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Correlation Between Knowledge, Attitude and Practice towards Malaria in Khuzdar Garrison and Surrounding Areas: A Cross-Sectional Study

Khurram Munir, Memoona Khan*, Zeenat Saulat**

Combined Military Hospital, Khuzdar/National University of Medical Sciences (NUMS) Pakistan, *Department of Pathology, Combined Military Hospital, Khuzdar/National University of Medical Sciences (NUMS) Pakistan, **Department of Radiology, Holy Family Hospital, Rawalpindi Pakistan

ABSTRACT

Objective: To find correlation between knowledge, attitude and practice of malaria in troops and to identify any significant factors associated with them.
Study Design: Cross-sectional study.
Place and Duration of Study: Pathology department, Combined Military Hospital, Khuzdar Pakistan from Nov 2019-Oct 2020.
Methodology: Troops admitted with malaria, stationed in Khz Garrison and operational areas were included. Descriptive statistics were used for patients' demographic profile and Mann-Whitney U-test was used for inferential statistics. Spearman's rho correlation was used to find out correlation between study variables. The data were analyzed using SPSS 20.0.
Results: A total of 203 troops (all males) with confirmed diagnosis of malaria were enrolled. Age of participants ranged from 20-48 years, with a mean of 30.49+6.45years. Troops deployed in Khuzdar, operational areas and those returning from leave were 124(61.1%), 59(29.1%) and 20(9.9%) respectively. There was no significant correlation found between knowledge-attitude (r=-0.025, p=0.725), knowledge-practice (r=0.049, p=0.485) and attitude-practice (r=0.034, p=0.631). The mean attitude score (mean =31.5) of troops of services was higher than the mean score (median=29.5) of other arms. There was significant association of practice with respect to area of deployment with low practice in operational areas (p<0.001).
Conclusion: All troops had adequate knowledge about malaria. Troops of services' arms had a better attitude towards malaria. Targeted interventions towards malaria prevention in operational areas should be enhanced.

Keywords: Correlation, Malaria, Prevention.

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INTRODUCTION

Malaria, as a significant public health disease, continues to claim lives worldwide and is considered as one of the leading causes of morbidity and mortality particularly in young children and pregnant women.[1-4] The worldwide incidence rate of malaria declined from 71 to 57 cases per 1000 population at risk between 2010 and 2018. In 2018, South-East Asia contributed to 3.4% cases of malaria and showed reductions in malaria deaths as compared with 2010.[5]

Pakistan is epidemiologically classified as a moderate malaria endemic country. Despite this, malaria stays among the priority communicable diseases in the country. In 2018, highest number of malaria cases were reported from Khyber Pakhtunkha (KPK) (32%) and Sindh (32%) followed by Balochistan (17%). Increasing evidence of drug and insecticide resistance, low level of immunity, travel within country and across international borders, and lack of access to healthcare facilities are some of the major factors contributing towards disease burden in the country.[6]

Number of malaria cases in Khuzdar district, Balochistan have risen significantly after 2008 with a reported prevalence of 27.9% in 2019 with Plasmodium vivax as the predominant species.[7] This may be partly explained by outdoor activities between dusk and dawn, increase number of floods, accumulation of stagnant water, limited healthcare facilities and emerging chloroquine resistance.[8,9]

Troops deployed in endemic areas are particularly susceptible to malarial threat. History shows that thousands of soldiers during World War II, Korean War and Vietnam War contracted malaria. This signifies the ensuring of availability of countermeasures including LLINs, topical mosquito repellants containing N,N- diethyl-meta-toluamide (DEET) in sufficient quantities, use of chemoprophylaxis , effective implementation of personal protective measures and strict adherence to policies in true letter and spirit. Cases and outbreaks

Correspondence: Dr Memoona Khan, Department of Pathology, Combined Military Hospital, Khuzdar Pakistan
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are generally attributable to lack of adherence to all these.[10]

Assessing the awareness and preventive practices of community towards malaria plays a crucial role in sustaining a successful malaria control program. Since there is no reported study available from Balochistan, on this important aspect of malaria prevention, our study aimed to determine correlation between the knowledge, attitude and practices towards malaria among confirmed malaria cases in troops admitted to Combined Military Hospital Khuzdar. The study also aimed to find any association of the study variables with area of deployment and arms (services vs other).

METHODOLOGY

A hospital based cross sectional study was conducted from 15 November 2019 to 31 October 2020 in the department of pathology at Combined Military Hospital Khuzdar. Non probability consecutive convenient sampling was used.

Inclsuion Criteria: A total of 203 patients with confirmed diagnosis of malaria by microscopic examination/rapid diagnostic tests (RDTs) were included in the study.

Exclusion Criteria: Admitted female patients and children with malaria were excluded.

Approval was obtained from the hospital ethics committee for conducting the study. (File No.03/ERC/CMH Khz).

Subjects of the study included all serving troops (males) irrespective of age, admitted with the diagnosis of P.vivax, P.falciparum and Mixed (P.vivax and P.falciparum) malaria infection. These included troops deployed in Khz Gar as well as operational areas of Awaran, Mashkay, Kashmore, Basima, Shingar and Khoro. Families of troops including children, wives and parents, with confirmed diagnosis of malaria and those labeled as Clinical malaria were excluded. Kish and Leslie formula[11] for sample size of cross sectional studies was used to calculate sample size, n=Zα2 p(1-p)/ δ2, (where Zα = Standard normal deviation at 95% confidence interval corresponding to 1.96; P = Assumed true population prevalence of Plasmodium falciparum malaria, assumed to be 15.8%, from a previous study done in Balochistan 7 ; δ = Absolute error between the estimated and true population prevalence of Plasmodium falciparum malaria of 5% or 0.05); and n = estimated sample size=1.962 x 0.158(1-0.158)/0.052 yields a minimum sample size of 203 study participants for this study.

A questionnaire was designed according to circumstances and sent to two different experts of epidemiology to ascertain validity and reliability. The aim of questionnaire was to collect information about demographic characteristics (age, sex, area of deployment) after taking informed consent and to assess knowledge, attitude and practices of the study population towards malaria. The questionnaire was designed in English but was translated in Urdu for those who were unable to comprehend the questions fully. The questionnaire was comprised of qualitative 32 questions. First 16 questions pertained to knowledge which was dichotomous and was decoded as 1 and 2. Questions 17 to 26 pertained to attitude with response categories of strongly disagree, disagree, agree and strongly agree. These were coded as 1, 2, 3 and 4 respectively. Questions 27 to 32 pertained to practice and their response scale was sometimes, always and never. These were coded as 2, 1 and 0 respectively.

Services arms were defined as troops from AMC (Army Medical Corps), Signals, and EME (Electromedical Equipment), while those of Infantry, Armoured, Artillery, SMG(Short Machine Gun) Bde and HQ(Headquarter 33 Div) and Engineers were labeled as other arms. Questionnaire based Performa were filled in by the admitted patients at the time of discharge. LLIN was defined as "factory manufactured net that does not require any treatment". The untreated net was defined as the net traditionally used by the population.

Statistical analysis of data was performed using Statistical Package for the Social Sciences (SPSS) for Windows, Version 20.0. Descriptive statistics, including frequencies, percentages and mean values were utilized to analyze results. Inferential statistics were used for comparison and Spearman's rho correlation was used to determine association between variables.

RESULTS

A total of 203 admitted patients (all males) positive for vivax, falciparum and mixed (vivax and falciparum) malaria on peripheral smear examination and/or antigen-based RDT were included in this study. All the participants were troops serving in Khz Gar and nearby areas. Age of participants ranged from 20 to 48 years ,with a mean of 30.49 years. Troops deployed in Khz Gar, operational areas and those returning from leave were 124(61.1%), 59(29.1%) and 20(9.9%) respectively.

Knowledge was assessed through questions focused on modes of transmission, signs and symptoms, vulnerable age group, endemicity of region and preventive measures. Responses were coded as 1 for 'yes' and 2 for 'no'. Score of knowledge measured from a min of 16 to a max of 32. Scores <24 were taken as adequate, >25 as poor knowledge. Mean score of knowledge of services' arms was 19.12+1.23 and that of other arms was 19.02+1.19. Although knowledge of troops deployed in Khuzdar Garrison as well as operational areas was adequate , there was no significant association of knowledge with area of deployment (p=0.84). 100% of troops had heard about malaria and had adequate knowledge about its mode of transmission through bite of infected mosquito, fever with chills as most common presenting feature and malaria prevention practices. The responses of troops to malaria knowledge items are shown in Table-I.

Table-II depicts troops' attitude towards malaria. Attitude was assessed by giving 1,2,3,4 values to responses of strongly disagree, disagree, agree and strongly agree respectively. Score of >30 and above was labeled as 'positive' attitude, <20 as negative attitude and 21-29 was labeled as neutral attitude. 84.3% had a positive attitude towards understanding of disease as potentially life threatening while 52.2% troops had a negative attitude towards use of chemoprophylaxis. 81.7% had a positive attitude towards sleeping indoors and 87.2% had positive attitude towards enhancing personal protective measures especially on guard duties. Overall, services arms had a positive attitude with a mean score of 31.5 while other arms had a neutral attitude with mean score of 29.5. There was no significant association of attitude with area of deployment (p=0.438) Details of attitude towards malaria are given in Table-II.

This study further assessed the preventive measures practiced by the study participants. Six questions pertained to practice of the study participants. Practice was assessed by giving 0, 1, 2 scores to responses of never, always and sometimes respectively. Practice had a min score of 0 to a max of 12. Individuals with scores of 4-8 were classified to have 'good practice' while those with score of 1-3 and 9-12 were labeled as having 'poor practice'. 70.9% had good practices about use of anti mosquito sprays and 71.9% had good practice about use of personal protective clothing. 87.2% had poor practice regarding use of mosquito repellant in a regular 3 hourly manner and no one reported use of LLINs owing to lack of access to the same. With regard to treatment practices, healthcare centre was regularly visited in case of

Table-I: Knowledge on malaria, transmission, symptoms, prevention and control measures

Characteristic	Frequency (%)
Heard of malaria (n=203)	
Yes	203(100)
No	0
Do you know that Balochistan is endemic for malaria (n=203)	
Yes	114(56.2)
No	89(43.8)
How can malaria be transmitted to man? (n=203)	
Bite of infected mosquito	
Yes	203(100)
No	-
Close contact with malaria patient	
Yes	89(43.8)
No	114(56.2)
Drinking contaminated water	
Yes	48(23.6)
No	155(76.4)
The following are signs/symptoms of malaria (n=203)	
Fever with chills	
Yes	203(100)
No	-
Vomiting	
Yes	104(51.2)
No	99(48.8)
Headache	
Yes	157(77.3)
No	46(22.7)
Myalgia	
Yes	152(74.9)
No	51(25.1)
Which age group is more predisposed to complications of malaria? (n=203)	
Pregnant ladies	
Yes	160(78.8)
No	43(21.2)
Children	
Yes	182(89.7)
No	21(10.3)
Following can be used to prevent malaria? (n=203)	
Sleeping indoors with screening of doors, windows and ventilators (n=203)	
Yes	203(100)
No	-
Using mosquito nets LLINs while sleeping outdoor (n=203)	
Yes	203(100)
No	-
Protective clothing like full sleeve shirts, long trousers and shoes (n=203)	
Yes	203(100)
No	-
Spraying of potential breeding areas regularly (n=203)	
Yes	203(100)
No	-
Use of mosquito repellants (n=203)	
Yes	203(100)
No	-

development of symptoms and signs of malaria. Services' arms were found to have better practices against malaria as compared to other arms (Mean 5.9+1.04 vs Mean 5.36+1.48 respectively)(Table-III).

Table-II: Troops' attitudes towards malaria.

Variable	Strongly Disagree n(%)	Disagree n(%)	Agree n(%)	Strongly Agree n(%)
Malaria can even cause death if not treated	7(3.4)	25(12.3)	86(42.4)	85(41.9)
I can contract malaria more than once in life	9(4.4)	31(15.3)	105(51.7)	58(28.6)
Development of malaria symptoms/signs warrant early seeking of medical care	3(1.5)	21(10.3)	73(36.0)	106(52.2)
Incomplete treatment can lead to complications of malaria	6(3)	36(17.7)	108(53.2)	53(25.6)
I may need chemoprophylaxis in special situations like war or exercise in a highly malaria's area	18(8.9)	88(43.3)	78(38.4)	19(9.4)
Sleeping outdoor predispose me more to malaria as compared to indoor	8(3.9)	29(14.3)	77(37.9)	89(43.8)
I need to enhance personal protective measures against malaria especially when on guard duty or while proceeding for ops	3(1.5)	23(11.3)	77(37.9)	100(49.3)
LLINs are more effective in protecting me from malaria	21(10.3)	57(28.1)	79(38.9)	46(22.7)
I need to be more careful between dusk and dawn to avoid mosquito bites	21(10.3)	39(19.2)	112(55.2)	31(15.3)
I have to apply mosquito repellant over exposed parts of body regularly at intervals of three hours except when sleeping under mosquito nets	17(8.4)	86(42.4)	59(29.1)	41(20.2)

The association of KAP with arms is shown in Table-IV. The attitude of troops was significantly associated with their arms (p<0.001), with services' arms having a positive attitude as compared to other. Both arms had adequate knowledge. However, there was no significant association between knowledge and arms (p=0.767), and between practice and arms (p=0.063)

The association of area of deployment with mean KAP scores is shown in Table-V. Our study showed that malaria prevention practice was significantly associated with troops' area of deployment (p<0.001). Despite adequate knowledge, troops deployed in operational areas had poor practices as compared to those in Khz Gar.

Following criteria was used for interpretation of correlations: 0-0.25=weak correlation, 0.25-0.5=fair correlation, 0.5-0.75=good correlation and greater than 0.75=excellent correlation.[12] No significant linear correlation was found between knowledge-attitude (r=-0.025, p=0.725), knowledge-practice (r=0.049, p=0.485) and attitude-practice (r=0.034, p=0.631).

Table-III: Troops' Malaria Prevention Practices

	Responses		
	Always n(%)	Sometimes n(%)	Never n(%)
How often do you use anti mosquito sprays?	144(70.9)	-	59(29.1)
How often do you use protective clothing like full sleeves shirt, long trousers and shoes while moving outdoors after sunset?	146(71.9)	57(28.1)	-
How often do you use mosquito repellant regularly in 3 hour manner?	57(28.1)	120(59.1)	26(12.8)
How often do you ensure prevention of accumulation of stagnant water in your respective AOR?	92(45.3)	54(26.6)	56(27.6)
How often do you use LLINs between dusk and dawn?	-	-	203(100)
How often do you visit healthcare facility when you develop symptoms/signs of malaria?	203(100)	-	-

DISCUSSION

Assessment of communities' awareness, prevention practices and attitude towards a disease is one of the most commonly used tools in public health sciences. Key determinants of such studies about malaria, have been focused on a better understanding of how much is known about its prevention, the general attitude of community and practical implementation of effective anti malarial strategies.[3,13]

Pakistan reported 20% decrease in malaria cases in 2018 as compared to 2016. However, the Pakistan Strategic Plan Malaria Control Program for 2015-2020 aims at 75% reduction of malaria burden by 2020 in high and moderate endemic districts and elimination of malaria in low endemic districts of the country.[6] Our study provides evidence of adequate knowledge of troops deployed in Khuzdar Garrison about malaria. This was in agreement with Malaria Indicator Survey in 38 High Risk Districts of Pakistan 2013-14, published by Directorate of Malaria Control ,Pakistan Medical Research Council.[14] They reported maximum malaria information from Balochistan (92.5%) followed by Sindh (87.2%), Khyber Pakhtunkhwa, KPK (70.2%) and Federally Administered Tribal Areas, FATA (66.6%). All 203(100%) of our study participants knew that malaria was transmitted through bites of infected mosquito and fever with chills as the most frequent symptom of malaria. 89(43.8%) had knowledge about transmission of malaria through

Table-IV: Comparison of Arms (Services vs other arms) and Mean KAP Scores

Arms	n=203	Knowledge Score (Mean+SD)	*p*-value	Attitude Score (Mean+SD)	*p*-value	Practice (Mean+SD)	*p*-value
Services	31	19.12+1.23	0.767	31.54+2.77	<0.001	5.9+1.04	0.063
Other	172	19.02+1.19		29.52+2.6		5.36+1.48	

**Mann Whitney Test, p<0.05*

Table-V: Comparison of Area of deployment (Khz Gar vs Ops Area) and Mean KAP Scores

Arms	n=203	Knowledge Score (Mean+SD)	*p*-value	Attitude Score (Mean+SD)	*p*-value	Practice (Mean+SD)	*p*-value
Khz Gar	124	19.00+1.25	0.84	29.95+2.66	0.43	6.08+0.90	<0.001
Ops Area	59	19.06+1.11		29.52+2.87		3.79+1.15	

**Mann Whitney Test, p<0.05*

close contact with infected patient. This was in agreement with a study carried out by Amusan VO in Nigeria in 2017, where he reported 253(96.94%) of respondents having a high knowledge of malaria.[15] However, in 2012, Qayum *et al.,* from Jalozai (Pakistan) reported over 42% of study population unaware of malaria.[16] Knowledge of troops regarding malaria prevention was also much higher than reported from Tumbi referral hospital, Tanzania in 2019. Munisi from Tanzania reported low level of knowledge of study participants on malaria preventive measures like only 38.6% identifying wearing of long sleeved clothes to be protective against malaria, and 52.7% recognizing spraying of insecticides to be protective against malaria. Their study participants included symptomatic malaria patients attending Tumbi Referral Hospital with various economical activities. While our study population (100%) had a min secondary education level in other arms with services arms having further specialized courses, they reported 44.07% of study participants having secondary education level and 80.68% were below secondary education level.[3]

We found that attitude of troops towards malaria was significantly associated with their arms (services vs other arms) (*p*-value<0.05). The relatively neutral attitude of other arms may be attributed to low cognition, behavioral factors, insufficient health education campaigns and non strict adherence to SOPs. Despite these factors, 88.2% of all troops had a positive attitude towards seeking of early medical care while the Malaria indicator survey reported only 65% seeking treatment within 24 hrs of developing fever.[14] Similarly, majority of our study population recognized malaria as a serious health issue. This was in accordance with a study carried out in Bangladesh. Saha from Bangladesh, in 2019, reported 87.5% of study respondents, believing that anyone could be infected with malaria and that it was a life threatening disease. Their study respondents comprised of slash and burn cultivators particularly vulnerable to malaria infection.[17] 0.5% of troops in our study had a positive attitude towards avoiding mosquito bites between dusk and dawn. However, our study revealed certain misperceptions regarding need of chemoprophylaxis and frequent use of mosquito repellants in the study population. While, Marta F Maia *et al*., in 2018, reported limited evidence for use of mosquito repellant as a protective measure, by stating that it was unclear whether topical repellants gave any protection against P.vivax (RR 1.32,95% CI 0.99 to 1.76, low certainity evidence) or P. falciparum (RR 0.84, 95% CI 0.64 to 1.12, low-certainity evidence),[17] chemoprophylaxis might be the major determinant of troops contracting malaria in operational areas.[10]

Vector control has been implemented as an effective preventive strategy in South Asia, with IRS (indoor residual spraying) as the main modality, despite emerging drug resistance.[18] Our study also had a similar observation with IRS 144(70.9%) as the most frequently used preventive practice against malaria ,followed by use of personal protective clothing 146(72.9%) and prevention of accumulation of stagnant water as a potential breeding place 92(45.3%). The preference of IRS in our study was similar to one carried out in a slum area of Karachi in 2013 by Bilal A, who reported 96% of people using coil and IRS as preventive measures. The use of bed nets was 85% in their study.[19] A Nigerian study also reported a high use of long sleeved shirts, trimming of bushes and use of ITNs as leading malaria prevention practices in private security guards within Kaduna Metropolis. While they found statistically significant association of practices between respondent's gender and level of education, we could not draw these conclusions because of all male patients with basic same level of education.[15] Munisi from Tanzania reported sleeping under LLINs as the main preventive practice .Moreover, they reported poor practices of vector control measures like use of mosquito sprays, clearing

stagnant water and use of personal protective clothing.[3]

We report significant association between malaria prevention practices and area of deployment of troops. Despite adequate knowledge, troops deployed in operational areas did not focuss on strict implementation of prevention practices. Non availability of LLINs, lack of chemoprophylaxis, and limited following of Standard Operating Procedures (SOPs) may contribute to these findings and need further evidence.

As per Malaria indicator survey 2013-14 Pakistan, 37.7% of Balochistan community had access to LLINs owing to their provision in Union Councils through Global Fund Support.[14] In our study, although 61.6% of study population agreed on LLINs as a better preventive measure, no one reported their use because of non availability of LLINs to the troops.

Finally, our study did not show any significant correlation between knowledge, attitude and practices at $p<0.05$. Aung from Myanmar also reported the same20. It implies targeting of specific priorities to be given to each activity separately, rather than emphasizing on overall KAP of the study population.

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LIMITATION OF STUDY

We acknowledge that the study included troops deployed in Khuzdar Garrison and surrounding areas only, and that the hospital based population may not be representative of the general population.

CONCLUSION

The study recognized gaps in knowledge, attitudes and practices towards malaria in troops, which is often a neglected aspect of malaria control plan. Despite adequate knowledge, malaria prevention practices of troops in Khuzdar Garrison were significantly better than those deployed in operational areas. We emphasize upon the collaborative efforts directed towards extensive health education campaign for troops especially for other arms to improve their attitude towards malaria. Furthermore, we recommend use of chemoprophylaxis before entrance to exercise/war to malaria endemic operational areas and ensuring availability of LLINs and implementation of SOPs in true letter and spirit. Together these efforts can contribute significantly to malaria eradication in Armed Forces.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

KM & MK: Data acquisition, data analysis, critical review, approval of the final version to be published.

ZS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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