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KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS THE USE AND CARE OF LONG-LASTING INSECTICIDAL NETS (LLINs) IN SIDOMULYO REGION PURWOREJO DISTRICT 2023

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Abstract: LLINs are one of the interventions in malaria vector control. Although LLINs are considered effective for three years, the way in which they are used and maintained by users affects their physical and chemical durability. The purpose of this study was to determine the relationship between the level of knowledge and attitude with the practice of using and maintaining LLINs in Sidomulyo Region. The population of this study was 153 households, and the research sample was 117 households with the criteria that respondents were ≥ 17 years old and received KBTL in August - September 2022. The results showed that knowledge with p value <0,001; CC 0,351 and attitude with p value <0,001; CC 0,507 were significantly associated with the practice of using and maintaining KBTL. The physical condition of the KBTL was in the good category, with 84% in good condition and 20.5% in good condition. The analysis showed that there was a relationship between knowledge level and attitude towards the use and maintenance of the KBTL (p value <0.001); there was a relationship between knowledge level and practice towards the use and maintenance of the KBTL (p value <0.001); and there was a relationship between attitude and practice towards the use and maintenance of the KBTL (p value <0.001). It was concluded that despite having negative attitudes, respondents' knowledge and practices related to the use and maintenance of long-lasting insecticidal nets were good enough to prevent malaria transmission.

Keywords: LLINs, malaria, knowledge, attitudes

Introduction

Malaria is considered one of the most widespread and dangerous infectious diseases. More than half of the populations in 86 tropical and subtropical countries are at risk of malaria infection.[1] Malaria continues to pose a threat to public health status.[2] This is due to the disease's impact on diminishing human resource quality and increasing mortality and morbidity among pregnant women, infants, and toddlers. The disease is transmitted through the bites of vectors, which are female mosquitoes of the Anopheles genus that are infected with the protozoa of the Plasmodium genus.[3] Purworejo Regency is classified as a malaria-endemic area in Central Java Province. Despite a declining Annual Parasite Index (API) in Central Java Province from 2016 to 2021 (0.03; 0.03; 0.02; 0.012; 0.009; 0.024), six

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regencies are still declared as malaria-endemic, and Purworejo Regency is one of them. It had the highest number of indigenous cases in 2021, accounting for 557 out of 601 cases (92.68%).[4] The API per 1000 population in Purworejo Regency from 2018 to the third quarter of 2022 has shown an increasing trend (0.12; 0.03; 0.01; 0.69; 0.54). This rises in the API per 1000 population has led Purworejo Regency to become the highest contributor of malaria cases in the Java-Bali region.[5]

One of the villages within the working area of the Purworejo Health Center, Sidomulyo, contributes to the malaria cases in Purworejo Regency. The Annual Parasite Index (API) per 1000 population in the Purworejo Health Center's working area in 2022 is 2.23 per 1000 population, categorizing it as moderately endemic (API 1-4.9/1000 population). The API per 1000 population in the Purworejo Health Center's working area from 2018 to 2022 are as follows: 0.16; 0.00; 0.00; 0.00; 2.23. In the past five years, there has been a surge in the API per 1000 population in the Purworejo Health Center's working area in 2022.[5]

The intervention of using long-lasting insecticidal nets can reduce vector-human contact and serve as an alternative for communities that reject Indoor Residual Spraying (IRS) interventions or if the walls of households are not suitable resting places for mosquitoes.[6]

Based on data from the Purworejo Regency Health Office, the working area of the Purworejo Health Center received the distribution of long-lasting insecticidal nets due to a surge in cases in August 2022 in Sidomulyo Village, caused by delayed detection of malaria cases. This delay led to an outbreak of malaria, as there were no cases (zero cases) reported in Sidomulyo Village in the previous year, and in mid-August 2022, 40 cases were discovered. The distribution of long-lasting insecticidal nets and Indoor Residual Spraying (IRS) took place in August 2022 with the aim of controlling and preventing the spread of malaria. However, the distribution of nets was not simultaneous but rather conducted in stages due to limited availability. The initial distribution and the education on how to use and care for the insecticidal nets coincided with the Mass Blood Survey (MBS) activities. Subsequent distribution and education on the nets were only carried out by neighborhood leaders (ketua RT) or local health cadres. This allowed for the possibility of incomplete information reaching the community members who received the nets during the following distribution periods. The non-simultaneous distribution of the nets enabled local malaria transmission to persist in Sidomulyo Village.

The objective of this study is to determine the relationship between knowledge and attitudes with the practice of using and maintaining long-lasting insecticidal nets.

Methods

This research is an analytical observational study with a cross-sectional community-based approach conducted to determine the relationship between knowledge and attitudes with the practices of using and maintaining long-lasting insecticidal nets.

The study population consisted of 153 households, with a sample size of 117 households in Sidomulyo Village, Purworejo Regency. The respondents were heads of households (HH) or other family members aged ≥ 17 years who received long-lasting insecticidal nets from the Purworejo Regency Health Office, distributed during August to September 2022. Simple random sampling was employed as the sampling technique in this study. Additionally, a questionnaire was used as the instrument or guide for collecting primary data.

Data analysis was performed through univariate and bivariate analyses using the chi-square statistical test at a 95% confidence level to establish connections between the variables of knowledge, attitudes, and practices.

Results

Table 1 presents the characteristics of the respondents, including gender, age, education, and occupation. Participants in this study were predominantly female respondents, accounting for 81.2%. The average age of the respondents was 47 years, with 28.2% falling in the age range of 50 to 59 years. The highest educational level attained by the respondents was high school diploma or equivalent, with 45.3%. The most common occupation among the respondents was categorized as "other" (56.4%), primarily consisting of homemakers.

Table 1: Respondents' Characteristics

Characteristics	f (n=117)	%
Sex		
Male	22	18,8
Female	95	81,2
Age (Year)		
17 – 29	14	12,0
30 – 39	29	24,8
40 – 49	13	11,1
50 – 59	33	28,2
≥ 60	28	29,3
Mean ± SD		
47 ± 15,3		
Education		
No schooling	11	9,4

Characteristics	f (n=117)	%
Elementary school or equivalent	53	45,3
Junior high school or equivalent	35	29,9
Senior high school or equivalent	15	12,8
Higher education	3	2,6
Occupation		
Not employed	8	6,8
Students	2	1,7
Daily labor	14	12,0
Civil servant	1	0,9
Farmer/planter	17	14,5
Entrepreneur	8	6,8
Trader	1	0,9
Others	66	56,4

The majority of respondents answered that they sleep inside insecticidal nets at night to avoid malaria mosquito bites (98.3%), followed by 94.9% acknowledging that malaria transmission originates from mosquito bites. Also, they are aware of the proper method of using newly opened insecticidal nets by airing them out first (Table 2).

Table 2: Respondents' Knowledge Regarding the Use and Maintenance of Long-Lasting Insecticidal Nets

Knowledge	f (n=117)	%
Malaria transmission method		
Mosquito bite	111	94,9
Sleeping with someone sick with malaria	6	5,1
Time of Anopheles mosquito bite		
Night	83	70,9
Daytime	34	29,1
Sleeping inside an insecticidal net at night to avoid malaria mosquito bites		
Yes	115	98,3
No	2	1,7
The ways to use a newly opened insecticidal net from its packaging		
Air it out first	111	94,9
Install and use it immediately	6	5,1
Time of using the insecticidal net		
Every night	108	92,3
When there are many mosquitoes	9	7,7
Tucking the bottom of the net under the sleeping mat, including proper use of the insecticidal net		
Yes	83	70,9
No	34	29,1
Frequency of washing the insecticidal net		
Washed every 3 months	66	56,4
Washed <3 months	51	43,6
Washing the insecticidal net by soaking it with		

Knowledge	f (n=117)	%
detergent		
Yes	51	43,6
No	66	56,4
Not brushing or rubbing the insecticidal net during washing		
Yes	68	58,1
No	49	41,9
Drying the insecticidal net directly under sunlight		
Yes	36	30,8
No	81	69,2

In Table 3, it is noted that respondents agree with washing insecticidal nets at the recommended frequency to prolong their lifespan (81.2%), and they believe that their family is protected from malaria by using insecticidal nets every night (79.5%). Overall, 53% of the respondents have a negative attitude (Table 4).

Table 3: Respondents' Attitudes Regarding the Use and Maintenance of Long-Lasting Insecticidal Nets

Attitude	f (n=117)	%
Insecticidal nets are distributed by the Health Center		
Strongly agree	27	23,1
Agree	86	73,5
Undecided	3	2,6
Disagree	1	0,9
Strongly disagree	0	0,0
Insecticidal nets are important to prevent malaria transmission		
Strongly agree	28	23,9
Agree	86	73,5
Undecided	3	2,6
Disagree	0	0,0
Strongly disagree	0	0,0
Using insecticidal nets every night protects the family from malaria		
Strongly agree	11	9,4
Agree	93	79,5
Undecided	12	10,3
Disagree	1	0,9
Strongly disagree	0	0,0
The family is protected from malaria without needing to maintain the insecticidal net		
Strongly agree	0	0,0
Agree	13	11,1
Undecided	23	19,7
Disagree	81	69,2
Strongly disagree	0	0,0

Attitude	f (n=117)	%
Washing insecticideal nets at the recommended frequency prolongs the net's lifespan		
Strongly agree	1	0,9
Agree	95	81,2
Undecided	11	9,4
Disagree	10	8,5
Strongly disagree	0	0,0
Every family member sleeps inside a net at night		
Strongly agree	15	12,8
Agree	88	75,2
Undecided	2	1,7
Disagree	10	8,5
Strongly disagree	2	1,7
Tucking the bottom of the net under the sleeping mat when used at night		
Strongly agree	7	6,0
Agree	74	63,2
Undecided	10	8,5
Disagree	25	21,4
Strongly disagree	1	0,9
Washing the net by soaking it with soap/detergent		
Strongly agree	0	0,0
Agree	40	34,2
Undecided	21	17,9
Disagree	50	42,7
Strongly disagree	6	5,1
Regularly washing the net every 3 months		
Strongly agree	0	0,0
Agree	55	47,0
Undecided	40	34,2
Disagree	21	17,9
Strongly disagree	1	0,9
Not drying the net directly under the sun		
Strongly agree	18	15,4
Agree	65	55,6
Undecided	17	14,5
Disagree	16	13,7
Strongly disagree	1	0,9

The majority of respondents wash insecticidal nets with a washing frequency of ≤ 2 times after use (93.2%), and 91.5% immediately install the nets after receiving them from the Health Center (Table 4).

Table 4: Respondents' Practices Regarding the Use and Maintenance of Long-Lasting Insecticidal Nets

Practice	f (n = 117)	%
All sleeping rooms have been equipped with insecticideal nets		
Yes	83	70,9
No	34	29,1
The insecticideal nets were immediately installed upon distribution by the local health centre (Puskesmas).		
Yes	107	91,5
No	10	8,5
Family members sleep inside insecticideal nets		
Yes	85	72,6
No	32	27,4
Insecticideal nets are not tucked under the sleeping mat		
Yes	52	44,4
No	65	55,6
Sleeping inside insecticidal nets even when it's hot		
Yes	91	77,8
No	26	22,2
Sleeping inside an insecticidal net only when there are many mosquitoes around.		
Yes	35	29,9
No	82	70,1
Frequency of using the insecticidal net in a week		
>3 times a week / Every night	86	73,5
≤ 3 times a week	31	26,5
Frequency of washing the insecticidal net after use		
Washed ≤ 2 times	109	93,2
Washed >2 times	8	6,8
Method of washing the insecticidal net		
Dip-washed	85	72,6
Brushed/rubbed	32	27,4
Method of drying the insecticidal net		
Air-drying only	95	81,2
Directly under the sunlight	22	18,8

The formation of categories for the variables of knowledge, attitude, and practice was done using the median value. Table 5 presents the distribution of frequency for the respondents' answers on knowledge, attitude, and practice. It is evident that 74 respondents (63.2%) have good knowledge, 62 respondents (53%) have negative attitudes, and 64 respondents (54.7%) exhibit good practices.

Table 5: Category: Knowledge, Attitude, and Practice of Using and Maintaining Long-Lasting Insecticidal Nets

Variable	Number	
	f (n=117)	%
Knowledge		
Good	74	63,2
Poor	43	36,8
Attitude		
Positive	55	47,0
Negative	62	53,0
Practice		
Good	64	54,7
Poor	53	45,3

Based on the chi-square statistical test results between knowledge and practice, a p-value of <0.001 (p-value <0.05) was obtained with a Contingency Coefficient of 0.351 (Table 6). This indicates a weak relationship between knowledge and the practice of using and maintaining long-lasting insecticidal nets.

Furthermore, the chi-square test results between attitude and practice also show a p-value of <0.001 (p-value <0.05) with a Contingency Coefficient of 0.507, which means there is a moderate to strong relationship between attitude and the practice of using and maintaining long-lasting insecticidal nets.

Table 6: Relationship Between Knowledge and Attitude with the Practice of Using and Maintaining Long-Lasting Insecticidal Nets

Variable (n=117)	Practice				P Value	*Contingency Coefficient*
	Poor		Good			
	f	%	f	%		
Knowledge						
Poor	30	56,6	13	20,3	<0,001	0,351
Good	23	43,4	51	79,7		
Attitude						
Negative	11	20,8	51	79,7	<0,001	0,507
Positive	42	79,2	13	20,3		

Discussion

This research was conducted in Sidomulyo Village, Purworejo District, with a sample of 117 respondents. The study aimed to explore the relationship between knowledge and attitudes with the practice of using and maintaining long-lasting insecticidal nets among the respondents. Prior to this study, the distribution of insecticidal nets was carried out by the Purworejo Regency Health Office and the Purworejo Health Center in response to the high transmission of indigenous malaria cases in Sidomulyo Village during the months of August to September in 2022.

Malaria is a tropical disease caused by a parasite. It is considered one of the most widespread and dangerous infectious diseases in the world.[1] Malaria continues to pose a threat to public health status.[2] This disease is transmitted through the bites of female mosquitoes of the Anopheles genus that are infected with the protozoa of the Plasmodium genus.[3] Prevention of malaria transmission can be achieved through various methods, including the proper use and maintenance of insecticidal nets. Effective coverage of using these nets can prevent malaria transmission if 80% of the population in the target area uses them correctly.[8]

In this study, the practices of using and maintaining insecticidal nets are still inadequate. Most respondents indicated that not all sleeping rooms were equipped with long-lasting insecticidal nets, which means there are family members who could potentially contract malaria. Some respondents mentioned that they only sleep inside the insecticidal nets when there are many mosquitoes, and the frequency of net usage is ≤3 times a week. Additionally, some respondents' methods of using the insecticidal nets are not entirely accurate, such as not tucking the net under the sleeping mat during nighttime use, and washing the net by brushing or rubbing. These practices could impact the effectiveness of preventing malaria transmission.[8] Respondents' knowledge and attitudes are additional factors that can influence the practices of using and maintaining long-lasting insecticidal nets.[9] Each of these factors was obtained through interviews with the respondents using a questionnaire. In addition to observing practices, this study also aims to examine the relationship between knowledge and attitudes with the practices of using and maintaining long-lasting insecticidal nets.

The research results revealed a significant correlation between respondents' knowledge and attitudes with the practice of using and maintaining long-lasting insecticidal nets. The knowledge of the population in Sidomulyo Village regarding malaria, the use, and maintenance of long-lasting insecticidal nets is still lacking. This is evidenced by the presence of respondents who answered that mosquitoes carrying malaria bite during the daytime. However, the habitual feeding time for malaria mosquitoes starts from the evening until early morning.[10] Furthermore, there are still respondents who are unaware that the proper way to use an insecticidal net is to tuck it under the bed to prevent any openings for mosquitoes to enter the net.[8] Not only the method of using insecticidal mosquito nets affects their effectiveness, but also the care and maintenance of the nets contribute to their efficacy in preventing malaria transmission. From the research findings, it is evident that there are respondents who still wash long-lasting insecticidal nets by soaking them with detergent, rubbing or brushing, and drying them under direct sunlight. Additionally, some respondents are not aware of the recommended frequency of washing insecticidal nets. The recommended washing frequency for these nets is four times a year, with a three-month interval between washes.

Other studies have demonstrated a statistically significant relationship between the level of knowledge and the practices of using and maintaining long-lasting insecticideal nets.[11–13] The respondents'

attitudes are also significantly related in an inverse manner to the practices of using and maintaining long-lasting insecticidal nets. The majority of respondents agree that following the recommended maintenance guidelines can prolong the lifespan of the insecticidal nets. Proper maintenance includes appropriate washing and drying methods. In this study, the majority of respondents washed the insecticidal nets by dip-washing and dried them solely through air-drying. This aligns with research conducted in Benin on the Olyset® and PermaNet® brand insecticidal nets. Community-based studies on LLIN (Long-Lasting Insecticidal Nets) washing practices in Benin indicate that people use traditional or local soap to wash their LLINs. LLINs washed with traditional soap and left to dry under sunlight lose their effectiveness more rapidly compared to LLINs washed with local soap and dried in shaded areas.[14] A previous study on the perception of LLINs usage and effectiveness in Ivory Coast showed that the use of industrial soap powder and regular washing frequency with tap water proved to maintain the effectiveness of LLINs.[15]

Conclusions

The respondents' knowledge and attitudes are weak to moderately associated with the practices of using and maintaining long-lasting insecticidal nets. Overall, the knowledge of the population in Sidomulyo Village is good. However, the majority of the population holds negative attitudes that lead to a lack of motivation for engaging in preventive practices against malaria transmission, such as using and maintaining long-lasting insecticidal nets. This presents a barrier that needs to be addressed as part of the national malaria control program. The Malaria Control Program in Purworejo Regency should focus on evaluating and monitoring community practices concerning the use and maintenance of long-lasting insecticidal nets in malaria-endemic and receptive areas.

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