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COMMUNITY, KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS MALARIA AMONG POPULATION AFFECTED BY FLOOD

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Abstract

Malaria remains a significant public health challenge in flood-affected areas of Rajanpur, Pakistan. Pakistan is thought to have a moderate malaria problem, but 177 million people are still at risk of getting malaria. About 60% of Pakistan's population lives in areas where malaria is common. This study assessed knowledge, attitudes, and practices (KAP) related to malaria prevention and control among 500 rural and urban residents through a cross-sectional survey using a structured questionnaire and SPSS analysis. Findings revealed poor malaria-related knowledge across both rural and urban groups, with many unable to correctly identify mosquito breeding sites or symptoms. Participants underestimated the disease's severity and health risks and showed complacency toward preventive measures. No significant differences in KAP were observed between rural and urban respondents i.e., $p>0.05$. Education and healthcare access were positively associated with better KAP. Despite widespread bed net ownership, compliance was low, and the use of traditional remedies and delayed clinical care was common. Preventive practices such as water drainage and larviciding were inconsistently applied. The study concludes that malaria-related KAP in flood-affected Rajanpur is insufficient regardless of residence. Targeted, culturally sensitive educational campaigns are needed to improve knowledge and attitudes. Additionally, increased community engagement to enhance access and use of preventive tools, including treated bed nets and indoor residual spraying, alongside promotion of timely clinical care, are critical for effective malaria control.

INTRODUCTION

Malaria is one of the world's most common and dangerous infectious diseases (1, 2). In the tropics and subtropics, it is the leading cause of illness and death (3). According to the latest World Malaria Report, Malaria affected 247 million people in 2021, compared to 245 million people in 2020. The number of deaths from malaria was predicted to be 619 000 in 2021, down from 625 000 in 2020. In

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2021, about half of the world's population is susceptible to malaria. There is still an excessively high rate of malaria in the WHO African Region. About 95% of malaria infections and 96% of deaths occurred in the Region in 2021. About 80% of all malaria deaths in the Region occurred in children under the age of five (4).

Pakistan is thought to have a moderate malaria problem, but 177 million people are still at risk of getting malaria. About 60% of Pakistan's population lives in areas where malaria is common (5). More than 200 million clinical malaria cases are reported annually, making it the most common vector-borne disease in the world. Annually, 0.6 million deaths in children and pregnant women have been linked to malaria. Currently, the world is not on track to meet the WHO Global Technical Strategy (GTS) of malaria 2016–2030 goals by 2020 (6). From 2015 to 2018, the number of malaria cases keeps going up. Malaria cases worldwide increased by 214, 217, and 219 million between 2015 and 2017 (7). Pakistan annually reports 3.5 million malaria cases, including suspected and confirmed cases. The history of malaria exemplifies our failure to tackle global epidemics, although it continues to be the biggest threat to public health, economic development, and growth in many nations (8). Five different types of Plasmodium cause malaria in humans: *P. vivax, P. falciparum, P. ovale, P. malaria*, and *P. knowlesi* (9). Even though vast and expensive steps have been taken to stop malaria for many decades. It has come back as a significant health problem in Asia. Sixty percent of Pakistan's people live in areas where malaria is common. *Plasmodium vivax* causes 81.3% of malaria in Pakistan, *P. falciparum* causes 14.7%, and mixed species cause 4% (10).

The World Health Organization (WHO) identified Pakistan as one of six nations in the Eastern Mediterranean region with high malaria transmission. About 100% of the population was at risk in 2017 and 2018. Malaria's prevalence fluctuates from province to province and even city to city due to climate differences. As a whole, Pakistan had an API of 1.8 in 2017. Khyber Pakhtunkhwa (30%) had the most significant number of reported cases in 2017, followed by Sindh (26.5%), the Federally Administered Tribal Area (FATA) (21.9%), Baluchistan (20.5%), and Punjab (1.1%) (6). Malaria is more common in some parts of Punjab than others. The Sutlej, Chenab, Beas, Ravi, and Jhelum rivers create a significant breeding ground for malaria vectors. Pakistan's 2017 census estimates 110,012,442 people live in Punjab, making it the country's most populous state. It has four seasons: spring, summer, fall, and winter. Most likely, the southwest monsoon starts in Punjab in June and lasts until September, but the weather trend in Pakistan has changed over the last few decades. June and July are both very hot months. It starts to rain again in August, which is a nice break from the heat. Then, the most challenging part of summer is over, but it won't get cooler until late October (11).

In rural areas, where living standards are lower, malaria is more common (12). Afghan refugees have a higher P. falciparum infection rate than their host people. According to several epidemiological studies, malaria cases in Pakistan increased by 24–36% because of the inflow of Afghan refugees (13). Rajanpur, a district in Pakistan, experiences frequent flooding, resulting in an increased presence of anopheles' mosquitoes and a heightened risk of malaria transmission. Floods provide optimal breeding conditions for mosquitoes, particularly the Anopheles species responsible for malaria transmission. Stagnant water and increased humidity facilitate mosquito breeding, resulting in a higher density of mosquitoes in flood-affected areas. This increased the risk of malaria transmission in both rural and urban areas of Rajanpur (14). Rural areas in Rajanpur often exhibit poor living standards and limited access to healthcare services. Factors such as inadequate housing, improper sanitation, and insufficient water supply contribute to an environment conducive to malaria transmission. Additionally, poverty, limited economic opportunities, and lack of proper preventive measures further amplify the vulnerability of rural populations to malaria (15). Inadequate knowledge and attitudes towards malaria and its vector, Anopheles, hinder practical malaria prevention and control efforts. Limited educational facilities in rural areas of Rajanpur contribute to the lack of awareness regarding malaria transmission, symptoms, and preventive measures. Insufficient knowledge regarding the importance of mosquito control measures, such as using insecticide-treated bed nets

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and indoor residual spraying, further exacerbates the malaria risk in flood-affected areas (16). This study was aimed to assess knowledge, attitudes, and practices (KAP) related to malaria transmission, symptoms, and prevention among rural and urban populations in flood-affected areas of Rajanpur. It also examines how socioeconomic status, education, and healthcare access influence these KAP factors.

Materials and Methods

Site and population

The urban and rural areas of Rajanpur affected with flood were selected to assess the knowledge of malaria among people. About 500 individuals were surveyed from different tehsils of south Punjab. Samples were taken using the probability sampling process. A randomly sampling of individuals was used to conduct a survey for this purpose.

Ethical concern

This study was conducted according to the declarations of Helsinki. This study was approved by the Ethical Review Committee of University of Okara with reference no.

Data Collection

The questionnaire was designed for data collection. The consent was obtained from all individuals who participated in the study. The data collection for the study was accomplished using a survey. Since there are a few different techniques to carry out a survey, Tayie, S. claims that they are widely employed for data collection. Balarabe Kura (17) argues that surveys offer rich qualitative and quantitative representations of communities and their inhabitants. Using a challenge in empirical measurement and data analysis stemming from an applied study as a starting point, he stressed that survey researchers employ a deductive approach. The data collection for the study was accomplished using a survey.

The final survey consisted of 22 closed-ended questions. The majority of the information that is derived from this is quantitative and can be used to study the percentage of individuals who agree with various ideas and those who do not. The entire questionnaire was broken up into two sections that were labeled section a, section and section B respectively. The demographic evidence of the respondents was contained in Section A of the questionnaire. Questions in Section B include those about the respondent (18).

Statistical analysis

The data was entered into Excel, and then manipulated in SPSS (19).

Results and discussion

4.1 Demographic analysis

We included total 500 people in this study out of which 315 (63%) were from Rural regions while 185(37%) from Urban areas of our area of study i.e., different tehsils from south Punjab such as DG khan, Fazilpur, Jampur, Kot chuta, Muzaffargarh, Rajanpur, Rojhan. So, we conducted interview with 500 people. This study showed that age of most of the people ranged 20-30 years with an average age of 30.53± 0.99 for 35-44 years' group and 49 ± 1.08 for 45-54 years' group. The p-value of 0.121 for residence is **not significant** at the conventional 0.05 level i.e., $p>0.05$. This means there is no statistically significant difference in the variable tested between rural and urban groups. This is shown in table 1.

Table 1. Sociodemographic characteristics of participants

Variable	Category	Number (n)	Percentage (%)	Mean ± SD
Age	Mean ± SD	–	–	30.53 ± 8.65
	Median	–	–	29
	Mode	–	–	29
Residence	Rural	315	63	
	Urban	185	37	
Tehsil	DG Khan	7	1.4	
	Fazil Pur	5	1	

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	Jam Pur	141	28.2	
	Kot Chuta	1	0.2	
	Muzaffargarh	1	0.2	
	Rajan Pur	294	58.8	
	Rojhan	51	10.2	

Differentiation of participants

Among the study participants, the highest proportion belonged to Rajanpur Tehsil, comprising 58.8% (n = 294) of the total sample. This was followed by Jampur with 28.2% (n = 141) and Rojhan with 10.2% (n = 51). The remaining tehsils had very low representation: Dera Ghazi Khan (1.4%, n = 7), Fazilpur (1.0%, n = 5), Kot Chutta (0.2%, n = 1), and Muzaffargarh (0.2%, n = 1). These figures reflect a geographically uneven distribution of respondents, with a strong concentration in Rajanpur and limited participation from other tehsils. This uneven sampling may influence the generalizability of the findings across all tehsils. This is shown in figure 1.

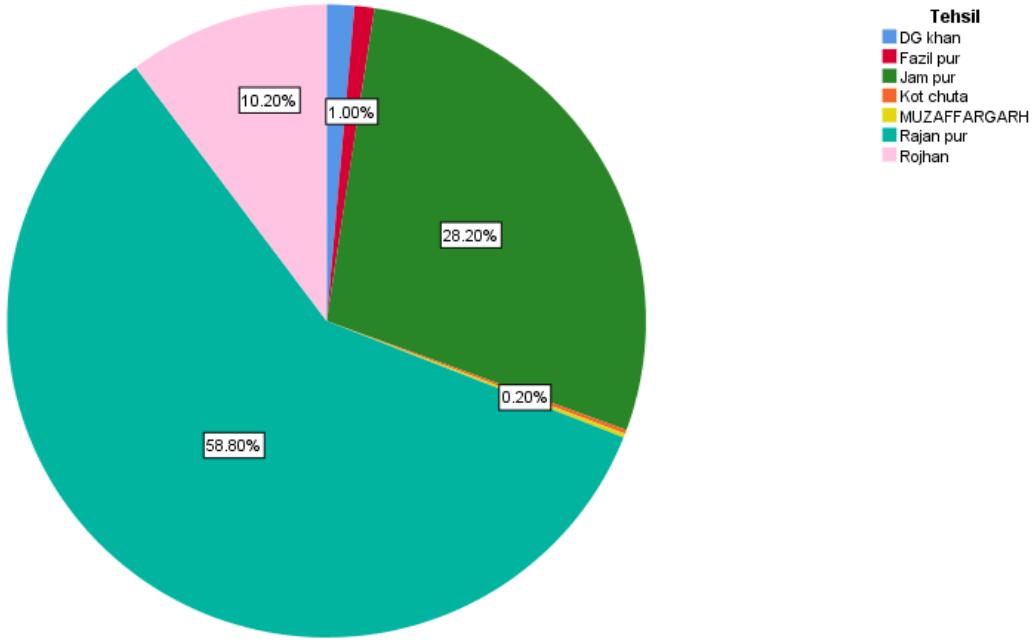

Figure 1: Frequency and percentage of participants from each Tehsil

Knowledge assessment among people

The majority of participants (98.4%) reported having knowledge about malaria, and 97.6% were aware of the precautionary measures required for its prevention. Regarding mosquito breeding habitats, 91.2% correctly identified standing pond water as the primary site, while only a small percentage selected incorrect options such as flowing water (0.4%) and sea water (1.4%). When asked about malaria symptoms, most respondents (61%) identified all related symptoms, with 25.4% mentioning fever specifically, and 12.2% identifying high temperature.

Awareness about the importance of draining stagnant water was high, with 70.2% recognizing its role in malaria prevention. The primary sources of malaria-related information were health departments and program staff (31%), banners and posters (30.8%), and TV or radio (27.2%). A significant proportion (93.2%) reported the presence of open manholes or broken lid holes in their surroundings, highlighting environmental vulnerabilities.

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Additionally, 91.6% reported having screens on their windows and doors.

In terms of vector recognition, 92.2% correctly identified the Anopheles mosquito as the malaria vector, while only 6% could accurately recognize its larval form. The majority (91%) correctly understood that malaria spreads through specific types of mosquitoes, while misconceptions such as handshakes or flies were noted in a minority (9%). Regarding treatment preferences, 74% of participants preferred government hospitals, while 23% chose nearby clinics or informal treatment options. Preventive behaviors were commonly practiced: 94.6% wore full-sleeve clothing during walks, 97% properly drained water after washing vehicles, and 91% managed rainwater appropriately. Additionally, 83.6% reported regular cleaning of rooftop water tanks, and 85.6% treated stagnant water with repellent sprays or kerosene oil. Various mosquito repellent methods were used, with the most common being repellent lotion (43.6%), spray (24%), and bed nets (18.8%). However, only 71.4% reported regular use of mosquito repellent spray indoors. This is indicated in table 2.

Table 2: Knowledge, Practices, and Environmental Awareness Related to Malaria among Participants

Category	Item/Response	Number (n)	Percentage (%)
Knowledge about Malaria	Yes	492	98.4
	No	8	1.6
Knowledge of Precautionary Measures	Yes	488	97.6
	No	12	2.4
Mosquito Breeding Sites	Standing pond water	456	91.2
	All types of water	35	7
	Sea water	7	1.4
	Flowing water	2	0.4
Symptoms of Malaria	All of these	305	61
	Fever	127	25.4
	High temperature	61	12.2
	Vomiting/Nausea	7	1.4
Drainage of Stagnant Water Awareness	Yes	351	70.2
	Neutral	127	25.4
	No	22	4.4
Sources of Malaria Information	Health department/staff	155	31
	Banners/Posters/Flexes	154	30.8
	TV/Radio	136	27.2
	Newspapers	44	8.8
	Other (social media, school, etc.)	11	2.2
Open Manholes/Broken Lids Nearby	Yes	466	93.2
	No	34	6.8
Window/Door Screens at Home	Yes	458	91.6
	No	42	8.4
Correct Mosquito Identification	Anopheles (correct)	461	92.2
	Culex/Ades (incorrect)	39	7.8
Correct Larva Identification	Culex (incorrect)	456	91.2
	Anopheles (correct)	30	6
	Ades (incorrect)	14	2.8
Malaria Transmission Knowledge	Through mosquitoes (correct)	455	91
	Incorrect options (handshake,	45	9

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	flies, etc.)		
Preferred Treatment Site	Government hospital	370	74
	Near quick/hakeem/self	130	26
Preventive Behavior	Full sleeves during walks	473	94.6
	Draining water after washing vehicle	485	97
	Draining rainwater	455	91
	Full sleeves to avoid bites	472	94.4
	Regular cleaning of rooftop tanks	418	83.6
	Regular treatment of standing water (spray/oil)	428	85.6
Mosquito Repellent Methods Used	Repellent lotion	218	43.6
	Spray	120	24
	Bed nets	94	18.8
	Coil, mat, other methods	68	13.6
Regular Indoor Spray Use	Yes	357	71.4
	No/Other/Sometimes	143	28.6

Chi-square analyses

Chi-square analyses revealed that the level of malaria knowledge was significantly associated with participants' age ($\chi^2 = 55.233$, df = 39, $p = 0.044$) and educational qualification ($\chi^2 = 156.448$, df = 95, $p < 0.001$). However, no significant associations were found between knowledge and residence ($\chi^2 = 2.401$, df = 1, $p = 0.121$) or healthcare access ($\chi^2 = 3.139$, df = 3, $p = 0.371$). The association between knowledge and use of preventive measures approached significance ($\chi^2 = 28.464$, df = 18, $p = 0.055$), indicating a potential relationship that warrants further exploration. This is indicated in table 3.

Table 3: Describes the association of malaria knowledge among people

Association Factor	Pearson χ^2 (df)	p-value	Interpretation
Knowledge × Age	55.233 (39)	0.044	Statistically significant
Knowledge × Residence	2.401 (1)	0.121	Not significant
Knowledge × Qualification	156.448 (95)	0	Statistically significant
Knowledge × Use of Preventive Measures	28.464 (18)	0.055	Borderline significant
Knowledge × Healthcare Access	3.139 (3)	0.371	Not significant

Discussion

Overall, the levels of Knowledge, Attitude, and Practice (KAP) were notably low, particularly in the practice domain, even among residents of malaria-endemic areas. This could be attributed to factors such as easy access to diagnosis and treatment through village health volunteer networks, widespread use of anti-malarial medications, improved transportation infrastructure, cultural beliefs, and the limited effectiveness of current health education programs and communication materials distributed by various stakeholders. Consequently, there is an urgent need for new strategies to enhance malaria-related KAP within this community. These findings align with previous studies that also reported low KAP levels in their target populations (20-22). This study evaluated malaria knowledge, attitudes, and practices (KAP) in flood-affected rural and urban areas of Rajanpur, Pakistan, revealing low levels of malaria prevention and control awareness across both populations. Surprisingly, no significant differences were found

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between rural and urban residents, despite the higher vulnerability of rural communities due to limited healthcare access. These findings underscore the urgent need for targeted interventions and comprehensive malaria education programs to improve awareness and prevention efforts. Both rural and urban inhabitants demonstrated insufficient knowledge about malaria transmission, symptoms, and its potentially fatal consequences. This gap is likely influenced by cultural biases, misinformation, and inadequate health education. To address this, community-based, culturally sensitive health education delivered through local channels is essential to effectively bridge the knowledge divide.

Only 38.4% of participants demonstrated a good level of malaria knowledge, despite residing in villages prioritized for malaria control activities. This finding is consistent with several other studies (23, 24). The low knowledge level may be due to persistent misconceptions and false beliefs within the community, despite exposure to health education sessions, talks, and peer education programs, as observed in Ethiopia (25). The effectiveness of interventions by various partners also remains questionable (26). Most educational activities were conducted during the daytime at convenient locations, often attended only by some family decision-makers. Since many villagers were working during these times, the majority of attendees were women who were either too young or too old to effectively disseminate information or make decisions for their households. Additionally, the high proportion of participants with low education levels (87.2%) likely contributed to limited knowledge (27). Significant associations were found between knowledge level and both age ($p = 0.022$) and annual income ($p < 0.001$). Older individuals, having more experience with the disease, participated more frequently in awareness activities, a result consistent with findings from Ethiopia (28).

The research revealed generally unfavorable attitudes toward malaria. Many participants underestimated the severity of the disease and its health consequences, with some showing complacency toward preventive measures, indicating a perceived low personal risk. Such negative attitudes can hinder effective prevention and management. Both rural and urban populations exhibited poor preventive practices, including inconsistent use of bed nets and low compliance with indoor residual spraying, despite their proven effectiveness. Additionally, reliance on traditional remedies and delays in seeking medical care may have contributed to ongoing malaria transmission and its impact. The negative findings highlight the need for further research to better understand the knowledge, attitudes, and practices related to malaria among flood-affected populations in Rajanpur. Future studies should use larger samples and more rigorous methods, while also considering socioeconomic status, education, and cultural factors as key variables.

Among the respondents, over half (56.8%) demonstrated a good level of attitude toward malaria, representing the highest level among the KAP components. These findings are consistent with studies conducted in Nigeria and Ethiopia (28, 29). This positive attitude may reflect a heightened awareness due to the study being carried out in high malaria burden villages during the peak transmission season (July 2018). However, the overall impact of attitude on malaria transmission remains relatively low (30). Notably, 43.2% of participants exhibited a poor attitude level, which could worsen during low malaria seasons, even in highly endemic areas. Additionally, having a family member who experienced a fever within the past two weeks was significantly associated with better attitude levels ($p = 0.023$). Specifically, 70.4% of respondents with recent family fever episodes showed a positive attitude compared to others, suggesting that direct exposure to the disease increases awareness and concern. This trend aligns with findings from a study on Chinese international travelers (31).

Regarding the correlations among knowledge, attitude, and practice (KAP), the results revealed a negative association between knowledge and both attitude and practice. Similar findings were reported in Nigeria (32) while contrasting results were observed in studies from Lower Myanmar, Lao PDR, and Southeast Ethiopia (25, 33). This suggests that even when knowledge improves, attitude and practice may remain unchanged or even worsen. Therefore, interventions should focus on each component—knowledge, attitude, or practice—individually rather than attempting to improve

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overall KAP simultaneously. On the other hand, a positive association was found between attitude and practice, indicating that greater attention to malaria correlates with better preventive behaviors. However, none of these correlations were statistically significant at $p < 0.05$.

This study examined malaria-related KAP among flood-affected populations in Rajanpur, revealing that socioeconomic status, education, and healthcare access significantly influence KAP levels. Cultural beliefs and misconceptions about malaria continue to hinder effective prevention. The findings emphasize the urgent need for targeted KAP interventions tailored to these communities, focusing on education about malaria transmission, symptoms, and consequences. Messaging should respect local cultural norms and aim to correct myths while promoting prevention and control measures. Community-based programs should enhance access to and use of bed nets and indoor residual spraying to improve preventive practices. Encouraging timely medical care for suspected malaria cases is also critical for prompt diagnosis and treatment. Limitations of the study include potential recall bias from self-reported data, the cross-sectional design limiting causal inference, and a relatively small sample size that may not fully represent the broader population.

Conclusion

This study highlights the urgent need for targeted Community Knowledge, Attitude, and Practices (KAP) interventions in flood-affected areas of Rajanpur, Pakistan, to reduce malaria and its public health impact. Strengthening KAP through coordinated efforts by government agencies, NGOs, and community leaders is essential. The findings reveal significant gaps in malaria-related knowledge and practices, underscoring the importance of culturally appropriate health education, effective communication, and local leadership. Interventions should promote awareness of transmission, symptoms, and prevention, while encouraging consistent use of protective measures like bed nets, indoor spraying, and timely medical care. Addressing misinformation and negative attitudes through community-driven strategies can lead to sustainable malaria control in these vulnerable regions.

Author's contribution

All authors contributed equally in the manuscript

Conflict of interest

None

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