



Malaria Prevention Through Bed Net Use: A Community-Based Study in Kaligesing, Central Java

Farindira Vesti Rahmasari^{1*}, Ekorini Listiowati²

^{1,2}School of Medicine, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Bantul, Indonesia

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ABSTRACT

Background: Malaria is a potentially fatal disease caused by Plasmodium parasites and transmitted through the bites of infected female Anopheles mosquitoes. This study aimed to identify factors associated with malaria knowledge, bed-net use, and bed-net quality in a high-risk area.

Methods: A descriptive cross-sectional study was conducted from January to March 2020 in the Kaligesing Primary Health Center catchment area, Purworejo District, Central Java, Indonesia. Individuals aged 5–55 years who had suspected malaria symptoms, lived in a predefined high-risk area, or had travelled to a malaria-endemic area. Individuals with severe or complicated falciparum malaria, malnutrition, non-malarial infections, pregnancy, or breastfeeding were excluded. Of 35 recruited participants, 32 with complete questionnaire data were analysed. Variables included sociodemographic characteristics, malaria knowledge, bed-net use, and bed-net physical quality. Data were summarized using frequencies and percentages, and associations were tested using the *chi-square* test.

Result: Participants aged 20–40 years comprised 50.0% (16/32). Females accounted for 40.6% (13/32), 40.6% had completed high school, and 34.4% were employees. Good malaria knowledge was observed in 93.8% (30/32). Bed nets were used by 59.4% (19/32), and 89.5% (17/19) of users had good-quality nets. Occupation was significantly associated with bed-net use (p -value=0.007) and showed a moderate positive association ($\chi^2 = 0.469$).

Conclusion : Occupation was associated with bed-net use. Despite good malaria knowledge and bed-net quality, use remained suboptimal, highlighting the need for targeted interventions among high-risk occupational groups.

Keywords: Malaria; Insecticide-treated nets ; Bed net use ; Malaria knowledge ; Bed net quality.

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*Corresponding author, farindira.vesti@umy.ac.id

Introduction

Malaria is a life-threatening disease caused by protozoan parasites of the genus *Plasmodium* and transmitted to humans through the bite of an infected female *Anopheles* mosquito. According to the World Health Organization (WHO), an estimated 247 million malaria cases occurred across 84 malaria-endemic countries in 2021, representing a slight increase of approximately 2 million cases from the 245 million cases reported in 2020¹. This trend continued in 2022, when malaria caused 249 million cases and 608,000 deaths globally, with Africa bearing the greatest burden, accounting for 94% of cases and 95% of deaths². Beyond its physical and psychological effects on affected individuals, malaria also imposes a considerable economic burden on patients and their caregivers. Even uncomplicated malaria may lead to substantial financial consequences, including direct costs such as consultation, diagnostic testing, and medication, as well as indirect costs related to productivity loss and time spent seeking care³. In Indonesia.

Central Java Province has made considerable progress toward malaria elimination, although malaria transmission persists in several areas. The malaria morbidity rate increased slightly from 0.05 per 1,000 population in 2014 to 0.06 per 1,000 population in 2015, with a total of 2,190 cases reported⁴. Despite this increase, the rate remained below the national target of 1 case per 1,000 population. Of the 35 districts and cities in Central Java, 29 had entered the maintenance stage of malaria elimination, while six regencies were progressing toward malaria-free status. Nevertheless, locally acquired malaria cases were still reported in five districts, namely Purworejo, Banjarnegara, Purbalingga, Banyumas, and Kebumen⁵. The Annual Parasite Incidence decreased from 0.03 per 1,000 population in 2017 to 0.023 per 1,000 population in 2018, remaining below the national target of 1 per 1,000 population. Therefore, despite the relatively low incidence and progress toward elimination, malaria remains an important public health problem in Central Java because

it continues to contribute to morbidity and mortality and may trigger outbreaks in endemic areas.

Purworejo is a district in Central Java that is one of the malaria endemic areas whose cases remain throughout the year. Malaria cases in 2000 reached 33,543 (API 43.7%), while in 2009, there was a decrease in the number of cases to 359 (API 0.47%). However 2010, malaria cases increased again to 372 cases (API 0.49%). In 2011, there were 1001 cases (API 1.34%), and 547 cases (API 0.57%) in 2012. The occurrence of malaria in Purworejo is influenced by several factors, namely high population mobility to and from other endemic areas, geographic conditions, population behaviour, and presence malaria vector mosquitoes^{6,7}. There are several sub-districts that still have endemic malaria cases by primary health care area. High Case Incidence occurred in Kaligesing and Dadirejo, Moderate Case Incidence in Banyuasin and Karanggetas and Low Case Incidence (LCI) Brono, Purworejo, Bener, Bagelen, Cangkreng, Loano, Winong, Kemiri, Bragolan, Wirun, Bubutan and Mranti. The characteristics of plasmodium infection are 58.5% plasmodium falciparum, 28.9% plasmodium vivax, a mixture of *P. falciparum* and *P. vivax* 3.5% and unknown species is 9.1⁸. Despite high coverage of Insecticide Treated Nets (ITNs) in Indonesia, usage and quality remain uneven across communities. This study aims to identify socio-demographic factors influencing bednet utilization in an endemic area, providing insight for more targeted malaria control strategies.

Methods

This research conducted at Kaligesing sub district, primary health center working area used a cross-sectional study with descriptive analysis. A cross-sectional study was conducted was conducted from January to March 2020 in the rural areas of Purworejo District, Kaligesing subdistrict in Central Java Province of Indonesia. There were 35 respondents recruited and involved in this study. The inclusion criteria including (1) respondent age 5-55 years old with malaria risk or respondents who have gone to

malaria endemic areas; (2) Willingness in participating voluntarily of this study such as fulfil informed consent either from the respondents or from a parent in the case of children. In addition, the exclusion criteria including (1) general danger symptoms or signs of severe and complicated falciparum malaria (2) respondents with malnutrition; (2) respondents with other infection which was not caused by malaria; (3) pregnant women; (4) a breastfeeding mother.

The final sample consisted of 35 respondents, exceeding the calculated minimum sample requirement for Kaligesing Subdistrict based on an expected malaria prevalence of 0.001 and an additional 10% allowance for potential sample loss. Because no complete line listing or sampling frame was available, participants were recruited using consecutive sampling from individuals with suspected malaria symptoms or apparently healthy residents living within a predefined high-risk area in Kaligesing, a high-case-incidence malaria area of Purworejo District. The application of specific inclusion and exclusion criteria and the focus on a geographically defined high-risk area limited the number of eligible participants; however, the final sample was considered adequate for the descriptive objectives of this study.

This study employed random sampling which was limited into some criteria as suspect of malaria symptoms and the neighbouring perimeter. Purworejo district has 3 different malaria endemic areas, namely High Case Incidence (HCI) Kaligesing and Dadirejo, Middle Case Incidence (MCI) Banyuasin and Karanggetas, and Low Case Incidence (LCI) Bruno, Purworejo, Bener, Bagelen, Cangkep, Loano, Winong, Kemiri, Bragolan, Winin, Bubutan and Mranti. The current research focused on an area with high malaria cases, namely Kaligesing. In the area, about 30 blood samples were collected from residents with suspected malaria symptoms or apparently healthy individuals. In these selected areas, also Artemisinin Combination Therapy (ACT) is used as an antimalarial drug.

From this formula, the minimum total number of Kaligesing subdistrict sample were 16 with expected prevalence or proportion is

0.001 and researcher add 10 %, to prevent loss of sample

$$n = \frac{Z^2 P(1 - P)}{d^2} \quad (1)$$

Where

n = Sample size,

Z = Z statistic for a level of confidence.

P = Expected prevalence or proportion

d = Precision (If the precision is 5%, then $d = 0.05$)

Data collection of this research generally based on Whiteman paper and laboratory.

Data collection of this research generally based on Whiteman paper and laboratory examination. The sampling strategy followed sample size calculation using Eq. (1). Then besides two kind examination, interview using questionnaire will be performed to investigate potential determinant of malaria incidence. The questionnaire consisted of three aspects namely (1) demographic factors such as age, gender, education level, number of family members, salary and respondent's occupation; (2) respondents' behaviour in facing malaria disease and prevention; (3) the using of bed nets and ventilation mosquito nets as a prevention to malaria disease. Further additional data was gotten from interview. Before the interview was started, the respondents were explained about the objectives of this research and asking them to involve in this study. In addition, respondents were asked to give signature before the interview was started. To examine the relationship of each demographic aspect to the malaria prevention practice, this study used Chi-square test. Statistical Package for the Social Sciences (SPSS) for Windows (version 21.0; Armonk, NY: IBM Corp., USA) was used in this study. Ethical approval for this study was granted by the Health Research Ethics Committee of Universitas 'Aisyiyah Yogyakarta, Indonesia (Ethical Clearance No. 1419/KEP-UNISA/I/2020).

Result

A malariometric survey and questionnaire was conducted in a selected village in high cases incidence area Kaligesing subdistrict and blood samples were collected via one or more of the following methods: smears on a glass

slide or as a blot on filter paper (3MM; Whatman, Hillsboro, OR). *Plasmodium falciparum* infected samples, as revealed by microscopic examination of a slide smear, were used for DNA isolation.

Table 1. Characteristics of Respondents in rural area Kaligesing of Purworejo District, Indonesia (n=32)

Variable	f	%
Age		
<20	1	3,12
20-40	16	50,00
40-60	13	40,63
>60	2	6,25
Gender		
Male	19	59,37
Female	13	40,63
Education		
Elementary school	11	34,38
Junior high school	6	18,75
Senior high school	13	40,62
Bachelor	2	6,25
Occupation		
Employee	11	34,37
Employes	4	12,5
Student	2	6,25
Farmer	6	18,75
Household mother	7	21,88
Retired/unemployed	2	6,25

In Table 1, Among 32 respondents, most of them (50%) was 20-40 years old, and followed by age 40-60 years old (40.63%), age > 60 years old 6.25% and age <20 years old (3.12%), female respondents (40.63%), high school was the most (40.6%), employee (34.4%), good knowledge (93.75%) and use of bed mosquito net (59.4%).

Table 2. Knowledge and behaviour of malaria prevention among respondents in rural areas Kaligesing of Purworejo District, Indonesia (n=32).

Variables	F	%
Knowledge toward malaria disease		
Good	30	93,75
Poor	2	6,25
Category of using bed mosquito net		
Use	19	59,38
Not used	13	40,62
Quality of bed mosquito net		
Good	17	89,47
Poor	2	10,53

Good knowledge toward malaria disease almost all showed 93.75 % (30/32) and majority 89.47 % (17/19) have good quality of bed mosquito net. Nineteen of 32 respondents have good behaviour towards malaria prevention by using bed mosquito net (59.38%) as seen in Table 2.

Table 3 showed that respondents who were less than 20 years old, most of them did not use bed mosquito nets. Respondents who were older than 20 years old, do the malaria prevention better. The *p-value* is > 0.005, so that there was no significant relationship between knowledge and bed net usage in malaria prevention for each age. Respondents who have occupation as employee, most of them use bed mosquito nets. Student did not use the nets. The *p-value* is < 0.005, so that there was significant relationship, it means that the background of occupation especially employee give more understanding the benefit of bed net usage. The highest percentage of using bed mosquito nets were respondents who graduated from senior high school even though with the *p-value* gotten from the analysis is 0.204.

Table 3. Association between baseline characteristics, knowledge and bed net usage in rural areas Kaligesing of Purworejo District, Indonesia (n=32)

Variable	Bed net usage		Knowledge	
	Yes	No	Good	Poor
	N (%)	N (%)	N (%)	N (%)
Age				
<20 years	0 (0)	1 (3,13)	1 (3,13)	0 (0)
20-40 years	10 (31,25)	6 (18,75)	14 (43,75)	2 (6,25)
40-60 years	8 (25)	5 (15,62)	13 (40,62)	0 (0)
>60 years	1 (3,13)	1 (3,13)	2 (6,25)	0 (0)
*p-value	0,84		0,23	
Gender				
Male	13 (40,63)	6 (18,75)	18 (56,25)	1 (3,13)
Female	6 (18,75)	7 (21,87)	12 (37,50)	1 (3,13)
*p-value	0,12		0,71	
Education				
Elementary school	5 (15,62)	6 (18,75)	10 (31,25)	1 (3,13)
Junior High School	3 (9,37)	3 (9,37)	6 (18,75)	0 (0)
Senior High School	10 (31,25)	3 (9,37)	13 (40,62)	0 (0)
Higher Education	1 (3,13)	1 (3,13)	1 (3,13)	1 (3,13)
*p-value	0,204		0,06	
Occupation				
Employee	10 (31,25)	1 (3,13)	10 (31,25)	1 (3,13)
Employees	3 (9,37)	1 (3,13)	4 (12,50)	0 (0)
Student	0	2 (6,25)	2 (6,25)	0 (0)
Farmers	3 (9,37)	3 (9,37)	5 (15,62)	1 (3,13)
Household mothers	2 (6,25)	5 (15,62)	7 (21,88)	0 (0)
Retired/Unemployed	1 (3,13)	1 (3,13)	2 (6,25)	0 (0)
*p-value	0,007		0,61	

Discussion

The occurrence of a malaria outbreak in Wadas Village, Purworejo district in 2021, which by the end of the year had found 535 cases. Whereas in 2022, until the second week of December, there were 544 cases spread across six sub-districts, 10 Community Health

Centres, and 58 villages in the Purworejo district, with the highest case in Kaligesing District⁹.

The mostly study participant was in age 20-40 year with dominantly male respondent. Good knowledge toward malaria disease almost observed in all study participant and 90

%. had good bednet quality. Contrast in another study showed knowledge of malaria was limited with 44.6% were aware of malaria symptoms, 40.6% knew the malaria transmission route precisely, and 29.2% knew of mosquito breeding places¹⁰. This study indicates the necessity and continuity of spreading accurate malaria knowledge and promoting behaviour especially good quality bed net usage to strengthen their engagement in malaria elimination. Results from this study will contribute to the development and implementation of future intervention programs to achieve malaria elimination in Purworejo.

Further investigation showed that, although most respondents reported using insecticide-treated bed nets at night, some did not use them consistently. Irregular use may reduce the protective effect of bed nets and increase exposure to mosquito bites. Among the 19 respondents who used bed nets, 17 (89.47%) had nets classified as being in good physical condition, whereas 2 (10.53%) used nets of poor quality. The physical integrity of a bed net is important because intact nets provide a more effective barrier against mosquito bites, while holes, tears, and deterioration may reduce protection. Previous studies have shown that the effectiveness of insecticide-treated nets is influenced by their physical condition, durability, insecticidal activity, and consistent use^{11,12}. However, the relationship between net damage and malaria infection may vary according to the extent of deterioration, local mosquito density, insecticide resistance, and other household environmental conditions^{13,14}. Therefore, the risk of malaria may be influenced not only by bed net ownership, but also by the quality of the net and adherence to its regular use. In this study, bed net use was lowest among respondents aged below 20 years and highest among those aged 20–40 years. This finding is consistent with previous research indicating that younger individuals may use insecticide-treated bed nets less consistently because of their greater mobility between their place of origin and destination¹⁵. Similar findings from the same area showed that migration patterns, insecticide-treated bed

net use, and chemoprophylaxis use were associated with malaria incidence⁷.

These findings may also be understood from a behavioral perspective. Previous research has shown that risk perception mediates the relationship between attitude and preventive practice, indicating that individuals with a more positive attitude are more likely to engage in prevention when they also perceive themselves to be at risk¹⁶. This suggests that inconsistent use of mosquito nets may not only reflect limited access or mobility-related challenges, but also insufficient perception of malaria risk. Therefore, strengthening health promotion and educational campaigns that emphasize the risk of malaria may help improve preventive behavior, including regular bed net use.

The findings demonstrated that several factors, including the usage of mosquito nets, the presence of breeding grounds, the propensity to venture outside at night, and the use of insect repellents, significantly influence the frequency of malaria in Indonesia. Residents in malaria-endemic areas are anticipated to use mosquito nets at night, clean any standing water around their homes, refrain from outdoor activities at night unless absolutely necessary, and use insect repellent to protect themselves from mosquito bites¹⁷. Some previous study that conducted in Ratanakiri Province of Cambodia found very high percentage for using bed nets. The study showed that 95.8% respondent use bed nets at home, 83.8% used long sleeved clothes for malaria prevention¹⁰, and other study demonstrated that majority of respondents (95.8%) thought that malaria was a preventable and curable disease. On the other hand, 25% of respondents conducted malaria prevention frequent and he used of insecticide treated bed nets, and respondents who practice malaria environmental management was only 57.6%¹⁸.

Several observational studies indicated that there is any relationship between each education level and the usage of bed and ventilation mosquito net. It is interesting that employee became the most respondents who used bed net rather than other occupation. An earlier study conducted in North West Ethiopia

revealed no statistically significant association between sociodemographic characteristics such as age, education level, sex, occupation, and religion and the prevention of malaria¹⁸. In addition, religion, occupation, and age groups were not statistically significant effect to attitude of malaria prevention¹⁹. According to a survey conducted at Tanzania, 37.9% of participants agreed, and 52.7% strongly agreed, that malaria is a severe and life-threatening disease. Twenty two percent of respondents agreed with this, that malaria can transmit from one person to another²⁰. Similar with study in North West Ethiopia found that socio-demographic factors such as age, education status, sex, and religion were not statistically significant relationship with malaria prevention^{18,19}.

Using mosquito nets effectively prevents contact between *Anopheles sp.* with healthy people while sleeping at night, as it is known that *Anopheles sp.* actively seeks blood at night. Using mosquito nets not damaged or with holes at night can prevent or protect against *Anopheles sp.* mosquito bites. Not biting means no contact between humans and these mosquitoes active at night. So it is necessary to prevent malaria using mosquito nets, especially in endemic areas²¹. The factors associated with bed net malaria usage was employee occupation ($P < 0.05$). The Chi-square test showed a statistically significant association between occupation and bed net use ($p = 0.007$). This result different with study in Aceh that there is no correlation between occupation with malaria incidence²². Highly malaria cases from imported and high risk group are more associated with demographic factors and occupation²³.

The main limitations of this study were that it was a single-centre study and the limited number of samples used in single primary health centre working area. The possibility of social desirability bias on self-reported behavioural and lifestyle factors. Additional investigation into the evaluation of active and passive surveillance data in low-endemic malaria settings was required to bolster efforts to identify and target high-risk people. The findings of this study suggest that behavioural and social determinants, particularly

occupational roles, influence the consistent use of bed nets in malaria-endemic areas. Individuals with formal employment may have greater access to health education, structured routines, or workplace health campaigns, which can promote better preventive practices. Conversely, groups such as students or informal labourers may lack exposure to sustained health messaging or resources. These behavioural insights underscore the need for targeted educational interventions that address community-specific routines, mobility patterns, and risk perceptions.

Furthermore, the results hold important implications for malaria elimination efforts. Public health authorities may consider integrating behaviour-based communication strategies into community education campaigns, especially for high-risk occupational groups. Strengthening bednet distribution programs with complementary education about proper use and maintenance could enhance the long-term effectiveness of vector control strategies. Coordination between primary healthcare centres and community leaders may also improve outreach in underrepresented demographic groups. However, the generalizability of these findings is limited by the modest sample size and the focus on a single high-risk subdistrict in Purworejo. While Kaligesing represents a high malaria burden area, broader studies across multiple endemic zones are needed to validate these behavioural trends. Future research should involve larger, multi-site samples and potentially longitudinal designs to assess the sustained impact of educational interventions and bed net utilization behaviours.

Conclusions

Occupation was significantly associated with bed net usage, suggesting a need for targeted educational and preventive efforts among specific demographic groups. Enhancing awareness and ensuring access to high-quality bed nets may accelerate malaria elimination in endemic regions. Future studies with larger samples and multi-site designs are needed to validate these findings.

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References

1. WHO. World Malaria Report. Geneva: World Health Organization; 2022.
2. Naveenkumar S, Kamaraj C, Kumarasamy V, Jayaseelan C, Prem P, Boomija RV, et al. Isolation and validation of antimalarial compounds from *Phyllanthus emblica* leaves for new antimalarial drug development. *Scientific Reports*. 2025 May 20;15(1):17452. doi:10.1038/s41598-025-99998-3
3. Ismail NE, Jimam NS, Goh KW, Tan CS, Ming LC. Economic Burdens of Uncomplicated Malaria in Primary Health Care (PHC) Facilities of Plateau State, Nigeria: Patients' Perspectives. *International Journal of Environmental Research and Public Health*. 2023 Jan 8;20(2). doi:https://doi.org/10.3390/ijerph200210
4. Alami R, Adriyani R. TINDAKAN PENCEGAHAN MALARIA DI DESA SUDOROGO KECAMATAN KALIGESING KABUPATEN PURWOREJO. *JPK*. 2018 Feb 26;4(2):199. doi:10.20473/jpk.V4.I2.2016.199-211
5. Office CJH. Kasus Malaria di Jawa Tengah. 2014.
6. Office PH. Profil Malaria Kabupaten Purworejo 2005. Purworejo; 2006.
7. Sekartami RP, Martini, Wuryanto MA, Hestningsih R, Yuliawati S, Setiawan H, et al. The Relationship between Mobility and Prevention Practices with Malaria Incidence in Purworejo District. *Journal of Communicable Diseases*. 2022;54(4).
8. Murhandarwati EEH, Fuad A, Sulistyawati, Wijayanti MA, Bia MB, Widartono BS, et al. Change of strategy is required for malaria elimination: a case study in Purworejo District, Central Java Province, Indonesia. *Malar J*. 2015 Dec;14(1):318. doi:10.1186/s12936-015-0828-7
9. Office PD. Kasus Malaria Tinggi, Pemkab Bentuk Relawan Gebrak Malaria. 2022.
10. Yasuoka J, Kikuchi K, Nanishi K, Ly P, Thavrin B, Omatsu T. Malaria knowledge, preventive actions, and treatment-seeking behavior among ethnic minorities in Ratanakiri Province, Cambodia: a community-based cross-sectional survey. *BMC Public Health*. 2018.
11. Okumu F. The fabric of life: what if mosquito nets were durable and widely available but insecticide-free? *Malaria Journal*. 2020 Jul 20;19(1):260. doi:10.1186/s12936-020-03321-6
12. Ladu HI, Shuaibu U, Pulford J. Reasons for mosquito net non-use in malaria-endemic countries: A review of qualitative research published between 2011 and 2021. *Tropical Med Int Health*. 2024 Jul;29(7):647–56. doi:10.1111/tmi.14006
13. Minta AA, Landman KZ, Mwandama DA, Shah MP, Eng JLV, Sutcliffe JF, et al. The effect of holes in long-lasting insecticidal nets on malaria in Malawi: results from a case-control study. *Malaria Journal*. 2017 Oct 2;16(1):394. doi:10.1186/s12936-017-2033-3
14. Sadoine ML, Smargiassi A, Ridde V, Tusting LS, Zinszer K. The associations between malaria, interventions, and the environment: a systematic review and meta-analysis. *Malaria Journal*. 2018 Feb 7;17(1):73. doi:10.1186/s12936-018-2220-x
15. Pindolia DK, Garcia AJ, Huang Z, Smith DL, Alegana VA, Noor AM, et al. The demographics of human and malaria movement and migration patterns in East Africa. *Malar J*. 2013 Dec;12(1):397. doi:10.1186/1475-2875-12-397
16. Zamzuri M, Ammar IA, Majid FNA, Dapari R, Hassan MR, Isa AMM. Perceived Risk for Dengue Infection Mediates the Relationship between Attitude and Practice for Dengue Prevention: A Study in Seremban, Malaysia. *International Journal of Environmental Research and Public Health*. 2022 Oct 14;19(20). doi:https://doi.org/10.3390/ijerph192013252

17. Lewinsca MY, Raharjo M, Nurjazuli N. Faktor Risiko yang Mempengaruhi Kejadian Malaria Di Indonesia : Review Literatur 2016-2020. JKL. 2021 Apr 30;11(1):16–28.
doi:10.47718/jkl.v11i1.1339
18. Alealign A, Petros B. Knowledge, attitudes and practices of malaria transmission and preventive measures in Woreta town, Northwest Ethiopia. BMC Public Health. 2018.
19. Assan A, Takian A, Hanafi-Bojd A, Rahimiforoushani A, Nematolahi S. Knowledge, attitude, and practice about malaria: Socio-demographic implications for malaria control in rural Ghana. Journal of Public Health Policy. 2017.
20. Munisi D, Nyundo A, Mpondo B. Knowledge, attitude and practice towards malaria among symptomatic patients attending Tumbi Referral Hospital: A cross-sectional study. PloS One. 2019.
21. Apriliani. Analisis Faktor Risiko Kejadian Malaria di Indonesia. [Medan]: UIN Sumatera Utara; 2021.
22. Pravsta IAP. Hubungan usia, pekerjaan dan kepatuhan penggunaan kelambu berinsektisida dengan kejadian malaria di desa Sukajadi Kecamatan Banda Mulia Kabupaten Aceh Tamiangs. Universitas Syah Kuala. [Aceh]: Universitas Syah Kuala; 2015.
23. Rachmad B. Isolasi Dan Identifikasi Mutasi Gen PfK13 (PF3D7_1343700) Sebagai Penanda Resistensi Artemisinin Pada Isolat Plasmodium falciparum Asal Lampung. In: Prosiding dalam rangka Rakernas XIV & Temu Ilmiah XXII. Bandar Lampung; 2019.