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Original Research Article

Etiologies of Maternal Mortality at the Mother and Child Health Center in the Zinder Region

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Abstract: ***Introduction:*** The study of mortality allows for the monitoring and review of therapeutic measures in a health facility. Maternal death is a major concern in the world and constitutes a social tragedy. We present a study on the etiologies of maternal death in the mother and child health center in the Zinder region. ***Methodology***: This was a retrospective, descriptive study covering three years from January 1st, 2017 to December, 31st, 2019. The study was carried out at the mother and child health center in the Zinder region, the main regional referral site for obstetrics and gynecology. The objective was to determine the etiologies and epidemiological profile of deceased parturients. Patients admitted directly or evacuated from other health facilities and who died according to the definition of maternal death were included. Accidental and incidental deaths and those that did not meet the WHO framework were excluded. Data were collected from the admission register, the maternal death audit report and the patient file. The variables studied were epidemiological data, causes of death, mode of transport and length of stay of the patient. ***Results***: A total of three hundred and ninety-seven (397) files were retained out of 13874 admissions, including 7606 live births. The mortality rate was 2.86% and the maternal mortality ratio was 5219.56 per 100,000 live births. The average age was 26 years with extremes of 15 and 45 years. The 25-29 year old age group was the most affected with 23.92% (n=95). Large multiparous women (6-13 parities) were the majority with 28.21% (n=135). Most patients (87.15) were evacuated and transported medically in 92.77%. They were from rural areas in 72.83% (305). More than half, 81.86% (n=325) were uneducated. The pregnancy was not monitored in 84.39% (n=335 cases). Management was immediate, in less than one hour in 70.78% (281 cases) of patients. It was provided by the midwife alone in 34.50% (137 cases) versus 26.44% (105 cases) by the obstetric gynecologist. The main reason for admission was anemia in 43.35% (n=199) of cases. Aggravating factors at admission were anemia, altered consciousness and gestational hypertension in 42.82%, 42.06% and 35.01% respectively. Delay in consulting the doctor (more than 6 hours) was one of the causes in 15.86% (n= 63) of cases, followed by delay in taking charge (more than 6 hours) in 18.63% (n= 74) of cases. In terms of pathology, anemia, hemorrhage, eclampsia and infection were found as causes in 51.88% (n= 206), 23.92% (n= 95), 20.90% (n= 83) and 12.59% (n= 50) respectively. Almost half (51.39%) of the deaths occurred within the first 24 hours of admission. ***Conclusion:*** These results reveal the extent of the problem and its avoidable nature, which calls for action from all actors. Let us make sure that women no longer lose their lives while giving birth.

Keywords: Etiologies, maternal mortality, Zinder-Niger.

INTRODUCTION

Maternal death is defined as the death of a woman during pregnancy or within 42 days after its termination, regardless of its duration or location, from any cause determined or aggravated by the pregnancy or the care it prompted, but neither accidental nor fortuitous. "WHO, Geneva 1977. The death of a woman during pregnancy or childbirth is a human tragedy at the individual, family and social levels. The best way to assess the quality of care in a hospital environment is still to determine the mortality figures. This allows for monitoring and review of therapeutic measures. In developed countries, the maternal mortality rate is constantly decreasing, thanks to the modernisation of the infrastructure and the adequate training of personnel. While one in 4,700 women in rich countries

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is at risk of dying from pregnancy-related complications, in Africa one in 39 women is at risk. (3). In Africa, the probability of a 15-year-old girl dying from a pregnancy or childbirth-related complication during her lifetime is higher, reaching one over twenty-six (1/26).

What is the situation at the mother and child health center in the Zinder region? Thus we proposed to study the etiologies of death, the epidemiological profile of the patients and the factors likely to influence the mortality and morbidity of these patients.

General objective

To identify the causes of maternal death at the mother and child health centre in the Zinder region in order to improve therapeutic measures.

- **Specific objectives**
- Identify the epidemiological profile of the patients
- To identify the etiologies involved.
- To determine the frequency of maternal mortality during the study period.

PATIENTS AND METHODS

It was a retrospective, cross-sectional, descriptive study covering three (3) years from 1st January 2017 to 31st December 2019. The study was conducted at the mother and child health center in the Zinder region. It is the main referral center for obstetrics and gynaecology for the region but also for patients from the Diffa region and Northern Nigeria. The target population consisted of pregnant and postpartum women who died during the study period. Patients who died during the study period according to the WHO definition of maternal death were included. Accidental and incidental deaths and deaths outside the WHO definition were excluded. Data were collected from the admission register, the patient file and the maternal death audit report. The variables studied were age, occupation, gender, parity, mode of discharge, time to discharge, type of anaesthesia, ASA class, time to care, cause of death and length of stay. Data analysis was done with the computer tool Epi inf. We had used two methods: univariate which consists of analysing each variable and bivariate which consists of crossing the variables two by two.

RESULTS

During the study period, 13874 patients were admitted, 7606 live births and 397 maternal deaths were recorded. The maternal mortality rate was 2.86% with a maternal mortality ratio (MMR) of 5219.56 per 100 000 live births.

Table-I: Annual distribution of maternal mortality

Years	Admission	Live births	Maternal deaths	MMR/100 000
2017	4840	2313	134	5793,34
2018	4029	2538	150	5910,16
2019	5005	2755	113	4101,63
Total	**13874**	**7606**	**397**	**5219,56**

The highest MMR was recorded in 2018 with 5910.16 maternal deaths per 100,000 live births. The average age of the patients was 26 years with extremes of 15 and 45 years. Table II shows the distribution of patients by age group.

Table-II: Distribution of patients by age group

Age group (year)	Number	Percentage %
15 - 19	79	19,89
20 - 24	84	21,15
25 - 29	95	23,92
30 - 34	69	17,38
35 - 39	59	14,86
40 and plus	11	02,77
Total	**397**	**100,0**

The age group 25-29 years was the most victimised. The patients who were included in the study were not enrolled in school in 81,86% of case. Seventeen patients had an unspecifed level of edication.

Regarding their origin, most of the patients came from rural areas (76,83%). Multiparity was the most common cause of death. The average parity was 4 deliveries with extremes of 0 to 13. Figure 1 gives us the distribution of deceased patients according to parity.

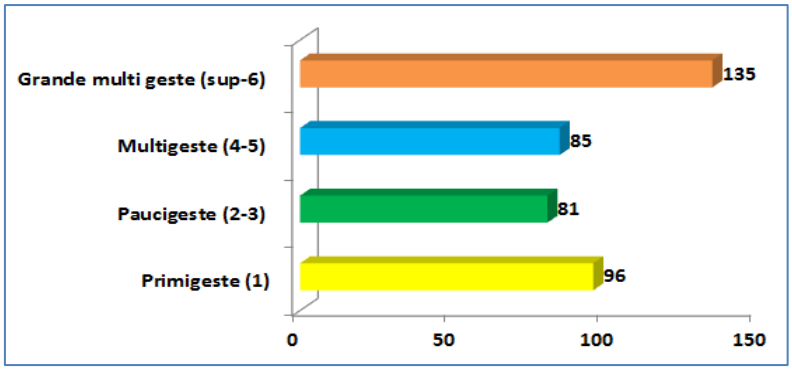

Fig-1: Distribution of deceased patients according to parity

Large multiparous represented 28.21% or 112 cases. Concerning the time bitwen admission and management, figure N°2 gives us more precise information.

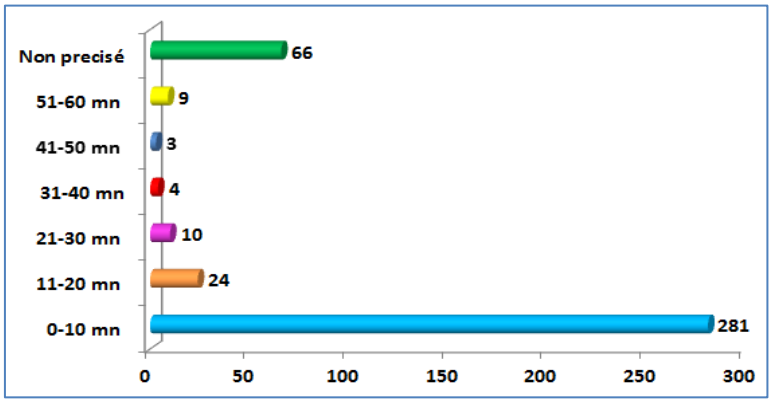

Fig-2: Time from admission to management)

The time taken between admission and management was 0 to 10 minutes in 70.78% or 281 patients. Regarding the mode of admission, 87,15% of patients had been referred by health centers in the area and even in neighbouring regions. Evacuation was medical in 92,77% of cases. The health district of Mirriah was the main source of patients with 31.98% or 127 patients followed by Zinder town with 21.15% or 84 cases. The reasons of admission are presented in table III.

Table-III: Reason for admission of patients

Reason	Numbers	Percentage %
Anemia	199	43,35
PES/Eclampsia	71	15,46
Haemorrhage	27	05,88
Infection	23	05,01
Better care	23	05,01
Dystocia	23	05,01
Delivery labour	21	04,57
Malaria	20	04,35
HRP	19	04,13
Scarred uterus	06	01,60
Placental retention	06	01,60
PP	06	01,60
APO	03	00,65
Uterine rupture	03	00,65
Abortion complication	03	00,65
Renal failure	02	00,43
Diabetes	01	00,21
Cervical tear	01	00,21
Asthma	01	00,21

Anemia was the main reason for admission in 43.35% or 199 patients. In 84.39% (335 patients) of cases the pregnancy was not followed up.

Table-IV: Time to admission - management by the obstetric gynaecologist.

Temps	Effectifs	Pourcentage %
0h - 1h	105	26,44
1h -2h	40	10,07
2h - 3h	20	05,03
3h - 4h	16	04,03
4h - 5h	09	02,26
5h - 6h	09	02,26
More than 6 hours	74	18,63
Not done	124	31,23
Total	**397**	**100,0**

Within the hour of admission only 26.44% or 105 patients were seen by an obstetrician gynaecologist and 31.23% (124 patients) had not been seen by the specialist at all.

Adequate care was provided in less than one hour in 29.97% of cases, i.e. 119 patients, and not at all in 74 patients, i.e. 18.63% of cases. Antibiotic therapy, hydroelectrolytic rehydration and oxygen therapy were used in 67.00%, 54.00% and 53.14% of cases respectively. The differnt indications for coesarean are shown in figue N°3.

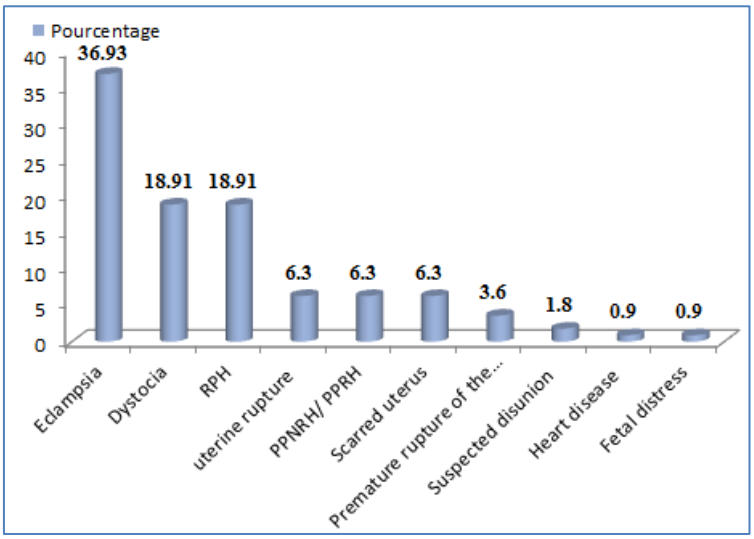

Fig-3: Distribution of patients according to indications for caesarean section.

Eclampsia was the main indication in 36.93% of cases, i.e. 41 patients. As for the fate of the design product, 44,97% were dead.

Several kind of complications were reported. These were: anemia (51,88%), eclampsia (20,90%), infection (10,07), RPH (09,82%), dystocia (06,20), malaria (05,54%), haemorrhage (04, 28), previa placenta (02,26%).

The causes of death of the patients were multiple : anemia (51,88%), eclampsia (20,90%), infection (12,59), RPH (09,06%), dystocia (06,29), malaria (05,54%), haemorrhage (10,32), previa placenta (02,26%). Severe anaemia was the main problem. More than half of the deaths were recorded in the postpartum period. In 137 cases, i.e. 34.50%, care was provided by the midwife alone.

DISCUSSION

During the study period, three hundred and ninety-seven (397) cases of maternal death were recorded out of 13874 patients admitted and 7606 live births, i.e. a maternal mortality rate of 2.86% and a maternal mortality ratio (MMR) of 5219.56 per 100,000 live births at the CSME of Zinder. Our results were superior to those of Abdoulahi Elhadj Y.A. [7] at the CSME of Diffa in 2017, of Toudou A.L. [30] at the CSME of Agadez in 2017, of Nayoussa I.A. [14] at the Issaka Gazoby maternity hospital in 2018 and Nayama [20] *et al*. in 2012 at the Issaka Gazoby maternity hospital with respectively 2788 per 100,000 NV; 2648.34 per 100,000 NV; 2831.37 per 100,000 NV and

2822.6 per 100,000 NV. On the other hand, our data were lower than those of Harouna M.D. [31] at the CSME of Tillabéry in 2018 with a rate of 5877.03 per 100,000 NV. The disparity in these rates can be explained by the number of people per region (Zinder is the most populated region in Niger), the level of education of the population and the number and quality of medical staff. Indeed, the Zinder region had only two obstetrician-gynaecologists until 2018. Developed countries had significantly lower maternal mortality rates than developing countries. France [32] recorded 10 per 100,000 NV; the UK 11.4 per 100,000 NV in 2007 - 2008; the Netherlands 13.2 per 100,000 NV [33]; the USA 7.5 per 100,000 NV and Finland 5.7 per 100,000 NV [34]. This was due to the material and human resources available in these rich countries. The health infrastructure, the quality of personnel, the quality and availability of emergency obstetric and neonatal care in developing countries explained this large gap in maternal mortality with developed countries. In Niger, the incidence was 520 deaths per 100,000 NV in 2015 [35]. In contrast, WHO [36] and WOAgri [37] recorded 680 deaths per 100,000 NV in 2001 and 211.1 deaths per 100,000 NV in 1995. Our high rate can be explained by the fact that the CSME received patients in a precarious clinical state. In addition, the precarious socio-economic conditions of the rural population in the region, the lack of empowerment of women to use health services, and the difficulty of accessing the health system in time for pregnant women. In our series the average age of the patients was 26 years with extremes of 15 and 45 years. The 25-29 age group was in the majority with 23.92%. The same observation has been made by some authors. Indeed Magagi A. *et al*. [38] in 2017 recorded 26.28 years, Toudou A.L. [30] in 2017 26 years, Akilou A.M. [39] in 2011 25.6 years and Nayoussa I.A. [14] en 2018 26.1 years. On the other hand, some teams recorded an average age lower than ours. This was the case of Harouna M.D. [31] in 2018, Nayama .M *et al*. [20] in 2001, Samahila N. [40] in 2017 with respectively 25 years, 24.6 years and 24 years. But Alassane M.M. [25] in 2017 and Traoré B. [41] in Segou, Mali in 2008 found 28 and 35.5 years respectively. We observed a predominance of 25-29 year olds. On the other hand, Abdoulahi Elhadj Y.A [7] and Alassane M.M. [25] recorded 25-39 years and 20-24 years respectively in 2017.

In the literature, the age of the mother is recognised as one of the factors most linked to maternal mortality. Indeed, according to WHO [42], extremes of age present increased risks of dystocia, gestational hypertension, iron deficiency anaemia and low birth weight. In Niger, and especially in the Zinder region, early motherhood reinforced this tragedy of maternal death. In our series 81.86% of patients were uneducated and 98.74% unemployed. Almost all the patients (99.49%) were married to low-income men in 78.87% of cases and lived in rural areas in 76.83% of cases. This explained the precariousness of our patients with limited financial means, limited access to information and an inability to pay for prescriptions on time. The primigravida represented 24.18% of cases, a higher rate than that of Toudou A.L. [30] in 2017 at the CSME of Agadez with 22.78%, of Alassane M.M. [25] in 2017 with 20.3%. This rate was lower than that of Magagi A. et Col [38] in 2017 at the CSME of Zinder with 25.86% and of Nayoussa I.A. [14] in 2018 at Gazoby with 26.11%. In our series, large multiparous women represented 28.21% and pauciparous women 20.15% of the deceased patients while nulliparous women.

We recorded 28.21% of large multiparous women, which was lower than that found by Idi N. and Col [43] at the Niamey CHR in 2017 with 48.5%, and Magagi A. and Col [38] at the Zinder CSME in 2017 with 46.55%. But it was higher than that of Aminou H.I. [44] and Samahila N. [40] with respectively 14.40% and 19.08% of cases. For the WHO, high multiparity constituted a risk of maternal mortality and morbidity due to exposure to dystocia, obstetric haemorrhage and hypertensive diseases. Primiparity was a negative factor because of pregnancy toxaemia and eclampsia. The lifestyle, early motherhood and lack of family planning also contributed to the increase in maternal death. In our series, 84.38% of patients did not have a pregnancy follow-up. Only 19.35% of the patients had performed 04 ANC. Our figures were close to those of Abdoulahi Elhadj.Y.A with 82.55 % of pregnancies not followed up and only 03.85 % of patients performed 04 ANC. On the other hand, our data were higher than those obtained by Harouna M.D. [31] with 40% of unattended pregnancies and 12.31% for the 04 ANC. Most of the patients, 76.82%, lived in rural areas. We recorded other factors leading to death. Thus, anaemia was observed in 42.82% of those admitted, deterioration of general condition in 40.06%, early age (< 19 years) in 19.89%. High multiparity accounted for 28.21% and 06.04% of haemorrhage on admission. Blood pressure was high (> 140/90 mmHg) in 19.39% of patients. Tachycardia (pulse between 120 and 170) was observed in 35.01% of patients. Proteinuria at three +++ was observed in 07.30% of patients (29 cases). In our study 51.39% of deaths were recorded within 24 hours of admission and 13.84% within 72 hours. Our results were similar to those recorded by Nayoussa I.A. [3] with 52.86% of deaths 24 hours after admission, but higher than those of Alassane M.M. [25] with 49.19%.

Our data were lower than those of Abdoulahi Elhadji Y.A [7] with 98.66% of deaths within 24 hours and those of Harouna M.D. [31] with 60% of deaths within one day. This death can be explained by the delay in consulting a doctor, the geographical inaccessibility of health facilities and the lack of financial means. In our study, 31.23% of the patients were not examined by a gynaeco-obstetrician. Appropriate management was instituted in less than one

hour after admission in 29.97% of patients. In 34.50% of cases, the midwife was responsible for the management. Delivery without medical assistance (at home) was recorded in 29.50% of patients and in 6223% in a health facility. Caesarean section was used in 63.75% of cases and laparotomy for uterine rupture in 02.32% of cases. The main indications for caesarean section were pre-eclampsia/eclampsia (36.93%), RPH and dystocia in 18.91% of cases each. Deaths occurred in the postpartum period in 70.02% of cases. This rate was clearly higher than those found by Alassane M.M. [25] and Abdoulahi Elhadji Y.A. [7] with respectively 20.32% and 36.16%, but lower than those of Toudou A.L. [30] and Mahamane N [45] with respectively 77.22% and 73.60% of cases. In our study, direct obstetrical causes represented 92.85%, dominated by severe anaemia (51.88%), haemorrhage (23.92%), eclampsia (20.90%), infections (12.59%), dystocia (06.29%) and malaria (05.54%). Our anaemia rate was lower than that of Saizanou and Col [46] in Benin with 58.3%, but higher than those of Abdoulahi Ehadji Y.A. [7] and Alassane M. [25] with respectively 20.83% and 25% of cases. According to the WHO [36] and the MOMA group [37] in Sub-Saharan Africa, half of women suffer from nutritional anaemia, and 10% of anaemias are linked to folate and iron deficiency. Parasitosis and chronic haemorrhage following closely spaced pregnancies do not allow reserves to be replenished. Haemorrhage remains the leading cause of maternal death in developing countries [48] and in developed countries. It represented 23.92% in our series, a lower figure than that recorded by Toudou A.L. [30] with 26.47% of cases. Among the haemorrhagic causes, postpartum haemorrhage was in first place with 43.15%, followed by PRH with 41.05%, whereas for the team of Nayama and Col [20], PRH and uterine rupture were predominant with 26.7% of cases respectively. For Traore B. and Col [41], uterine rupture and haemorrhage were predominant with respectively 15.9% and 13%. The delay in evacuation appears here to be the key element in these cases.

For Traore B. and Col [41], uterine rupture and haemorrhage predominated with 15.9% and 13% respectively. The delay in evacuation appears here to be the key element in these causes of death by haemorrhage, thus favouring certain complications such as coagulation disorders. We recorded 20.90% of cases of eclampsia, but Samahila N. [40], Halilou S. [49] and Akilou A.M observed respectively 12.23%, 11.82% and 12.56% of cases. The MOMA group survey noted 0.4% in Abidjan and 08.8% in Saint-Louis [37]. Maternal mortality due to eclampsia is tending to disappear in developed countries due to rigorous surveillance and adequate treatment [50]. Infections were observed in 12.59% of patients. This rate was lower than that of Hassane A.N. [1] with 14.73% and Toudou A.L. [30] with 20.58% of cases.

CONCLUSION

Maternal mortality is still a tragedy that poses a public health problem despite the many efforts made by the state in Niger and in particular in the Zinder region. The failure to monitor pregnancies, the poor quality of care, the delay in care and the inadequacy of equipment and personnel in terms of quality and quantity were the determining factors in the occurrence of deaths at the mother and child health centre in the Zinder region. The maternal mortality ratio is high, indicating dysfunction. These results reveal the extent of the problem and its avoidable nature, which calls for action from all actors. So should we continue to record maternal deaths when we had the means to do so? Let us make sure that women no longer lose their lives while giving birth.

Conflicts of Interest

The authors declare no conflict of interest.

Authors' contributions

All authors contributed to the development of this study and declare that they have read and approved this manuscript.

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