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Research Article

Adaptive Capacity of the Communities in View of Climate Change in Areas Vulnerable to Malaria in the Himalayan Region of India

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A B S T R A C T

Background: Malaria is one of the major public health problems in India and climate change is expected to aggravate the situation by opening new windows for transmission, particularlyin the Himalayan region. It is, therefore, essential to identify knowledge gapsand adaptive capacity of communities to the adverse impacts of climate change, to develop adaptation plan and improve resilience.

Methods: The adaptive capacity to potential risks of malaria due to climate change was assessed in the states of Himachal Pradesh and Uttarakhand, based on the knowledge, attitude, health seeking behaviour, practices and socio-economic status of the communities. The preparedness of health facilities was also assessed in the respective healthcare facilities in view of the threat of climate change.

Results: Though communities had basic knowledge about malaria, lack of specific knowledge about breeding sources of mosquitoes, use of traditional protective measures (41%) from mosquito bites, delayed health seeking behaviour by 40% households (2-4 days after illness) were found unsatisfactory.The assessment of health system revealed inadequacies in capacity for beds at CHCs (in 60%), lack of training of staff and logistics in preparedness for the threat of malaria.

Conclusion: The general knowledge of communities regarding malaria was satisfactory, but several misconceptions which may affect the vulnerability to future risk of malaria were found. The adaptive capacity was found slightly above average (57.04) owing to the overall good socio-economic status. However, lack of proper health care infrastructure may impact the overall adaptive capacity of the communities to malaria.

Keywords: Malaria, Climate Change, Knowledge, Adaptive Capacity, Himachal Pradesh

Introduction

Climate Change is an emerging public health problem which is affecting the distribution of malaria.[1,2] Studies undertaken in India have projected the opening of new foci for malaria transmission in the Himalayan region by 2030s and altered windows of transmission in other parts[2-4] as a result of climate change. The communities in the Himalayan

region have little experience of malariaowing to very low endemicity due to low temperatures. In order to develop adaptation plan for vulnerable communities in Himalayan region, it is imperative to know the knowledge, attitude, health seeking behaviour, practices, and socio-economic status of the communities and the health system.

The societal response that enables the community to adapt and cope with adverse effects of climate change is defined as their adaptive capacity. Socio-economic status, knowledge and practices play a crucial role in building this resilience at the local level, which is supported by availability of adequate health infrastructure.[5-7] The present study was, therefore, undertakenin vulnerable areas of the Himalayan region to assess the adaptive capacityof the communities as well as health system. The results of this study would guide the local health authorities to develop adaptation plan to combat the adverse impacts of climate change on malaria.

Materials and Methods

Study Locations

The study was conducted in districts Chamba and Kangra in Himachal Pradesh, and Tehri Garhwal and Almora in Uttarakhand, where 36 villages (Table 1) were selected from regions which are projected as vulnerable to malaria due to climate change.[2,3] An assessment of the nearest primary and secondaryhealth centres was also conducted to ascertain their preparedness for potential risks of malaria and climate change based on the National Rural Health Mission (NRHM) norms.[8]

Table 1.Details of Villages and Health Centres Surveyed

District	Date of survey	Block	Village	Total population	No. of houses in village	No. of houses surveyed
Tehri Garhwal (Uttarakhand)	10/01/2018	Devprayag	Bhadoli	222	59	16
	12/01/2018	Devprayag	Bagi	93	27	6
			Gorti Kanda	584	125	20
			Koti	301	64	7
			Muneth	408	97	20
			Rampur	283	67	7
			Rampur-Shyampur	452	109	10
Chamba (Himachal Pradesh)	30/01/2018	Samot	Dentha			12
			Samot	817	184	3
			Har			11
	31/01/2018	Pukhari	Karori	464	93	21
			Bhardawi			9
	31/01/2018	Sundla	Sundla	464	91	15
			Danun	515	103	16
			Koti	55	17	16
	01/02/2018	Rajnagar	Rajnagar	1437	306	20
			Kiyani	1539	319	18
			Ramgarah			6
		Kakira	Nainikhad	416	93	12
Kangra (Himachal Pradesh)	30/01/2018	Tiara	Lulehr	1253	270	17
			Tarsuh	821	161	15
	31/01/2018	Jia	Jia	212	52	7
		Gopalpur	Gopalpur	918	202	7
Almora (Uttarakhand)	13/02/2018	Takula	Amkholi	259	67	11
			Bina	134	24	15
			Chaupata			14
			Kandey	930	198	9
		Baisiyachhina	Kalon	416	116	13

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	14/02/2018	Barechhina	Petashal	673	148	26
			Bajyoli	205	43	13
		Panuwanaula	Toli	375	78	13
			Maniagar	787	125	21
	15/02/2018	Dhauladevi	Burarbanj			5
			Garurabanj	726	166	11
		Hawalbagh	Hawalbagh	325	77	28
			Jyoli	585	114	23

Study Design

Adaptive Capacity of communities for potential risk of malaria in selected districts was assessed with the help of a structured interview schedule based on knowledge of disease, attitudeand practices for vector control, health seeking behaviour and socio-economic status (KABPS). A separate set of interview schedulewas used to assess the preparedness of health systems based on knowledge of impacts of climate change on malaria and availability of adequate manpower and resources.

Study Population and Participants

Assuming a confidence level of 95% and margin of error 5%, minimum sample size required to represent the population of 3,270,592 in the selected districts was found to be 384. Households were selected by random sampling (minimum 5% of households from each village) and in total, 493 households were interviewed.

Data Collection and Analysis

The data was collected in three field visits between 10-January to 15-February 2018. All the participants were informed about the purpose of the research and importance of their contribution. Informed consent was taken from each participant, with due regards to confidentiality. The interview schedule was then administered in 15-minute face to face interactionsand responses were noted on questionnaire sheets. The health system questionnaires were administered to the Medical Officers (MO) and the Block Malaria Officers (BMO) in the respective Health Centres.

To compute the KABPS score each response was scored either - 1 (incorrect/inappropriate responses), 0 ('Don't Know') or 1 (most appropriate response). Village and district wise adaptive capacities were evaluated by additive aggregation of KAPBS scores using equal weights, and converted to percentage. Cross tabulation, frequencies and Chi square testswere carried out using SPSS Software 17.0 to determine the dependenceof categorical variables. Multiple regression was used to analyse the association between continuous variables (KAPBS scores).

Results

Demographic Characteristics

The average size of the households was approximately 5 people per household, while the average age of respondents was 47 years. Male to female ratiowas approximately 7:3. Almost all respondents were indigenous (97.54).

Socio-economic Status

Most respondents (86.93%) had someformal education of which 22% had studied up to high school while 23% were graduates or higher. Almost 23% of the respondents worked in the Private sector, 12% worked in the government sector, 18% were labourers and 19% were self-employed. Housewives constituted 19% of the respondent population while 9% were unemployed.

Table 2.Scores with Descriptive Statistics

Variables	Range			Mean	25 percentile	Median	75% percentile
	Low	Medium	High				
Literacy	0 to 1	1.01 to 2	2.01 to 3	1.29	0	1	2
Socio-economic Status (S)	-5 to -1	-1.01 to 3	3.01 to 7	3.47	2	4	5
Knowledge (K)	-10 to 0	0.01 to 9	9.01 to 18	8.89	5	8	10
Attitude (A)	0 to 1	1.01 to 2	2.01 to 3	2.61	1	3	4
Practices (P)	0 to 3	3.01 to 6	6 .01 to 9	3.61	3	4	4
Health seeking Behaviour (B)	-5 to 0	0 to 1.50	1.51 to 3	2.17	2	2	3
Total Adaptive Capacity (AC)	0 to 33	33 to 66	66 to 100	63.10	57.25	65.17	71.69

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Though 43% of the respondents earned more than INR 100,000 annually, 12% were below poverty line (< INR 25,000 per annum).The number of mud houses was highest in Kangra (21.75%) and lowest in Almora (3.05%).

Most of the houses (89.87%) had piped water supply. Hand pumps and streams were used less frequently (13.5% and 24.68%).Domestic containers were the most common form of water storage (61.03%) followed by overhead tanks (48.82%). Cattle (cows and buffalos) were the most common type of livestock owned (1.22 per household), followed by goats and sheep (0.7 per household).

Knowledge of Malaria and Climate Change

Awareness of malaria was significantly high (92%). Radio, television and newspapers were the most common source of information (86%) followed by friends and family (26%). Though role of mosquitoes in malaria transmission was well known (84%), few respondents were aware of breeding sites, with many mistaking garbage as a breeding site (60%).

The major symptom of malaria (high fever with chills) was fairly well known (69%). While most respondents knew about anti-malarials (76%), some were less familiar with malaria treatment (16%).

Majority of the respondents were aware of climate change (87%), believedit could affectmalaria (73%) and had noticed significant changes in temperature and rainfall over the last 10 years (94%). Cross tabulation results revealed that higher the literacy, greater the likelihood to understand the impact of climate change on malaria (Table 4).

Attitude towards VBD Control

More than half of the respondents considered malaria to be life threatening (59%) and understood the role of both government intervention and personal protection in malaria control (55%).

Table 3.Socio-economic and demographic characteristics of study population

Attribute	Chamba	Kangra	Tehri Garhwal	Almora	Total
Average size of family	4.81	5.07	4.76	4.51	4.70
Average age of respondents (years)	45.87	44.79	49.94	47.67	47.23
Gender	%	%	%	%	%
Male	65.81	67.50	79.07	69.70	68.56
Female	36.77	47.50	20.93	29.80	31.44
No. of houses surveyed	159.00	46.00	86.00	202.00	493.00
Education	%	%	%	%	%
Illiterate (%)	9.77	14.63	16.88	12.96	12.83
Primary/Secondary School	46.62	46.34	45.45	35.19	41.89
High School	18.80	19.51	15.58	29.01	22.28
Graduate	23.31	19.51	22.08	23.46	22.76
Occupation	%	%	%	%	%
Labourer	12.50	21.05	16.25	21.35	17.50
Government employee	13.89	15.79	17.50	7.87	12.27
Private employee	18.75	31.58	30.00	21.35	22.95
Housewife	23.61	23.68	8.75	19.66	19.32
Self-employed	20.14	7.89	22.50	18.54	18.86
Unemployed / Retired	10.42	21.05	5.00	11.80	9.09
Annual income	%	%	%	%	%
< 25,000	4.17	13.95	21.79	13.89	11.98
25,000 – 50,000	4.86	23.26	12.82	30.56	17.36
50,000 – 1,00,000	28.47	11.63	25.64	32.64	27.63
> 1,00,000	62.50	51.16	39.74	22.92	43.03

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Behaviour and Practices

Mosquito coils and traditional methods were the most common form of personal protection used (57% and 41% respectively), while bed nets and doors and window screens were rarely used (9% and 7%). Use of personal protection was lowest in Tehri Garhwal (45%). Almost all respondent kept water containers covered (97%), and the majority cleaned containers at least once a week (81%).

Health Seeking Behaviour

Almost all respondents (96%) visited the nearest health facility in case of a recurrent or prolonged fever. There was very low preference for self-medication (2.4%) and traditional healers or quacks (1.5%). Government health centres were the most preferred health facility (88.7%). While more than half of the respondents sought treatment within the first 24 hours of fever (54%), many waited at least 2 - 4 days before visiting a health facility (40%). Lack of facilities (47.6%) and medicines (31.5%) were the most commonly cited reasons for preferring private over government health facilities. In most villages, regular health worker visits were not conducted (73.4%).

Adaptive Capacity of the Community

The variable scores and total adaptive capacity was categorized into three groups (Table 5) – Low (*), Medium (**) and High (***) based on the 25th and 75th percentiles. The overall adaptive capacity of both states was similar (57.89-Uttarakhand and 59.81-Himachal Pradesh). Almora had the highest adaptive capacity (61.10), while Tehri Garhwal had the lowest (50.45).

Table 4.KAPBS and Adaptive Capacity Scores of Different Villages

District	PHC	Village	K	A	P	B	S	AC
Tehri Garhwal (Uttarakhand)	Devprayag	Badhal	7.19 **	1.50 **	3.50 **	2.63 ***	2.50 **	56.80 **
		Bagi	6.50 **	1.17 **	3.17 **	1.83 ***	1.17 **	50.06 **
		Gorti Kanda	4.89 **	1.04 *	1.35 *	1.00 **	2.40 **	46.93 **
		Koti	7.14 **	1.57 **	3.14 **	2.00 ***	6.14 ***	60.77 **
		Muneth	5.50 **	0.85 *	2.90 *	1.75 ***	3.20 ***	50.72 **
		Rampur	4.71 **	0.57 *	1.71 *	0.86 **	2.14 **	42.45 **
		Rampur-Shyampur	6.10 **	0.80 *	3.50 **	1.90 ***	3.80 ***	53.63 **
District Average Score			5.66 **	1.01 *	2.66 *	1.71 ***	2.97 **	50.45 **
Chamba (Himachal Pradesh)	Samot	Dentha	7.33 **	1.42 **	3.83 **	2.00 ***	4.17 ***	58.52 **
		Samot	9.67 ***	2.00 ***	4.33 **	2.00 ***	5.00 ***	64.91 ***
		Har	8.91 **	2.18 ***	3.64 **	2.27 ***	4.64 ***	63.66 ***
	Pukhari	Karori	6.95 **	1.43 **	4.10 **	2.19 ***	3.48 ***	57.98 **
		Bhardawi	8.44 **	0.89 *	4.00 **	2.00 ***	2.67 **	54.46 **
	Sundla	Sundla	6.8 **	2.27 ***	3.47 **	2.53 ***	5.40 ***	65.11 **
		Danun	7.31 **	1.81 **	3.50 **	2.56 ***	4.44 ***	61.20 **
		Koti	7.25 **	1.81 **	3.81 **	2.31 ***	5.06 ***	61.65 **
	Rajnagar	Rajnagar	6.00 **	1.60 **	3.35 **	2.45 ***	4.85 ***	59.55 **
		Kiyani	9.17 ***	2.06 ***	3.67 **	2.67 ***	5.56 ***	65.91 ***
		Ramgarah	9.50 ***	2.67 ***	3.50 **	2.17 ***	5.50 ***	66.86 ***
	Kakira	Nainikhad	7.50 **	1.75 **	4.25 **	1.83 ***	4.83 ***	61.58 ***
District Average Score			7.57 **	1.70 **	3.74 **	2.26 ***	4.62 ***	61.02 **
Kangra (Himachal Pradesh)	Tiara	Lulehr	6.24 **	1.94 **	3.88 **	1.94 ***	3.88 ***	59.37 **
		Tarsuh	6.53 **	0.8 *	3.13 **	1.80 ***	3.73 ***	52.74 **
	Jia	Jia	4.86 **	1.14 **	2.86 *	1.86 ***	2.00 **	49.63 **
	Gopalpur	Gopalpur	7.57 **	1.71 **	3.57 **	1.86 ***	4.00 ***	58.65 ***

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District Average score			6.33 **	1.41 **	3.43 **	1.87 ***	3.57 ***	55.60 **
Almora (Uttarakhand)	Takula	Amkholi	10.27 ***	2.27 ***	3.64 **	2.55 ***	3.46 ***	63.64 ***
		Bina	7.33 **	1.73 **	3.93 **	2.27 ***	2.93 **	58.62 **
		Chaupata	8.79 ***	2.00 ***	3.57 **	2.36 ***	2.71 **	59.71 **
		Kandey	8.00 **	2.44 ***	3.89 **	2.56 ***	1.22 **	59.68 **
	Baisiyachhina	Kalon	8.08 **	1.92 **	3.54 **	2.31 ***	1.69 **	57.03 **
	Barechhina	Petashal	7.23 **	2.23 ***	4.04 **	2.04 ***	3.15 ***	60.57 ***
		Bajyoli	7.92 **	2.39 ***	4.15 **	2.31 ***	1.92 **	60.53 ***
	Panuwanaula	Toli	9.08 ***	2.15 ***	3.92 **	2.62 ***	2.54 **	61.65 **
		Maniagar	8.33 **	2.57 ***	4.29 **	2.14 ***	3.76 ***	64.49 ***
	Dhauladevi	Burarbanj	9.80 ***	2.60 ***	4.40 **	2.40 ***	3.40 ***	65.88 ***
		Garurabanj	8.36 **	2.18 ***	3.82 **	2.27 ***	1.27 **	58.09 **
	Hawalbagh	Hawalbagh	8.96 ***	2.39 ***	4.11 **	2.82 ***	3.54 ***	65.12 ***
		Jyoli	8.17 **	1.65 **	3.91 **	2.17 ***	2.48 **	57.82 **
District Average Score			8.35 **	2.17 ***	3.96 **	2.36 ***	2.77 **	61.10 **

High*** | Medium ** | Low *.

Table 5.Correlation Matrix of Socio Demographic Factors and Outcome Scores

	Knowledge score	Attitude score	Practice score	Health seeking behaviour	Adaptive capacity
Age	0.121	-0.19	-0.132	-0.038	-0.025
Family Size	-0.024	-.117	0.065	0.003	-0.052
Literacy	0.278	0.207	0.091	0.104	0.282
Socio economic status	0.213	0.239	0.219	0.194	0.534
Knowledge	-	0.520	0.378	0.385	0.687
Attitude	-	-	0.395	0.288	0.839
Practice	-	-	-	0.435	0.652
Health Seeking Behaviour	-	-	-	1.00	0.570

Knowledge of malaria and climate change washighly correlated with attitude and health seeking behaviour and moderately correlated to behaviour and practices. Literacy was found to have weak association with KAPBS scores and adaptive capacity, while age and family size showed no significant correlation (Table 5).

Health System Assessment

On an average, 21% of the posts in the Health centres surveyed were vacant (Table 6). More than 33% of the PHCs and 60% of the CHCs lacked the required number of beds as per NRHM norms.

Spray pumps and insecticides were present in only 33.3% and 16.7% of the health centres surveyed, as the districts are not selected for Indoor Residual spraying due to low API (<2).[11] Rapid diagnostic kits for malaria were present in only 16.7% whereas anti-malarials were available in 41.7% of the health centres. Chloroquine and primaquine were the only anti-malarials available. More than 33% of the Health Centres lacked basic diagnostic equipment.

Most of the health professionals were aware about climate change and its effect on potential risk of malaria. However, more than 90% of the health professionals had no knowledge of the locally prevalent vectors.

Discussion

Knowledge, attitude and practice (KAP) surveys have been used previously and was used to assess the adaptive capacity of communities to potential risk of malaria due to climate change.[9-12]

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Table 6.Preparedness of Health Systems in Vulnerable Areas of Malaria due to Climate Change

Question	Response (%)			
Average % of vacancies	SC	PHC	CHC	
	0	29.5	14.4	
Frequency of Training	Every year	Once in 2 years	Every 5 years	No schedule
	50	0	0	50
Capacity (beds)	% PHC with beds as per norms		% CHC with beds as per norms	
	66.7		40	
Availability of RDKs	Adequate	When required	Few	None
	8.3	0	8.3	83.3
Availability of slides and stains	Adequate	When required	Few	None
	58.3	16.7	8.3	16.7
Availability of Spray pumps	Adequate	When required	Few	None
	0	25	8.3	66.7
Availability of anti-malarials	Adequate	When required	Few	None
	25	8.3	8.3	58.3
Availability of insecticides	Yes	No	Don't know	
	8.3	83.3	8.3	
IRS planning	6 months prior	1 year prior	3 months prior	Never
	0	0	0	100
Anti-malarials available	Chloroquine	Primaquine	Sulphadoxine Pyrimethamine	Quinine
	41.7	33.3	0	0
	ACT	None of the above	Others	
	0	58.3	0	
Diagnostic equipment	Stereoscopic Microscope	Compound Microscope	RDT	None of the above
	25	58.3	8.3	33.3
Availability of Vehicles	Yes		No	
	41.7		58.3	
Knowledge of CC	Yes		No	
	83.3		16.7	
Noticed change in Temp. and R/F	Yes	No	Don't Know	
	100	0	0	
Noticed change in mosquito activity	Yes	No	Don't Know	
	83.3	16.7	0	
Believe CC will affect malaria	Yes		No	
	90		10	
Noticed any change in malaria	Yes	No	Don't Know	
	16.7	50	0	
Knowledge of locally prevalent vectors	Yes	No	Don't Know	
	9.1	90.9	33.3	

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Plan for surveillance	Fortnightly	Monthly	Seasonally	When needed
	16.7	0	25	66.7
Records of surveillance	Yes	No		
	83.3	16.7		

The socio-economic status of the communities was good, with only 12% households below the poverty line and 43% earning more than INR 100,000 per annum. This was reflected in better housing conditions observed in most of the villages surveyed.

Most people wereaware of only the basic knowledge regarding malaria (92%) as it is one of the oldest and well-known diseases in India. How ever significant misconceptions regarding breeding sites and vector control methods were observed, with garbage often cited (60%) as one of the main breeding sites for mosquitoes. The communities were also less aware about the symptoms of malaria (69%) and its treatment methods (74%). A quarter of the respondents were unaware about symptoms of malaria and several even attributed headaches and body aches as symptoms of malaria.

Television, radio and newspapers were the most commonly cited sources of information (80%) followed by sharing of knowledge from family members living in cities (24%). Earlier studies have highlighted the role of these factors in disseminating information regarding malaria.[13-19] However, role of health professionals as source of information was slightly lower (21%) than friends and family, which highlights the need for doctors and paramedical staff to take more active participation in information exchange.[19, 20] The impact of climate change was fairly well known and the majority of the respondents had noticed a significant change in climate and understood its impact.

No significant correlation was found between literacy and knowledge score in our study (Table 6). However, more than 70% of the respondents who were graduates or higher, had a high knowledge score as opposed to only 19% of the respondents who were illiterate. While some earlier studies have found that knowledge of VBD depends on literacy,[15,21] some have also found no relation between the two.[22] This shows that the majority of the population has basic awareness about malaria irrespective of education, whereas literacy plays a role in more specific knowledge. Knowledge of malaria was found to have a significant influence on the attitude and the HSB of the community.

The use of personal protective measures (PPM) for prevention from mosquito bites has been found to vary depending on the location.[23-25] In the present study, use of PPM (mainly mosquito coils and traditional methods) was significantly high (41-57%) in all the districts surveyed, indicating abundance of mosquitoes.The most common forms of PPM used were mosquito repellents followed by traditional methods such as burning certain plants or aromatic wood were. The usage of bed nets (9%) was low as districts were non-endemic.

HSB of the community was generally high, as many of the villages surveyed were situated closeto a Health Centre. This could also be the reason for government health facilities being mostly preferred. More than 20% of the respondents in Tehri Garhwal were below the poverty line (annual income < INR 25,000) and 16.89% had no education, highest among the four districts. These factors, resulted in a lower knowledge score as well as a lower health seeking behaviour in the community when compared to the other districts.

In Uttarakhand, district Tehri Garhwal had a lower adaptive capacity (50.54), whereas Almora had higher adaptive capacity (61.1). In Himachal Pradesh, Chamba had high adaptive capacity (61.02), while Kangra had lower adaptive capacity (55.6). Villages Kiyani and Ramagarh in Chamba had the highest adaptive capacity, 65.91 and 66.86 respectively. On the other hand, villages Rampur and Gorti Kanda in Tehri Garhwal were found to be the most vulnerable with adaptive capacity 42.45 and 46.9 respectively.

The health system preparedness with respect to malaria was found grossly insufficient. A large number of the health centres did not have anti-malarials and lacked sufficient facilities for malaria diagnosis and treatment, as the area is non-endemic for malaria. A high percentage of vacancies in local health facilities also hampers their ability to cope with the potential risks of malaria.

The study suggests that the adaptive capacity of communities has scope of further improvement by providing specific health education about breeding habitats of mosquitoes, prevention from mosquito bites, signs and symptoms of malaria, importance of insecticidal spray and complete treatment. It was also observed that vector populations already exist in these districts and the emergence of malaria may have severe impacts on the community. It is, therefore, recommended to impart specific health education to communities about prevention from mosquito bites and strengthen health systems in terms of logistics and training of health officials so as to reduce the imminent impact of malaria in view of climate change.

Conclusion

The adaptive capacity of the communities in regions vulnerable to climate change and its potential impact

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on malaria, was assessed using a KABPS survey. It was found that awareness of malaria was limited to the basic knowledge ofmalaria, whereas knowledge regarding breeding sites, symptoms and treatment was lacking in the community. This resulted in poor practices in the community thatcould increase their exposure to mosquitoes, which were abundant in the surveyed villages. The health seeking behaviour of the community was satisfactory (96%) as most respondents depended on the local health centres for treatment rather than quacks. However, the significant lack of preparedness was found (plan for training (50%), microscope (33.3%) and inadequate anti-malarials) in several health centres that were surveyed. Adaptive Capacity in District Almora was found best (61.1), while lowest (50.45) in Tehri Garhwal, which was basically due to difference in components of KABPS.

Significant efforts must be made to educate the communities about transmission and preventive measures of malaria and improve the health infrastructure by training of health personnel, procuring the necessary diagnostic equipment and medicine for detection and treatment of malaria to minimize the impacts of climate change on malaria in India.

Declarations

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List of Abbreviations

AC: Adaptive Capacity
BCC: Behavioural Change Communication
BMO: Block Malaria Officer
CHC: Community Health Centre
IEC: Information, Education and Communication
KAPBS: Knowledge, Attitude, Practices, Health-Seeking Behaviour and Socio-economic Status
KAP: Knowledge, Attitude and Practices
MO: Medical Officer
PHC: Primary Health Centre
PPM: Personal Protective Measures
RDK: Rapid Diagnostic Kits
SC: Sub-Centre
SAD: State Allopathic Dispensary
VBD: Vector Borne Diseases

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