Maternal Mortality in Maroua Provincial Hospital, Cameroon (2003–2005)

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ABSTRACT

Background: *In September 2000, the Heads of States of the 191 countries of the United Nations approved the Millennium Declaration in which reduction of pregnancy-related deaths to a quarter by 2015 was one of its goals. However, before the middle of the first decade of this millennium, there were no reports on the status of maternal mortality in Maroua, Cameroon.*

Objective*: The aim of this study was to establish baseline data on maternal mortality for future evaluation of pregnancy-related mortality trends in this city.*

Subjects and Methods: *Maternal deaths that occurred from 2003 to 2005 in Maroua City, Cameroon, were analyzed. Mortality ratios were determined by comparing the number of the deaths related to pregnancy with that of women with safe deliveries. Mortality risks were determined by comparing the characteristics of women with pregnancy-related deaths to those of women with safe deliveries.*

Results: *The overall maternal mortality ratio was 1266 maternal deaths per 100 000 live births. The leading causes of death were hypertension (17.5%), obstetric infections (14.3%), uterine rupture (14.3%), anaemia (12.7%) and HIV complications (9.5%). Among the women who died, 28.6% were teenagers and 14.3% were at their sixth delivery (or above). Compared with women aged 20 to 24 years, those aged 25 to 29 years were more than twice as likely to die from pregnancy-related causes (HR: 2.34; CI: 1.07,5.08;* p = *0.029). A similar trend was also found in those aged 30 to 34 years (HR: 2.26; CI: 1.02,5.00;* p = *0.042).*

Conclusion: *The findings suggest that Maternal Mortality Ratio in Maroua, City, Cameroon, is very high. Since most of the causes of death were preventable, we propose that the current maternal and Family Planning strategies be reviewed with the view to reducing the current trend. Such a strategy would enable the Maroua city to meet the Millennium goals by 2015.*

Mortalidad Materna en el Hospital Provincial de Maroua, Camerún (2003–2005)

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RESUMEN

Antecedentes: *En septiembre del 2000, los Jefes de Estado de 191 países de la Naciones Unidas, aprobaron la Declaración del Milenio, una de cuyas metas es la reducción hasta una cuarta parte, de las muertes relacionadas con el embarazo, para el año 2015. Sin embargo, antes de mediados de la primera década de este milenio, no habia reportes sobre el estado de la mortalidad materna en Maroua, Camerún.*

Objetivo: *El objetivo de este estudio fue establecer los datos preliminares comparativos de referencia sobre la mortalidad materna para la evaluación futura de las tendencias de la mortalidad en relación con el embarazo en esta ciudad.*

Sujetos y Métodos: *Se analizaron las muertes maternas ocurridas del 2003 al 2005 en la ciudad de Maroua, Camerún. Las tasas de mortalidad fueron determinadas comparando el número de muertes relacionadas con el embarazo, con el número de mujeres que tuvieron partos seguros. Los riesgos de mortalidad fueron determinados comparando las características de mujeres que murieron por causas asociadas al embarazo, con mujeres que tuvieron partos seguros.*

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Resultados: *La tasa general de mortalidad materna fue de 1266 muertes maternas por cada 100 000 nacidos vivos. Las causas principales de muerte fueron: hipertensión (17.5%), infecciones obstétricas (14.3%), ruptura uterina (14.3%), anemia (12.7%) y complicaciones por VIH (9.5%). De las mujeres que murieron, 28.6% eran adolescentes y 14.3% estaban en su sexto parto (o por encima). En comparación con las mujeres de 20 a 24 años de edad, las de 25 a 29 años presentaban una probabilidad dos veces mayor de morir por causas relacionadas con el embarazo (HR: 2.34; CI: 1.07, 5.08;* p = *0.029). Una tendencia similar se halló también en las mujeres de 30 a 34 años de edad (HR: 2.26; CI: 1.02, 5.00;* p = *0.042).*

Conclusión: *Los hallazgos sugieren que la tasa de mortalidad maternal en la ciudad de Maroua, Camerún, es muy alta. Puesto que la mayor parte de las causas de muerte son prevenibles, proponemos que se revisen las estrategias actuales de maternidad y planificación de familia, a fin de reducir la tendencia actual. Tal estrategia permitiría a la ciudad de Maroua alcanzar las metas del Milenio para el 2015.*

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INTRODUCTION

In 1995, the maternal mortality rate (MMR) in Africa was reported by the WHO as varying between 360 and 1300 per 100 000 live births (1). At that time, the MMR for Cameroon was reported as 420 per 100 000 live births (2). In September 2000, the Heads of State of 191 countries promulgated the Millennium Declaration initiative. In the declaration, they affirmed the importance of freedom, peace, security, equality, tolerance, respect for nature, sharing of responsibilities, ensuring development and eliminating poverty throughout the planet and guaranteeing democracy and good governance. These sentiments were translated into eight practicable goals to be achieved by 2015. One of these goals was to improve maternal health by reducing pregnancy-related deaths by three-quarters (3).

Since 1915, the pregnancy-related mortality ratio has declined in the United States of America (USA) from 700 in 1915 to 7.8 pregnancy-related deaths per 100 000 live births in 1984 (4). Recently, maternal mortality ratios in France were reported to have reduced from 18 to 9 per 100 000 from 1989 to 1999 and these results were interpreted as a sign of improvement in care (5). Pregnancy-related mortality ratios in the North-Eastern USA and in countries such as Ireland, the Netherlands, Scandinavia and Switzerland have been reduced to between 4 and 5 per 100 000 live births (6). All these reductions in pregnancy-related deaths were attributed to improvements in maternal health services.

However, many researchers have described significant under-reporting of cases and have found the actual rate of pregnancy-related mortality to be between 39% and 112% (7–9). If these declarations were true, then the true pregnancy-related mortality ratio in Cameroon in 1995 would be between 584 and 890 per 100 000 live births. Under-reporting is possible in a country like Cameroon because MMR are compiled from provincial hospital reports and extrapolated to the entire country. However, since the middle of the first decade of this millennium, there have been no data on maternal mortality ratios (MMR) in Maroua, Cameroon. We therefore carried out this study in order to describe the risk factors for maternal mortality and to establish baseline data on maternal mortality ratios in Maroua, Cameroon.

SUBJECTS AND METHODS

Study design and setting

This was a descriptive and historical cohort study performed in the Provincial Hospital at Maroua, Cameroon. A retrospective study is not required to be submitted to the ethical board of the hospital. Cameroon is one of 17 African nations that got its independence in 1960. This country is situated at the Guinean Gulf in the Atlantic Ocean and covers a surface area of 475 440 square kilometres. Cameroon has about 16 million inhabitants of which about 51% are female. The Far North Province has a population of about three million and Maroua is the capital. It is one of the five most important towns in Cameroon.

Population

Data collection was performed from delivery room and death registers between 01/01/2003 and 31/12/2005. Deaths were identified from the maternal death register (n = 63). We selected cases of safe deliveries during the same period from delivery room registers (n = 4975). Each case of maternal death identified over the three-year period was matched with three controls that had safe deliveries. There was not always the situation where there could be up to three controls before a maternal death. Controls were matched on birth order and time of delivery with each case. The controls were selected from the first safe three deliveries following the identification of each case of maternal death during the study period, as they occurred in the delivery register. For the purpose of the estimation of maternal mortality ratio, the denominator considered was the total safe deliveries in the study period. In this study, only birthweights $ 1000g were considered because, in our setting, pregnancies that end with birthweights < 1000g were more likely to be classified as abortions. Such cases in this study would have tended to

increase the denominator and consequently reduced the MMR.

Variables

There is no centre for the registration of deaths in Maroua. Deaths are reported only for cases that occur in hospitals. Data on socio-demographic characteristics and disease patterns of the subjects in this study were obtained from the medical files. The hospital keeps different registers for recording deliveries and maternal deaths.

We collected information on the following variables: age at the time of death or delivery, marital status, number of previous births and number of antenatal care visits, using the software Excel. In this study, a maternal death was defined as the death of any woman from any cause while she was pregnant and up to forty-two days after termination of pregnancy, regardless of the length and site of pregnancy (*ie* intrauterine or ectopic). Deaths were classified as resulting from direct, indirect or unknown causes. The so-called unknown was used to identify any missing information about one variable of the woman. A direct maternal death was defined as a death that resulted during the management of a pregnancy condition, labour, delivery or postpartum. An indirect maternal death was defined as a case in which pregnancy exacerbated a pre-existing health condition.

Statistical analyses

The baseline characteristics of the two groups using the Chi-square test for heterogeneity were compared. We compared the causes of deaths and computed the maternal mortality ratio for the two groups using SPSS and Epi-info 6.0. Relative Risk (and not Odds Ratio) would seem to us the appropriate risk to have been calculated in a historical cohort study of this nature. Thus, the Hazard Ratio with 95% confidence interval was used to measure the effect of age on the risk of maternal death. The level of significance (p) was set at 0.05.

RESULTS

During the study period, we identified 63 maternal deaths and selected 171 controls. We found a slight decrease of MMR from 1407.5 in 2003 to 1322.6 in 2005 and an overall pregnancy-related mortality ratio of 1266.3 deaths per 100 000 live births (Table 1).

The majority of the pregnancy-related deaths (73.0%) were the direct results of complications during pregnancy. These included hypertension (17.5%), obstetric infections (14.3%), uterine rupture (14.3%), anaemia (12.7%), HIV complications (9.5%), Caesarean section (7.9%), post partum haemorrhage (3.2%) and malaria (6.3%) (Table 2).

Of the women who died, 28.6% were teenagers whilst 14.3% were having their sixth (or more) delivery. However, 46% of the deaths occurred in women having their first delivery (Table 3). Fourteen per cent of the maternal deaths occurred during the first six months of pregnancy (Table 3); 14.3% of the women who died were 20 to 24 years old compared to 32.7% who survived delivery in this age group (Table 3).

After 35 years, there were three (4.8%) deaths compared to 17 (10%) safe deliveries (Table 3). The 12 (19.0%) instances in which age was not recorded in this study were in the women who died (Table 3). Maternal age was significantly different between those who died and those who survived delivery ($p = 0.000$).

The marital status was not recorded in 10 (15.9%) of the women who died as compared to only two (1.2%) instances of the women who survived delivery. The majority of the women (94%) in this study were married: 51 (81%) among the dead and 169 (98.8%) among women who survived. The difference in proportion was statistically significantly different ($p = 0.000$).

Although there was a higher proportion of first delivery among women who died (46%) compared to among those

Table 1: The maternal mortality ratio in Maroua, Cameroon, from 2003 to 2005.

Year of the event	Total live births	Maternal deaths	MMR[a]
2003	1492	21	1407.5
2004	1744	19	1089.4
2005	1739	23	1322.6
Total	**4975**	**63**	**1266.3**

[a] = Maternal mortality estimated as death per 100 000 lives birth

Table 2: Causes of pregnancy related deaths

Causes of death	n	(%)
Direct causes	**46**	**73.0**
Hypertension	11	17.5
Obstetric infections	9	14.3
Uterine rupture	9	14.3
Anaemia	8	12.7
Caesarean section	5	7.9
Post partum haemorrhage	2	3.2
Abruptio placenta	2	3.2
Indirect causes	**14**	**22.2**
HIV complications	6	9.5
Malaria	4	6.3
Respiratory distress	2	3.2
Meningitis	2	3.2
Unknown	3	4.8
Total	**63**	**100.0**

n = number of death; % = percentage

Table 3: Characteristics of women according to the live status

Characteristics		Death				Total		*p*-value
		Yes n (%) n = 63		No n (%) n = 171		n (%) n = 234		
Age classes (years)								0.000**
	10–19	18	28.6	53	31.0	71	30.3	
	20–24	9	14.3	56	32.7	65	27.8	
	25–29	11	17.5	23	13.5	34	14.5	
	30–34	10	15.9	22	12.9	32	13.7	
	35–39	1	1.6	15	8.8	16	6.8	
	40–99	2	3.2	2	1.2	4	1.7	
	Unknown	12	19.0	–	–	12	5.1	
Marital status								
	Married	51	81.0	169	98.8	220	94.0	0.000**
	Not married	2	3.2	–	–	2	.9	
	Unknown	10	15.9	2	1.2	12	5.1	
Previous birth								
	0	29	46.0	70	40.9	99	42.3	0.519*
	1	7	11.1	33	19.3	40	17.1	
	2	5	7.9	20	11.7	25	10.7	
	3–4	9	14.3	22	12.9	31	13.2	
	5–8	11	17.5	24	14.0	35	15.0	
	Unknown	2	3.2	2	1.2	4	1.7	
Antenatal care attendance								
	No ANC	2	3.2	13	7.6	15	6.4	0.000**
	1–4 ANC	10	15.9	112	65.5	122	52.1	
	Unknown	51	81.0	46	26.9	97	41.5	
Age status of pregnancy at death								
	< 7 months	9	14.3	–	–	–	–	–
	$ 7 months	44	69.8	–	–	–	–	
	Unknown	10	15.9	–	–	–	–	

ANC = Antenatal Care

(40.9%) who survived, a higher proportion were having their sixth (or more) delivery among women who died (17.5%) compared to those (14%) who survived. The number of previous deliveries was not statistically different in the two groups ($p = 0.519$).

Among the women who died, only 2 (3.2%) and 10 (15.9%) respectively had 'no antenatal consultations and 'between 1 and 4 ANCs'; whilst only 13 (7.6%) and 112 (65.5%) of those who survived had respectively 'no ANC' or 'between 1 and 4 ANCs'. The ANC attendance status was 'unknown' in 41.5% of women in this study. Among those 137 women who attended for ANC and the appropriate statistics given, 12 (8.8%) were from those who died and 125 (91.2%) from those who survived. The number of antenatal consultations was statistically significantly different in the two study populations ($p = 0.000$) (Table 3).

The death of 44 (69.8%) of the women occurred when the pregnancy was > = 7 months. The gestational age at the time of death was not known in 10 (15.9%) cases. In comparison with women aged 20 to 24 years, those aged 25 to 29 years were more than twice as likely to die from pregnancy-related causes (HR: 2.34; CI: 1.07,5.08; $p = 0.029$); a similar observation was noted for those aged 30 to 34 years (HR: 2.26; CI: 1.02,5.00; $p = 0.042$). In comparison with women who had 3 to 4 previous deliveries, women with 5 to 8 deliveries were more likely to die from pregnancy-related causes, however there was no significant association

Table 4: Maternal mortality ratios by risk factor

Characteristics		Death		HR (95% CI)	*p*-value
		Yes	No		
Age classes (years)					
	20–24	9	56	1[a]	
	10–19	18	53	1.83 (0.89–3.78)	0.092*
	25–29	11	23	2.34 (1.07–5.08)	0.029**
	30–34	10	22	2.26 (1.02–5.00)	0.042**
Previous birth					
	3–4	9	22	1[a]	
	0	29	70	1.01 (0.54–1.89)	0.977*
	1	7	33	0.60 (0.25–1.44)	0.248*
	2	5	20	0.69 (0.26–1.80)	0.600*
	5–8	11	24	1.08 (0.52–2.26)	0.832*

CI = Confidence Interval, a = reference; *= $p > 0.05$; ** = $p < 0.05$

between MMR and parity in this study (HR: 1.08; CI: 0.52, 2.26; $p = 0.832$) (Tables 3, 4).

DISCUSSION

The mean pregnancy-related mortality ratio for Maroua from 2003 to 2005 appears to be much higher than the mean of 420 per 100 000 live births reported for the entire country of Cameroon ten years ago (2). The present study is hospital-based and is therefore likely to suffer from 'under-reporting biases'. Therefore, like other studies of this nature, our findings are likely to be under estimations (7– 9). The following are other possible explanations why the findings in this study are different from that of the rest of the country. The social and demographic characteristics of the population of Maroua are likely to be different from that of the rest of the country. Maroua is known as a very poor region of the country and it is uncommon to find women with social insurance and every woman has to pay the ANC and delivery fee from her own resources. Poverty, consequently, tends to favour delivery at home in Maroua. Maroua is close to the Northeast of the Republic of Nigeria and the Southwest of the Repulic of Tchad. Populations from these countries live in Maroua and surrounding areas. It is unusual for many of them to have regular occupation and financial support. The immigrant population from neighbouring countries could also influence the results of this study.

Although the MMR in this study is higher than the 800 per 100 000 live births reported for West Africa in one multicentre study, it is still lower than the 2989.2 per 100 000 live births reported recently in the Southwest of Niger (10,11).

WHO emphasizes that knowledge of MMR for any population is not enough; stressing that knowledge of the leading causes of death in a given population was also of paramount importance (12). Our study showed that 28.6% of maternal deaths in Maroua was among teenagers. This finding is similar to the 26.5% of teenager deliveries recently reported in the same unit (13). These findings suggest that efforts to reduce MMR in Maroua should target teenagers.

This study has also shown that women in their sixth delivery contributed to 17.5% of maternal deaths. Therefore intensification of Family Planning services that target this population of women could go a long way in reducing the overall MMR in Maroua, Cameroon.

Hypertension, obstetric infections, uterine rupture, anaemia, HIV complications and Caesarean section were found to be the six most frequent causes of pregnancy-related deaths in Maroua during the study period. These causes are also somewhat similar to those recently reported in a Nigerian study where the three leading causes of maternal deaths were hypertension, haemorrhage and sepsis (11). In another study in Senegal, infections, haemorrhage, eclampsia, ruptured uterus and anaemia were found to be leading causes of maternal mortality (14). In a hospital-based multicentre study involving several hospitals in some countries along the West African coast (Benin, Ivory Coast and Senegal) similar trends have also been reported (*ie* hypertension, haemorrhage and sepsis as leading causes of maternal deaths) (10).

In one New York study (1999), complications arising from ectopic pregnancies, embolism and hypertension were the most frequent causes of pregnancy-related deaths (15). Whether in Africa or in America, hypertension has always been found to be among the three leading causes of maternal mortality. Abortion and ectopic pregnancy were not found to constitute important causes of deaths in this study. However, it is possible that some deaths which were reported as due to either obstetric infections or anaemia could probably have been due to these conditions because 14.3% of pregnancy-related deaths occurred before seven months of pregnancy (Table 3).

This study did not feature deaths from anaesthetic causes. Nevertheless, it is possible that some deaths attributed to Caesarean sections could have been due to anaesthetic procedures.

We found that 14.3% of the women who died were 20 to 24 years old compared to 32.7% who survived delivery in this age group. We found also that about half of those women who died (46.0%) were nulliparous. Age greater than 30 years has also been found to be associated with a higher risk of pregnancy-related deaths (16, 17). The findings in our study are consistent with this observation. In addition, we found, in this study, that this risk increases with each five-year age grouping after 24 years.

In this study, there was no association between increasing parity and the risk of maternal death. This could probably be due to the fact that there was a small number of grand multiparous women in the study.

Some studies have shown that specific interventions like facility-based maternal death reviews have led to changes in organizational structure that improved life-saving by significantly decreasing by fifty per cent the overall mortality in a district hospital in Senegal (18).

One factor common to all these African studies and our own study is that the causes of maternal deaths were mostly preventable. We therefore recommend the adoption of a common evidence-based protocol, which will target these conditions during the antenatal period, during the delivery and in the post partum period in Maroua and the rest of the West African region in general. Moreover, according to the large number of 'unknown data' in this study, the Ministry of Public Health should introduce a national strategy for centralized reporting of maternal deaths.

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