



RESEARCH ARTICLE

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RISK ASSESSMENT OF VECTOR BORNE DISEASES IN ROHINGYA REFUGEE'S CAMPS, COX BAZAAR. BANGLADESH

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ABSTRACT

Risk assessment was carried out for vector borne diseases (VBDs) in displaced persons of Rohingya refugees camps, Bangladesh to control the danger posed by these diseases. This paper brings together the latest malaria surveillance data of the affected Cox Bazar district where one million refugees settled from Myanmar. Risk assessment for Rohingya refugee camps on the basis of abiotic and biotic factors revealed that Low risk for dengue due to no storage practice in Refugees camp and Population largely immune. There was moderate risk for malaria in refugee's camps with potential for epidemic transmission in absence of interventions and active surveillance in the coming transmission. Rice field with water nearby camps is one of risk factor for transmission of Japanese Encephalitis. But pigs and birds population are not available in refugees camps and catchment area. Thus there was pig cycle or Bird cycle not possible for Japanese Encephalitis. The risk of transmission of malaria is a function of crowding in the refugees camps and might be more in post moon season. At present breeding places are few in these camps so Anti larval measures should carried out by Temphos application which will look after mother foci of primary vectors of malaria and dengue and no more proliferation possible during raining season to mitigate the risk. Entomological surveillance revealed that competent vectors for malaria and dengue are not present now, but vector activity will high during coming transmission months when environmental conditions may become permissive.

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INTRODUCTION

The erection of a massive refugee camp, housing more than one million fleeing Rohingya to the Rohingya people, ranging from basic necessities like food and shelter to WASH and hygiene programmes within the camp, and as the construction of the camp grows exponentially in size and complexity, the moment to Vector Borne Disease control is now. Structures are being built from makeshift materials like bamboo and plastic tarpaulin, on grounds muddied by the monsoon season which is just now started now. These seasonal Muslims and spread across an open area in Ukhiya and Tekaf camps of Cox Bazar district, Southern Bangladesh. The emergency and humanitarian aid organisations step up to offer assistance weather factors, along with the logistical nightmare of waste management for any camp erected to this magnitude and at such a speed, create the prime breeding conditions for disease vectors like mosquitoes to establish themselves and multiply. The highest population density (590,041) was based in Kutuplaong expansion sites.

MATERIALS AND METHODS

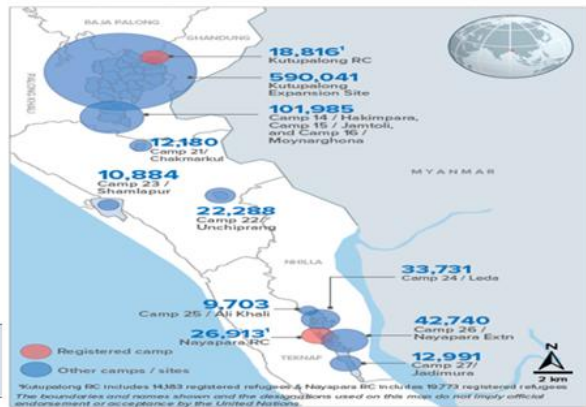
The study was conducted to assess the risk of vector borne diseases in the Rohingya Camps in Cox's Bazar-Bangladesh and in planning and implementation of the response, which include assessments on human, vector, environmental and health system

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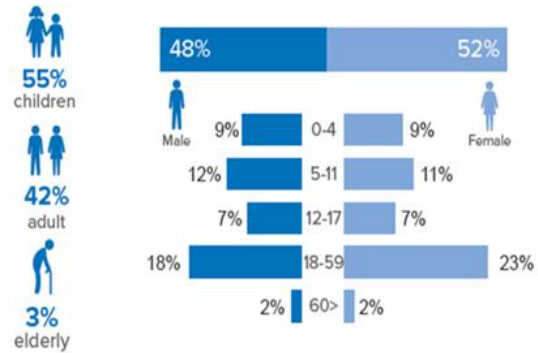
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determinants. It was also reviewed and monitors the actual VBD burden and trends in displaced and host populations to assess the risk of VBD transmission and potential for outbreaks^{1,2}. The guidance provided to strengthening and expansion of the coverage for laboratory confirmation of malaria, and other VBDs such as dengue depending the resources available prior to initiation of anti-malaria treatment and organizes training of health care workers including lab Technicians in the correct use and interfere VBD prevention and control of malaria (dengue) Rapid Diagnostic tests. The malaria case investigations were carried out for confirmed malaria cases and foci investigations including parasitological screening of the neighbourhood and entomological investigations. Depending on the epidemiological, entomological, environmental and health system Assessments, a plan was developed for VBD outbreaks preparedness and response including an outline of key coordination mechanism, advocacy and resource mobilization considerations for VBD prevention and control.

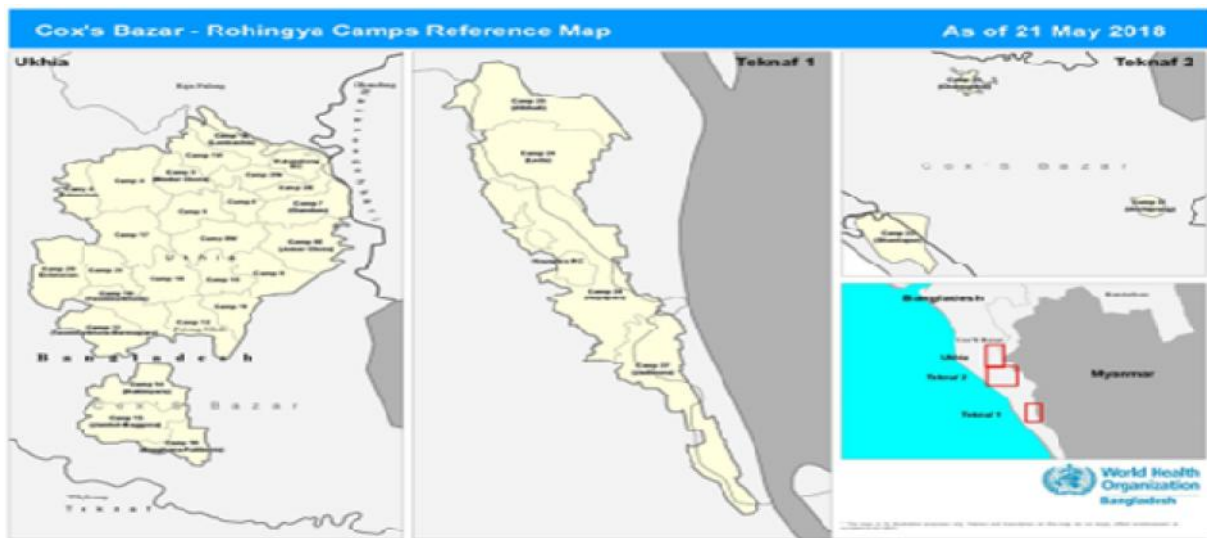
Refugee population density



Demography



Refugee camps in Ukhiya (26) and Teknaf (8)



RESULTS

Malaria burden: Malaria is identified as one of the vector borne diseases which poses risk to public health of the target population.. Cox's Bazar is one of 13 endemic district of country (Fig1). The disease is highly endemic in international boundaries of India Tripura, Assam and Meghalaya) and Myanmar. The forested and hill terrain has potential for intense malaria transmission. Houses in the district are scattered and situated on the hill tops or foot hills. The people of these areas live in thatched houses made of bamboos and wood which facilitated the vector mosquitoes. Invasion of large number Myanmar since 1978 .Now more than 1 million populations were driven away from Rakhine state of Mynamar to Bangladesh from 25th August 2017. Almost of them are staying in Ukhiya (26 camps) and Teknaf of Rohingya refugees from upzila(8 camps) . The Three Hill Track Districts-Bandarban, Khagrachari and Rangamati- report the highest malaria cases and deaths every year; followed by Cox's Bazar district. NMEP reported 25,273 malaria cases and 4 found positive (1Pf and 1Pv) from September to December 2017. Various NGO,s reported 8079 malaria suspected cases and 316 confirmed cases during the period of October ,to December 2017. The comparative epidemiological data Cox's Bazar district revealed 1404 and 1654 malaria cases in 2016 and 2017 respectively. Ukhhuya and Teknaf sub zila contributed 16 % malaria cases of district 2017. The slide positivity rate (1.27 %) 2016 increased to 1.38 in 2017 . 2 deaths due to malaria reported in the district in 2017 Previously there was no death reported since 2014.

But there is fear that there may be an upsurge in the number of malaria cases in Cox's Bazar as a result of the influx of Rohingya refugees due to several factors including forest clearing to build temporary shelters, increase in mosquito genic potential, and water usage with poor drainages.

The epidemiological data revealed that the slide positivity decreased from 7.3% (2014) to 1.38 % (2017) Table 1-3. There is an increase in malaria cases in 2017 in comparison to 2016. The slide positivity rate also increased in 2017. Two deaths were reported Sadar Hospital, Cox's Bazar in 2017. The Pf cases were increased in 2017 (180) from 98 (2016). The blood slide collection increased by more than 50% with microscopy as well as RDT in 2017 in Ukhiya Sub zila where majority of refugees settled in 26 camps. Malaria cases also increased in Teknaf in 2017 in comparison to 2016. The epidemiological data reached after 10 days from field to HQ. Till 5th June, 2018 malaria cases for the month were not available at Civil surgeon office

Epidemiological update of Refugees camps: A total of 12043 test done and 13 malaria positive cases (4 Pf) reported in Ukhiya upzila from Jan to April 2018. In the same period, 2 malaria cases reported in displaced and host population from Teknaf upzila. Although there have been no suspected cases of Dengue, Chikungunya and JE fevers reported through EWARS event based surveillance in 2018. With the onset of the rainy season these Vector borne diseases remain a risk. There is no increase in malaria cases as compared to last 3 weeks of the current month.

Trend analysis of malaria: As per EWARS report, 21 health facilities are reporting confirmed malaria cases from the Rohingya refugee's camps from 1st week up to 21st week. Malaria as total of 19760 cases of suspected malaria have been reported from week 1 to week 22nd 2018, of which 53 cases were confirmed (EWARS). The maximum malaria cases 6 each were reported in 3rd and 4th week, 2018 respectively (Fig 2,3). Geographical distribution of confirmed malaria cases by weeks in Cox's Bazar (Ukhiya & Teknaf). 2018 (Fig 4,5). As per EWARS, 53 confirmed malaria cases up to 22nd week reported in the current year. Sudden there was increase of 9 cases in a 21st week. 5 cases below 5 age alone reported by one health facilities from Refugees camp. But on enquiry he refused any case of malaria. Data quality assurance system should be established and implemented to avoid such situations.

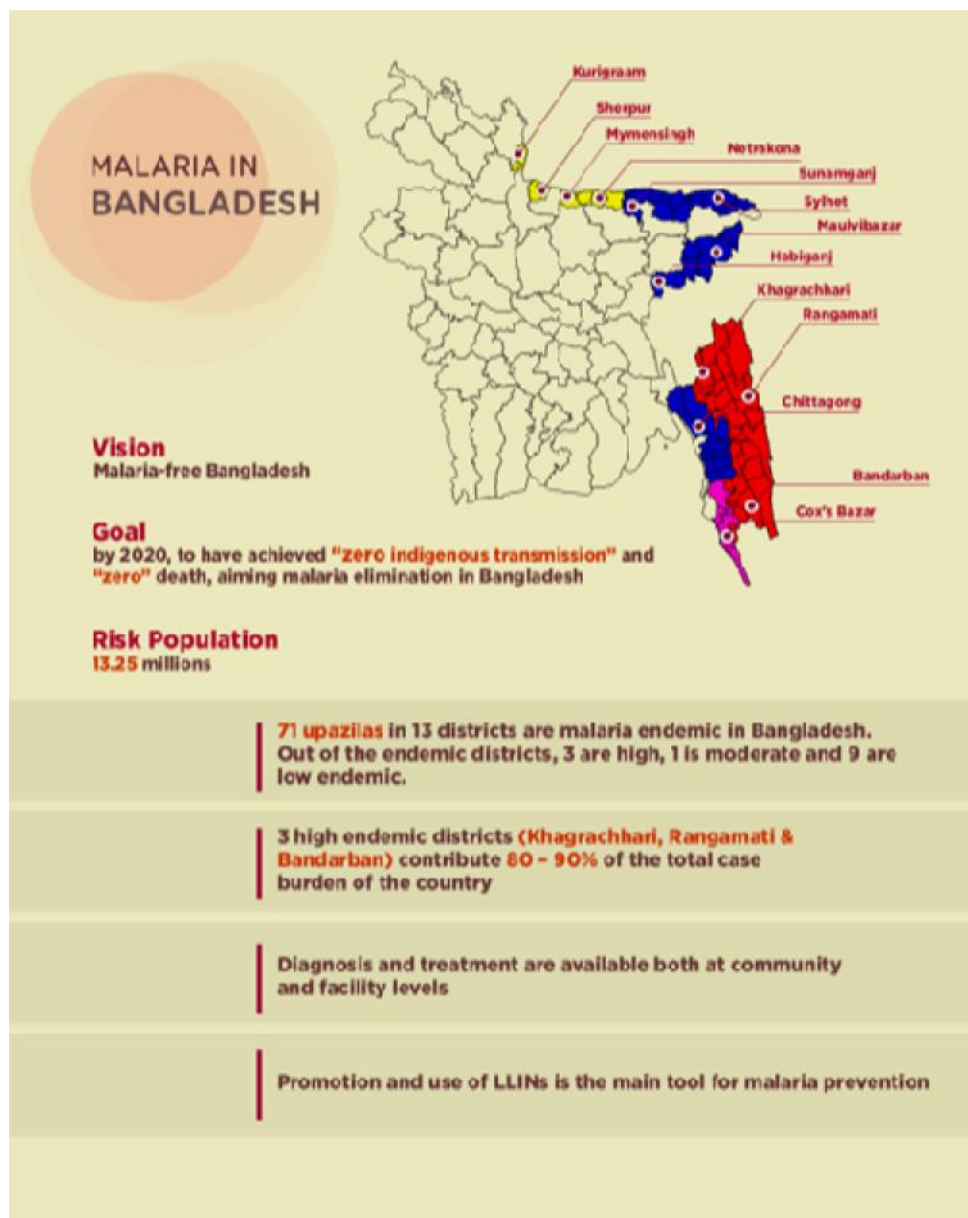


Fig 1 High risk districts of Malaria in Bangladesh

Table 1. Epidemiological analysis of Cox's Bazar district

Year	Microscopy	RDT	Malaria cases	Pf cases	Deaths	SPR
2014	45003	15139	4432	2809	0	7.3
2015	66042	24446	2923	1770	0	3.2
2016	69016	40796	1404	806	0	1.27
2017	82538	36932	1654	1134	2	1.38
2018(up to April)	20131	11643	93	39	0	0.29

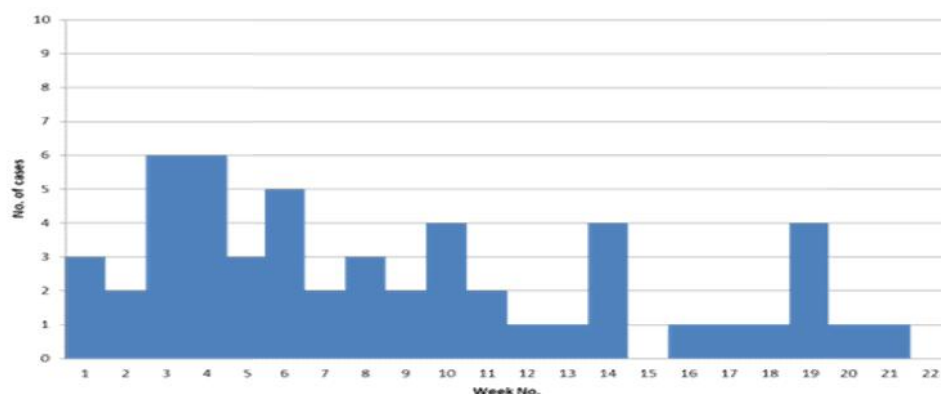
Table 2 Malaria situation of Upzila- Ukhia

Year	Microscopy	RDT	Malaria cases	Pf cases	Deaths	SPR
2014	6519	1208	330	249	0	
2015	11271	2085	269	220	0	
2016	10758	6608	188	98	0	
2017	22766	8976	240	180	0	
2018(up to April)	7454	4589	13	4	0	

Table 3. Malaria situation of Upzila –Teknaf

Year	Microscopy	RDT	Malaria cases	Pf cases	Deaths	SPR
2014	5766	1350	40	31	0	
2015	8700	2252	34	10	0	
2016	8985	3607	25	14	0	
2017	12056	3945	25	18	0	
2018(up to April)	3691	2343		2	0	

Week No.	Total No. of Suspected malaria	Total No. of Confirmed malaria
1	642	3
2	230	2
3	901	6
4	814	6
5	802	3
6	830	5
7	893	2
8	790	3
9	889	2
10	742	4
11	527	2
12	739	1
13	815	1
14	1240	4
15	1107	0
16	1448	1
17	1339	1
18	655	1
19	1241	4
20	1294	1
21	1001	1
22	821	0
Grand Total	19760	53

Fig 3. Weekly Confirmed and Suspected malaria cases in Rohingya Refugee camps in Cox's Bazar 2018**Fig 4. Weekly trend of Confirmed malaria cases in Rohingya Refugee camps in Cox's Bazar.2018**

Capacity building of health care workers in refugees camps: As IFM are already working in the field , the basic orientation for larval ecology and personal protection to 12 IFM were given in field for further dissemination information to community in Refugee camps for prevention and control of VBD,s. Now in the camps they further generate community awareness about mosquito bite and use of LLIN,s. Training of Health staff at Camp no 3 conducted for correct use of RDT in field . The mosquito larvae was demonstrated to staff and informed about prevention from mosquito bite and to promote source reduction methods in the community. Lab technologists in 8 camps were also trained in microscopy. The different international health partners were also informed about prevention and control of VBD, s.(Fig7)

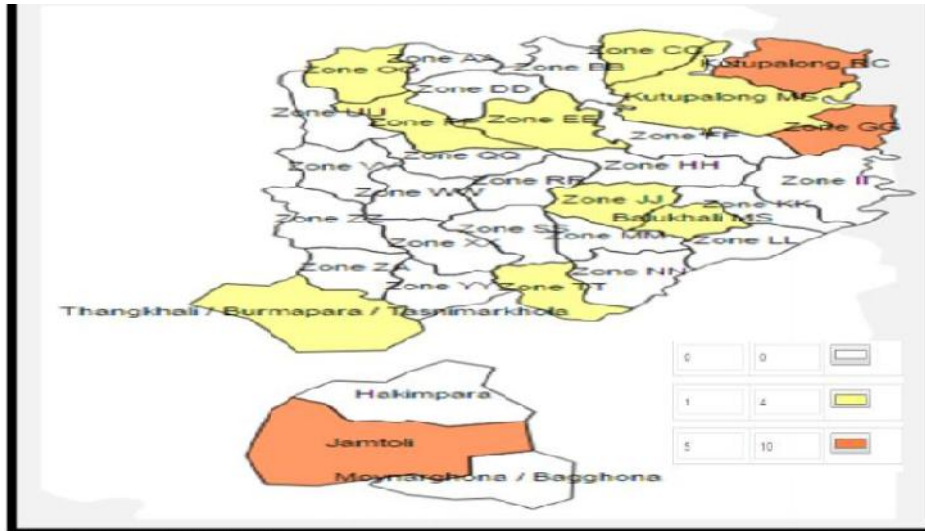


Fig 5. Stratification and geographical distribution of malaria in Ukhaia refugees camps



Fig 6. Stratification and geographical distribution of malaria in Ukhaia Teknaf refugees camps





Name – Salimuullah, Thayngkhali
 Refugees camp no -13 Age-68,
 Date of identification- 7.5.2018,
 visit on 23.5.2018P.vivax
 He came from Myanmar after 10
 yrs in jail to camp. Taken
 chloroquine 10 tab(4,4,2) and
 Primaquine for 14 days . Old
 infection not treated earlier .
 No other positive case of malaria
 in camp in 2018
 No clustering of cases. 25 RDT
 tests done nearby the patient. All
 negative. No breeding near by
 areas

Fig 6. Investigation for malaria positive case for radical treatment (RT) - Balukali camp -2



Fig 7. Capacity building of different health partners

MSF Primary Health care centre-Kutupalong: MSF Malaria lab- The lab reported 6 positive cases through RDT and 4 cases through Blood slide collections. 2 cases were reported in the month of May. 10 cases were reported in the month of Jan, 2018. Dengue RDT kit was available in lab. The training on RDT was imparted to Lab Technologist for dengue detection. All the positively slides through BSC were not available to establish fresh infection or old infection. LT was advised to kept positive slides in future for cross checking. Lab is functioning before Refugees arrival since last 7 yrs. 100 bed indoor facilities is available under this MSF health centre. Its situated in front of refugees camp no 2.

Month	RDT test	BSC	RDT POSITIVE	BS POSITIVE
Jan	588	12	5	2
Feb	471	2	0	0
Mar	344	2	0	0
aApl	349	1	0	1
May	412	2	1	1
Total	2164	19	6	4

As LT is working last 7 yrs in this lab with back ground of MPH shared his experience for malaria

“Malaria prevention rate is low now at Kutupalong and Balukhali refugees camps. The reason behind might be as there is quite movement restriction to refugees to move one place to another’s year malaria rate was high and we found one of fine justification for that. That is many male adult were moving to Banderban, Khagrachari and Rangamati for safely working purpose to earning money where malaria prevalence rate was quite high among community and affected with malaria to come back with high grade fever and we diagnosed as malaria. Within the catchment area malaria is quite low among the host population.

Malaria lab of Upzila heath Centre: Ukhiya upzila health centre is the primary health unit nearby Ukhiya refugees camps Two lab technician (LTs) are working in this unit. The slides preparation was doing properly. Practical demonstration done for lab facilities for malaria at the spot for these technicians. RDT test was carried out correctly by the technicians. The RDT can detect Pf and mixed infections only. Both the LTs are trained in malaria microscopy. The RDT for dengue is available at District level. The parasitic load in the community is low as evidence by the following Lab, passive data during the current year of Ukhiya Upzila health centre

Month/2018	BSC	Positives
Jan	36	0
Feb	53	0
March	63	0
April	93	0
May(22 nd)	60	0

The maximum malaria case in refugees camps cases were reported by BRAC agency followed by MOASM station 2 and 1 (Fig 8).

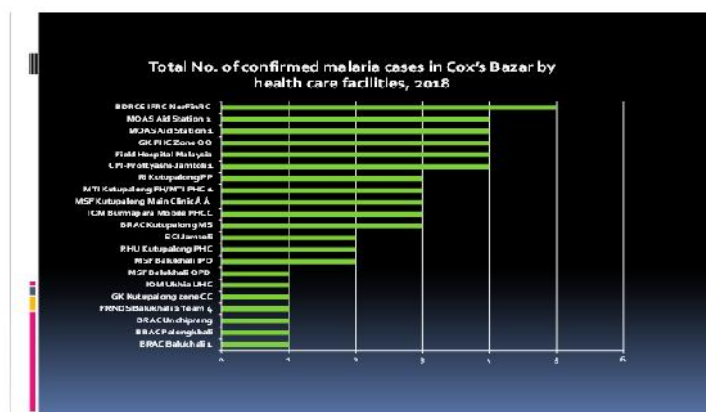


Fig 8 Facilities wise malaria cases in refugees camps

Risk assessment: Threats and risk were analysed for risk assessment for malaria and other VBDs .There was increase in malaria cases after arrival of refugees in the district.Pf cases were also increased .On the basis of abiotic and biotic factor risk assessment was done .

Capacity building of Immunization Field Monitors (IFM) for VBDs

The refugees camps were having IFM and already working in the field . The basic orientation for larval ecology and personal protection to 12 IFM were given in field for further dissemination information to community in Refugees camps for prevention and control of VBD,s. IFM,s for practical demonstration on vector biology and control (Fig 9). Fig 9 Capacity building Immunization Field Workers

Malaria microscopy training -A training programme was conducted for Lab technologists and medical assistants of different partners on RDT and Microscopy at Cox’s Bazar medical college on April 21,2018. A total of 37 (30 Medical technologist and 7 Medical Assistant) attendees from NGO,s participated in the training.

Health partner	Participants
1,BRAC	11
2. Friends and Humanities	6
3 Gonoshasthya Kendra	7
4.International organization for Migration	2
5.Field hospital Malasia	1
6.Migrant offshore Aid station	1
7.Refugees relief and Repatriation commission	1
ce wing Japan	1
9.Research training and management international	4
10.Pattern in Health development	1
11 Terre des homes	2
Total	37

Malaria Lab Balukali Camp 2: The orientation for use of RDT and preparation of thick and thin Blood slides given to field workers and LT,s .The anti-malarial were available in sufficient quantity. The lab monitoring formats were available in the lab.

Risk assessment for Malaria and other VBDs in Rohingya camps

More than 1 million Rohingya in Ukhiya and Teknaf camps . The scale and magnitude of influxes created high vulnerability and receptivity malaria and other VBDs. Kutupalong expansion site along includes 587,293 refugees .



Real time analysis of event

Threats, risks

- Cox's bazar continues to be among malaria endemic district and Plasmodium falciparum and P. vivax are circulating
- Malaria cases increased from 1404(2016) to 1654(2017) in Cox,s Bazar district
- The malaria slide positivity increased from 1.27(2016) to 1.38(2017) in the district
- A total of 53 confirmed malaria cases reported from Rohingya camps by 22nd week,2018
- Pf cases also increased from 806(2016) to 1134(2017)
- No dengue and Japanese encephalitis detected so far. (No pig population) Rice filled with water –No birds
- Both Bangladesh and Rakhine state are endemic for malaria ,dengue and Japanese encephalitis
- Poor disease surveillance (ACD) and control in Bangladesh and Myanmar
- Mosquito genic potential and risk of transmission increased in coming monsoon season with high rainfall



Risk assessment and interventions

- In refugees camp there is an increase in mosquito genic potential, water usage with poor drainage and owing to influx human population
- Change in bionomics and behaviour of vectors after deforestation viz resting and biting habits and response to insecticide
- Deforestation (camp made)
- Increase in breeding and density of vectors after heavy rainfall
- Increase in quantum of man mosquito contact
- More than 3 lakh LLIN distributed in the camps
- Total of 48 Knap- sac sprayers are available with WHO-Cox' Bazar ware house . 27 Knap sac sprayers given to health partners.
- RDT Kits for diagnosis of malaria, dengue and Japanese encephalitis are available and has been distributed to health facilities in the camps.



- Risk assessment– Low risk for dengue- Not prevalent in Cox's Bazar district No storage practice in Refugees camp and Population largely immune . Endemic in adjoining hill districts.
- Moderate risk for malaria - Endemic disease with potential for epidemic transmission in coming monsoon season .

The age wise dose chart for anti-malarial was also available. Lab. technician was well aware about not to use RDT in lab. The following data clearly indicates parasitic load in the community is not there since Jan-May 2018

Month/2018BSCRDTPositives

Jan2181970

Feb2551270

Mar. 1981260

Apl3193230

May(22nd)1821601 Pv (Investigated for RT)

The on spot orientation imparted to field workers on correct use of RDT and slide collection for Lab technologists during field visit . It was also suggested that they will prepare blood slide for RDT confirm cases before administering anti-malarial for fresh infection or old infection. Lab technologist asked to send all positive slides and 10% slides for cross checking at BRAC HQ at Cox's Bazar. A technician is given responsibility for cross checking.



Fig. 9. Capacity building of Immunization Field Workers (IFM)

IOM PHC –Kutuplaong- Malaria cases were analyzed weekly through EWARS report . Suddenly there were 9 cases reported by IOM PHC –Kutuplaong to EWARS . Visited the PHC for investigation for these 5 malaria cases under age 5. The PHC reported these cases in 21 st week of EWARS report. There was no any such malaria cases and informed that it was typing error in information to EWARS. The data quality assurance system should adopt by the international organization for malaria and .The Malaria Response-Emergency Preparedness & Response division informed that;

-) Clinician received training on malaria
-) Lab technicians received training on malaria microscopy and RDT
-) Received malaria treatment module of WHO
-) Conducting RDT ,no positive cases up to now (4th June,2018)
-) Will start microscopy once electricity once
-) Conduct health education on malaria (Fig 10)



Fig. 10.IEC activities for malaria at IOM PHC- Kutuplang

Environmental factors for risk assessment: The climatic conditions have a profound effect on the longevity of vector mosquitoes and also on development of parasite. The abiotic factors viz temperature, humidity and rainfall are highly conducive foe disease vectors in the refugees camps. The temperature is ranged between 27-29 deg. with 70% humidity In the camp areas usually precipitate factors related to increase in malaria cases. The rainfall has started now and heavy rains in next month will boost the mosquitogenic potential in these camps. The rainfall will increased the rainy days from Mid June to Mid August and breeding places for mosquito vectors . The Larval Source Management with anti larval measuers should start with temephos at weekly intervals in these camps or by any other WHO approved larvicide.

Combining these environmental conditions with the malnutrition and displacement the Rohingya are suffering, known causal factors in the susceptibility to VBDs by weakening the immune system and increasing physical exposure to the vectors carrying these diseases, the likelihood of potentially multiple outbreaks of disease grows with each passing day.

The Rohingya people have fled to a part of the world with rising case numbers of both Dengue and Chikungunya, spread by the native *Aedes aegypti* mosquito BRAC through Community Health Workers (CHWs) working to mobilize the Rohingya population in camps in Ukhya and Teknaf to protect themselves by keeping their environment clean thereby eliminating the potential breeding places for mosquitoes. But still insanitary conditions prevailed in these camps.

Ecosystem Approach: The camps are situated in different type of ecological conditions. Camps are based in plain areas, foot hill areas and foot hill forest areas. These ecological conditions are highly conducive for malaria vectors and their resting and biting behaviour. Mostly vectors are zoophilic in nature but in absence of cattle they may shifted to human being with high anthropophagic behaviour. There will more risk for malaria. *Aedes aegypti*, vector of dengue is container breeder and domestic/per-domestic, so no such ecological impact (Fig 11).



Fig. 11. Refugees Camps adjoining Foot hill forest, No -3 Camps on hills with forest and Camps in plain areas

Entomological surveillance: The entomological surveillance carried out in old and new Rohingya refugees camps. The place is situated in south-eastern part of Cox's Bazar district.

The ecosystem of the area consists of forest foot hill, hill and plain. Kutupalong extension is biggest camp alone having 587,293 refugees population and 50 % of total population refugees camps. There are different houses found in areas made of polyethylene, bamboo, tin, thatched and mud. Both the areas of Ukhiya and Teknaf were surveyed for mosquito fauna

Larval survey

Total breeding places checked -380

Positives for Anophelids -25 (6.57%)

Positive for Culex-170 (44%)

No *Aedes* breeding was detected during larval survey.

Adult survey-

The adult survey was conducted in different camps viz, 2, 2a 3, 12,20, Kutuplang RC, Naya para 26, Camp 27 Jadimura, Camp 24 Leda Balikula camp 2 and Thayngkhali camps following species encountered during the collection. A total of 158 mosquitoes captured

1. *Anopheles subpictus* 20 (12%)

2. *Anopheles vagus* 45 (28.48)

3. *Culex quinquefasciatus* 93 (58.86)

The maximum anophelins mosquitoes collected from Kutuplang area. There is no rain in last 7-8 days. The breeding places are dry now. The normal monsoon will arrive from mid-June to mid-August (Fig 12).

Dengue- The risk of dengue / chikungunya transmission in refugee population in affected areas may be increased during monsoon and post monsoon. The fresh water is stored in protected water containers and rainfall collects in other artificial containers allowing mosquito vectors to breed. Refugee camps face additional risk due to large population can expose these displaced persons to dengue without immunity. Both the bordering areas of Bangladesh and Myanmar are endemic to dengue and Chikungunya. The peak transmission of dengue in Bangladesh from June to October due to favourable abiotic factors with breeding of disease vectors. Chittagong district is high risk area for Dengue and Chikungunya, some Rohingya settlements are also part. The arrival of the rains marks the start of what is going to be an incredibly challenging period for the refugees. The receptivity in old camps is very high in settlements of Refugees. The population movement especially from endemic areas, topography and physical conditions increase the vulnerability. Thus there is more increase in man mosquito contact. But storage practice is not high as hand pumps are available for regular water supply. Cox's Bazar never reported any case of dengue in past.

No Aedes breeding reported during entomological collections. The water in refugees camps is saline in nature and don't promote Aedes aegypti breeding in containers.



Fig. 12. Entomological surveillance in refugees camps and adjoining areas

Containers in camps – wells ,

Pots

Water tank adjoining Masjid, camp-3



Kutupalong Old camp near camp no 2, containers on roof



Fig. 13. Breeding potential for Aedes aegypti

Vector control interventions in Refugees camps: The ecosystem of the refugee's camps comprises of 3 types viz. Hill and forest areas, Foot hill areas and plain areas. Deploying preventative measures against the rise and spread of these vectors and the diseases they carry needs to happen as soon as possible. The transmission of diseases within such a densely populated area can grow out of control in a very short amount of time, especially when combined with such a lack of facilities, services, medical responses, and under the conditions of malnutrition and weakened immune systems indicative of severe displacement. Through the application of a targeted Integrated Vector Management toolkit, utilising techniques such as Larviciding to minimise the vector breeding cycle minimise the transmission cycle along with extensive information and education efforts within the community, existing cases of these diseases can be managed and new cases can be prevented.

These preventative efforts will go a long way to promoting much needed relief from yet another potential hardship these already stained refugee community's face; a relief and impact that will stay with them as a community wherever they may go, minimising the inevitable challenges these refugees will undoubtedly face both now and into the future. The Govt of Bangladesh procured 3.2 million LLINs and distributed in different camps by BRAC. A total 3 persons are sleeping in a net , so it will cover more than 9 million population in refugees camps The community at risk of malaria are using the LLINs in Ukhiya camps. But there was problem in Nayapara camp in Teknaf. New LLIN in packets were available and not used by the community. There may be 2 reasons. The weather is hot and humid due to nearby river. Another reason they want to sell in market . At the spot, community meeting was held for use and benefits of LN. The matter was also discussed with communication team of WHO Carolyn Davis, WHO Risk Communication Technical Officer Cox's Bazar, Bangladesh and they are preparing Community message in Rohingya language on mosquito bite and use of LLIN.

The effective behaviour change communication strategies are required to ensure that all people at risk of malaria sleep under a LLIN every night, and that the net is properly maintained (Fig 14).

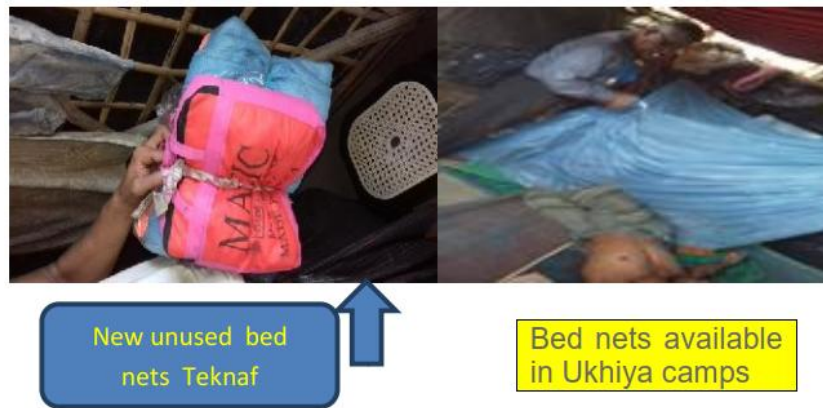


Fig 14. Availability of LLINs in refugees camps



Fig 15. Community awareness for vector control in refugees camps

Role of partners: Many international organizations and NGOs are working in the refugees camps. The partners are also asking the approved larvicides during regular weekly meetings. Information was given to all health partners during meeting about WHO approved larvicides. Mostly orientation to all the health partners imparted in field also for prevention and control of VBD,s .The other information on suspension ,discharge rate and other aspects of sprayer was also provided during regular meeting of partners. Two fogging machines with insecticide are available with Cox's Bazar Municipality for any emergency . The matter was also discussed with Country programme Manager, Entomologist for additional support for any outbreak of VBD,s in refugees camps . The discussion were held with Civil surgeon about preparedness of any outbreak of malaria and other VBD,s in the Rohingya refugees camps. The discussion also held on availability of RDTs and anti-malarial and correct reporting of malaria on weekly basis by partners. The guidelines on National drug policy are available and the same be distributed to all partners (Fig 15)

Suggestions: There is no District VBD officer in Cox's Bazar district and Civil Surgeon looking after all health activities. A trained officer of VBD background should be available for monitoring, coordination and implementation of NVBDCP activities for coming transmission to avoid any outbreak of malaria and other VBDs. He will also ensure the availability of anti-malarial to intended users and to the beneficiaries at field level. So many health facilities providers are functioning in the refugee's camps. As to date, 170 health facilities are currently registered as active Warning Alert and Response system reporting sites. The district VBD officer may coordinates with these health facilities providers and did capacity building for correct malaria reporting. Now the Cox's Bazar district is in malaria elimination mode.

Conclusion

-) Risk assessment for Rhingya refugee camps on the basis of abiotic and biotic factors revealed Low risk for dengue. As No storage practice in Refugees camp and Population largely immune to VBDs
-) Moderate risk for malaria in refugees camps with potential for epidemic transmission in absence of interventions and active surveillance in the coming transmission.
-) Rice field with water nearby camps is one of risk factor for transmission of Japanese Encephalitis . But pigs and birds population are not available in refugees camps and catchment area . Thus pig cycle or Bird cycle not possible for JE

REFERENCES

1. Braks^b M.A.H., De Simone, L., ^cD. Benz^a D. J. Rogers^a 2014. Risk assessment of vector-borne diseases for public health governance. Public Health 128(12) 1049-58
2. Simon more *et al.* 2017. Vector borne diseases journal .efsa.2017.4793
