RESEARCH ARTICLE

SITUATION OF P. VIVAX MALARIA IN AHMEDABAD CITY – A STUDY IN PURVIEW OF NATIONAL GUIDELINES

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ABSTRACT

Background: Malaria is still the most important cause of morbidity-mortality in India. NVBDCP in urban areas is implemented through UHCs. In Gujarat, 89764 malaria cases were reported in 2011 with 127 deaths with 17.9% of them being the P. vivax (Pv) cases. Ahmedabad is at the receiving end of malaria menace due to its rapid growth. Compared to 2011, significant rise in number of Pv cases has been observed in Ahmedabad in 2012.

Aims & Objective: The study was carried out to assess the Pv malaria detection modalities, relevant indices, existing radical treatment strategies and adherence to national guidelines in the urban areas of Ahmedabad.

Material and Methods: Data of all 9 UHCs of south zone, catering total population of approximately 1 million and showing significant rise in Pv cases were verified clubbed with field analysis, for the corresponding quarters of March, April and May of two consecutive years–2011-2012. Concerned healthcare staff was interviewed. Guidelines and definitions of national anti-malarial guidelines and operational manual were followed. Process indicators for surveillance, case finding and disease burden were considered.

Results: Out of total blood smears examined, Pv cases raised from 97 (2011) to 382 (2012). Statistically significant rise of Pv% was 0.35% and 2.79% in active and passive slide collection respectively. 71% slides were actively collected in both years. QBER rose from 1.50% to 2.41%. QPI rose from 0.12 to 0.39. Successful RT completion decreased from 59.8% to 29.1%. Knowledge regarding national-anti-malarial-guidelines was satisfactory in more than 70% of healthcare functionaries.

Conclusion: Number of cases significantly increased in two years, Pv-positivity rise being 1.04%. Active slide collection is static. Rise in Pv-positivity should trigger improvement in the same. Average QBER and QPI rose in two years. QBER never reached prescribed levels. Successful RT-completion is the key towards drug-resistance and relapse prevention. Adherence to national-anti-malarial-guideline is imperative.

Key-Words: P. Vivax Malaria; Radical Treatment; Blood Examination Rate; Follow-Up Smear; Parasite Index

Introduction

Most malaria cases and deaths occur in sub-Saharan Africa. In Asia, India is a badly affected country[1], malaria being one of the major public health problems. There are about 216 million cases of malaria (with an uncertainty range of 149 million to 274 million) and an estimated 655 000 deaths in 2010 (with an uncertainty range of 537 000 to 907 000).[1] Malaria is still the most important cause of morbidity and mortality in India with approximately 2 to 3 million new cases arising every year.[2] In the country, national vector borne disease control program (NVBDCP) auspices the combating measures for malaria that are vertically implemented nation-wide.

Around 1.5 million laboratory confirmed cases of malaria are annually reported in India. In Gujarat, 89764 malaria cases were reported in 2011 with 127 deaths with 17.9% of them being the vivax cases. In 2012, the total malaria cases in the state are 13420 by the month of May with Pf cases proportion reduced to 7.1% [3]. In Ahmedabad city the number of cases was 7,158 with P. Falciparum cases 1265 and percentage being 17.7%.[4]

Transmission season for malaria in the city of Ahmedabad is believed to be from May to August. Compared to 2011, a significant rise in the number of cases of plasmodium vivax (Pv) has been observed in the city of Ahmedabad in 2012.[5,6] Efforts have been made to understand possible parasitological and vector-related changes or mutations. Consecutively, role of primaquine in preventing relapses of Pv malaria and the necessary radical treatment is unquestionable according to national anti-malarials guidelines-2010 and other world-wide research.[7,8]

Ahmedabad is the financial capital of Gujarat state worth 6 million population and one of the biggest as well as fastest developing cities in India. Rapid urbanization, immense industrialization and constantly humid temperature are some of the factors responsible for mosquito breeding and resultant urban epidemic of malaria. Government healthcare delivery and implementation of NVBDCP in the urban areas are through 56 Urban Health Centers spread in 6 zones.

The study was carried out to assess the case detection modalities for Pv malaria, existing healthcare delivery for curbing it, existing radical treatment strategies and adherence to national guidelines by healthcare machinery and to assess the basic malariometric indices in the catchment areas.

Materials and Methods

The city of Ahmedabad caters the population of about 6 million and is divided into 6 geographical zones. Healthcare delivery in this population is through Ahmedabad Municipal Corporation (AMC)-run urban health centers (UHCs) as well as private practitioners.

Data of recent years are suggestive of higher incidence of malaria cases especially Pv in the south zone which includes 9 wards, total population worth 1 million approximately. Almost 80% of this population comprises the inhabitants of urban slums. Entire south zone of AMC consisting of 9 wards and subsequently 9 UHCs was studied for aforementioned study objectives. The UHCs were visited and data were obtained and verified by the team of public health and internal medicine personnel of AMC MET Medical College and LG Hospital, Ahmedabad.

After informed consent, interviews of the healthcare staff including medical officer, pharmacist, multi-purpose worker and laboratory technician were taken regarding national anti-malarial guidelines and their level of understanding. Other methods implied were data verification from all levels of generation and Pv case verification for their RT completion status. Successful RT completion was defined as when the management was as per the national anti-malarial

guidelines 2010 as well as follow-up smears within the course of 14 days and at the end of RT declared the person Pv-non-reactive.[7]

Data for quarter previous to the date of visit (March, April and May) for two corresponding years – 2011 and 2012 were obtained and assessed.

Process indicators for surveillance, case finding and disease burden like BER, PI and TPR along with active and passive case detection etc. were considered.[9]

Data entry was done in MS Excel and analysis was carried out in MedCalc v10.

Results

All 9 UHCs of south zone were assessed catering total population of 9,23,350 for the entire zone (Average population being 1,02,594). Out of total blood smears examined, total P. vivax cases were 382 (1.82%) compared to 97 P. vivax cases (0.78%) of previous year. There was no P. falciparum case reported in the reviewed period for 2011, while there were 6 cases of P. falciparum in 2012. (Table 1) Pv% was the proportion of confirmed Pv cases out of total blood smears examined.

A rise in Pv% was observed in quarters of both years as well as in both types of active and passive surveillance of fever cases. Rise of 0.35% in actively found Pv cases and rise of 2.79% in passively found Pv cases were observed in corresponding quarters of two years. Comparison of Pv% proportions for both active and passive slide collection was done. The Pv% rise was found to be statistically significant in the proportion rise of Pv% among active slide collection. (χ^2 4.761 at df 1, p<0.05 for Pv% proportion rise in active slides and χ^2 =0.642 at df 1, p=0.42 in passive slides collection).

Total 21,025 blood slides were examined for malaria detection in reviewed quarter of 2012. Amongst them, 71% were actively collected. (Table 1) Blood examination rate for the reviewed quarter (QBER) was 1.50% in 2011 which rose to 2.41% in 2012.

Table-1: Blood Slide Collection in South Zone and Malarial Positivity

Year	Type of Cases	BSE	Pv (No.)	Pf (No.)	Mixed (No.)	Pv Positive (%)	Pf Positive (%)
2011	Active	8872	12	0	0	0.14	0
	Passive	3625	85	0	0	2.34	0
	Total	**12497**	**97**	**0**	**0**	**0.78**	**0**
2012	Active	15007	73	1	0	0.49	0.01
	Passive	6018	309	5	0	5.13	0.08
	Total	**21025**	**382**	**6**	**0**	**1.82**	**0.03**

Table-2: Status of RT in Confirmed Malaria Cases (Cases from Quarters of '11 & '12)

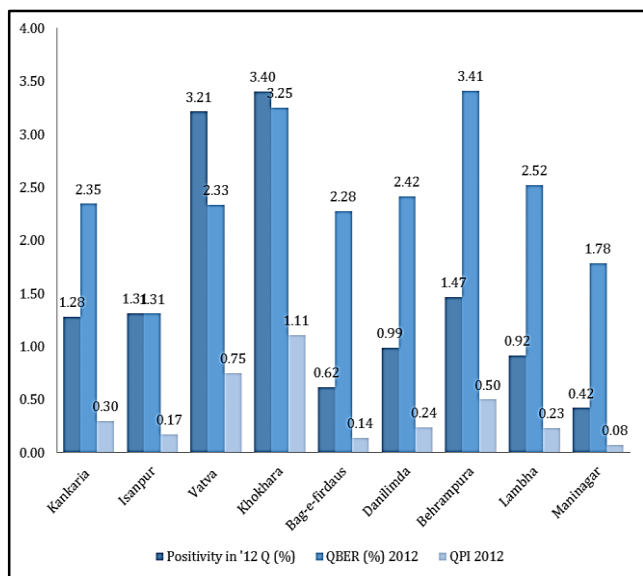|	2011 (1Q)	% (n=97)	2012 (1Q)	% (n=382)
RT Complete	58	59.8	111	29.06
RT incomplete	39	40.2	271	70.94
Death	0	0.0	0	0.00
Total Cases	**97**	**100.0**	**382**	**100.00**

Figure-1: UHC-wise Distribution of Pv Positivity, QBER and QPI in Reviewed quarter of 2012

There were 2 UHCs with QBER more than 3% in 2012. UHC-wise distribution of QBER in 2012 quarter is as per figure I. Parasite index for the reviewed quarter (QPI) was 0.12 in 2011 which rose to 0.39 in 2012. QPI was more than 1 in one UHC. UHC-wise distribution of QPI in 2012 quarter is as per figure 1.

RT was observed to be correctly and successfully given in 59.8% of the cases in 2011, while in 2012, successful RT was given in 29.06% of the cases. The difference was statistically significant (χ^2 30.67 at df 1, p<0.0001). (Table 2)

Knowledge regarding national anti-malarial guidelines was assessed based on a pre-tested checklist in all the medical officers, laboratory technicians, pharmacists and 20% of the MPWs of the visited UHCs. It was found satisfactory in 75% of the medical officers, in 62.5% of the laboratory technicians and pharmacists and in 80% of the MPWs. 12.5% of the pharmacists were found to have poor knowledge about the same.

Discussion

All 9 UHCs of south zone were assessed catering total population of 9,23,350 for the entire zone (Average population being 1,02,594). In the corresponding quarters of 2011 and 2012, the rise in the detection of number of Pv cases was significant. 285 more Pv cases were recorded in 3 reviewed months of 2012 compared to 2011. The rise in positivity was 1.04%. Pf positivity was 0.03% in 2012 while it was nil in 2011. There was no death reported in reviewed quarters though Kochar DK et al in their study in Bikaner reported that Pv mono-infection was almost equally serious to cause significant mortality in comparison to P. falciparum.[10]

Active slides are the blood slides collected by the field workers e.g. multi-purpose workers, link workers etc. and passive are the fever cases self-reported at healthcare facilities whose slides are taken there by laboratory technicians. Though, 8528 more slides were collected in 2012 compared to 2011, proportion of active slide has been 70% of total. The proportionate rise in PV positivity is statistically significant in actively collected blood slides which clearly points towards existence of underlying disease in the community. The rise of 2.79% in passive cases of Pv compared to 0.35% rise in active Pv cases over 2 years suggests that more self-reported cases to the UHCs are turning reactive for Pv which indirectly confirms the underlying presence of disease in the community at silent level. Therefore, improved and strengthened active slide collection can still yield more Pv cases.

ABER according to national malaria guidelines should be more than 10% annually and should be more than 12% during transmission seasons and in high-risk malaria areas. This means monthly blood examination rate (MBER) should be minimum 0.5-1% and subsequently quarterly blood examination rate (QBER) should be minimum 3% of total population.[9] For none of the quarters reviewed either in 2011 or in 2012, the average QBER exceeded 3%. A rise of 0.91% in

QBER was observed over a year which is still under-achieved. Out of total 9 UHCs of south zone, there were only 2 UHCs with QBER more than 3% in 2012 and none in 2011.

Sharma PK et al in their outbreak investigation in Naxalbari and Mukhopadhyay AK in their study in Kolkata found the ABER to be below 4% annually compared to 10%. ABER is the indicator of operational efficiency of the programme. Our study reported comparatively better QBER but in purview of constantly rising numbers of SPR, concerted efforts are required in terms of ABER improvement.[11,12]

National malaria guidelines for monitoring and evaluation and subsequent preventive measures primarily revolve around annual parasitic load (API) in the community per which is measured per 1000 population. API value more than 2 calls for stringent and immediate measures.[9] Quarterly parasitic indices can be calculated accordingly. QPI was 0.11 in 2011 which rose to 0.40 in 2012, showing the rise of 0.29 in one year. QPI was reported to be more than 1 in only one UHC. QPI values do not exceed 2 in any quarter, total population covered by each ward is humongous which may dilute the ultimate index in the end. Plain numbers of slide positivity in total population are staggering (rise from 97 to 369 in corresponding quarters) and should be considered alarming.

RT in Pv cases was considered to be complete only when diagnosis was confirmed within one day of slide collection and full course of Chq and Pq were given and monitored along with follow-up smears. [7] successfully RT completed cases were found to be around 60% in quarter of 2011 while in 2012, the proportion reduced to half i.e. about 30% cases and this difference was statistically highly significant.

Adherence to National anti-malarial guideline 2010 is the need of hour in order to prevent relapses, to generate compliance and to prevent drug resistance.[7] WHO also suggests the rational and correct use of medicine to prevent development of resistance.[13] Srivastava HC et al in their study in Kheda district of Gujarat reported to have 20% lower relapse rates with primaquine

treatment for 5 days (15 mg/day) along with routine chloroquine dose.[14] However, national anti-malarial guidelines now defines the radical treatment of Pv as primaquine for 14 days along with chloroquine.[7] Understanding of the same was assessed in the healthcare machinery of each UHC. Knowledge regarding the same was found satisfactory in 3/4th of the medical officers, in more than 60% of the laboratory technicians and pharmacists and in 80% of the MPWs but the same needs to be translated into practice.

Study Limitation

Private practitioners and their malaria-management activities were not taken into account in the current study. Pf cases were not considered because the study objectives were oriented towards Pv cases only.

Conclusion

Almost 15% urban Ahmedabad population was taken into account. Number of cases significantly increased in 2012 compared to 2011. The rise in Pv positivity over corresponding quarters of two consecutive years was 1.04%. Proportions of active slide collection are static. Rise in yield of Pv cases at the healthcare settings suggest the presence of disease in the community at silent level. Improved and strengthened active slide collection is imperative. QBER percentages are inadequate as per the national guidelines. QBER especially during malaria transmission seasons must be minimum 3% of total population. There is a rise in parasitic index for the reviewed quarters but that should not generate complacency. Plain numbers of newly detected Pv cases are on rise and concerted efforts should be channelized to curb the same.

Successful RT completion is the key towards prevention of drug resistance as well as disease relapse by parasitic clearance in the individual which can only be confirmed by timely follow-up smears. Adherence to latest national anti-malarial guideline is imperative and it must be followed not only by the medical officers but also by the field health workers.

ABBREVIATIONS

NVBDCP: National Vector Borne Disease Control Program; Pf: Plasmodium Falciparum; Pv: Plasmodium Vivax; Chq: Chloroquine; Pq: Primaquine; AMC: Ahmedabad Municipal Corporation; UHC: Urban Health Center; RT: Radical Treatment of Pv Malaria; BER: Blood Examination Rate; PI: Parasite Index; TPR: Total Positivity Rate; QBER: Quarterly Blood Examination Rate; QPI: Quarterly Parasite Index; MPWs: Multi-Purpose Health Workers; MBER: Monthly Blood Examination Rate; ABER: Annual Blood Examination Rate

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