International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Assessment of Risk Factors Associated with Malaria Infection Among Adult Populations in Selected Internally Displaced Camps in Goma, North Kivu Province, Dr. Congo

William Mbalikada Kotebeda[1], Dominic Mogere[2], Joseph Juma[3]
[1,2,3]School of Public Health, Department of Community Health, Epidemiology and Biostatistics, Mount Kenya University

ABSTRACT: Malaria remains a significant public health concern in many parts of the world, particularly in Africa. The Democratic Republic of the Congo (DRC) is one of the countries most heavily affected by malaria, with millions of cases reported annually. In the Eastern region of the DRC, ongoing conflict has resulted in large numbers of people living in precarious conditions within IDP camps, where the risk of malaria transmission is heightened due to unsuitable housing conditions, lack of bed net, overcrowded and unsanitary conditions with limited access to essential healthcare services. This study aims to assess the risk factors associated with malaria infection among adult populations in the Kashaka and Shabindu IDP camps in Goma, North Kivu Province. The study employed a cross-sectional design using a mixed-method approach. Data were collected from 371 households through interviews and medical record reviews. Chi-square tests were performed for bivariate analysis, and then logistic regression to evaluate the impact of multiple variables simultaneously. All participants pointed to mosquitoes as the causal agent. Around 97.8% confirmed that fever is the main symptom followed by chills (75.2%), headache (54.5%), and sweating (10.2%). Bed net was identified as a preventive measure at (100%), mosquito repellents (71.7%), and Indoor residual spraying (68;2%). Approximately 43.9% of households had at least one case of malaria with an increasing incidence in April (26.7%) and October (35.9%). The most significant factors affecting the spread of malaria were gender (OR: 1.73; p-value < 0.001), lack of bed net (OR: 5.231; p-value < 0.001), outdoor activities at night (OR: 0.661; p-value = 0.0364), and being close to sanitation facilities (OR: 2.458; p-value = 0.0013). These underscore the critical need for targeted malaria prevention measures, including increased bed net availability and usage, enhanced sanitation infrastructure, and heightened awareness about the dangers of outdoor nighttime activities.

KEYWORDS: Dr. Congo, Malaria Infection, Public health

INTRODUCTION

Malaria is a potentially fatal infectious disease caused by the microscopic organisms known as Plasmodium. Five species impact humans: P. falciparum, P. malaria, P. ovale, P. vivax, and P. knowlesi. The disease is transmitted by Anopheles mosquitoes that carry the parasite responsible for its spread (WHO: Guidelines for Malaria 2023).

In 2022, around 249 million malaria cases were reported worldwide in 85 countries and regions, representing a 5 million rise from the previous year. The WHO African Region reported the highest figure (94%), while a significant portion (2%) was also reported in the WHO South-East Asia Region. Four African nations, including Nigeria (26.8%), the Democratic Republic of the Congo (12.3%), Uganda (5.1%), and Mozambique (4.2%), were responsible for almost half of the total global malaria cases (World malaria report, 2023).

The prevalence of malaria differs significantly across different regions of the globe. Malaria mainly affects countries located within the intertropical zone such as Sub-saharan Africa, South-East Asia, and South America (Sadie J. Ryan, et al., 2023).

In East Africa, malaria occurrence varied across different countries and regions. In early 2019, it was estimated that more than 12.7 million individuals lived in areas with a predicted parasite prevalence of around 30%. This included 6.4% of Kenya's population, 12.1% of Tanzanians, and 6.3% of Ugandans. On another side, there were regions with a very low proportion of the parasite (> 1%), yet still conducive to transmission and covering about 46.2 million people in the region. This encompassed 52.2% of people living in Kenya, 26.7% of those living in mainland Tanzania, and 10.4% in Uganda. While no health administrative sections were considered completely inadequate for the transmission of malaria, Nairobi County in Kenya had a very low prevalence of 0.1% in the same year (Victor A. Alegana et al., 2021).

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

According to the DRC National Strategic Plan 2020–2023, every individual in the Dem. Rep. of the Congo faces the risk of contracting malaria. In 2022, the Dem. Rep. of the Congo, one of the original eleven high burden to high impact (HBHI) nations, reported more than 30 million malaria cases. The proportion of malaria among children > 5 years was particularly worrying, reaching 39% using rapid tests (PMI report, 2022).

A study conducted by Hamza E., et al. (2020), found that in some malaria-endemic countries, internally displaced persons (IDPs) are up to five times more at risk of getting malaria compared to the general population. Similarly, a study conducted to compare the prevalence of malaria among children in a displacement camp versus a nearby village in the Democratic Republic of the Congo attributed the higher percentage of malaria infection among children in the displacement camp (17%) compared to those in the control village (7.5%) (Rhianna C., et all., 2016).

The main objective of this study was to assess the risk factors associated with malaria infection among adult populations in Kashaka and Shabindu IDP camps in Goma, North Kivu Province, Democratic Republic of the Congo.

Specific objectives were :

- To assess the level of awareness and knowledge about malaria infection among the adult populations in the Kashaka and Shabindu IDP camps in Goma, North Kivu Province, Democratic Republic of the Congo.
- To assess the number of households that reported at least one case of malaria in the last 12 months in the Kashaka and Shabindu IDP camps in Goma, North Kivu Province, Democratic Republic of the Congo.
- To identify behaviors and practices associated with increased risk of malaria infection among adult populations in the Kashaka and Shabindu IDP camps in Goma, North Kivu Province, Democratic Republic of the Congo.
- To investigate environmental factors associated with malaria transmission among adult populations in the Kashaka and Shabindu IDP camps in Goma, North Kivu Province, Democratic Republic of the Congo.

LITERATURE REVIEW

Between 2000 and 2014, the number of malaria cases varied but ultimately decreased from 243M to 230M across countries affected by malaria in 2000. However, since 2015, there has been a resurgence in malaria cases (Cibulskis, et al., 2016), with the most significant annual surge estimated between 2019 and 2020, mainly affecting countries in the WHO African Region. Noteworthy increases in cases between 2021 and 2022 were observed in Nigeria (5.3M), Ethiopia (2.4M), Madagascar (1.5M), Uganda (1.3M), the United Republic of Tanzania (1.3M), Mali (1.1M) and Mozambique (1M) (WHO Regional Office for Africa, 2023).

The number of malaria new cases decreased from 81/1000 population at risk in 2000 to around 56.8 in 2019, and then a slight increase of three percent in 2020. Over the past three years, the incidence rates of 58.4 per 1000 have stayed stable. Similarly, malaria deaths dropped from 864,000 in 2000 to 576,000 in 2019, then increased to an estimated 631,000 in 2020, largely due to COVID-19 disruptions in accessing prevention and treatment tools. However, there was a slight decrease in deaths in 2021 and 2022 to 610,000 and 608,000, respectively (World Malaria Report, WHO, 2023).

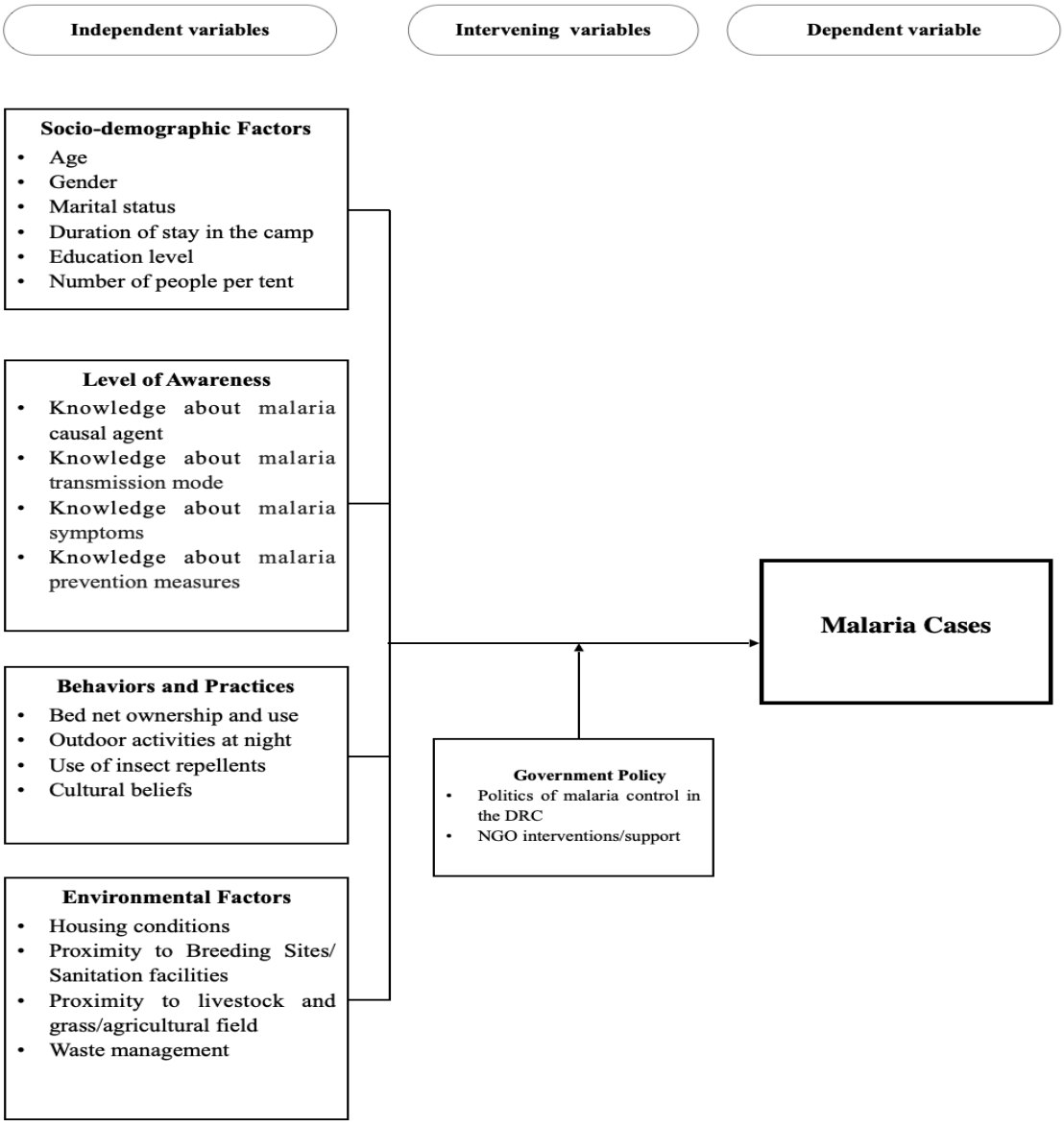
Between 2019 and 2022, the number of malaria cases in the original 11 high burden high impact (HBHI) countries gradually increased from 157M cases reported in 2019 to 167M in 2022. The rise in cases was primarily attributed to the impact of the COVID-19 pandemic, with subsequent small increases in 2021 and 2022 partly due to population growth. India, despite its minimal overall contribution to the total cases among HBHI countries, saw the highest percentage reduction in cases (around 30%). Collectively, these 11 countries represented 67% of malaria cases worldwide in 2022 (WHO World Malaria Report, 2023).

The spread of malaria is highly dependent on environmental factors including, rainfall, housing conditions, sanitation and hygiene, temperature, humidity, and other factors that influence the mosquito's survival, the lifecycle of the parasite, and the breeding and feeding habits of the vector. Climate plays a crucial role in the spread of malaria, influencing both mosquito development and parasite replication in a complex manner. Parasites cannot develop below 18°C or above 48°C, impacting the survival of the mosquitoes that carry them. The most favorable temperature range for the transmission of malaria is typically between 20 and 30°C (WHO: Fight against malaria, 2019). Warmer temperatures can accelerate mosquito breeding cycles and shorten parasite development within the mosquito, potentially increasing transmission risk. However, excessively high temperatures can also stress and kill mosquitoes, leading to a non-linear relationship between temperature and transmission. Additionally, temperature influences human behavior, affecting the use of bed nets and outdoor activity, further impacting transmission dynamics (Sinka et al., 2010).

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

In a study conducted by Amani et al. (2019), it was found that substandard housing conditions significantly amplify malaria transmission risk, creating a breeding haven for mosquitoes and facilitating their contact with humans. Lack of walls, proper roofing, or screens in dwellings expose residents to mosquito bites, particularly in areas with high mosquito densities. Factors like gaps in walls, thatched roofs, and open eaves provide easy access for mosquitoes, while improper ventilation and lighting can create favorable breeding sites within the house itself. This combination increases the risk of mosquito-human interaction, especially at night when people are most susceptible to bites. Additionally, studies have explored the complex interplay of knowledge, attitudes, and practices (KAP) related to malaria within communities across various regions. A crucial barrier to its eradication lies in the knowledge gaps and misconceptions surrounding the disease.

In investigating the relationship between gender and malaria, Mbonye et al. (2021), found that gender roles and responsibilities often expose females to higher mosquito bite risks. Females often disproportionately bear the burden of household chores like fetching water, outdoor activities, collecting firewood, and other activities that might coincide with peak mosquito activity, putting them at greater risk compared to males who might engage in different activities.



International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

CONCEPTUAL FRAMEWORK

RESEARCH METHODOLOGY

a. Study design and approach

This study employed a descriptive cross-sectional design and was conducted in Kashaka & Shabindu IDP camps. The study adopted a mixed-method approach combining quantitative and qualitative data collection techniques.

b. Study population and sample

The study included all households or tents that were sheltering in the Kashaka and Shabindu IDP camps during the study period. With a total number of 11,110 households, the sample size was determined using Cochran's formula, yielding a sample of 371 households. The study used multistage random sampling which was chosen due to the complex and layered structure of the camp. This approach involved three stages: camp selection, bloc selection, and proportional stratified random sampling of households within selected blocs.

c. Data Collection and Analysis

A semi-structured questionnaire containing close-ended and open-ended questions was designed using Kobo Collect to collect data through face-to-face interviews and medical records were reviewed. A total of twenty-seven key informants were interviewed to explore the population's experiences, perceptions, and observations related to malaria in the IDP camps.

Data analysis was performed using SPSS software version 29.0. Chi-square tests assessed associations between independent and dependent variables, with statistical significance set at an alpha level of 0.05 and a 95% confidence interval. Multivariate logistic regression analysis evaluated the strength and direction of associations between variables.

d. Ethical considerations

The study obtained ethical clearance from Mount Kenya University's Ethical Review Committee. Permission to conduct field research was sought from the Urban Division of Goma and acknowledged by the Mayor of Karisimbi commune, Mugunga Head Quarter, and the president of the Kashaka & Shabindu IDP camps. Verbal consent was obtained from all participants.

RESULTS

Response rate

The study achieved a 100% response rate, with all 371 participants completing the survey.

Age

The respondents' ages ranged from 18 to 77 years, with an average of 36.3 years, and a standard deviation of 11.83, indicating how spread out the ages were from the mean.

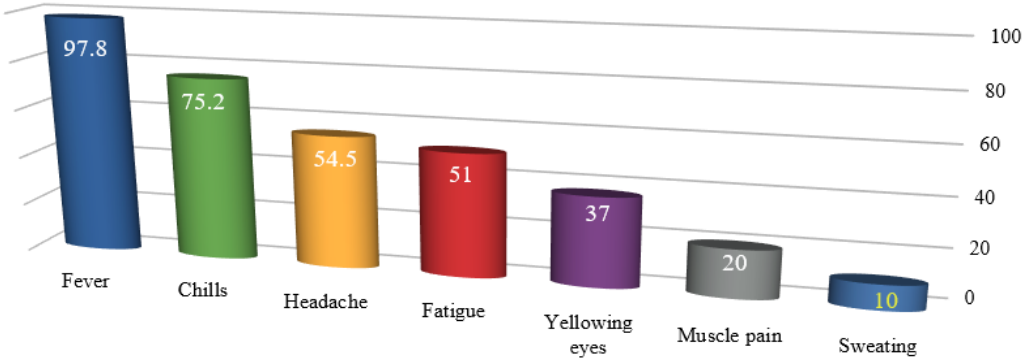
Knowledge regarding malaria causative agent

The study found that all respondents (100%) correctly identified mosquitoes as the causative agents of malaria, demonstrating a high level of awareness about the transmission mode.

Knowledge regarding malaria symptoms

Malaria prevention measures and practices

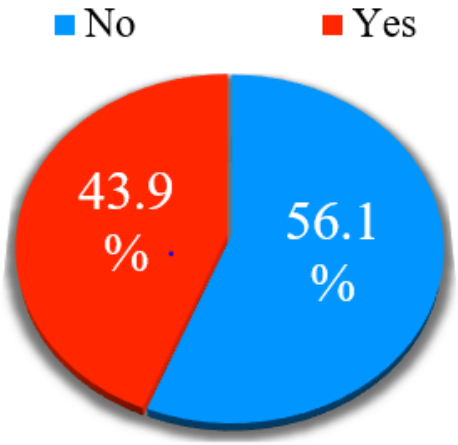
The proportion of households that reported malaria cases in the last 12 months



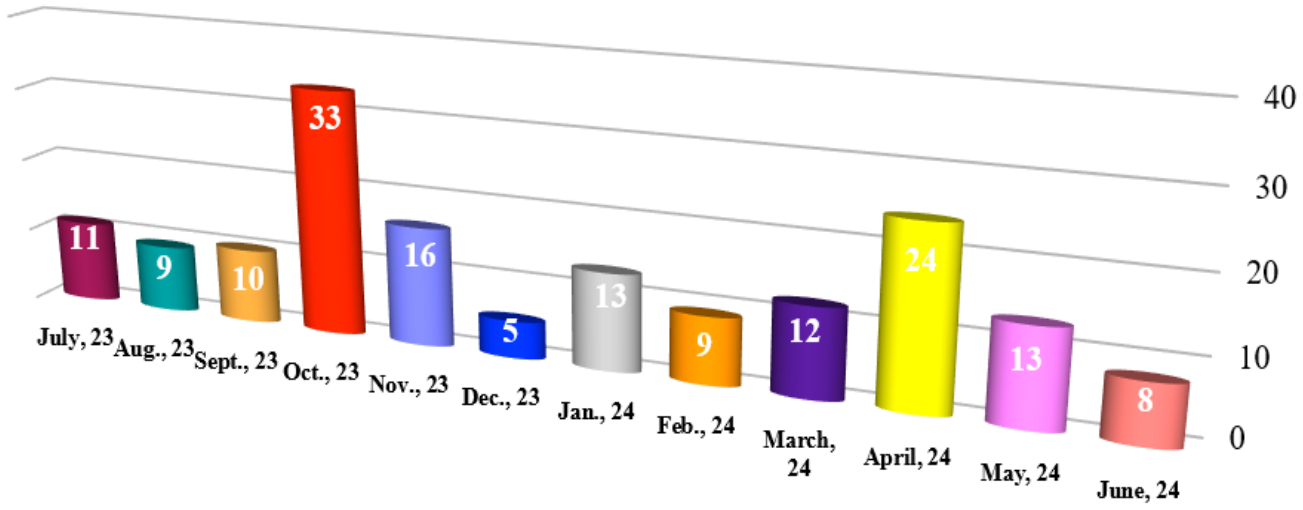
International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Preventive measure	Knowing		Practicing	
	n	%	n	%
Bed net	371	100	92	24.8
Mosquito repellent	266	71.7	14	3.8
Indoor residual spraying	253	68.2	0	0
Wearing long-sleeved clothing	201	54.2	198	53.4
Environment sanitation	87	23.5	18	4.9
Medication	31	8.4	0	0

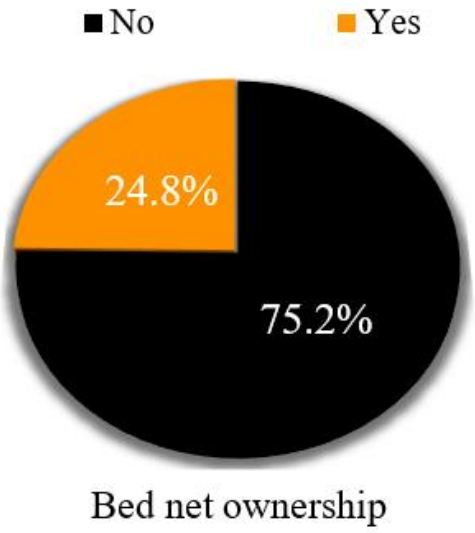
The trend in malaria cases over the past twelve months

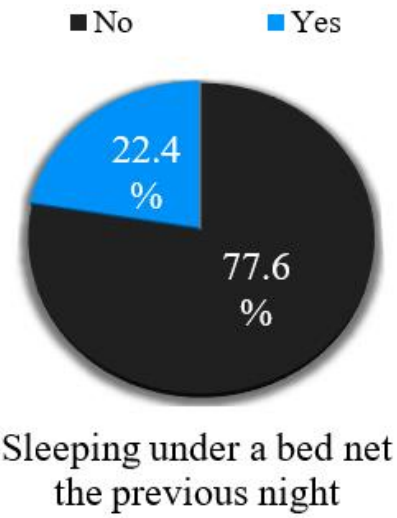


Bed net ownership and use



International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org





Bivariate Analysis Using Chi-Squared Test
Binary Logistic Regression with Predictors

Variables	Pearson χ^2	df	Likelihood Ratio	Cont. Coeff.	p-value
Gender	39.429	1	40.725	0.313	< 0.001
Education	2.675	3	2.662	0.085	0.444
Duration in the camp	3.073	1	3.139	0.091	0.079
Number of people in the tent	18.302	2	1.421	0.071	0.192
Lack of bed net	22.131	1	23.318	0.237	< 0.001
Poor quality of shelter	27.943	2	29.79	0.265	0.625
Outdoor activities at night	0.238	1	0.237	0.025	< 0.001
Proximity to the agriculture field	1.291	1	1.287	0.059	0.256
Poor waste management	19.338	2	20.725	0.223	< 0.001
Proximity to sanitation facilities	10.638	1	10.744	0.167	0.0011

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Predictor	Coeff. (Estimate)	Std. Error	z-value	Odds Ratio	p-value
Gender					
Male	Ref.				
Female	1.2043	0.1827	-6.593	1.73	< 0.001
Bed net ownership and use					
Yes	Ref.				
No	1.6546	0.3117	5.308	5.231	< 0.001
Outdoor activities at night					
No	Ref.				
Yes	0.731	0.3971	-1.044	0.661	0.0364
Waste management					
Good	Ref.				
Fair	0.0121	0.2471	0.049	1.012	0.9611
Poor	0.3643	0.3529	1.032	1.439	0.3019
Proximity to sanitation facilities					
No	Ref.				
Yes	-0.7813	0.2422	-3.226	2.458	0.0013
Intercept	0.4799	0.4097	-1.171	0.619	0.2415

DISCUSSION

a. Awareness

The study found a high level of knowledge about malaria among participants. Mosquitoes were correctly identified as the cause of malaria and there was high awareness of its transmission. Common symptoms such as fever and chills were well recognized. While awareness of preventive measures like bed nets and mosquito repellents was high, actual usage was low. Similarly, awareness of indoor residual spraying and environmental sanitation was high, but practice was minimal. Medication as a preventive measure was low, with no participant practicing it.

Previous research has shown widespread awareness of malaria's causes, symptoms, and prevention measures in various regions. In Ghana, 93.6% of participants identified mosquitoes as the malaria vector, with fever, chills, and headaches recognized as primary symptoms by 96%, 72%, and 51% of respondents, respectively. Bed nets were chosen as the main preventive measure by 89.4% of participants (Ahorlu et al., 2019). In rural Ethiopia, 95% of respondents recognized fever as a major symptom, followed by chills (70%) and headaches (55%) (Deressa et al., 2020).

The endemic nature of malaria in Sub-Saharan Africa has led to extensive public health campaigns in countries like Ghana, Ethiopia, and the DR Congo, resulting in a high level of awareness and knowledge regarding the disease. These campaigns have effectively educated communities about the disease's symptoms, prevention measures, and the role of mosquitoes as vectors. Despite varying practices due to access and cultural differences, the emphasis on preventive measures like bed nets remains consistent globally. Furthermore, continuous education efforts by healthcare workers and organizations like Doctors without Borders (MSF) have significantly contributed to the dissemination of accurate information within Kashaka and Shabindu IDP camps.

b. Malaria Cases

The study analyzed malaria cases in Kashaka and Shabindu camps over twelve months to understand the disease's prevalence. 43.9% of households reported at least one malaria case, indicating a significant burden. Monthly variations were observed, with the highest incidence in October (20.2%) and April (14.7%), and the lowest in December (3.1%). These fluctuations in malaria prevalence are consistent with environmental factors, particularly seasonal rainfall patterns and limited access to preventive measures. In the

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Democratic Republic of the Congo (DRC), the rainy season, which typically begins in April during the mango harvest and tapers off in October, creates favorable breeding conditions for mosquitoes, thereby contributing to the elevated malaria incidence observed during these periods.

The findings from this study align with other studies conducted in similar settings. In a study conducted in refugee camps in Tanzania, it was found that 31.2% of households reported malaria. The research emphasized the impact of overcrowded living conditions and inadequate sanitation facilities on malaria transmission (Mwangangi & Muriithi, 2020). Overcrowding increases human-vector contact, while poor sanitation contributes to the proliferation of mosquito breeding sites. These conditions create an environment conducive to sustained malaria transmission, complicating efforts to control and reduce the disease in vulnerable populations, particularly in displaced persons camps.

Moreover, research in Kenya has demonstrated that malaria cases often rise during the long rainy season and the following months due to the proliferation of stagnant water, which provides ideal breeding conditions for mosquitoes (Omumbo & Snow, 2018).

c. Behavior and Practice

The study identified behaviors and practices associated with increased malaria infection risk among adult populations. It found significant gaps in malaria prevention practices, revealing that only 22.4% of surveyed households used a bed net the previous night. This low uptake of bed nets is concerning considering their established efficacy in reducing malaria incidence. Additionally, only 24.8% of participants owned a bed net, and a substantial portion were in less-than-optimal conditions. Low usage of bed nets in the Kashaka and Shabindu camps was attributed to the lack of possession of ITNs among participants. Moreover, 63.3% of participants reported engaging in outdoor activities at night, a behavior that can exacerbate malaria risk due to increased exposure to mosquito bites during these periods.

In a study conducted in Somalian IDP camps, bed net use was found to be at 15% and indoor residual spraying at 10% (Abdi et al., 2020). This reflects the common challenges in implementing and sustaining malaria prevention practices in resource-limited settings like IDP camps. Despite widespread awareness of their effectiveness, both studies reveal low bed net usage and ownership. These findings highlight the ongoing challenges in translating knowledge into action in settings highly vulnerable to malaria. However, in a study conducted in Uganda, bed net usage was found to be at 50%, with indoor residual spraying at 20% (Epstein, et al., 2022). Similarly, a study in Nigeria revealed that engaging in outdoor activities after dusk significantly increased the risk of malaria infection (Isiko et al., 2021).

d. Environmental Factors

The study found that a significant percentage of households were close to conditions conducive to mosquito breeding, such as livestock, green grass, and agricultural fields (31.3%), poor waste management (47.7%), and sanitation facilities (57.4%). These environmental factors create ideal habitats for Anopheles mosquitoes, leading to a higher incidence of malaria among nearby populations.

In a study conducted in Nigerian IDP camps, 56% of households were found to be located within 500 meters of agricultural fields, and 63% were near livestock (Ajakaye and Mojirayo, 2020). Moreover, research in Ugandan IDP camps revealed that 47% of households had poor waste management, and 54% were close to sanitation facilities with stagnant water (Okello et al., 2019).

Proximity to agricultural fields, livestock, poor waste management, and poor sanitation facilities are recurring issues in many IDP camps, creating ideal breeding grounds for Anopheles mosquitoes, and therefore universally enhancing the risk of malaria transmission. These consistent findings across different regions emphasize the need to address environmental factors in malaria control efforts within vulnerable populations.

Furthermore, the study conducted in Tanzania demonstrated a correlation between inadequate sanitation and higher malaria rates (Liheluka et al., 2023).

The environmental and living conditions in IDP and refugee camps, including proximity to agricultural fields, livestock, and poorly managed waste and sanitation facilities, provide ideal breeding grounds for Anopheles mosquitoes, the primary vectors for malaria. Factors such as poor infrastructure, limited resources, and inadequate access to preventive measures, along with climatic and seasonal influences, contribute to the persistence of malaria transmission in these settings. Moreover, systemic challenges like political instability, insufficient funding, and logistical difficulties further worsen the risk factors for malaria. These conditions are prevalent in camps across sub-Saharan Africa and other malaria-endemic regions, resulting in similar health outcomes. The similarities across

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

these studies reflect the shared environmental, infrastructural, and systemic challenges faced by IDP and refugee camps across sub-Saharan Africa and other malaria-endemic regions, resulting in similar health outcomes.

CONCLUSION

The study found that participants had a high awareness of malaria transmission and symptoms, recognizing mosquitoes as the vector of malaria. However, there was a gap between knowledge and practice, with only 24.8% of respondents using bed nets despite 100% awareness of their importance. Almost half of households reported at least one malaria case in the past 12 months, indicating a high prevalence of malaria in the Kashaka and Shabindu camps, with seasonal fluctuations. Despite widespread knowledge about prevention measures, only 22.4% of respondents slept under a bed net the previous night stating that behavioral practices still need to be improved. The study also identified key environmental factors associated with malaria transmission, emphasizing the role of environmental conditions in malaria risk and not just individual behaviors.

REFERENCES

1. World Health Organization (2023). Guidelines for malaria. Retrieved from: https://www.mmv.org/sites/default/files/content/document/WHO-UCN-GMP-2023.01-eng.pdf
2. World Health Organization (2023). World malaria report. Retrieved from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023
3. Sadie J. Ryan, Catherine A. L., & Fernanda Z. (2023). Shifting transmission risk for malaria in Africa with climate change: a framework for planning and intervention. *Malaria Journal*, 22:282.https://doi.org/10.1186/s12936-023-04715-y
4. Victor Alegana A., Macharia PM, Muchiri S., Mumo E, Oyugi E, Kamau A, et al. (2021). Plasmodium falciparum parasite prevalence in East Africa: Updating data for malaria stratification. *PLOS Glob Public Health* 1(12); https://doi.org/10.1371/journal.pgph.0000014
5. U.S. PRESIDENT'S MALARIA INITIATIVE: Democratic Republic of Congo report, (2022). Retrieved from: https://d1u4sg1s9ptc4z.cloudfront.net/uploads/2022/01/FY-2022-DR-Congo-MOP.pdf
6. Rhianna Charchuk, Makelele Katsuva J.P, Kasereka Masumbuko C., Stan Houston, & Michael T. H. (2016). The burden of malaria is higher among children in an internal displacement camp compared to a neighboring village in the Democratic Republic of the Congo. *Malaria Journal*, 15:431. https://doi.org/10.1186/s12936-016-1479-z
7. Cibulskis R., Alonso P., Ryan W., Aponte J., et al., (2016). Malaria: Global progress 2000 – 2015 and future challenges. *National Center for Biotechnology Information*, 2016; 5: 61. Doi: 10.1186/s40249-016-0151-8
8. World Health Organization (WHO) Regional Office for Africa (2023): https://www.afro.who.int/health-topics/malaria
9. Sinka, M. E., Bangs, M. J., Manguin, S., Rubio-Ponce, A., Snow, R. W., & Smith, D. L. (2010). The global distribution of Anopheles mosquitoes responsible for malaria transmission. *Parasites & Vectors*, 3(1), 44
10. Amani, H., Njau, J., Mwangalila, G., Mbogo, C., Kasubi, P., & Ngonyo, J. (2019). Effect of house improvement with insecticide-treated bed nets on malaria prevalence in Tanzania: a cluster randomized controlled trial. *The Lancet Global Health*, 7(1), e82-e92
11. Mbonye, A. K., Byamukama, J., Nsobya, S., Atuhwera, L., & Ndyanabangi, T. (2021). Gender differences in health-seeking behavior for malaria in a rural Ugandan community: a mixed-methods study. *BMC Public Health*, 21(1), 1-10
12. Ahorlu C.S., Adongo P., Koenker H., et al., (2019). Understanding the gap between access and use: a qualitative study on barriers and facilitators to insecticide-treated net use in Ghana. *Malar Journ. 18: 417* https://doi.org/10.1186/s12936-019-3051-0
13. Deressa, W., Olana, D., Chibsa, S., & Community, K. (2020). Community knowledge, attitudes, and practices about malaria in rural Ethiopia: A baseline survey. *Ethiopian Journal of Health Development*, *34*(2), 100-107.
14. Mwangangi, J. M., & Muriithi, M. K. (2020). Prevalence of malaria and associated risk factors among refugee populations in Tanzania: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *17*(8), 2942

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-06, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

15. Macharia, P. M., Giorgi, E., Noor, A. M., Waqo, E., Kiptui, R., Okiro, E. A., & Snow, R. W. (2018). Spatio-temporal analysis of *Plasmodium falciparum* prevalence to understand the past and chart the future of malaria control in Kenya. *Malaria Journal, 17*(1), 340. https://doi.org/10.1186/s12936-018-2489-9
16. Pryce, J., Medley, N., & Choi, L. (2022). Indoor residual spraying for preventing malaria in communities using insecticide-treated nets. *Cochrane Database of Systematic Reviews, 2022*(1), CD012688. https://doi.org/10.1002/14651858
17. Epstein, A., Maiteki-Sebuguzi, C., Namuganga, J. F., et al., (2022). Resurgence of malaria in Uganda despite sustained indoor residual spraying and repeated long-lasting insecticidal net distributions. *PLOS Global Public Health, 2*(9), e0000676. https://doi.org/10.1371/journal.pgph.0000676
18. Isiko, I., Nyegenye, S., Bett, D.K. *et al.* Factors associated with the risk of malaria among children: analysis of 2021 Nigeria Malaria Indicator Survey. *Malar J* **23**, 109 (2024). https://doi.org/10.1186/s12936-024-04939-6
19. Ajakaye, O. G., & Ibukunoluwa, M. R. (2019). Prevalence and risk of malaria, anemia and malnutrition among children in IDPs camp in Edo State, Nigeria. *Parasite Epidemiology and Control, 8*, e00127. https://doi.org/10.1016/j.parepi.2019.e00127
20. Okello, P. E., Van Bortel, W., Byaruhanga, A. M., Correwyn, A., Talisuna, A., ... & Coosemans, M. (2019). Variation in malaria transmission intensity in seven sites throughout Uganda. The American Journal of Tropical Medicine and Hygiene, 100(3), 620-630.
21. Liheluka, E. A., Massawe, I. S., Chiduo, M. G., et al. (2023). Community knowledge, attitudes, practices, and beliefs associated with persistence of malaria transmission in North-western and Southern regions of Tanzania. *Malaria Journal, 22*, 304. https://doi.org/10.1186/s12936-023-04738-5

Cite this Article: William Mbalikada Kotebeda, Dominic Mogere, Joseph Juma (2024). Assessment of Risk Factors Associated with Malaria Infection Among Adult Populations in Selected Internally Displaced Camps in Goma, North Kivu Province, Dr. Congo. International Journal of Current Science Research and Review, 7(10), 7501-7510, DOI: https://doi.org/10.47191/ijcsrr/V7-i10-06