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Malaria and Maternal Mortality In Gezira-Sudan

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ABSTRACT

The **objectives** of this study include:(1) to identify the magnitude of malaria as a cause of maternal mortality (MM) (2) to study the demographic characteristics of MM cases caused by malaria and (3) to identify the actual cause of MM due to malaria.

Methods: This is a six years hospital based retrospective review of hospital records of ladies died due to malaria in Wad Medani Teaching Hospital for Obstetrics and Gynaecology (WMTHOG), form1 January 1998 to 31 December 2003.

Results: malaria caused 10% to 40% of MM per year. The mean age was 27.57 years, most of them were primigravidae and from rural areas. 37.8% of the deaths occurred between 28 and 36 weak of gestation. The median duration of stay in hospital was two days. However 32.4% of deaths stayed for less than 24 hours that indicated severe and serious clinical presentations. The main causes of death due to malaria or its complication were: anaemia (24.3), cerebral malaria (21.6%), circulatory failure (12.51) and renal failure (8.1%). Others were pulmonary oedema , hyperpyrexia , puerperal psychosis , abortion , severe epistaxis , cardiac arrest , black water fever, electrolyte imbalance, and hepatic failure. The study recommended effective prevention of malaria and an intensive care approach in its management.

ملخص الدراسة

أهداف الدراسة :1)دراسة الصفات الديمغرافيه للحالات التي توفيت 2)تحديد حجم مشكلة الملاريا كأحد الأسباب الهامة لوفيات الأمهات 3)تحديد الأسباب المباشرة التي أدت الي الوفاة بسبب الملاريا)بسبب الملاريا .

منهجية البحث: هذه دراسة إستعاديه مبنيه علي دراسة سجلات وفيات الأمهات بسبب الملاريا في ست أعوام (من يناير 1998 الي ديسمبر 2003) في مستشفي أمراض النساء والتوليد التعليمي بمدني.

النتائج: تسببت الملاريا في موت 00% في السنه ء ومتوسط العمر عند حدوث الوفاة 27.5 سنه14% الي 00 أغلب المتوفيات خروس من تميزت فترة الإقامه بالمستشفي قبل الوفاه . حوالي 38.8 % من المتوفيات كن بين العمر الحملي 28 الي 36 أسبوعاً.المناطق الريفية وقد وجد أن 32.4% من المتوفيات مكثن بالمستشفي لأقل من 24 ساعه ء وهذا يعكس بوضوح .بالقصر فقد كان الوسط الحسابي 2 يوم شدة خطورة الحاله السريريه عند الدخول بالمستشفي. أهم أسباب الوفاة بسبب الملاريا كانت فقر الدم (24.2%) والملاريا المخيه (21.6%) وهبوط الدوره الدمويه (13.51%) وهبوط الكلى (8.1%)ء وأسباب أخرى تتضمن الأتي :- وزمة الرئة ، ارتفاع الحرارة الوخيم ، الذهان النفاسي ، الإجهاض ، الرعاف الوخيم ، توقف القلب ، حمي بيله خضاب الدم ، فقدان توازن الكهارل وهبوط الكبد.

key words :- maternal mortality , malaria , Sudan , Wad Medani, Gezira

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Introduction

Maternal mortality (MM) is a major problem worldwide. In 2000, the United Nations estimated global MM at 529,000, of which 99% occurred in the developing countries[1]. In Sudan the estimated MM ratio is 509 per 100,000 life births. In Gezira, the figure is 689 per 100,000[2]. Malaria is a common and

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serious medical disease in the Sudan. It constitutes 40% of the infectious disease burden and it is the cause of hospital consultation in about 50% to 70% of patients[3]. It causes between 7.5 to 10 million cases and 35,000 deaths every year in Sudan[4].In fact it is one of the most important indirect causes of MM. It caused up to 46.7%of MM in Kasala east of Sudan during 1995[5]. In a previous review of MM in Wad Medani hospital malaria was responsible for 37.2 %of the total maternal deaths during the period 1985 and 1999[6]. The share of malaria as n indirect cause of MM in Omdurman was 18.1%.[7] The efforts to improve the situation must operate though the main causes of MM.

The objectives of this study are: to review the percentage of maternal mortality caused by malaria in the Sudan, to study the demographic factors and characteristics of deaths and to identify the actual causes of maternal death due to malaria, so as to provide data that help in the achievement of safe motherhood initiative goal. That is lowering MM.

Methodology

This is a retrospective, hospital based, six years review study of MM due to malaria in Wadmedani- Gezira state-central Sudan.. The records of MM at Wadmedani teaching hospital for Obstetrical and Gynaecology (WMTHOG) for the years1998-1999 -2000-2001-2002 and 2003 were reviewed. Those who died due to malaria were identified. A data sheet (master sheet) was designed to study these deaths according to: year of death, age, residence, gestational, age parity, duration of stay in hospital and actual cause of death due to malaria. The details of 4 cases in the year 2002 were missing.

This data was processed using **SPSS** (Statistical Package for Social Science). Frequency distributions for all variables were made for all cases in addition to frequency distribution for cases in rural areas and urban areas. Chi-square test was used to study the relationships between the age of mothers and the following variables:

1. Duration of stay in hospital
2. Actual cause of death due to malaria

In the same way the relationship between cause of death and he following variables were studded:

1.Duration of stay in hospital

2. Parity

Results and statistics

This study showed that the percentage of malaria as a cause of MM in the records of WMTHOG was highest in the year 1999 (39.29%) followed by the year 1998 (25.71%). These results state that the risk years of maternal deaths from the records were (1999, and 1998). In 2002 the percentage of mothers who died of malaria out of all mothers died due to other reasons was 24.14, in 2001 was 19.44, in 2000 was10.26% and in 2003 is 8.82%. For the whole period of six years (1998-2003) the percentage of mothers who died due to malaria out, of all MM was 24.40%. (Table1)

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Table (1) Numbers and percentage of MM due to Malaria in WMOGTH records by year (1998-2003)

Year	Total numbers of MM	Number of deaths due to malaria	Percent of deaths due to malaria
1998	35	9	25.71
1999	28	11	39.29
2000	39	4	10.26
2001	36	7	19.44
2002	29	7	24.14
2003	34	3	8.82
Total	201	41	20.4

Descriptive analysis:

Demographic characteristics of mothers:

1. The mother age: The mean age distribution of mothers (18-40) was 27.57 years. This indicates that the mother age who died due to malaria in pregnancy on average was 28 years in the hospital records. According to the normal distribution test (or z-distribution) the expected mean age of mothers at risk of dying from malaria cause in the whole population of mothers in Gezira state will be in the range of (27.57 ±(1.96)(0.9288) or (25.75-29.39) with 95% confidence level. The probability of finding a mother whose age is out of this range is 5% or 5 out of 100 mothers. (Table 2).
The age group (20-34) is the risk age of mothers who died due to malaria. 32.4% of mothers were in the age of (25-29). The percentage of mothers in age less than 20 years and more than 40 years were 5.49 and 2.7% respectively. (Table 2)

2. Duration of stay in hospital. The majority of mothers stayed in hospital for less than 24 hours before they die. The mean of days of stay in hospital was found to be one. The mean duration of stay in hospital was 3.27 days, and the median was 2.5 days. The mean duration of stay in hospital for mothers (18-40) in the population is expected to be between (327±1.96(0-41)) or (4.07-2.47) days. Fig. No(1)

Fig(1)Distribution of maternal deaths due to malaria by hospital stay

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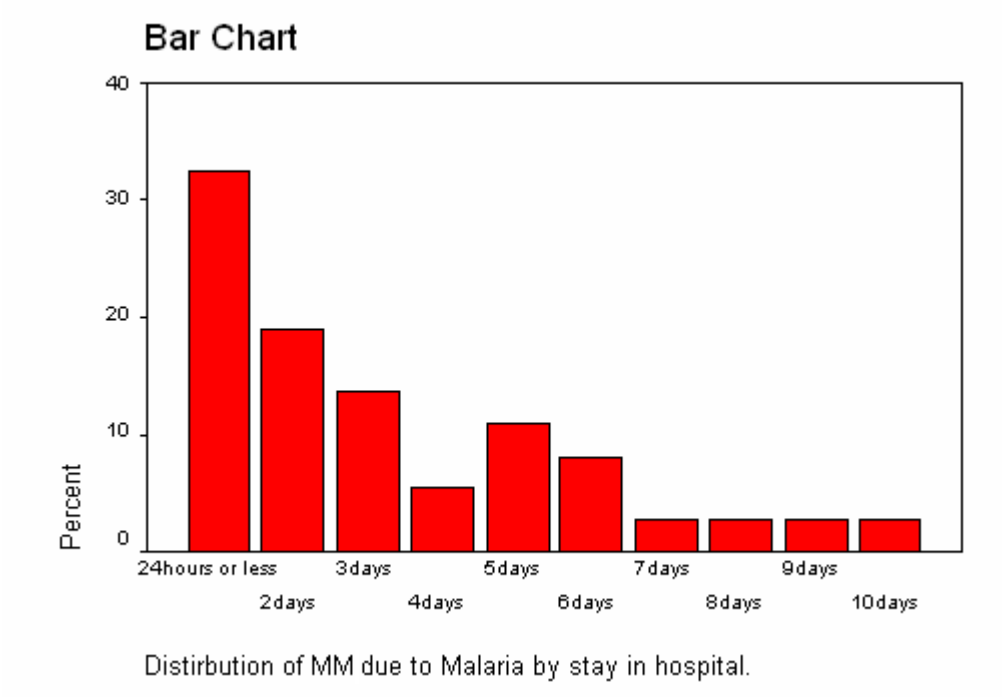

Distirbution of MM due to Malaria by stay in hospital.

3. The mothers' residence. 70.3% of mothers, who died, were from rural areas. 29.7% of them from urban areas. (Table 2)

4. The parity of the mothers: more than one third of deaths were primigravidae (35.1%). The same percentage was having 2-4 children. Eleven cases (29.7%) had 5 children and more. (Table2)

5. Gestational age of mothers. The study showed that 37.8% of mothers were reported at a gestational age between 28 and 36 weeks, 18.9% of them were below 28 weeks of gestation and 10.8% were of gestational age 36 to delivery. There were 32.4% of the deaths occurred in the puerperium.(Table 2)

Table (2) Demographic characteristics maternal death and their distribution by residence

Character	Total		Urban		Rural	
	No	%	No	%	No	%
1. **Ag of Death**						
< 20 years	2	5.4	0	0	2	7.7
20-24	9	24.3	0	0	9	34.6
25-29	12	32.4	0	0	12	46.2
30-34	8	21.6	5	45.5	3	11.5
35-39	5	13.5	5	45.5	0	0

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> 40 years	1	2.7	1	9.0	0	0
Total	37	100	11	100	26	100
2. parity of Death						
One child	13	35.1	1	9.1	12	46.2
2-4	13	35.1	1	4.1	12	46.2
5children and more	11	29.7	9	81.8	2	7.7
Total	37	100	11	100	12	100
3. Gestational Age						
Below 28 weeks	7	18.9	0	0	7	26.9
28-33	14	37.8	0	0	14	53.8
36 and above	4	10.8	0	0	4	15.4
Puerperal	12	32.4	11	100	1	3.8
Total	37	100	11	100	26	100

6. The actual cause of maternal mortality due to malaria. When the details of the files of deaths were studied, the actual cause of malaria was recorded ,to be the highest, due to anaemia and cerebral malaria (24.32 % and 21.62 % respectively),followed by circulatory failure(13.52%) and renal failure(8.11%). Pulmonary oedema and hyperpyrexia was 5.41% each. Other causes included; puerperal psychosis, abortion, severe epistaxis, cardiac arrest, black water fever, electrolyte imbalance and hepatic failure. (table 3)

Table No (3) Actual cause of death due to malaria by number and percentage

cause of death	No	%
Anaemia	9	24.32
Cerebral malaria	8	21.62
Circulatory failure	5	13.51
Renal failure	3	8.10
Pulmonary oedema	2	5.40
Hyperpyrexia	2	5.40
Puerperal psychosis	1	2.70
Abortion	1	2.70
Severe epistaxis	1	2.70
Cardiac arrest	1	2.70
Electrolyte imbalance	1	2.70
Hepatic failure	1	2.70
Unknown	1	2.70

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Inferential statistic Analysis:

1. The age of the mothers and duration of stay in hospital. The relationship between the age group of mothers and the duration of stay in hospital is statistically highly significant at 0.001 level of significance. Since chi-square is 127.907, d. f is 45and the level of significant is 0.000. This significant result states that the duration of stay in hospital is dependant on the mothers' age. It was found that younger aged deaths stayed for shorter period. These are most likely to be primigravidae. So it may indicate that the disease is more severe among them. 32.24% of mothers were reported to stay in hospital for three days or less.

2. The age of mothers and the actual cause of maternal death due to malaria. The relationship between the age of mothers and the actual cause of maternal mortality due malaria is very strong. Since chi-square is 127-907, df is 45 and p. value is 0.000. This result is statistically highly significant at 0.001 level of significance. That means the actual cause of maternal mortality due to malaria was strongly related to the age of the mother. 66.7% of mothers in the age group (20- 24) died due to cerebral malaria, 50% of mothers in (25 – 29) died due to anaemia and 50% of mothers in (30- 34) died of circulatory failure. So cerebral malaria was observed to the main cause of death in the younger age group, the pattern changed in the elder age groups, where anaemia dominated in the next age group and circulatory failure in the age group after.

Maternal mortality: Rural and Urban Comparison:

A. The mother age. 91% of mothers in urban area were in the age group (30-39) and only one woman (8%) was in age 40. In comparison 11.5% of mothers in rural areas in age (30-34). No mothers in the early ages (18-26) were from urban areas, whereas mothers who died from malaria in the age group (18-26) in rural areas were 88.5%. This might be because in rural areas marriage is expected to be early with early pregnancy and therefore younger deaths due to malaria.

B. The parity of the mothers. 46.2% of mothers rural areas who died, had only one child. The same percentage had between 2 and 4 children. 7.7 % had 5 children or more. This indicates that 92% of deaths in rural areas have small parity and they were the most at risk of dying due to malaria. In urban areas 81.8% of mothers who died, had 5 children or more. Only 2 mothers or about 18.2% of mothers in urban areas had a parity of 1-4 children. This demonstrates that malaria, as a cause of death, affects ladies of lower parity in rural areas, and ones of higher parity in urban areas.

Discussion

The commonest cause of malaria in Sudan is plasmodium falciparum. It accounts for 90% of cases.[8 9] Unfortunately this is the most problematic type of malaria in pregnancy. Almost all the estimated >one million deaths from malaria each year world-wide are attributed to Plasmodium falciparum[10]. Malaria in pregnancy is more common, shows more atypical presentations, more severe and more fatal.11 12 In addition it has got special complications regarding the fetus and placenta. Pregnant women are more likely to be parasitaemic and to have heavy parasitaemias than non-pregnant women of the same age. In this study the short stay in hospital indicated the grave situation of malaria on presentation. There were high fatalities among primigravidae. This is in agreement with the established fact that in primigravidae the disease is more common and more severe and with more effects on the outcome[13]. There is due to the immunosuppressive effect of pregnancy. That is transient depression in cellular immunity aiming at prevention of rejection of the fetus, being an allograft.[14] In addition there is sequestration of plasmodium falciparum infected red blood cells in the placentae of primigravidae. That is because the infected red

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blood cells express a specific phenotype antigen, named (plasmodium falciparum membrane surface protein) which allows them to cytoadhere to certain components in the syncytiotrophoblast, a glycosaminoglycans could chondroitin sulphate A (CSA) and hyalouronic acid . [15] [16]The higher susceptibility of primigravidae is thought to be due to the expression of particular variant surface antigens (SAs) binding to CSA in the placenta. The multiparae are protected from these placental parasites due to formation of antibodies, as a result of previous infections. Antibodies against placental parasite are present in multiparae in endemic areas.[17]The four most important causes of death due to malaria were anaemia, cerebral malaria, circulatory failure and renal failure. It is rather strange to see anaemia and cerebral malaria as approximately equal percentage, because the pattern of presentation differs in high transmission areas compared to low transmission ones. In the former women have gained a level of immunity to malaria infection hence anaemia is more likely to result.[18]Where as in the later women generally have no immunity and one will expect cerebral malaria. The top cause of death due to malaria in this study was anaemia. This is supported by the fact that malaria is a cause of 2% to 15% of maternal anaemia which increases the risk of maternal mortality; as is estimated that malarial anaemia causes as many as 10.000 maternal deaths in Africa.[19]

The highest percentage of deaths due to malaria is observed to be in the third trimester before 36 weeks and in the puerperium. This is in contradiction with the established fact that the highest parasitaemia occurring during the second trimester.[20] In Gezira state, a positive blood film can be positive co-incidentally with any other problem. One must be very careful in relating the death to malaria. In this study death due to obvious infections such as post operative septicaemia were not considered as malaria even when the treatment sheet of these include quinine. The options of treatment of malaria in pregnancy are limited especially during the first trimester. For the treatment of uncomplicated cases the combination of artesunate and sulfadoxine-pyrimethamine is effective and safe[21]. The first line for the treatment of complicated malaria in pregnancy is Quinine, its dose is 10 mg/ kg body weight 8-hourly for 7 days. Prevention is by proper case treatment, use of insecticide-treated nets and chemoprophylactic. Interventions to prevent the harmful maternal and foetal effects of malaria are often recommended.[23] The use of sulfadoxine-pyrimethamine as prophylaxis in primigravidae was shown to effective in Wad Medani- Sudan , in terms of reduction of malaria episodes, prevalence of low birth weight and placental parasite.[24] Identification and understanding the way or ways by which malaria killed these ladies is important for the improvement of management and hence prevention of deaths due to malaria in the future. Unfortunately this is not always possible either because of limited investigative facilities, short stay or absence of post-mortem examination.

Conclusion. Malaria is an important cause of maternal mortality in Sudan. It kills ladies by causing anaemia, cerebral malaria and circulatory failure. The primigravidae and ladies from rural areas are most at risk.

Recommendations

1. Design protocols that cover prevention of malaria in pregnancy at all levels.
2. The short stay in hospital and the serious presentation calls for support of hospital to enable management of severe malaria in pregnancy through an intensive care approach.

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