Original article

The distribution and magnitude of malaria in Oromia, Ethiopia

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Abstract

Background: Health facility records are important sources of malaria data not only to describe disease patterns and trends but also for planning malaria control and evaluating the impact of health interventions.

Objective: To assess the importance of health facility data and determine the distribution and magnitude of malaria on the services of health care facilities by emphasizing on outpatient consultations.

Methods: A retrospective record review based on data routinely collected on malaria cases for five years from 1995-2000 was conducted at all health care facilities in Oromia Regional State between March and May 2001.

Results: From a total of 190 *weredas* and 6,107 *kebeles* of the region, 172 (90.5%) *weredas* and 3,932 (64.4%) *kebeles* were found to be partially or completely prove to malaria, with about 65% of the total population residing in these areas. A total of 6,214,132 malaria cases were diagnosed and treated microscopically or clinically during 1995-2000 with an annual average of 1,242,826. The number of malaria cases showed a steep increase from 816,114 in 1995/6 to 2,020,308 in 1998/9, and then declined to 729,176 in 1999/2000. The total number of outpatients registered at all health facilities during the period was 23,522,714, of which malaria cases accounted for 11.7%. The proportion of malaria cases increased during the period, from 10.6% in 1995/6 to about 15% in 1998/9. The two most important causes of malaria during the period were *P. falciparum* and *P. vivax*, comprising of 51.5% and 32.3% of the case respectively. A significant number (16%) of microscopically confirmed malaria cases in hospitals and health centers were not identified by *Plasmodium* species. The disease affected all age groups of the population.

Conclusion: The retrospective analysis of the health facility records revealed the heavy burden posed by malaria. Thus, improving the quality of diagnosis and treatment at health care facilities would play an essential role in malaria control. Strengthening the surveillance systems for generating reliable data would also help in reflecting the magnitude of specific diseases burdening the health services. [*Ethiop.J.Health Dev.* 2004;18(3):164-170]

Introduction

Malaria has been a major challenge to both public health and socio-economic development particularly in countries sub-Saharan African. The nature of the topography, variations in climatic conditions and concentration of populations in highland, malaria free areas indicates the long history of malaria in Oromia and the country a whole. Recognizing the disease as a priority health problem, organized intervention efforts were initiated during the late 1950s. Since then, strong malaria prevention and control activities have been carried out, and significant achievements were made through malaria control.

Malaria has been a major cause of both morbidity and mortality in Oromia Regional State, and primarily occurs in epidemic forms from the monthes of September to December, peaking in October and November. Rainfall, temperature and humidity play a significant role in the transmission of malaria, and temperature is the most important factor in the highlands while rainfall and humidity determine its transmission in midland and lowland areas of the Region (1). In addition to malaria, infectious communicable diseases like tuberculosis, sexually transmitted diseases including HIV/AIDS, diarrhoeal diseases, respiratory tract infections and malnutrition are major health problems in the Region (2). Frequent disease outbreaks like meningitis, measles and diarrhoea have also been a challenge for the Region.

The National Malaria Control Programme was integrated into the general health services in 1993 based on the Health Policy and Health Sector Development Programme of Ethiopia. The Malaria Control Department at Oromia Regional State Health Bureau came into existence as a result of this decentralization policy (3). Despite the intensive control efforts made, malaria still stands top in the list of common diseases and its resurgence has been observed since the mid 1980s (4). The burden of the disease has been increasing and is now at an intolerable stage. In spite of its importance, however, assessment of the real magnitude and burden of the disease has been difficult.

Despite the importance of accurate and reliable information on the burden of the disease to evaluate current interventions deployed to revitaliz and bolster the fight against malaria, major information gaps exist. Although few quantitative data have been provided from weak health information systems, their use and

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interpretation have been seldom maximized for planning, timely decision-making and assessing the burden and health impact of malaria. Routine reports on malaria morbidity and mortality are compiled monthly and annually from hospitals, health centers, malaria control laboratories (MCLs) and peripheral health care facilities.

In this context, health facility records are important sources of malaria data, because they are readily available, can provide useful indicators on the situation of malaria at a lower cost. They are seful not only for planning malaria control and evaluating the impact of health services, but also for epidemiological surveillance. If properly utilized, this information will urge the decision makers to act timely to intensify malaria control interventions effectively and efficiently. This paper is intended to highlight the importance of health facility data and quantify the burden of malaria by emphasizing on the outpatient consultations.

Methods

To determine the distribution and magnitude of malaria, a retrospective record review based on data routinely collected on malaria cases for five years from 1995-2000 was conducted at all health care facilities located in the Oromia Regional State. Oromia, which covers 366,910 km^2 of land, is the largest of all regional states in Ethiopia. Population statistics for the year 2001, based on the 1994 census, estimated that 23,704, 000 people with a male to female ratio of 1:1 live in Oromia (5). Only 13% of the population resides in urban areas. Oromia is divided into 12 administrative zones and 190 *weredas* (districts). A *wereda* is the basic administrative unit with further divisions into urban and rural *kebeles*.

The health service coverage of Oromia for the year 2000/01 was about 47% (6). Higher and intermediate levels of health professionals and health facilities are concentrated in urban areas. This problem is further compounded by high attrition rate for all categories of health workers. Next to hospitals and health centers, health stations and health posts are the smallest health units in the health care delivery system with 1-3 health workers. MCLs are special laboratory services designed for staining and examining blood slides collected from patients suspected of having malaria. No changes in diagnosis, outpatient consultation and admission criteria were made in any of the health care facilities during the period under consideration for data collection. All health care facilities collect data according to the health information system of Oromia Health Bureau, which is in line with the Federal Ministry of Health. Specifically, diagnoses at hospitals and health centers are coded according to the current reporting system, which is based on the International Classification of Diseases (7).

The data on outpatient malaria cases for 1995-2000 were collected from all hospitals, health centers, MCLs, health stations, health posts and NGO clinics from March to May 2001 to prepare the profile of malaria situation in Oromia for the Regional level 'Roll Back Malaria Inception and Consensus' meeting. The malaria data used to prepare this report do not include those from private health care facilities due to the absence of a reporting system. In addition, the performances of community health workers were not considered as this was at an early stage during the period under consideration. Data on malaria admissions and deaths were published separately (8).

Specifically developed forms were applied to collect data on "top ten outpatient consultations", proportion of malaria cases from all outpatient consultations, sex and age distribution of cases by malaria species, number of *weredas* and *kebeles* with their corresponding population sizes in malarious and non-malarious areas. Data were collected from monthly and/or yearly morbidity records on total cases and malaria cases of all the health care facilities. Malaria was diagnosed either microscopically or by clinical signs and symptoms of the disease. Only new cases were considered for the purpose of this report. In addition, records form zonal and *wereda* administration offices were reviewed to determine the population size of the zones, *weredas* and *kebeles*. The types and number of different health care facilities in all *weredas* and zones were also identified.

A five-day training on health management information systems, surveillance systems, malaria data collection at health care facilities, record review and data collection formats, data compilation, analysis and reporting was given for malaria control workers recruited from zonal and *wereda* health offices in February 2001 by the Regional Health Bureau Malaria Control Department personnel at Adama Malaria Control Training Center. They collected the data by reviewing the relevant documents and records of the five-year records of health care facilities in their respective *weredas* and zones. Data were compiled and organized at *wereda* level and submitted to zonal health departments. The collection and compilation of data at the *wereda* and zonal levels took about three months from March to May. The zonal health departments checked, compiled and organized *wereda* reports and submitted them to the Regional Health Bureau Malaria Control Department. The completeness and reliability of the data were rechecked and corrected for incomplete or incorrect data. Data were finally entered into the computer and analyzed using EPI INFO Version 6.02 statistical software package at the Malaria Control Department of Oromia Health Bureau.

Results

There were 28 hospitals, 114 health centers, 795 health stations, 145 health posts, 435 private clinics and 36 MCLs in Oromia in 2000/01. There were more than 6000 health workers in public health care facilities in the Region, including 41 specialists, 276 general practitioners, 94 health officers, 15 pharmacists, 2327

nurses, 2538 health assistants, 276 environmental health workers and 146 laboratory technicians.

From a total of 190 *weredas* and 6107 *kebeles* surveyed in Oromia, 172 (90.5%) *weredas* and 3932 (63.4%) *kebeles* were found to be partially or completely malarious, with about 65% of the total population of the Region residing in these areas (Table 1). Some of the *weredas* found to be completely free of malaria include: Goba, Adaba, Dodola, Kokosa, Uraga, Bore, Abichu and Kokir. Among

the malarious *kebeles*, 1407 (37.8%) were recognized as areas under the indoor residual spray operation, although only 953 (24.2%) were currently getting the first and second round chemical spray during Jan-February and/or May-July, respectively.

A total of 6,214,132 malaria cases were diagnosed and treated at different health care facilities in Oromia in the period 1995-2000 (Table 2). The total number of malaria cases showed a steep increase from 816,114 in 1995/6 to 2,020, remove space 308 in 1998/9, then declined to 729,176 in 1999/2000. The proportion of malaria cases treated at MCLs was incredibly high above 71% of the total malaria cases, but relatively low for hospitals (3.4%), health centers (4.4%) and health stations/posts (20.3%). The total number of outpatients registered at all health facilities during 1995-2000 was 23,522,714 with 11.7% accounted for by malaria (Table 3). The proportion of malaria cases increased during the period, from 10.6% in 1995/6 to about 15% in 1998/9. This was highest for health stations/posts and NGO clinics, but lowest for health centers and hospitals.

Table 1: **Geographic distribution of malaria by wereda and kebeles of Oromia with population living in these areas, 2000**

Malaria status	*Wereda*	*Kebele*	Population	*Kebele* spray status				
				Spray round			Non-operational	Total
				0	1	2		
Malarious	172	3932	14424379	454	824	129	2525	3932
Non-malarious	18	2175	7715429	NA[a]	NA	NA	NA	NA
Total	190	6107	22139808	454	824	129	2525	3932

[a] Not applicable

Table 2: **Total number of malaria cases during outpatient consultations at different health care facilities in Oromia, 1995-2000**

Year	Hospitals	Health centers	MCLs		Health station/ posts[a]	NGO clinics[a]	Total
			Microscopically confirmed	Clinically treated[a]			
1995/6	46722	51605	136045	461677	224962	17473	816114
1996/7	45756	49089	188458	656195	238583	30132	1209213
1997/8	41578	48367	203265	795755	312584	37772	1439321
1998/9	45176	76611	209461	1358353	296516	34191	2020308
1999/2000	30423	45280	110101	323135	188269	31968	729176
Total	*209655*	*270952*	*847330*	*3595115*	*1260914*	*151536*	*6214132*

[a] Patients were diagnosed and treated based on clinical signs and symptoms of malaria

Table 3: **All causes and malaria specific outpatient cases treated at different health care facilities in Oromia, 1995-2000.**

Year	Cases of malaria among all causes	Hospitals	Health centers	MCLs[a]	Health stations/ posts	NGO clinics	Total
1995/6	% malaria	7.7	6.53	40.1	8.7	9.2	10.6
	Total malaria	46722	51605	136045	224962	17473	476807
	All causes	608331	789949	338912	2588669	190455	4516316
1996/7	% malaria	6.5	4.9	42.2	9.2	9.4	10.1
	Total malaria	45756	49089	188458	238583	30132	552018
	All causes	703890	997755	446644	2579495	319809	5047593
1997/8	% malaria	5.7	5.8	42.2	11.5	10.2	12.5
	Total malaria	41578	48367	203265	312584	37772	643566
	All causes	728980	841033	481203	2729899	370448	5151563
1998/9	% malaria	7.2	10.0	46.1	13.0	10.1	14.8
	Total malaria	45176	76611	209461	296516	34191	661955
	All causes	631226	766808	454150	2285410	336568	4474162
1999-2000	% malaria	4.6	5.6	36	8.5	9	9.4
	Total malaria	30423	45280	110101	188269	31968	406041
	All causes	657880	802278	305157	2216111	351654	4333080
Total	% malaria	6.3	6.5	41.8	10.2	9.7	11.7
	Total malaria	209655	270952	847330	1260914	151536	2740387
	All causes	3330307	4197823	2026066	12399584	1568934	23522714

[a] All causes for MCLs represented all self-reported patients to the laboratory

Table 4: **Species distribution of microscopically confirmed malaria cases at health care facilities with laboratory diagnosis, 1995-2000.**

Year	Type of health care facility	Species distribution					Total
		P. falciparum	*P. vivax*	*P. malariae*	Mixed[a]	Unspecified[b]	
1995/6	Hospital	17643	4075	0	0	25004	46722
	Health Center	12545	8427	0	0	30633	51605
	MCLs	92181	43794	28	42	0	136045
	Sub-total	122369	56296	28	42	55637	234372
1996/7	Hospital	13242	5550	0	0	26964	45756
	Health Center	12639	12961	0	0	23489	4089
	MCLs	114997	71099	199	2243	0	188458
	Sub-total	140878	89610	199	2243	50489	283303
1997/8	Hospital	23921	10122	0	0	7535	41578
	Health Center	10455	9915	0	0	27997	48367
	MCLs	135927	67198	31	109	0	203265
	Sub-total	170303	87235	31	109	35532	293210
1998/9	Hospital	21447	16168	0	0	7561	45176
	Health Center	22788	21466	0	0	32357	76611
	MCLs	126362	83012	3	87	0	209464
	Sub-total	170597	120646	3	87	39918	331251
1999-2000	Hospital	12689	12608	0	0	5126	30423
	Health Center	9592	10004	0	0	25684	45280
	MCLs	57066	53016	2	17	0	110101
	Sub-total	79347	75628	2	17	30810	185804
Total	Hospital	88942	48523	0	0	72190	209655
	Health Center	68019	62773	0	0	140160	270952
	MCLs	526533	318119	183	2498	0	847333
	Sub-total	683494	429415	183	2498	212350	1327940

a Represents patients simultaneously having both *P. falciparum and P. vivax*
b Plasmodium species for the cause of malaria illness not specified

Table 5: **Species distribution of microscopically confirmed malaria cases by age, at hospitals and health centers, 1995-2000.**

Year	Malaria species	Age groups (years)				Total (%)
		< 1	1 - 4	5 – 14	≥ 15	
1995/6	*P. falciparum*	1469	3894	7878	16947	30188
	P. vivax	765	1546	2769	7422	12502
	Unspecified[a]	1787	6018	12518	35314	55637
	Sub-total	4021	11458	23165	59683	98327
1996/7	*P. falciparum*	940	2669	5077	17195	25881
	P. vivax	1285	3008	3747	10471	18511
	Unspecified[a]	1828	6220	12193	30212	50453
	Sub-total	4053	11897	21017	57878	94845
1997/8	*P. falciparum*	1470	4592	8408	19906	34376
	P. vivax	1415	2925	4515	11182	20037
	Unspecified[a]	1608	3700	7203	23021	35532
	Sub-total	4493	11217	20126	54109	89945
1998/9	*P. falciparum*	1677	6063	9528	26967	44235
	P. vivax	2096	4607	8612	22319	37634
	Unspecified[a]	2180	4749	7833	25156	39918
	Sub-total	5953	15419	25973	74442	121787
1999-2000	*P. falciparum*	811	2965	4931	13574	22281
	P. vivax	974	2598	4524	14516	22612
	Unspecified[a]	1615	2969	6539	19687	30810
	Sub-total	3400	8532	15994	47777	75703
Total	*P. falciparum*	6367	20183	35822	94589	156961
	P. vivax	6535	14684	24167	65910	111296
	Unspecified[a]	9018	23656	46286	133390	212350
	Sub-total	21920	58523	106275	293889	480607

[a] *Plasmodium* species for the cause of malaria not specified

Malaria remained to be the second of the top ten leading causes of outpatient consultations in Oromia during the periods under consideration, except for 1998/9 when it was the first. The two most important causes of malaria in hospitals, health centers and MCLs during the period were *P. falciparum* and *P. vivax*, comprising 51.5% and 32.3%, respectively (Table 4). A significant proportion (16%) of microscopically confirmed malaria cases in hospitals and health centers were not identified by species. In contrast, all the confirmed cases of malaria at MCLs were identified to be *Plasmodium* species through reading Giemsa stained thin films.

All age groups were affected with relatively more cases of malaria in the age group 15 and above (Table 5). Children under the age of five accounted for about 18% of the total population of Oromia and contributed about 16.7% of the total confirmed malaria cases reported in hospitals and health centers during the study period. There was an increasing trend in the proportion of confirmed malaria cases in under-five children from 15.7% in 1995/6 to 16.8% in 1996/7, 17.5% in 1997/8, 17.6% in 1998/9, except that it was 15.8% in 1999/2000.

The proportion of malaria cases relative to all the other cases of illnesses diagnosed and treated during outpatient consultations at selected hospitals and health centers in the period 1995-2000 is shown in Table 6. Malaria outpatients accounted for 25.6% in 1999/2000 for Negele Borena Hospital, 25% for Merti Hospital in 1995/6, about 30% for Anger Guten and 33.5% for Modjo health centers in 1995/6. Since there were fluctuations in the proportion of malaria cases in the health facilities from year to year, no evident trend was observed in each of the selected health facilities, expect an upward trend observed in Negele Borena Hospital from 9.3% in 1995/6 to 25.6% in 1999/2000.

In Merti Hospital, Modjo and Anger Guten health centers, malaria remained to be the first of the top ten causes of outpatient consultations during the period

Table 6: **All causes and malaria specific number of outpatients in selected health facilities in malaria endemic areas of Oromia, 1995-2000**

Name of health facility	Cases of malaria among all causes	Year in G.C 1995/6	1996/7	1997/8	1998/9	1999-2000	Total
Negele Borena Hospital	% malaria	9.3	13.4	11.8	24.2	25.6	14.8
	Total malaria	1174	3622	4484	3476	2091	14847
	All causes	12632	27022	38150	14375	8155	100334
Merti Hospital	% malaria	25.0	20.6	16.9	22.0	14.3	19.9
	Total malaria	25595	27455	17207	25519	14155	109931
	All causes	102277	133500	101995	116181	98820	552773
Bisidimo Hospital	% malaria	12.5	12.8	10.2	9.3	10.0	11.0
	Total malaria	3131	3882	3242	1965	1637	13858
	All causes	25155	30411	31867	21134	16431	124998
Nekemt Hospital	% malaria	NA[a]	8.2	2.8	10.7	9.7	7.6
	Total malaria	NA	2120	870	3085	2130	8205
	All causes	NA	26014	31427	2875	22059	108251
Modjo Health Center	% malaria	33.5	11.3	14.1	21.7	14.7	19.8
	Total malaria	4513	1320	1364	1946	1429	10572
	All causes	13493	11681	9672	8986	9696	53528
Anger Guten Health Center	% malaria	29.5	27.8	17.7	27.3	13.5	18.4
	Total malaria	5665	5371	2428	7333	3180	18877
	All causes	19214	19323	13714	26833	23565	102649
Agaro Health Center	% malaria	9.3	3.5	7.2	7.5	3.65	6.5
	Total malaria	2824	1021	2119	1500	534	7998
	All causes	30440	28972	28455	20031	14621	122519
Ejaji Health Center	% malaria	8.3	16.7	10.2	6.5	9.9	9.3
	Total malaria	644	890	1211	1097	1030	4872
	All causes	7744	5373	11832	16974	10376	52299
Zeway Health Center	% malaria	6.0	8.2	5.1	13.0	9.8	8.1
	Total malaria	2203	2914	1221	3251	1783	11372
	All causes	36986	35615	24006	25085	18183	139875
Moyale Health Center	% malaria	8.4	13.3	3.9	18.6	9.4	10.6
	Total malaria	1562	4636	683	2140	2622	11643
	All causes	18552	34788	17345	11481	27935	110101

[a] Data not available

1995-2000. In Negele Borena Hospital, malaria was the 6th, 4th and 2nd cause of outpatient consultations in 1995/6, 1996/7 and 1997/8, respectively, but it was the 1st for 1998/9 and 1999/2000. Except in 1997/8 when it was the 3rd, malaria was the 1st of the ten leading causes of outpatient visits in Bisidimo Hospital. In Nekemt Hospital, and Agaro, Ejaji and Moyale health centers, although malaria was in the list of the top ten leading causes of outpatient visits, there were fluctuations in its position from year to year in these health facilities.

There has been an increase in the trend of confirmed malaria cases at MCLs over the last 16 years, with the most significant increases in 1981 and 1991 EC., at 10 years interval (Figure 1). There were no changes in the number of MCLs in the years under consideration for trend analysis. Although the proportions of both *P. falciparum* and *P. vivax* were very similar for the years 1977-79, 1986 and 1992 E C, that of *P. falciparum* was higher for the remaining years.

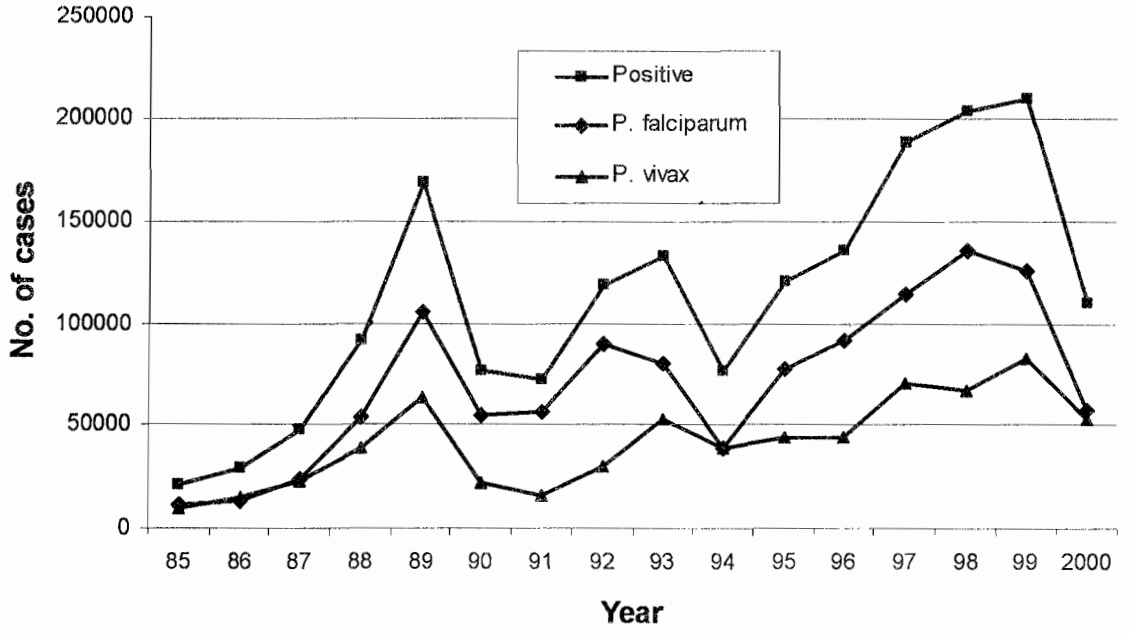

Figure 1: **Trend of microscopically confirmed annual cases for malaria at MCLs in Oromia, 1985 - 2000 (1977-1992 EC.)**

Discussion

Malaria was the most important disease in terms of service utilization and its burden on health care facilities in Oromia during the 1995-2000 period, accounting for the high and increasing percentage of outpatient consultations in most of the health services. Changes in climatic conditions in different parts of the world probably played major roles to the steep upward trend in malaria cases observed in recent years (1,9. The findings of this study point out the heavy burden that malaria poses on the health of the population.

The disease mainly affects young children in highly endemic areas where there is a stable malaria transmission but where adults have protective immunity. In contrast, in areas with low to moderate endemicity, the disease affects all age groups of the population. In such areas, severe epidemics occur with high incidence of morbidity and mortality in the non-immune populations (1,9). Ethiopia is one of the countries mostly affected by seasonal malaria transmissions due to its varying topographical and climatic features, and hence, all age groups are affected (4).

This study demonstrates that a significant number of malaria patients in the peripheral areas of Ethiopia are mainly diagnosed and treated based on the clinical findings according to the national guideline (10). Contrary to our expectations, the species for the cause of malaria for most patients diagnosed and treated at hospitals and health centers were not specified. There are two main explanations for this. The first reason is that the diagnoses are not confirmed by the laboratory as is true in many situations or the other reason might be the reluctance in recording the type of *Plasmodium* species involved in the cause of malaria illness. This has a big implication in the prompt treatment of malaria, particularly in terminating the progression of the disease from mild situation to severe complicated malaria by administering the right drug for the right *Plasmodium* species.

In endemic areas that do not have laboratory facilities, the treatment of malaria is based on clinical signs and symptoms of the disease (11, 12). However, species differences in infection has become increasingly important since the last decade due to the different types of antimalarial drugs administered for malaria cases due to *P. falciparum* and *P. vivax* (10, 13). The national guideline outlines species-specific first line treatment, with Sulfadoxine-Pyrimethamine (SP) for *P. falciparum* infection and chloroquine for *P. vivax*, *P. malariae* and *P. ovale* infections, for health services with laboratory facilities. The guideline recommends SP at the village and health post level, and SP plus chloroquine at higher-level institutions for patients diagnosed clinically. Therefore, improving the quality of laboratory facilities particularly at hospitals and health centers that undertake malaria diagnosis is highly needed as both *P. falciparum* and *P. vivax* are the main causes of malaria in Ethiopia.

Records kept health care facilities are important sources of data os they areoften readily available at low cost and are useful for planning and evaluating the effectiveness of interventions for malaria control. However, health facility data also have certain limitations. First, in rural areas, where the burden of the disease is high and basic laboratory facilities such as microscopes are lacking, diagnosis of malaria is generally based on clinical criteria without parasitological confirmation. Second, health care facilities can't adequately detect all cases of malaria because many cases, especially those living in rural areas, have limited access to basic health services. Furthermore, health facility records may be incomplete or missing as observed from this study. However, health facility records are useful to determine trends in morbidity and mortality, to establish the proportion of outpatient consultations, hospital admissions and deaths for a specific disease, and determine the characteristics of those attending health care facilities at a very low cost. While recognizing the limitations and strengths of health facility data, we also need to a ckknowledge that they may also enable us to understand the magnitude and burden of malaria outpatient consultations.

In conclusion, we can say that the retrospective analysis of the health facility records reveals the heavy burden posed by preventable and treatable malaria. In this context, improving the quality of diagnosis and treatment of malaria in health care facilities would play an essential role in controlling the disease. Health care systems need to ensure the prompt treatment of malaria with the right antimalarial drugs, especially in malaria endemic areas and instances of epidemic conditions. In addition, strengthening the surveillance systems of the health delivery system for generating reliable and quality data would help in reflecting the magnitude of specific diseases burdening the health services.

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