

Malaria Prevention Knowledge and Practices Among Mothers of Under 5 Children in Rural Southern Haryana, India

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ABSTRACT

Background

Children under 5 years of age are the most vulnerable group affected by malaria. Mother is the primary caretaker of children. This study was conducted to estimate the knowledge and practices regarding prevention of malaria among mothers of under 5 children

Methods

It is a community based cross sectional study. A total of 440 mothers of under 5 children were interviewed using a pretested and pre-designed schedule. Descriptive statistics were used to summarize the variables. The data were analyzed using Epi-Info.

Results

Majority of study subjects had awareness about malaria. However, less than 50% under 5 children slept under the insecticide treated net. About one-fourth of households accepted the IRS in the previous year.

Conclusions

Well-planned and well implemented communication programs with special focus on proven effective malaria control interventions can contribute to achieving multi-level malaria prevention and treatment targets

Key-words: Knowledge, Practices, Malaria, Under five children, Vector Control

GJMEDPH 2025; Vol. 14, issue 6 | OPEN ACCESS

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Conflict of Interest—none | Funding—none

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INTRODUCTION

Even in the 21st century, malaria remains a significant public health concern, despite being a curable and preventable disease. According to the World Health Organization, the global estimated number of malaria cases in 2023 was 263 million, with an estimated 0.59 million deaths.^[1] Children under the age of 5 are the most vulnerable group affected by malaria, accounting for 76% of all malaria deaths worldwide in 2023.^[1] Childhood survivors of cerebral malaria may experience developmental and behavioural impairments in later life.^[2] In India, out of 0.42 million reported malaria cases in 2018, 0.20 million were due to falciparum malaria, resulting in 96 deaths. In the same year, the state of Haryana reported 3,146 cases with no reported deaths.^[3] However, focal outbreaks subsequently occurred, which could not be contained due to technical and operational challenges, leading to a resurgence of malaria cases to 6.4 million in 1976.^[4] Malaria has posed significant public health challenges in India. However, thanks to extensive efforts in malaria control, the documented number of malaria cases in India plummeted to 0.1 million in 1965, with no reported fatalities.^[4] Outbreaks in previously malaria-free countries and resurgences in countries with progress in reducing morbidity and mortality highlight the continuous threat of re-establishment and the need for vigilance to promptly identify and contain transmission.^[5] In countries where the disease is endemic, efforts to reduce and eliminate malaria are increasingly viewed as high-impact strategic investments that generate significant returns for public health, help to alleviate poverty, improve equity and contribute to overall development. In order to accelerate progress towards elimination, World Health Organization (WHO) urges affected countries to ensure universal access to malaria prevention, diagnosis and treatment.^[6] In year 2014, Malaria Policy Advisory Committee had developed a modelling which suggests that, if coverage of malaria interventions at levels above 80% at risk population which could significantly reduce incidence of and deaths due to malaria.^[7] Malaria interventions cannot succeed unless communities adopt governmental guidance on the use of prevention tools (Sleep under Insecticide treated Net [ITN], Acceptance of Indoor Residual Spray [IRS]) and

recommended antimalarial therapies.^[8] It was necessary to know the current level of knowledge and practices of malaria control activities among mothers of under 5 children.

METHODS

The Mewat district (Nuh), as per latest census 2011, is constrained by 4 tehsils, viz. Taoru, Nuh, Ferozepur Jhirka and Punhana.^[9] In Mewat, the majority population resides in rural areas and is engaged in agriculture. When examining overall development at the district level, it becomes evident that Mewat stands out as the least developed district in Haryana. Particularly concerning factors such as standard of living, education, and health indices, Mewat significantly trails behind other districts in the region.^[10] In spite of many efforts by the health authorities of government of Haryana, more than three fourth of malaria cases of the Nuh district (about 80% malaria cases) had been reported from areas catered by PHC Ujina under CHC Nuh in 2018 (source: Office of Civil surgeon, Nuh). The study was conducted in areas covered under PHC Ujina. The study was a community based cross sectional study. To have adequate sample size for the survey, assuming prevalence of knowledge and practices of malaria as 50% among mothers of under-five children^[11], confidence interval (CI) of 95%, and an acceptable absolute error of 5%, sample size was calculated to be 384. Hence for carrying out survey, a rounded figure of 440 was considered as final sample size to cover the assumed risk of non-responses up to 10% among the selected study subjects. Multistage random sampling technique was used for selection for study subjects. The study area has four sub centers. A total of 110 mothers of under 5 children were selected from each sub center randomly to complete the 440-sample size. Mothers of under 5 children, who were living in the villages of the study area for more than 6 months and who were willing to participate, were included in the study. Mothers of under - five children with known significant comorbidities in the child were excluded from the study. The study period was between Sep 2018 to Aug 2020. The data were collected during the transmission season of malaria in the study area from May to September 2019. The data were collected on a pre-designed, pre tested,



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semi-structured interview schedule by the investigator. The first part of the interview schedule was concentrated on demographic variables. Socio-economic status was assessed on the basis of Modified B G Prasad Scale [12] (Consumer Price Index [CPI], May 2019). The second part of interview schedule was designed to capture knowledge and practices for the prevention of malaria

The collected data were entered on an Excel spreadsheet and cleaned. During the data collection process, periodic quality checks of collected data were done. The quantitative variable was summarized using mean (Standard Deviation [SD]) and median (Inter Quartile Range [IQR]). The qualitative variable was summarized using frequency and proportion. The data were analyzed using Epi-Info version 7.2.2.16 (Centers for Disease Control and Prevention, Atlanta, GA). The statistical level of significance was set at $P < 0.05$. Ethical clearance for the study was obtained from the Institutional Ethics Committee. Permission was also obtained from the

medical officer of the study area. Written informed consent was taken from all the study participants. The study participants were explained about the purpose of study and it was ensured to them regarding anonymity and confidentiality of data obtained from them. The participation in this study was voluntary and the participant was given the option to withdraw from the study any time in between and they were told that there was no administrative consequence to them. The study did not impose any kind of financial burden to the participants.

RESULTS

Table 1 showed the median age of study subjects was 26 years (IQR: 23-32 years). The majority of study subjects (294;66.8%) were illiterate. The mean family size of study subjects were about 7 members. Majority of the study subjects (62.5%) came under Socio Economic Status (SES) class IV according to Modified B.G Prasad classification (CPI 2019)

Table 1: Characteristics of study subjects included in the study. (n=440)

Variables	Distribution	
	Frequency	Percentage (%)
Age of mother	Median - 26.0 years (IQR; 23-32 years)	
Religion		
Muslim	329	74.8
Hindu	111	25.2
Education of mother		
Illiterate	294	66.8
Below Primary	16	3.6
Primary	44	10.0
Middle	34	7.7
Matriculation/Secondary	28	6.4
Higher Secondary	18	4.1
Graduate and above	6	1.4
Occupation of mother		
Home maker	439	99.8
Others	1	0.2
Type of house		
Kuccha	8	1.8
Semi pucca	59	13.4
Pucca	373	84.8
Type of family		

Nuclear	330	75.0
Joint family	110	25.0
Total family members	Mean - 6.9 (Range 3-30) S.D - 3.5	
Socio Economic Status (SES)		
I (Upper class)	2	0.5
II (Upper middle class)	19	4.3
III (Middle class)	86	19.6
IV (lower middle class)	275	62.5
V (Lower class)	58	13.1

Seasonal variation in malaria transmission was known to 92.1% (n = 405) of respondents. More than half (n = 239; 54.3%) identified pregnant women and nearly half (n = 205; 46.6%) identified under-five children as high-risk groups for malaria (Table 2). Regarding preventive measures, 86.6% (n = 381) were aware of sleeping under a bed net as an effective intervention. Other reported preventive methods included the use

of mosquito repellents such as coils, liquids, or creams (62.0%), wearing full-sleeved clothing (11.8%), insecticide spray (8.6%), and burning herbs (0.9%). More than half (68.0%; n = 299) believed that using fans, keeping lights on, and maintaining a clean environment would help prevent mosquito bites. However, 3.4% (n = 15) of respondents did not know any method for malaria prevention (Table 2).

Table 2: Knowledge about route of transmission of malaria, environmental factors related to transmission of malaria and risk groups for malaria among study subjects. (n=440)

Variables	Frequency	Percentage (%)
How people got malaria		
Bite of infected mosquito	405	92.1
Do not know	34	7.7
Breeding place of mosquito which spreads malaria		
Rain water pools, Pond, Rice field, well, stream, river bed	75	17.1
Others (Garbage, dirty water, walls)	317	72.0
Do not know	48	10.9
Biting time of the mosquito that spreads malaria		
Night and Evening time	243	55.2
Biting time varies	163	37.0
Do not know	34	7.7
Seasonal variation of malaria		
Yes	405	92.1
No	3	0.6
Do not Know	32	7.3
People at risk of getting malaria*		
Pregnant women	239	54.3
Under 5 children	205	46.6
Others (Elderly)	29	6.6
Do not know	12	2.7
Ways of prevention of malaria*		
Sleep under mosquito bed Net	381	86.6
Mosquito repellent coil, liquid and cream	273	62.0

Wearing full sleeved clothes	52	11.8
Insecticide spray	38	8.6
Burn herbs	4	0.9
Others**	299	68.0
Do not know	15	3.4

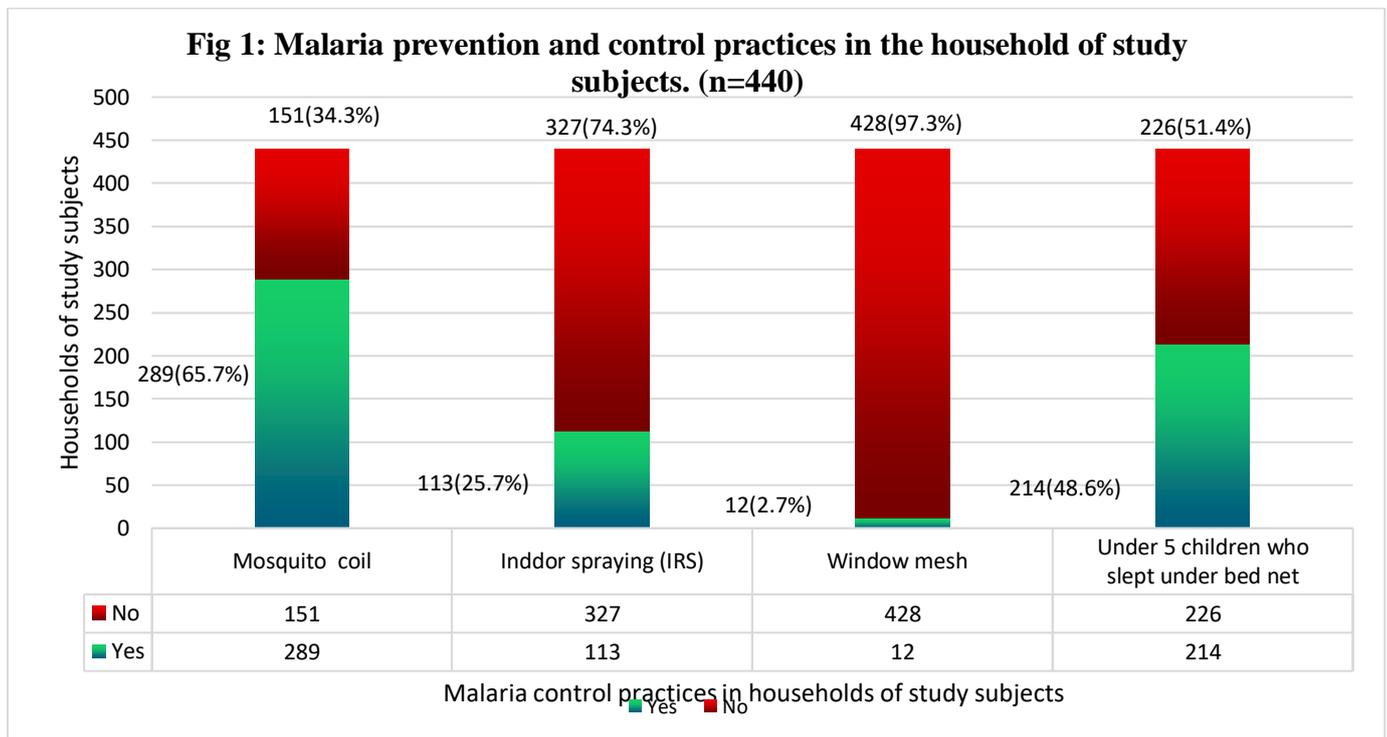
*Multiple Responses allowed

** Using fan, light and clean surrounding

Preventive Practices Against Malaria Among Mothers of Under-Five Children

Figure 1 showed that, 65.7% (n = 289) reported using mosquito repellents, while only 2.7% (n = 12) had window mesh installed in their homes. Nearly half

(48.6%; n = 214) of under-five children slept under a mosquito net. Acceptance of indoor residual spraying (IRS) in the previous year was low, with only 25.7% (n = 113) of households reporting IRS coverage.



As presented in Table 3, the proportion of households that had accepted indoor residual spraying (IRS) in the preceding year was 25.7% (95% CI: 21.8–29.9), which was significantly lower than the national malaria elimination target of 80% ($Z = -28.48$; $p < 0.0000001$). Similarly, only 48.6% (95% CI: 44.0–53.3) of under-five children were reported to have slept

under insecticide-treated nets, also significantly below the programmatic target of 80% ($Z = -16.45$; $p < 0.0000001$). These findings highlight substantial shortfalls in achieving universal coverage of proven malaria prevention interventions in the study area, underscoring the need for intensified vector control and community engagement strategies.

Table 3: Comparison of observed malaria prevention indicators with national targets

Indicator	n	N	Proportion (%)	95% CI of Proportion (Wilson Method)	Statistical Test	Test Statistic (Z value)	P value
Indoor spraying (IRS) acceptance in past year (Target = 80%)	113	440	25.7	21.8 – 29.9	One-sample test of binomial proportion	-28.48	< 0.0000001
Under-5 children sleeping under insecticide-treated net (Target = 80%)	214	440	48.6	44.0 – 53.3	One-sample test of binomial proportion	-16.45	< 0.0000001

DISCUSSION

Almost all study subjects (99.1%) were aware of malaria in the present study. Similar findings of high awareness of malaria were reported among community members in previous studies.^[13,14] In the present study, malaria was perceived as the main illness causing fever among study subjects because data was collected during a season favorable for transmission of malaria (May - September 2019). But Yadav et al (2010) found that less than three fourth of the study subjects in desert area perceived malaria as a cause of fever.^[15] Even though more than half of study subjects were illiterate in the present study, the majority of study subjects (92.1%) perceived mosquito bite as a route of transmission of malaria. This finding is similar to other study conducted by Dhawan et al (2014) in Mumbai.^[16]

In the current study, less than one fifth of mothers (17.1%) knew the correct breeding place of mosquitoes that spread malaria. However, Nejati et al (2018) found more than three fifth of the community members identified stagnant water as breeding place of mosquito that spreads malaria.^[17] Malaria is seasonal in the study area and the majority of the mothers (92.1%) knew seasonal variation of malaria in the present study. This finding is comparable to a study conducted by Dhawan et al (93%).^[16] But Nejati et al found lower awareness of seasonal variation of malaria among community members (63%) in Iran compared to present study.^[17]

The present study found that about half of the mothers were aware that pregnant women (54.3%) and under 5 children (46.6%) were the vulnerable group of malaria. Kimbi et al also found that about three fourth of study subjects were aware of at least one effect of malaria in pregnant women and under 5 children.^[13] In the present study, more than two third of the mothers (86.6%) knew sleeping under the bed net in the prevention of malaria. This finding is in agreement with Kimbi et al.¹³ However Nejati et al found less than one third perceived bed net as a strategy for the prevention of malaria in Iran.^[17] More than half of the mothers (62.0%) in the present study knew insecticide coil, repellent usage at night for the prevention of malaria. This finding is similar to the studies conducted by Dhawan et al. (68.0%).^[16] Less than 10 percent of the mothers in the present study perceived IRS in the prevention of malaria. This finding is in agreement with the studies conducted by Birhanu et al (10.4%).^[18] However few of previous studies showed higher perception of IRS in the prevention of malaria among community members than the present study.^[16,17] There is a need for intensive IEC activities in the study area to increase the awareness and knowledge of beneficial effects of IRS in the prevention of malaria among community members.

In the present study, about one tenth of study subjects perceived wearing full sleeved clothes as a way in the prevention of malaria. This is a personal



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protective measure which minimizes the mosquito bite in the evening time. Dhawan et al found about one half of respondents perceived wear full sleeved clothes as a way of prevention of malaria.^[16] Even though the majority of the mothers knew the seasonal variation in the transmission of malaria, the study subjects had no awareness of environmental measures to control breeding places of mosquitoes. However, some of the previous studies found that the community members had perception of environmental engineering in the prevention of malaria.^[14,16] More than one half of the mothers in the present study believed that fan, light and clean environment (68.0%) as a way of prevention of malaria. This belief may lead to false sense of protection among mothers as it is not effective intervention in the prevention and control of malaria

The early diagnosis and treatment role in the prevention of malaria was not known by study subjects in the present study. In a study conducted in Tanzania (2010), treatment of malaria was mentioned as a way of prevention of malaria among community members (6%).^[19] As IEC activities majorly focused on vector control activities (IRS and ITN), there is a need to include this message in all IEC activities to increase the awareness of prompt blood test and treatment for fever for the control of malaria.

Surprisingly in the present study, very few study subjects (3.4%) were not aware of ways of prevention of malaria. Kimbi et al also found that very few respondents (3.8%) were not aware of ways of prevention of malaria.^[13] In the present study, very few houses of study subjects (2.7%) had window mesh/screen in all windows of their home. The reason for low proportions of households with window mesh in the present study may be due to factors associated with affordability to improve housing quality. Several studies also found the low proportion of window mesh in houses (< 15%).^[13,16] Even though less than one tenth (8.6%) perceived IRS in the prevention of malaria, about one fourth of the households of study subjects (25.7%) accepted IRS in their household in the past 12 months. The contradiction between the perception of benefits of IRS and acceptance of IRS should be further explored. Dhawan et al also found

less than one fourth of acceptance of Insecticide spray.^[16] Mazigo et al in Tanzania found that more than 80% of houses accepted IRS.^[19] The other vector control intervention for source reductions include environmental engineering and larval control measures were not practiced by mothers in the present study. Several previous studies found a significant proportion of community members following environmental engineering like draining stagnant water in and around the house.^[14,16] Even though only 62.0% knew the benefits of mosquito repellent in the prevention of malaria, more than three fifth of households of study subjects (65.7%) were using mosquito coil/repellent/cream as a way of prevention of malaria. This discordance between knowledge and practice of mosquito coil may be due to the study subjects using mosquito coil for some other reason (to avoid biting of mosquito) without knowing the benefits of it in preventing malaria. This finding is similar to the previous studies.^[14,16]

No matter how effective a mosquito net is in the laboratory, it cannot provide optimal protection unless it is used. In this study, about one in two households (48.6%) in which under 5 children slept under mosquito bed nets. The study conducted in Zambia and southern Africa also found that only one half of under 5 children slept under mosquito nets.^[20,21] The present study has some limitations. The cross-sectional design provides information about a particular point in time, but it is unable to determine rates of change in knowledge and practices in the prevention and control of malaria among community members. The data collected by interviewing mothers of under 5 children, so recall bias and social desirability bias are also possible.

Conclusion

Overall knowledge about malaria among study subjects was good. There are some gaps in universal coverage of malaria control intervention among community members. Well-planned and well implemented communication programs with special focus on proven effective malaria control interventions can contribute to achieving multi-level malaria prevention and treatment targets and will help in achieving elimination of malaria from India.

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