)	22(27.9)	9(22.5)	<b>df = 9</b>
Bad environment hygiene/dirt	61(40.13)	46(35.66)	24(30.4)	7(17.5)	<b>P = 0.0001</b>
Don't know	20(13.16)	13(10.08)	8(10.1)	2(5.0)	
<b>Availability of MBDs treatment</b>					
Yes	151(99.3)	128(99.2)	79(100.0)	40(100.0)	$\chi^2= 0.87053$
No	1(0.7)	1(0.8)	0(0.0)	0(0.0)	<b>df = 3</b>
					<b>P = 0.835</b>

\*multiple response answers