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Full Length Research Paper

Analysis of malaria prevalence in Arsi Negelle health center, Southern Ethiopia

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Malaria is an issue in Ethiopia of which there is still no "Magic bullet", no quick or easy solution, apart from extensive progress in its control over the past years. Analysis of documents on malaria data from health care system is essentially important to assess achievement or failure of malaria control programmes. The aim of this study was to investigate the five year trend of malaria prevalence in the southern Ethiopia. A retrospective record review was conducted in southern Ethiopia. All malaria cases reported from January, 2009 to December, 2013 were carefully reviewed and analyzed. Information about laboratory results and Socio demographic futures were collected from patient's registration book. A total of 22,025 malaria suspected patients gave blood films for malaria diagnosis in the past five years at Arsi Negelle health center. 2521 (11.45%) microscopically confirmed malaria cases were reported with a fluctuating trend. Among the identified plasmodium species, *Plasmodium vivax* accounted 74%, *Plasmodium flciparum* was 19.8% and mixed infection was 6.2%. Children in the age range 0 to 5 years were the most affected by the disease (22.8%), followed by 16 to 20 age groups (17.8%), which necessitate suitable consideration in the effort of malaria control. Despite the apparent fluctuation of malaria trends in the area, the highest peak of malaria cases was reported during spring seasons. In conclusion, children under five years, who were more affected by the disease, imply presumed exposure, therefore attention should be given to children under five years of age. The rate of malaria was moderate even though it is not as satisfactory as to malaria control strategy of the country. This might be due to the likely *P. vivax* drug resistance to chloroquine. In support of this, health planners need further strong malaria control and assessment of drug resistance.

Key words: Southern Ethiopia, health service, malaria trend, malaria prevalence.

INTRODUCTION

Malaria has been a scourge of mankind through the centuries; it has left its mark on world history, affecting the outcome of wars, movements of population, growth and development of nations. It is a major public health

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problem in Ethiopia where an estimated 68% of the population lives in malaria infested areas (Federal Ministry of Health, 2006). The disease remains important in the world. Still there is no “Magic bullet”, no quick or easy solution, especially in Africa, including Ethiopia. The number of cases reported annually fell by at least a quarter, and in some instances, by more than half, between 2000 and 2010 (World Health Organization, 2011).

Regardless of extensive progress in malaria control over the past decade, it is the most important public health problem in Ethiopia where an estimated 68% of the population lives in malaria infested areas and three quarters of the total land mass is regarded as malaria infested. The two predominant malaria parasites are *Plasmodium falciparum* and *Plasmodium vivax* (Ministry of Health, 2004). *P. vivax* is the most widely distributed in the temperate, sub tropics and some parts of the tropics. Unlike the other species, it is more common and well adapted to the temperate region than in tropics (Ministry of Health, 2002).

Strategies for malaria control in Ethiopia take account of early diagnosis and prompt treatment, selective vector control, epidemic management, and control, environmental management and personal protection through the use of insecticide-treated bed nets. In spite of recent efforts to control the disease, malaria continues as the leading cause of mortality and morbidity in the country (Federal Ministry of Health, 2006). There is enormous impute for malaria control by estimating malaria incidence and time trends, especially nowadays where malaria control is intensified in Ethiopia (Deressa et al., 2006). Studying the rate is necessary to put into action control measures. Hence, the intention of this study was to assess a five-year malaria time trend.

METHODOLOGY

Study area

The study was conducted in Arsi Negele health center, which is located at north East of West Arsi zone, Oromia region. Arsi Negele is found at southern part, 232 km away from the capital Addis Ababa. The town is located at an altitude of 2,000 to 2,400 m, with average temperature of 14 to 23°C. The health center serves about 72,114 population of the city and surrounding rural areas, of which 35,745 are males and 36,369 are females. Malaria is a prevalent seasonal disease in the area, which is reported as one of the top ten diseases in the health center. October to December is the peak malaria transmission season in the area. Both *P. vivax* and *P. falciparum* exist in the area, with *P. falciparum* prevailing all year.

Study design

A retrospective study was conducted to determine the five year trend prevalence of malaria by reviewing of blood film malaria documents at Arsi Negele health center, from January 1, 2009 to December 31, 2013.

Data collection

Information about laboratory results and Socio demographic futures were collected from patient’s registration book. Nationwide, in every corner of Ethiopia, peripheral smear examination is used as the gold standard in confirming the presence of the malaria parasite as World Health Organization (WHO) protocol. For this study, we have collected a five years (2009 to 2013), well recorded malaria data at Arsi Negele health center.

Data analysis

Data was entered and analyzed by statistical packages for social sciences (SPSS) version 16.0 software package. The frequency distribution of both dependent and independent variables were worked out by using crosstab. Finally, the data was described and presented accordingly using figures.

Ethical consideration

Data was collected after official letters and ethical clearance obtained from The Department of Medical Laboratory Sciences, College of Medicine and Health Science, Hawassa University. Subsequently, written permission was sought from the Head of health centre before the data collection.

RESULTS

Annual trends of malaria prevalence in Arsi Negelle health center

In the past five years (2009 to 2013), a total of 22,025 malaria suspected patients gave blood films for malaria diagnosis in Arsi Negelle health center. From those requested blood films, 2521(11.45%) microscopically confirmed malaria cases were reported. The minimum microscopically confirmed malaria cases of 269, being reported in 2013, and the maximum of 791 were reported in 2009 (Figure 1). Regarding the identified plasmodium species, *P. Vivax* accounted for 1,868 (74%), *P. falciparum was* 499 (19.8%) and mixed infection were reported as 154 (6.2%) of malaria prevalence throughout the five year period in the study area (Figure 2). *P. vivax* was decreased from 488 in 2009 to 282 in 2010 and consequently there was increasing trend of *P. vivax* (282) in 2010 to 500 in 2011, whereas *P. falciparum* decreased throughout the past five years. Mixed infection in the study area decreased from 2009 to 2013 (Figure 1).

Prevalence of malaria parasite in relation to sex and age in Arsi Negelle health center

As of record review, among 2,521 (11.45%) positive,

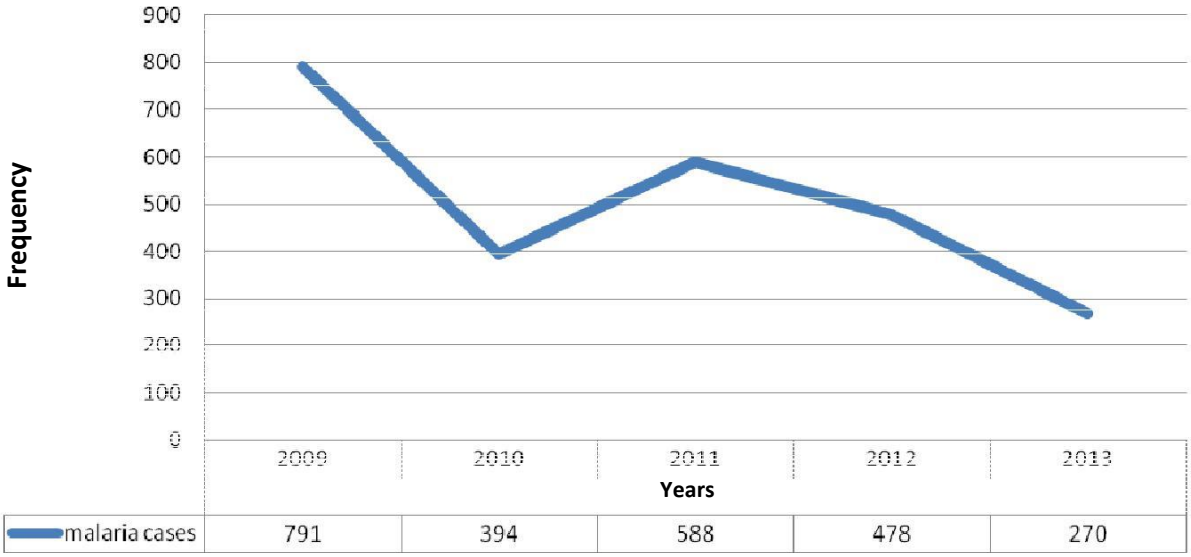

Figure 1. Annual trends of total malaria cases in Arsi Negelle health center from 2009 to 2013.

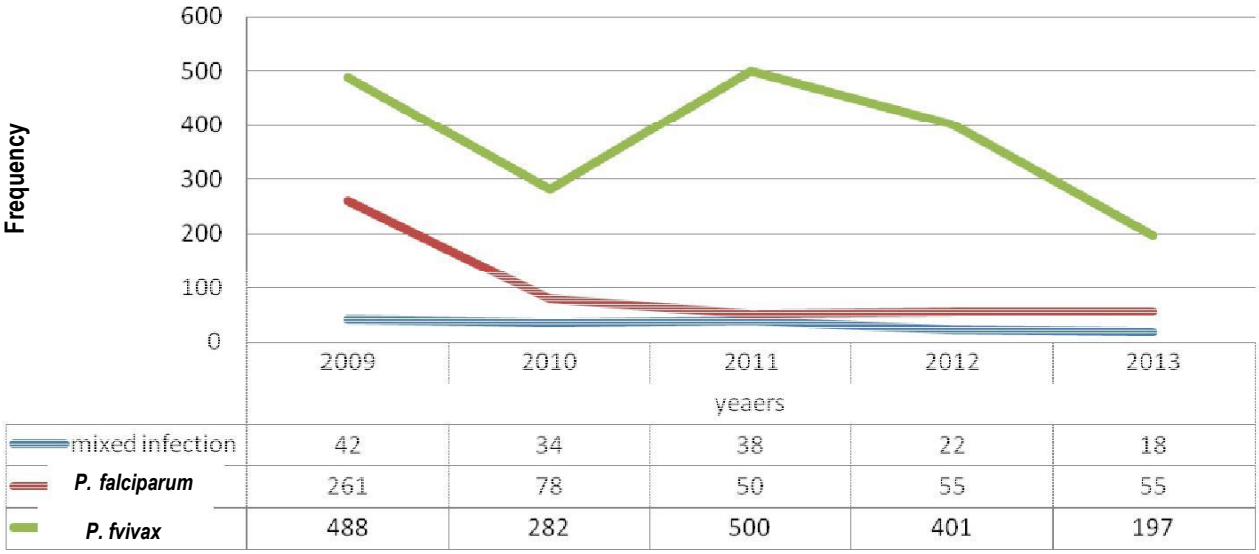

Figure 2. Species trend of malaria parasite in Arsi Negelle health center from 2009 to 2013.

1,387 (55%) were males and 1,134(45%) were females, with male to female ratio of 1.2. Malaria was reported in all age groups but the infection rate was higher in age groups of 0 to 5 years, with a prevalence rate of 575 (22.8%) followed by 16 to 20 years of age with a prevalence rate of 449 (17.8%). The rate of infection was almost similar for both male and females (Figure 3). Regarding plasmodium species and age groups in study area, *P. vivax* was the predominant parasites in all age groups. The rate of *P. vivax* was higher in age groups of 0 to 5 years 414 (16.5%) followed by age group 16 to 20, with the prevalence rate of 306 (11.8%). *P. falciparum* was also the predominant parasite in the age groups of 0 to 5 and 16 to 20 with prevalence rate of 112 (4.3%) and 82 (3.2%), respectively. Mixed infection was more in age groups of 0 to 5 years and 36 to 40 years old, with prevalence rate of 36 (1.4%) and 26 (15%), respectively (Figure 4).

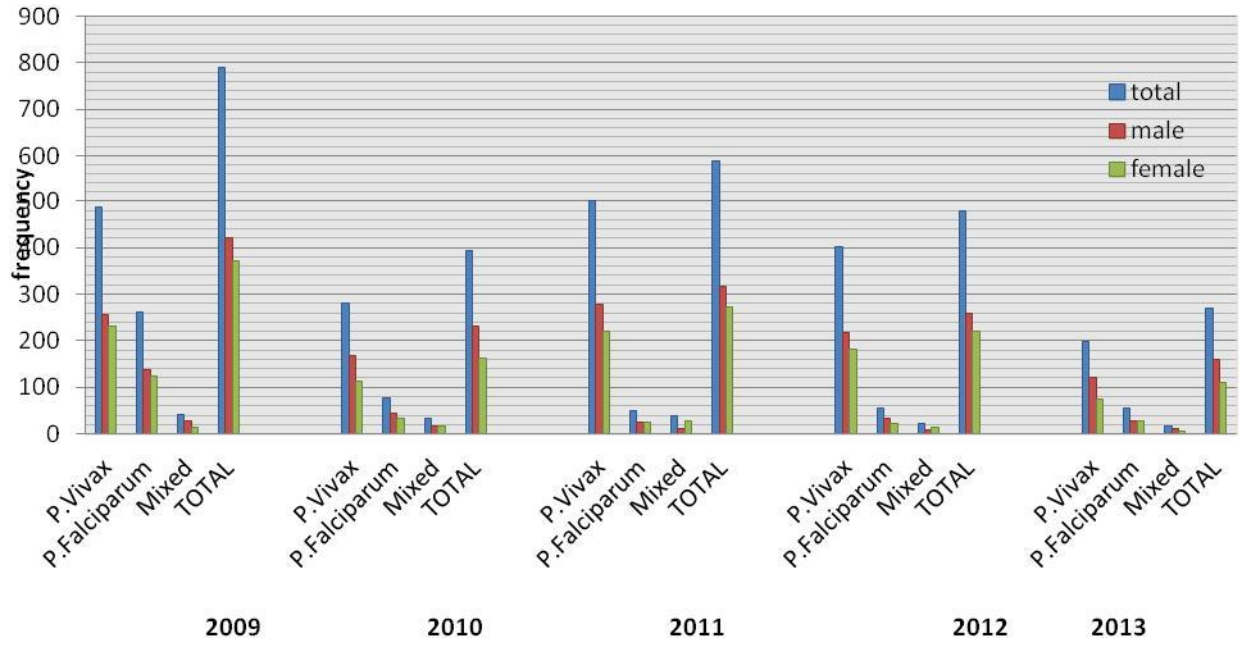

Figure 3. Distribution of confirmed malaria cases by species composition and year, in Arsi Negelle health center from 2009 to 2013.

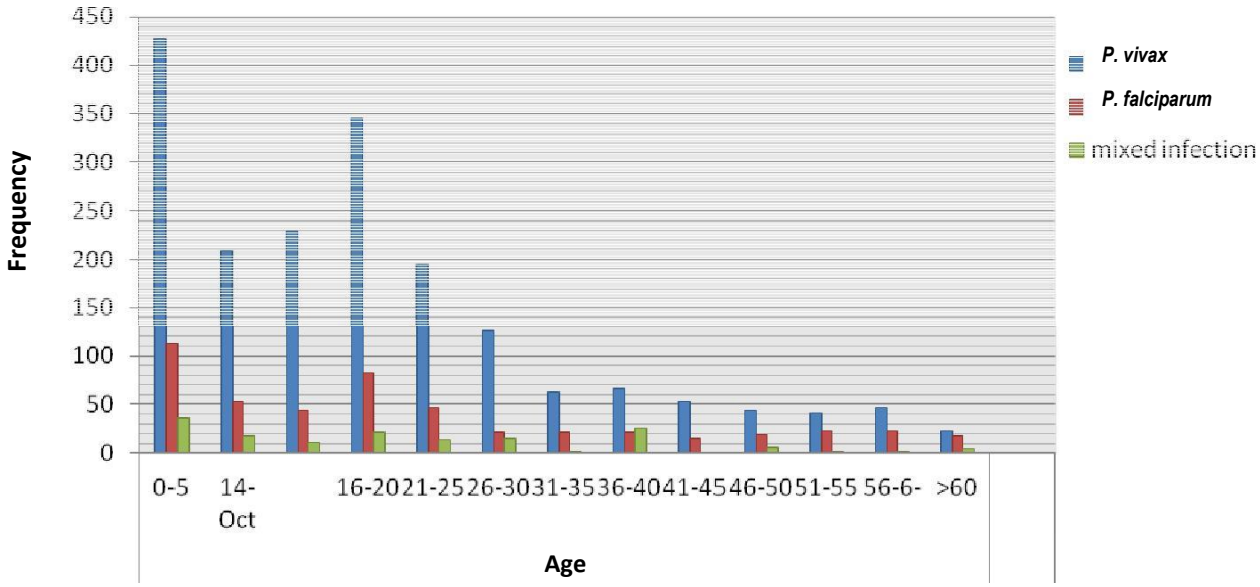

Figure 4. The distribution of *Plasmodium* in different age groups in Arsi Negele health center from 2009 to 2013.

Seasonal variation of malaria prevalence in Arsi Negele health center

Seasonal variation of malaria case in our study illustrates the highest peak 806 (32.3%) during spring season and the minimum 405 (16.2%) malaria cases were observed during winter season. The malaria cases in summer was found to be high next to spring season, which accounts

for 793 (31.8%) of malaria cases. At species level, the highest number of slide positives of *P. falciparum* were recorded in spring and summer, on the other hand, the *P. vivax* peak were observed in spring, followed by autumn. The highest cases of mixed infection were observed in summer and minimum cases were recorded in winter season.

DISCUSSION

This document based healthcare service study has assessed the distribution of malaria over a period of five years by person, place and composition of *Plasmodium* species. The results of our study revealed that during the last five years, a fluctuating fashion of malaria rate was observed. The number of malaria cases in 2009 was twice higher than that of the year 2010. After the significant increment rate starts to decline gradually and the least rate recorded in the year 2013, an increase and continuing decrement of both species *P. falciparum* and *P. vivax* was seen likewise. The study shows that the *P. vivax* as common in the study area. This is lower than other studies reported from Ethiopia (Asnakew et al., 2009; Yewhalaw et al., 2011; Alemu et al., 2012; Lelisa et al., 2014); this is due to the relatively highland climatic condition of the study area in which *P. vivax* is a predominant species in the highland. This might be due to the emergence of drug resistant and the parasite's ability to transmit early in the course of the disease and a relapse from dormant liver stages at varying time intervals after the initial infection. Although often regarded as causing a benign and self-limiting infection, *P. vivax* has been underestimated.

The decrease in rate in 2010 possibly due to better malaria control and preventive activities like awareness of the community on use of ITNs was not persistent in a regular manner. Rather, after the peak year 2009, again a raise in rate was observed in 2011. Observed results in 2011 of increased malaria case reports in the study area in agreement with other reports in Ethiopia, which indicated that the common cyclic period of epidemic changed and we observed malaria epidemics every one or two years, and also in different places (Murphy and Breman, 2001; Karunamoorthi and Bekele, 2009).

P. vivax was the predominant species in the study area and accounted for 74% of malaria morbidity. Based on climatic distribution of malaria in which *P. vivax* were dominant in highland area, the finding was considered with the usual distribution. This study also shows that both *P. falciparum* and *P. vivax* are slightly decreasing with no increasing trend in the subsequent 3 years, so we can say there is no trend in shift. The finding was different from other similar study in Ethiopia (Asnakew et al., 2009; Alemu et al., 2012; Lelisa et al., 2014; Deressa et al., 2005). The possible reason for this might be the effective control strategies for massive problem caused by *P. falciparum,* on the other hand the problem of overlooked *P. vivax* allowed the trend as it is (Hay et al., 2004; Baird, 2007). In addition, the prevention and control activities of malaria as guided by the National Strategic Plan (2006 to 2010) mainly focus on *P. falciparum* because it is assumed to be more prevalent and fatal in the country of Ethiopia. Other possible reasons might be climate variability, and *P. vivax* might have developed resistance for the currently used drug chloroquine (Alemu et al., 2011).

Regarding the age groups, 0 to 5 years (22.8%) were highly affected followed by 16 to 20 year olds (17.8%). At species level, *P. vivax* was more prevalent in all age group. The prevalence of malaria parasites among males (55.4%) was somewhat higher than females (44.6%). The reason why malaria affects these age groups might be due to the fact that children below the age of five have immunity systems which are not yet fully developed. For those 16 to 20 years, most of them were students in rural areas of the surrounding because they had to relocate for education purpose and as such they get the infection since they were from non malaria area previously (Martens and Hall, 2000; Sachs and Malane, 2002).

Maximum malaria cases in almost all year were observed during spring. The major transmission of malaria all over the nation follows the June to September rains and occurs between September and December, while the minor transmission season occurs between April and May, following the February to March rains (Ministry of Health, 2002). This might be associated with the universal fact in which the range of malaria disease is not solely determined by season. Social, biological and economic factors such as mosquito control measures, population immunity, governmental policy and drug resistance have also an impact of malaria transmission and prevalence. As a result, seasonality of the case was certain (Adhanom et al., 2006; Molineaux, 1988).

Conclusion

The rate of malaria was moderate even though it is not as satisfactory as to malaria control strategy of the country. This might be due to the likely *P. vivax* drug resistance to chloroquine. This indicates that for malaria, there is no "Magic bullet", and no quick or easy solution. In support of this, health planners need further strong malaria control and assessment of drug resistance also should be addressed in parallel if malaria control desires to arrive at its mission. As a limitation to this study, document based study is restricted to the data obtained from the patients' health records, being a secondary data; it is liable to disadvantages associated with any secondary data.

Conflict of interests

The authors declare that they have no conflicts of interest.

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