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Analysis of the Socio-cultural and Economic Factors Affecting Malaria Prevention in Provinces with high Malaria Prevalence In Zambia

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DOI 10.53974/unza.jabs.7.4.1219

ABSTRACT

Malaria, which is endemic in all the provinces of Zambia, remains one of the leading causes of morbidity and mortality. Records of the high prevalence of malaria is evident in Northern, Eastern, Muchinga and Luapula provinces, despite the implementation of malaria control and prevention strategies aimed at interrupting the disease transmission, which includes the use of treated mosquito nets, indoor residual spraying, presumptive, and treatment therapy among others. These provinces' socio-cultural and economic factors were explored to ascertain if they might contribute to the altered effectiveness of malaria control interventions that have proved successful in other provinces. This study analysed the socio-cultural and economic factors affecting malaria prevention in provinces with high malaria prevalence in Zambia. A descriptive cross-sectional study was conducted. An interviewer-administered questionnaire was administered to selective households in the four study provinces.

1,580 people participated in the study, with a response rate of 98.8%. 684 were male, and 896 were female. Findings suggest practices and beliefs concerning socio-cultural and economic factors influence the success of malaria control interventions in the provinces. Low levels of education and lack of it, directly impacted the understanding of malaria prevention, transmission, and interventions. Self-medication, use of leftover medicines, and seeking treatment late were attributed to low-income levels in all the four provinces. Type of housing and occupation exposed individuals to malaria infection. Tailoring malaria preventive measures to the socio-cultural and economic practices of the provinces will help reduce malaria cases in the provinces.

KEYWORDS: *social-cultural, economic factors, malaria prevention, high malaria prevalence provinces, Zambia.*

BACKGROUND

Malaria occurs mostly in poor tropical areas of the world, although it can be prevented. The latest world malaria report by the World Health Organisation (WHO,2022) revealed that, globally, there were approximately 247 million malaria cases in 2021 in 84 malaria-endemic countries (including the territory of French Guiana), an increase from 245 million in 2020, with most of this increase coming from countries in the WHO African Region. In 2015, the Global Technical Strategy (GTS) baseline year for malaria was 2016–2030, with an estimated 230 million malaria cases. There were approximately 619,000 malaria deaths globally in 2021 compared to 625,000 in the first year of the COVID-19 pandemic. In 2019, before the pandemic struck, the number of deaths stood at 568,000. Malaria cases continued to rise between 2020 and 2021, but at a slower rate than in 2019 and 2020. The global tally of malaria cases reached 247 million in 2021 compared to 245 million in 2020 and 232 million in 2019 (WHO 2022). Africa has a combination of factors, such as predominant parasite species (plasmodium falciparum), local weather conditions and socioeconomic instability, which have hindered efficient malaria control activities (CDC, 2021). The long lifespan and strong human-biting habit of the African mosquito species that carry malaria are the main reasons for the high prevalence of malaria in Africa. Hence, it persists and harms people's health and livelihoods (WHO, 2019, 2022).

Zambia is a low-middle-income country located in the southern part of Africa, and although its border touches a few lakes, it is otherwise landlocked. Its population as of 2019 was 19,145,090 (CSO, 2020; ZDHS, 2018; UN 2021). Malaria transmission occurs all year round, with variations in transmission intensity across the country.

In Zambia, 77% of the total population resides in rural areas (ZSA, 2020), where the risk of malaria infection is 4.5 times greater than in urban areas (2021 HMIS). Not only is Zambia a highly malaria-endemic country, but malaria is also endemic in all eight neighbouring countries.

Figure 1. Map of Zambia with its neighbours (Source: https://ontheworldmap.com/zambia)

There were 7,050,968 reported total malaria cases; malaria case incidence was estimated to be 340/1,000 population/year; prevalence in children under five was found to be 29% (RDT-based); and the incidence of in-patient malaria deaths was estimated to be 8/100,000 population per year (HMIS 2021).

The key malaria control, prevention, and management strategies that Zambia has taken to mitigate the disease are vector control using Indoor Residual Spraying (IRS) and promotion of ownership and use of Insecticide-Treated Nets (ITNs); malaria case management using effective diagnostics and lifesaving Drugs-artemisinin-based Combination Therapy (ACTs) and control of malaria in pregnancy through Intermittent Presumptive Treatment (IPTp) strategy (Chanda *et al*., 2013).

The levels of malaria transmission intensity are stratified as "high" level 4 (above 500 cases per 1000 population/year), "moderate" level 3 (between 200 and 500 cases per 1000 population per year), "low" level 2 (between 50 and 200 cases per 1000 population/year), "very low" level 1 (between 0 and 50 cases per 1000 population/year), or "no malaria" level 0. Stratification is also done at the district level to inform certain operations which are best targeted by the district instead of by HFCA. Based on this stratification of malaria incidence in 2021, 19% of the population of Zambia lived in level 4 areas where malaria incidence is above 500/1,000; 24% are in level 3 areas with 200- 499 per 1,000; 23% in level 2 areas with 50-199 per 1000; and 33% in the level 1 areas with above zero but less than 50 cases per 1000 (HMIS/MRRS, 2021). Malaria prevalence differs among provinces (HMIS 2021). Risk is highest in the wetter, rural, impoverished provinces of Luapula, Northern, Muchinga, North Western, and Western Provinces (40–63 per cent RDT-based prevalence in the 2021 MIS) and in adjacent rural areas of the Copperbelt and eastern provinces to 3% in Lusaka and Southern provinces (RDT-based prevalence, MIS, 2021; U.S President's malaria initiative, Zambia malaria profile 08/18/2022 update).

Malaria control interventions have been shown to reduce malaria transmission and parasite prevalence in some areas, whereas other places continue to record high incidence and resurgence. This study aimed to ascertain why some places, specifically those in level 4 of the malaria transmission epidemiological zones (Muchinga, Luapula, Northern and Eastern province), have continued to record high malaria cases and deaths despite the implementation of control measures, which have proven to be successful in level 1 (Larsen *et al*., 2015; National malaria strategic elimination plan (ZNMESP 2022-2026), MOH).

METHODOLOGY

Selected Areas

The study was conducted in Northern, Luapula, Muchinga and Eastern provinces of Zambia with high malaria prevalence, as reported in the malaria presidential malaria initiative and snaps reports. The populations of the selected provinces as of the 2019 census were as follows: Northern Province 1,105824, Luapula Province 1,070,000, Eastern Province 1,696,555 and Muchinga Province 821,564. The Northern Province is a predominately Bemba ethnic region; Luapula Province extends along the Luapula River from Lake Bangweulu to Lake Mweru and is inhabited by several Bemba-speaking but culturally distinct peoples (among them the Lunda, Kabende, Aushi, and Chishinga). Eastern Province is the home of the Nsenga, Chewa, Kunda, and Ngoni; and Muchinga province with regard to ethnicity, the Bembas, the Bisa, and the Namwanga are the dominant ethnic groups (ZDHS2021; CSO,2019). The four provinces have a similar landscape comprising wet areas, high and low lands (valley plateau layout). The Households in these provinces automatically qualified to participate in the study. A person per household in the provinces was interviewed and included randomly selected adults between the ages of 20 and 70 years old who were also willing to participate in the study. The study also included individuals who were present during data collection.

Furthermore, only individuals who gave consent were included in the study. The age range was adopted from a cross-sectional study analysis of age and Wechsler Adult Intelligent Scale (WAIS-R) intelligence, which showed that performance Intelligence Quotient (IQ) and full-scale intelligence quotient between these age ranges remain the same irrespective of the level of education (Kaufman, A.S *et al*., 1989). A sample size of 400 people per province was determined to be sufficient to answer the research question with a +/-3% margin of error as the population in each of the selected provinces exceeded 5000. The total sample size came to 1600.

Study Design

This was a descriptive cross-sectional study where data was obtained using an interviewer-administered questionnaire. The questionnaire was adopted from a study the researchers previously did on socio-economic and socio-cultural factors in Milenge (Zingani *et al*., 2017) and modified to suit the objectives of this study comprising of both closed and open-ended questions with four (4) sections: demographic factors (gender, age, marital status, religion, level of education), Socio-economic factors (income, occupation, type of household), Malaria knowledge (transmission, symptoms and prevention) and Traditional practices and beliefs on malaria. Participants who found challenges in understanding were provided with an interpretation from an interpreter in their convenient language. Informed consent was obtained from the participants, and their confidentiality was ensured before completing the questionnaire. Data was obtained from households in the four provinces involving a single respondent per household between October 2022 and November 2022. Non-probability convenience sampling was used. The research comprised four research assistants assigned to one province each for 14 days. Permission was obtained at both provincial and district levels to conduct the study;7 days before the commencement of the study, letters were sent to respective authorities from the Department of Pharmacy, School of Health Sciences, University of Zambia.

Study Variables

The dependent variables were income, education, and culture, whereas the independent variables included education, age, marital status, employment, and residential status.

Data Collection, Analysis and Presentation

Data was collected from researcher-administered questionnaires. The data collectors comprised fifth year Pharmacy students. This was double-checked for accuracy, and the data was sorted out manually. Data analysis involved statistical programmes, such as Statistical Package for Social Science (SPSS) version 22.0 for quantitative data analysis (IBM SPSS Inc., Chicago, IL, USA) and tables generated using Microsoft Excel 2013. Subsequently, the analysed data was presented in reader format tables and pie charts to yield the results. A Chi-Square test was used to test the relationship between the dependent and independent variables. The Statistical significance was at a 95% confidence level (p-value < 0.05) with a margin of error of 5%.

Ethical Issues

Ethical clearance was obtained from the University of Zambia School of Health Sciences Research Ethics Committee (UNZAHSREC) no. 202112030006. Written consent was obtained from all interview participants. Permission was sought from respective provincial directors. In addition to actual provincial names, pseudonyms were used for individuals and household names to protect informants' identities.

RESULTS AND DISCUSSION

Demographics and Socioeconomic Practices

A total of 1580 participated in the study, giving a response rate of 98.8%. The sample size of 400 households from each province was used, of which Northern and Luapula had 100% response rates, whereas Eastern was 98.8% (395) and Muchinga was 96,3% (385). Six hundred eighty-four were male, and 896 were female. Luapula and Eastern provinces had high levels of uneducated participants, 214 and 206, respectively. The northern province had the highest of those with tertiary education at 93. Small-scale subsistence farming was the main occupation in Northern, Eastern and Muchinga provinces. However in Luapula province the main occupations of the respondents were farming and fishing at 358(89.5%) of the total number of respondents in the province. Nomadic farming was practiced in all the provinces, with the highest being Luapula province at 350/400, as shown in Table 1. The main occupations of farming and fishing in the provinces have been found to increase human and vector contact, and hence, occupations have been found to vary with malaria control measures. Some participants practised nomadic type of farming and stayed in temporal houses at the camps, making them an easy target for the vector (Mosquitoes). The findings correlate with those of WHO, which revealed that the agricultural sector offered risky jobs that predispose people to malaria and that in several agricultural communities in Asia, people who worked in the sector were at a higher risk of getting malaria (WHO, 2007). Our study in the Milenge district further supported this, which revealed that economic activities such as farming and fishing were the most significant practices hindering malaria control interventions (Zingani *et al*., 2017). A study done by Tusting revealed that variations in socioeconomic and sociocultural characteristics are significant in explaining the incidence of malaria even in an endemic malarial setting; hence, among other factors, socioeconomic and sociocultural practices might have a great influence on the implementation of malaria intervention strategies which despite being implemented, cases of malaria continue to escalate in some areas (L.S. Tusting *et al*., 2013). This suggests that strategies alone may not significantly reduce the spread of malaria. Socioeconomic and sociocultural factors are at play in provinces experiencing high malaria prevalence. For instance, in a study done in Ghana, it was found that the participants identified mosquitoes as a major nuisance and a cause of malaria and convulsions but that sociocultural features of malaria in the two rural Ghanaian communities indicated the need for regular re-evaluation of community experiences, meanings and behaviour to inform the implementation and effectiveness of control programmes (C.K Ahorlu., *et al* 2007).

A significant relationship was found between participants and earning status in the provinces and an association between level of education and employment status. Small-scale subsistence farmers, who cultivate for family consumption and have little for sale, contribute to the provinces' low-income and high poverty levels. This can affect the type of housing and living conditions that may play a role in exposure to malaria vectors and hinder malaria control. This is in line with a study done in Cote d'Ivoire that indicated that malaria was linked to household socioeconomic status, with wealthier individuals reporting mosquitoes more frequently than poorer households. It added that the wealthier social strata used bed nets more frequently than the poorer ones (Clemence *et al*.,2008). Most residents in the provinces could not afford particular housing structures with features that limit contact with the mosquito vector to reduce infection, hence dwelling in houses with greater exposure to the outdoors, increasing contact with the mosquito, the transmitter of malaria. Social-economic inequalities that affect malaria control interventions are likely to arise from mechanisms including the cost of treatment, diffusion of information about malaria, uptake of preventive technology such as bed nets, exposure and treatment for malaria symptoms, susceptibility and because malaria may in turn burden communities (Clouston *et al*., 2015).

Table 1: Demographic and socioeconomic characteristics of respondents

	PROVINCES				
	NORTHERN	**LUAPULA**	**EASTERN**	**MUCHINGA**	**TOTAL**
AGE RANGE OF RESPONDENTS					
• 20 -29	77	248	207	137	669
• 30-39	197	96	93	101	487
• 40-49	100	29	34	73	236
• 50 years and above	26	27	61	74	188
					1,580
GENDER					
• Male	201	148	175	160	684
• Female	199	252	220	225	896
MARITAL STATUS					
• Single	107	69	117	82	375
• Married	253	304	241	225	1023
• Divorced	33	27	29	32	121
• Widowed	7	0	8	46	61
RELIGION					
• Christian	370	400	364	379	1513
• Islam	20	0	12	3	35
• Hinduism	0	0	13	2	15
• Others	10	0	6	1	17
EDUCATION LEVEL					
• No formal schooling	83	214	206	19	522
• Primary education	143	133	100	260	636
• Secondary education	81	27	68	79	255
• Tertiary education	93	25	23	26	167
SOCIO-ECONOMIC FACTORS					
OCCUPATION					
• Farming	133	0	198	176	507
• Fishing	68	0	44	1	113
• Farming and fishing	15	358	51	3	427
• Government employee	88	25	80	24	217
• Other	96	17	22	181	316
NOMADIC FARMING/ FISHING					
• Yes	185	350	255	203	993
• No	200	50	140	181	571
• N/A	15	0	0	1	16
TYPE OF HOUSING	70	154	127	197	548
• Permanent housing	143	236	215	157	751
• Temporal housing	187	10	53	31	281
• Other					
MONTHLY INCOME					
• K300 and below	66	200	132	86	484
• K300 to k500	173	90	105	123	491
• K500 to k1000	30	68	104	65	267
• K1000 and above	131	42	56	109	338

Knowledge of malaria, cultural beliefs and practices

Knowledge about malaria signs and symptoms was high in 3 of the provinces, whereas, in Muchinga, it was relatively low concerning identifying the causes of malaria and its clinical presentation. Treatment-seeking behaviour was relatively good in all the provinces, because the majority of the participants went to health facilities when presented with malaria signs and symptoms. However, self-medication (223) and use of leftover medication (320), seeking treatment later than 24 hours/2-3 days (410), migration to fishing and farming camps (993), living in temporal houses (751) and misconceptions about malaria transmission (949) and prevention were among the practices and beliefs that were found to be negatively affecting malaria control interventions in the provinces as shown in Table 3. A study done by Mensah, revealed that despite the endemic malaria situations, there was still limited understanding of the relative importance of economic factors that contributed to people acquiring malaria and thus, variations in socio-economic and socio-cultural characteristics were significant in explaining the incidence of malaria (Mensah *et al*., 2004).

The knowledge on malaria transmission was exhibited in all the provinces, although some respondents, particularly from the Northern Province, had misconceptions, saying that malaria was transmitted by getting soaked in the rain and witchcraft. Muchinga had little knowledge of the signs and symptoms and needed to gain more. The assumption that knowledge of the disease did not hurt malaria control can be implied in the provinces with high knowledge, whereas the low levels of knowledge in Muchinga may contribute negatively to malaria control. However, the persistent high disease burden in the high and low knowledge areas indicated other factors affecting malaria control and prevention measures. The findings of this study are a variant of those of a study conducted in southwest Nigeria, which revealed that malaria was common among people who had little knowledge about it (Dike, 2006). However, they align with the Cot d Ivoire study, which revealed that people who presented with malaria were aware of malaria-related symptoms and their association with mosquitoes (Clemence *et al*., 2008). In 2013, a study was conducted in Malawi using a stepwise model selection procedure. The study revealed that education status affected people's information on malaria prevention and control in the population. The many potential drivers of malaria, both extrinsic and intrinsic, present a challenge in modelling malaria risk in space and time (Lowe *et al*., 2013).

The participants from all the provinces knew the prevention measures for malaria. There were misconceptions about Intermittent Residual Spraying (IRS) as a preventive measure. It could have been more effective as an increase in the number of mosquitoes and other vectors, such as ticks and cockroaches, was observed after spraying. As for access to Insecticide-treated mosquito nets (ITNs), they said that it was difficult for them to access bed nets as local health centres only provided bed nets to pregnant women and not the rest of the community to enable them to protect the rest of the family and some of the participants could not afford to buy one of their own. People living in poverty may forgo one necessity for another, such as medicine and mosquito nets for food, compared to those in the middle or upper classes with higher income status. This is in agreement with a study done by Sharma in 2009, which revealed that many people struggle to balance their daily necessities and engage in the fight against malaria. A better understanding of the association of various risk factors influencing malaria incidence is required to deploy effective policies and strategies for malaria elimination (Sharma *et al*., 2021). Findings in a study done in Italy in 2012 showed that for malaria interventions to succeed, interventions that improve the living conditions of populations in endemic areas, individually and as communities, should be implemented (Ricci *et al*., 2012).

Additionally, it had become clear that the discovery of an effective vaccine would still not eradicate the disease; therefore, there is a need to have a fundamental understanding of mechanisms related to low socio-economic status that cause malaria to remain one of the major killers in the world (Ricci *et al*., 2012). The study also revealed that there were social implications of malaria and their relationship with poverty, and these were determined. Louis *et al*., 2012 found that the free distribution of ITNs was quite effective in a randomised controlled ITN intervention study in Burkina Faso; hence, the need for free distribution and diverse strategies to be employed in the distribution of mosquito nets. The findings of this study confirm the WHO's recommendation that the most effective strategy to attain universal access to ITNs is through free distribution.

Wearing long-sleeved clothing as a preventive measure against mosquito bites was a common practice in all the provinces. It would be important to note that during periods of high malaria transmission, the weather is either wet or wet and cool.

The majority of the respondents would seek treatment immediately after noticing the symptoms (588) and within 24 hours (563) later than 24 hours or 2 to 3 days of onset of symptoms (410). This implies that treatment-seeking practices were good in all the provinces presenting with high malaria prevalence, which is similar to the findings of a study done in Swaziland (Eswatini), which revealed that 90% of respondents in the study would seek treatment within 24 hours of the onset of signs and symptoms of malaria (Hlongwana *et al*.,2009). Considering that most of the respondents did farming or some gardening, which is laborious work, signs and symptoms of headache, body pain, and loss of energy could have been mistaken for fatigue and only taken seriously if they persisted after taking painkillers; hence, some of the respondents seeking treatment after 24hours. Furthermore, the tendency to seek treatment after 24 hours was common among those who did the nomadic type of farming and those who migrated to fish camps; out of 993 migrants, 101 would seek treatment after 24 hours, whereas out of 571 non-migrants 61 would seek treatment after 24hours. 80 out of 993 of those who migrated self-medicated compared to those who did not, 57 out of 571 who did not migrate. Out of 162 respondents who sought treatment after 24 hours, 62% were migrants, and 38% were non-migrants to fishing camps. At the same time, 58% of those who migrated to fishing camps self-treated compared to 42% of non-migrants out of 137 respondents who self-medicated, as indicated in Table 2. In a study done in Germany in 2017, with the main objective of discussing the implications and challenges related to the four phases of migration from arrival to settlement, it was revealed that activities such as migration practices of the fishermen in places where fishing was the main occupation, traditional belief systems and the use of unconventional herbal medicines were still embraced despite sufficient knowledge of malaria transmission and the use of ITNs for malaria (Castelli, F. and Sulis, G., 2017).`

Table 2: fish/farming migrants and non-migrants treatment-seeking practices

Variables	Seeking treatment after 24hrs	Self-treatment	Percentage (%)
Migrants	101	80	61
Non-migrants	61	57	39
Total (out of 1580)	**162**	**137**	19

Some respondents preferred treating themselves at home, because of the distance to the health facility, being stationed at fishing or farming camps, and the centres' operating hours. The latter reason could have been given but may not reflect what's happening on the ground since government facilities are open 24hrs. There was a direct correlation between migration to fishing or farming camps and self-medication as well as that of seeking treatment after 24hrs. Inadequate treatment/ dosage regimens and incorrect administration of anti-malarial drugs remain a hindrance to successful control interventions of malaria and promote drug resistance. Delay in seeking appropriate treatment by 410 respondents, representing 26%, leaves room for disease progression in the individual affected and, therefore, increases the likelihood of person-to-person transmission, which can explain why the prevalence of malaria in these areas is still high. This correlates with a study done by Pell *et al*. Which revealed that attitudes and behaviour towards malaria control interventions are often shaped by socio-cultural factors; hence, attitudes towards one's understanding of malaria influence how, where and when the individual seeks malaria prevention and treatment (Pell *et al*., 2011).

Several respondents (156) indicated using herbs and traditional medicines to treat malaria, of which Northern provinces had a high percentage of 76%, despite having a high number of respondents attaining tertiary education among the four provinces. A study done in Tanzania revealed similar results, which showed the use of traditional medicines to treat convulsions associated with severe malaria instead of seeking modern medical services (Nsimba *et al*., 2004).

Table 3: Knowledge of malaria, cultural beliefs and practices

	PROVINCES				
	NORTHERN	**LUAPULA**	**EASTERN**	**MUCHINGA**	**TOTAL %**
MALARIA TRANSMISSION					
• Getting soaked in the rain	178	154	157	13	502
• Mosquito bite	321	394	365	348	1428
• Eating unripe mangoes	0	92	142	21	255
• Witchcraft	118	4	68	2	192
COMMON SIGNS SYMPTOMS OF MALARIA					
• High temperature	322	362	371	26	1081
• Loss of energy	291	302	157	139	889
• Loss of appetite	268	167	263	10	708
• Itching	156	42	121	0	319
• Chills	243	233	133	28	637
• Dizziness	254	260	155	90	759
• Vomiting	225	17	267	34	543
• Sweating	262	227	147	26	662
• Body pains	234	42	299	19	594
• Headache, fever, vomiting	302	179	267	113	861
• Headache, fever, vomiting, body pains	354	77	268	155	854
MALARIA PREVENTION					
• Sleeping under ITNs	303	396	369	274	1342
• Wearing long sleeves	208	275	242	7	732
• Spraying insecticides	140	81	197	74	492
• ITNs, Spraying & long sleeves	285	354	380	56	1075
• Trimming bushes	244	338	346	28	956
• Painting the house	0	60	99	0	159
• Use of local herbs	120	40	10	19	189
ADOPTED METHODS OF TREATMENT					
• Health centre or clinic	308	400	372	356	1436
• Leftover medicine	204	73	16	27	320
• Traditional healers/herbs	118	10	7	21	156
• Self-medication	92	84	20	27	223
TREATMENT SEEKING BEHAVIOUR					
• Immediately	204	146	116	122	588
• Within 24 hours	154	168	179	62	563
• Later than 24 hours	38	86	85	201	410
• Never	5	0	15	0	20

CONCLUSION

The findings of this study revealed that socio-economic factors prominent in the provinces, such as nomadic types of farming and low income, and cultural factors, such as misconceptions about malaria prevention strategies, among others, contribute to the persistent increase in malaria cases in the four provinces. Aligning preventive measures to the economic and socio-cultural practices in the provinces, coupled with information, will go a long way in reducing malaria cases.

LIMITATIONS

Information relayed on malaria depended on the respondents; thus, the possibility of participants responding to what they did not practice should be considered.

RECOMMENDATIONS

1. It would be good to do an ethnographic study within the same communities.
2. The provision of free malaria intervention measures, such as insecticide-treated mosquito nets, will go a long way toward reducing the number of malaria cases in communities.
3. Improving economic activities in these provinces will improve the people's livelihood and reduce poverty, which is clearly a factor in malaria prevention.

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