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Original Research Article

Overview of malaria situation in Sudan

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ABSTRACT

Background: Malaria the world's most prevalent vector borne disease, is endemic in 92 countries worldwide, remains a major public health threat to more than 600 million Africans. Approximately 41% of the world's population is at risk, and each year 300 million to 500 million clinical cases of malaria, >90% of them in Africa, are reported. The objective of the study was to present an overview of the malaria situation in Sudan, to assess the trend of malaria infection amongst the local population of Sudan during the period 1990 to 2008, to assess the trend of proportion of all consultations and mortality attributable to malaria amongst the local population of Sudan during the period 2000 to 2008.
Methods: The study design was a retrospective cohort study design. Data from all sources was validated, compiled and analysed statistically using standard statistical tests.
Results: Overall malaria incidence shows a significantly decreasing trend during the period of study. Disease burden due to malaria as proportion of all consultations also shows a significantly decreasing trend during the period of study. Mortality attributable to malaria also shows a significantly decreasing trend.
Conclusions: The epidemiology of malaria infection and disease risks are in transition is some parts of Africa, in part as a result of scaling of the provision of insecticide treated nets and adoption of new effective therapeutics.

Keywords: Malaria, Sudan, Chi-square

INTRODUCTION

Malaria is the most prevalent vector borne disease worldwide. It is endemic in 92 countries worldwide; and poses a major public health problem to over 600 million Africans. Malaria control is recognized as critical to achieving the Millennium development goals. In endemic regions in Africa which bear the greatest burden, the disease pathogen is continuously present in the community.[1,2]

Worldwide, approximately 41% of the population is at risk, of malaria, with nearly 300 million to 500 million clinical cases of malaria, being reported every year. More than 90% of these cases are in Africa. Approximately, 2 million deaths can be attributed to malaria every year all over the world. Half of these deaths occur in children under 5 years of age.[2]

The country of Sudan has been known for its long history of wars, poverty, and disease. These multiple factors combine to cause a high incidence of morbidity and mortality, besides the inability of the population to seek and receive medical care.[3] Malaria in Sudan affected more than two million people in Sudan in 2005. It is the number one killer in the country. Malaria being endemic to most of Sudan; 75% of the population lives daily with the risk of contracting it. Malaria contributes to 30% of hospital admissions and 16% of hospital deaths. As compared to other age groups., children below 3 years are

at three to four times higher risk of death due to malaria than.[4] Malaria is considered endemic in low-altitude Aweil east county (Bahr el Ghazal state, Southern Sudan). Most cases occur from July through January after spring rains.[5]

METHODS

General settings

Sudan located in north eastern Africa, (15º 00' N, 30º 00' E) is the largest country in Africa and the Arab world; and the 10th largest in the world. The world's longest river, the Nile, divides the country between east and west sides. The terrain is generally flat, featureless plain; broken by several mountain ranges in the far northeast and west; while desert dominates the north. The blue and white Niles meet in Khartoum to form the river Nile, which flows northwards through Egypt to the Mediterranean Sea. The amount of rainfall increases towards the south. In the north there is the very dry Nubian desert; in the south there are swamps and rainforests. Sudan's rainy season lasts for about three months (July to September) in the north, and up to six months (June to November) in the south. The climate is tropical in the south; arid desert in the north. The overall environment is thus very conducive for mosquito proliferation, survival and longevity and also favours active malaria transmission satellite terrain map of Sudan is presented in (Figure 1).

Research design

The study design was a retrospective cohort study design. Data collection: data for this overview were identified by searches of Medline, current contents, and references from relevant articles. Search terms were 'Malaria' and 'Sudan'. The study was carried out from May 2010 to Jun 2011.

Approval of the Institutional Ethical Committee was obtained prior to commencement of the study. Data on morbidity and mortality attributable to malaria for the past two decades was collected by visits to local hospitals, Ministry of health, Govt. of Sudan, various International organizations employed in humanitarian missions in Sudan such as WHO, UN, UNICEF, and several NGOs. The data presented here pertains to the local population of Sudan for the period 1990 to 2008. Data from all sources was validated, compiled and analysed statistically using standard statistical tests.[6] The same was taken into account to measure morbidity and mortality attributable to malaria.

Statistical analysis

Data from all sources was validated, compiled and analysed statistically using standard statistical tests.

RESULTS

Overall malaria incidence shows a significantly decreasing trend during the period of study with a slight increase in the years 1992, 1993, 1998, and 2005 to 2007. Chi square for linear trend= 37575204.31; p= 0 (Figure 2).

Data on incidence of malaria infections amongst the local population of Sudan for the period 1990 to 2008 is tabulated in (Table 1).[7,8]

Data on disease burden/mortality attributable to malaria as a proportion of all consultations/deaths amongst local population of Sudan for the period 2000 to 2008 is presented in (Table 2).[8]

Over the nine years period, it was observed that 12.11% to 33.19% of all consultations was attributable to malaria. Disease burden due to malaria as proportion of all consultations also shows a generally significantly decreasing trend during the period of study with a slight increase in the years 2001, 2003, 2005 and 2006 (Chi square for linear trend= 4293305.45; p=0) (Figure 3). Mortality attributable to malaria ranged from 1.72% to 7.04%. Mortality attributable to malaria as a proportion of all deaths also shows a generally decreasing trend with a slight increase in 2008. Chi square for linear trend= 1096.140; p=0) (Figure 4).

Table 1: Malaria attributable morbidity amongst local population of Sudan for the period 1990 to 2008.

Year	Incidence malaria	No. of population	%
1990	7508704	27411751	27.39
1991	6947787	28002200	24.81
1992	9326944	28605368	32.61
1993	9867778	29221527	33.77
1994	8562205	29850959	28.68
1995	6347143	30493949	20.81
1996	4595092	31150788	14.75
1997	4065460	31821776	12.78
1998	5062000	32507217	15.57
1999	4215308	33207423	12.69
2000	4332827	33922711	12.77
2001	3985702	34653406	11.50
2002	3056400	35399840	08.63
2003	3237006	36162353	08.95
2004	2214296	36941290	05.99
2005	2648310	37737005	07.02
2006	2888943	38549860	07.49
2007	3166661	39380224	08.04
2008	3185930	40228474	07.92

Table 2: Data on disease burden/mortality attributable to malaria as a proportion of all consultations/deaths amongst local population of Sudan for the period 2000 to 2008.

Year	Total consultations (all causes)	No. of malaria cases	Disease burden attributable to malaria (%)	Total deaths (all causes)	Deaths attributable to malaria	Mortality attributable to malaria as a proportion of all consultations
2000	25151371	4332827	17.23	11344	798	7.04
2001	20337398	3985702	19.60	14207	816	5.74
2002	20486801	3056400	14.92	15057	700	4.65
2003	19628283	3237006	16.49	19267	863	4.48
2004	18285220	2214296	12.11	17771	749	4.21
2005	17462890	2648310	15.16	19654	570	2.90
2006	8703556	2888943	33.19	19353	565	2.92
2007	13988723	3166661	22.64	25954	446	1.72
2008	13745635	3185930	23.18	17311	359	2.07

Figure 1: Satellite terrain map of Sudan.

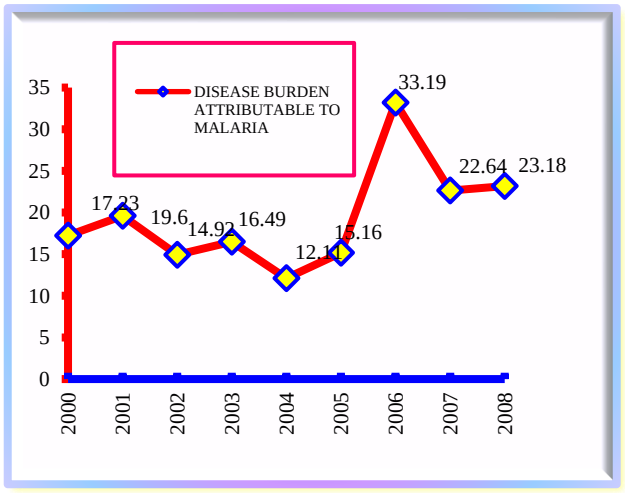

Figure 3: Disease burden attributable to malaria as proportion of all consultations also during the period of study.

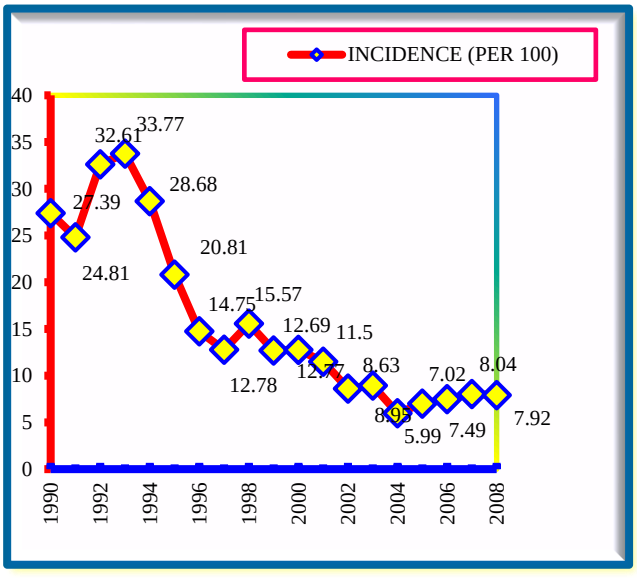

Figure 2: Trend of malaria during the period of study (incidence per 100).

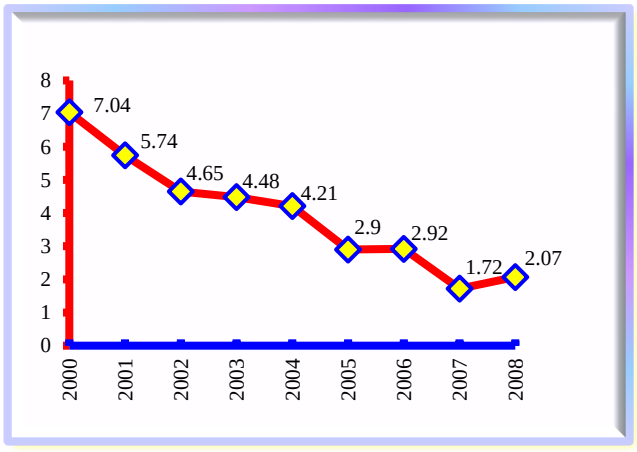

Figure 4: Mortality attributable to malaria as a proportion of all deaths during the period of study.

DISCUSSION

A review of the federal health Canada databases for the incidence of malaria in Canada , from 1990 through 2002 , documents a range from 364 to 1,029 cases per year , with an average of 538 cases per year during the period (or an average of ≈1.8 cases per 100,000 population per year).[9] This is much lower than the incidence in the present study. This study also contrasts with that conducted by Singh PMP, Bhalwar, Mehta, Mahendraker, Mehta. wherein the incidence of malaria showed a statistically significant increasing trend from 2000 to 2006 amongst army units deployed in Assam.[10] Periodic epidemics of malaria are a major public health problem for many sub - Saharan African countries as well.[11] Experiences in Kisii, Gucha, Ayana, Gutten, and Damot Gale probably reflect conditions in neighboring regions affected by the corresponding epidemics, although scarcity of published records makes comparisons difficult.[12] In high altitude zones of western Kenya , clinical malaria has an acutely seasonal distribution ; and is a substantial public health problem every year.[13] Sudan is a country known for its long history of wars, poverty, and disease. These factors combine to cause a high incidence of morbidity and mortality and the inability of the population to seek and receive medical care.[3] The number one killer in Sudan is malaria, which affected more than two million people in 2005. Malaria is endemic to most of Sudan; 75% of the population lives daily with the risk of contracting it.[4] The epidemiology of malaria infection and disease risks are in transition is some parts of Africa, in part as a result of scaling of the provision of insecticide treated nets (ITN) and adoption of new effective therapeutics.[14] In 1998, with the support of WHO, the government initiated a plan to revitalize malaria control. In 2001, a national 10 years strategic plan was developed; in 2002, the Malaria free initiative was launched; in 2003, a plan was developed for scaling up the use of ITNs including using communication for behavioural impact; and in 2004 a national policy for control of malaria in pregnancy was initiated. Also, in 2004, the national drug policy was updated to use the ACT ASU+SP for first-line treatment.[7] In these areas, the malaria control programme distributed over 3.3 million long lasting insecticide impregnated nets between 2006 and 2008. About 90% of public health facilities provide ACTs free of charge; in 2008, about 3 million treatment courses were delivered, enough to treat all reported cases. During the past 5 years, the Government has allocated more than US$ 31 million for malaria control, complemented by more than US$ 69 million from the global fund.[8] Malaria reporting from national surveillance systems varies in quality and reporting completeness and may have limited value in understanding the actual malaria burden, but may be useful for understanding trends in the relative burden of malaria in the public health sector.[7]

More and more of those working in the government and other important positions are recognizing the crucial need for improving the health care system in all areas and are working to bring about this change.[15] For 1 billion people at risk of unstable malaria transmission, elimination is epidemiologically feasible, and large areas of Africa are more amenable to control than appreciated previously.[16]

Limitations

The data presented here is only strongly suggestive of the trend of malaria amongst the local population of Sudan. It is quite probable that few cases would have been missed due to inadequacies of the reporting system. This analysis relies on programmatic data, the limitations of which are apparent. The data presented in this study pertains to the country of Sudan, before it was separated into two nations viz North Sudan and South Sudan in 2011.

CONCLUSION

The study attempts to highlight the trend of malaria amongst the local population of Sudan over last nearly two decades. Various important topographical, operational, socioeconomic, political and environmental factors contributing to the high incidence of malaria in this population have been discussed. The study population though comprising of the local population of Sudan is also suggestive of trends in other countries of the African continent.

Recommendations

Based on the findings of the study the following recommendations are submitted: areas at risk for epidemics through the influx of infected people should be identified to avoid or control epidemics. Particular attention should be paid to urban areas, given the ongoing trend towards uncontrolled urbanization. The risk for increased malaria transmission through economic development of an area should be analyzed thoroughly before development begins. Surveillance should be strengthened, which would help to prevent the reintroduction of malaria transmission by local mosquitoes, which could acquire the infection by biting persons with airport or imported malaria.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kopec GEK, Blumenthal MB, Ceccato P, Dinku T, Omumbo JA, Connor SJ. Web based climate information resources for malaria control in Africa. Malar J Internet. 2006;5:3.

2. Martens P, Hall L. Malaria on the Move. Emerging Infectious Diseases Internet. 2000;6(2):9.
3. Whitney CK. Obstacles to Health Care: A Nurse's Experience in Sudan. Urol Nurs Internet. 2010;27(5):10.
4. Whitney CK. Obstacles to Health Care: A Nurse's Experience in Sudan: Causes of Morbidity and Mortality. Urol Nurs Internet. 2007;27(5):12.
5. Francesco C, Jonathan C, Sunna B, Abiy T, Gerardo P, Kathryn PA, et al. Malaria Epidemics and Interventions, Kenya, Burundi, S. Sudan, and Ethiopia: Results. Emerging Infectious Diseases Internet. 2006;10(12):30.
6. Knapp, Grant R. Clinical Epidemiology and Biostatistics. Maryland: Williams and Wilkins, 1992. Roll Back Malaria Monitoring and Evaluation, Sudan Internet. 2005:21.
7. World Malaria Report Internet. c2009. 9 screens. Available from: http://www.who.int/malaria/publications/country-profiles/2009/mal2009_sudan_0043.pdf. Accessed: 11 June 2010.
8. Dick MJ, Marie DA, Momar N, Evelyne K, Brian JW, Theresa GW. Malaria Epidemics and Surveillance Systems in Canada. Emerg Infect Dis Internet. 2004;10(7):7.
9. Singh PMP, Bhalwar R, Mehta VK, Mahendraker AG, Mehta AK. Malaria in Assam: A Challenge. Ind J Comm Med. 2009;25:445-7.
10. Grover EK, Kawano M, Klaver RW, Blumenthal B, Ceccato P, Connor SJ. An online operational rainfall - monitoring resource for epidemic malaria early warning systems in Africa. Malar J Internet. 2005; 4:9.
11. Francesco C, Jonathan C, Suna B, Abiy T, Gerardo P, Kathryn PA, et al. Malaria Epidemics and Interventions, Kenya, Burundi, S. Sudan, and Ethiopia: Discussion. Emerging Infectious Diseases Internet. 2006;10(12):28.
12. Simon HI, Abdisalan MN, Malka S, Millie B, Helen LG, Sam OA, et al. Clinical Epidemiology of Malaria in the Highlands of Western Kenya. Emerg Infect Dis Internet. 2002;8(6):7.
13. Emelda AO, Abdullah AT, Hugh R, Idro R, James AB, Robert WS. Age Patterns of Severe Paediatric Malaria: Discussion. Malar J Internet. 2009:20.
14. Whitney CK. Obstacles to Health Care: A Nurse's Experience in Sudan: Conclusion. Urol Nurs Internet. 2007;27(5):9.
15. Guerra CA, Gikandi PW, Tatem AJ, Noor AM, Smith DL, Hay SI, et al. The limits and intensity of Plasmodium falciparum transmission: implications for malaria control and elimination worldwide. PLoS Med Internet. 2008;5(2):3.

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