

Analysis of Maternal Mortality at the Maradi Maternal and Child Health Center/Niger: About 379 Cases

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Abstract

Introduction: Pregnancy, childbirth, and their consequences continue to be the leading cause of death, illness, and disability among women of reproductive age in developing countries. In Niger, maternal deaths account for about 39% of all deaths of women aged 15-49. Our aim was to identify the factors linked to maternal mortality in order to contribute to its reduction. Method: this is a descriptive retrospective study of 379 cases of maternal deaths collected at the Maradi CSME from January 1, 2018, to December 31, 2021.Results: Our study's maternal mortality ratio is 2645.72 per 100,000 live births. The mean age of our patients was 27.46 years, with extremes ranging from 15 to 47 years. The 20-24 age group was the most represented, with 88 cases (23.2%). Housewives were 361 (95.3%), and 334 patients (88.1%) were uneducated. There were 261 of them from rural areas, i.e. 69%. The mean parity in our study was 3.46, with extremes ranging from 0 to 15. Multiparous patients 117 cases (30.9%) represented the most significant proportion. Only 42 patients (11.08%) had performed four or more antenatal consultations. Direct obstetric causes accounted for 56.73% of the causes of maternal death. Anemia was the leading cause of maternal death (31.66%). Nearly half of the patients had died before 24 hours after admission, i.e. 49.86%. Conclusion: Maternal mortality remains a significant challenge for developing countries, given its magnitude and timid decline. The fight to reduce maternal mortality must be the priority of our countries' health policies.

Keywords

Maternal Mortality, CSME, Maradi, Anemia

1. Introduction

Maternal mortality has a significant impact on women and their families annually. According to the WHO, approximately 287,000 women died during or after pregnancy or childbirth in 2020 [1]. Sub-Saharan Africa accounted for about 70% of maternal deaths worldwide in 2020, followed by Central and South Asia with nearly 17% [2]. Niger, a country in sub-Saharan Africa, is classified as one of the countries with a very high maternal mortality ratio (MMR). This rate was 594 in 2010, 491 in 2015, and 441 per 100,000 live births (LB) in 2020 [2]. To address this issue and achieve the Sustainable Development Goals, Niger has implemented various policies, programs, and training initiatives. One of these initiatives involves the continued surveillance of maternal deaths in health facilities, established by Order No. 296/MSP/DGSR/ DSME of August 2, 2013, which created the National Multidisciplinary Committee for the Review, Surveillance, and Response of Maternal Deaths. This study will contribute to the national strategy to reduce maternal deaths in Niger by examining maternal deaths at the Maradi CSME, a second-level reference center.

2. Patients and Methods

We conducted a retrospective descriptive study at the Maradi Mother and Child Health Center (CSME) from January 1, 2018, to December 31, 2021. All maternal deaths that met the WHO definition during the study period were included. Also included were patients who died during evacuations, on admission to the department, and deaths whose records are incomplete. Also, the newborns of deceased patients were included. Patients who died of gynecological causes were not included in the study. We developed a data collection sheet with all the variables studied. Data collection was done using individual survey sheets completed from obstetric records. Thus, the variables examined are sociodemographic data, diagnostic and therapeutic modalities, mode of delivery, time between admission and death, cause of death, and perinatal prognosis. The data collected in this way was entered and processed using Sphinx plus² version 5.1.0.4, Excel 2016, and Word 2016.

Constraints and Limitations

In the course of this work, we were confronted with the absence of certain information in the files.

3 Results

3.1. Prevalence of Maternal Mortality

During the study period, 14325 live births were registered at the Maradi CSME, and 379 cases of maternal deaths were noted. The maternal mortality ratio (MMR)

was 2645.72 per 100,000 live births (LB).

3.2. Annual Evolution of the Maternal Mortality Rate in the Maradi CSME

Figure 1 shows that the highest rate was observed in 2019 with 3505.22 maternal deaths per 100,000 LB.





3.3. Epidemiological Aspects of Patients

Socio-demographic aspects	N	%
Age		
15 - 19	66	17.4
20 - 24	88	23.2
25 - 29	67	17.6
30 - 34	75	20
35 - 39	59	15.5
≥40	24	6.3
Profession		
Housewife	361	95.3
Official	12	3.2
Students	4	1
Tailor	2	0.5
Level of education		
Uneducated	334	88.1
Elementary level	16	4.2
Secondary level	26	6.9
Higher level	3	0.8
Origin		

 Table 1. Distribution according to sociodemographic aspects.

Continued		
Rural	261	69
Urban	118	31
Parity		
Nulliparous (0)	70	18.5
Primiparous (1)	52	13.7
Pauciparous (2-3)	71	18.7
Multiparous (4-5)	69	18.2
Grand multiparous (≥6)	117	30.9
Number of prenatal consultations		
No	171	45.12
1-3	166	43.80
≥4	42	11.08

The mean age of the patients was 27.46 years, with extremes of 15 and 47 years. The 20-24 age group was the most represented with 88 cases (23.2%), followed by the 30-34 age group with 75 cases (20%). Housewives were 361 (95.3%), and 334 patients (88.1%) were uneducated. There were 261 of them from rural areas, i.e. 69%. The mean parity in our study was 3.46, with extremes ranging from 0 to 15. Grand multiparous cases (117 cases) (30.9%) accounted for the most significant proportion, followed by pauciparous cases (71 cases (18.7%). Only 42 patients (11.08%) had performed four or more Prenatal Consultations, and 171 patients (45.12%) had not performed any prenatal consultations (**Table 1**).

Table 2. Distribution by area of origin of patients.

Area of origin	Distance in kilometers (km)	Ν	%
Commune urbaine	4.4	118	31.13
Guidan roumdji	50.44	68	17.94
Madarounfa	35.3	52	13.72
Dakoro	120	36	9.50
Aguié	77.3	26	6.86
Bermo	164	24	6.33
Mayahi	95.6	23	6.07
Tessaoua	122	20	5.28
Gazaoua	92.4	12	3.17
Total		379	100

Table 2 shows that the average distance covered per area is 84.6 kilometers(km) with extremes ranging from 4.4 to 164 km.

3.4. Clinical Features

In this study, 363 patients (95.8%) were referred. The means of transport used was

the ambulance in 85.8% of cases, i.e. 325 patients. 225 patients (59.4%) were admitted with an altered general condition, and 229 had pale conjunctivae (60.40%). Compared to the history, 369 patients (97.36%) had no medical history.

3.5. Period of Death

Table 3. Distribution by period of death.

Period of death	Ν	%
Antepartum	92	24.27
Peripartum	17	4.48
Postpartum	264	69.65
Post-abortion	6	1.60

Table 3 shows that 264 deaths (69.65%) occurred in the post-partum period, 92patients (24.27%) died ante-partum and 17 (4.48%) per-partum.

3.6. Mode of Delivery of Patients Who Died Postpartum

Mode of delivery			
Vaginal delivery	148	56.06	
Caesarean section	107	40.53	
Laparotomy	9	3.41	
Main indications for caesarean sections			
Eclampsia	52	48.60	
Retroplacental hematoma	26	24.30	
Dystocia	10	9.35	
Severe pre-eclampsia	5	4.67	
Other	14	13.08	
Perinatal prognosis			
Living	218	78.41	
Stillborn	49	17.63	
Neonatal deaths	11	3.96	

Table 4. Mode of delivery, and perinatal prognosis.

Of the 264 postpartum women who died in the postpartum period, 148 (56.06%) had given birth vaginally, 107 (40.53%) had undergone a caesarean section. The main indications for these cesarean sections were dominated by eclampsia (48.60%), retroplacental hematoma (24.30%), and dystocia (9.35%). The table above also shows us that 218 newborns (78.41%) were taken out alive, 49 newborns (17.63%) were stillborn, 11 newborns (3.96%) died after birth (**Table 4**).

3.7. Causes of Maternal Deaths

Figure 2 below shows that 215 cases (56.73%) of deaths were related to direct obstetric causes, and 164 cases (43.27%) were related to indirect causes.



Figure 2. Distribution of patients by cause of maternal death.

Direct causes	Ν	%	
Severe pre-eclampsia/Eclampsia	73	19.26	
Postpartum bleeding	36	9.5	
Puerperal infections	62	16.36	
Retro placental hematoma	20	5.28	
Uterine rupture	9	2.37	
Abortion	5	1.32	
Postpartum heart disease	5	1.32	
Placenta previa	4	1.05	
Ectopic pregnancy	1	0.26	
Indirect Causes			
Anemia	120	31.66	
Malaria	35	9.24	
Sickle-cell anemia	2	0.53	
Rapid hepatitis B	4	1.06	
Diabetes	2	0.53	
Asthma	1	0.26	
TOTAL	379	100	

As shown in Table 5, direct causes of maternal mortalities were predominantly

hemorrhage with 75 cases (19.79%), followed by hypertensive states with 73 cases (19.26%) and puerperal infections with 62 cases (16.36%). Indirect causes included anemia with 120 cases (31.66%), followed by malaria with 35 cases (9.24%).

3.8. Period of Stay before Death

Time to death	Ν	%
On arrival	11	2.90
Less than6 h	107	28.23
6 - 24 h	71	18.73
More than 24 h	190	50.14
Total	379	100

Table 6. Distribution of patients by time from admission to death.

Nearly half of the patients had died before 24 hours after admission, i.e. 49.86% (Table 6).

4. Discussions

4.1. Frequency

Our study's maternal mortality rate was 2645.72 per 100,000 live births (LB). Similar studies carried out in Niger a few years ago found rates of 3063.3 [3] and 3713.53 [4] per 100,000 live births, respectively. These very high intra-hospital rates reflect a national situation where national trends have remained high for several years. According to the WHO, it had risen from 491 deaths per 100,000 NV in 2015 to 441 deaths per 100,000 NV in 2020 [2]. Sujani Kempaiah and Coll. in India [5] in 2021 had found a mortality rate of 432.73 per 100,000 NV in their study, and Ketevi Ameya all in Togo [6] in 2023 had reported a rate of 555 deaths per 100,000 NV. We can explain our very high result because it is the only reference center that received all obstetric emergencies, often in deplorable conditions. This result further demonstrates the distortion between sub-Saharan and other countries in terms of maternal mortality. Elsewhere, Badis Bougali and all in Algeria [7] reported a maternal mortality rate of 101.3 deaths per 100,000 live births. According to the WHO, in 2020, sub-Saharan Africa was the only region with a very high maternal mortality ratio, estimated at 545 maternal deaths per 100,000 live births (uncertainty range 477 to 654) [2].

4.2. Socio-Demographic Characteristics

In our series, the average age was 27.46 years, with extremes ranging from 15 to 47 years. It was 28.22 years, with extremes ranging from 15 to 44 years in the series reported by Fomulu *et al.* [8] in Cameroon. The average age in our study is lower than those of Philémon in the DRC [9] and Traoré in Ségou [10], which found respectively 33 and 35.5 years old. This result is comparable to those of Garba M

and Traoré, which reported 25% for the 20-24 age group and 26.1% for the 20-25 age group, respectively. In the series by Hansda J et al. in India [11], in 2021, the most affected age group was 20 - 29 years old, with 59.7%. In our series, 95.3% of the patients who died were housewives, and 88.1% were uneducated. Housewives and uneducated women often lack income and depend financially on their husbands. This situation makes them vulnerable to decision-making about their health because they cannot afford the health costs. This socioeconomic aspect was reported in the Fomulu series, where 74.8% of the deceased patients were unemployed, and 64.08% had a level of education less than or equal to primary school [8]. In the Hansda J series [11], 83.58% of the patients had a low socioeconomic status. The low socioeconomic level may be a contributing factor to maternal deaths, as it is women who have the most difficulty in consulting in time, thus aggravating their health status before any contact with the care teams. To this can be added the distance traveled by these women because 69% of these victims came from rural areas in our series. The most significant proportion of victims were large multiparous (30.9%), followed by pauci-parous (18.7%) and multiparous (18.2). It is a factor often linked to lifestyle, habits, and tradition. Several African studies indicate that the incidence of maternal mortality increases as we move from pauciparity to multiparity and from multiparity to great multiparity [9]. The greater incidence of large multiparous women in our series can also be explained by the pro-natalist context in the Maradi region, whose fertility rate per woman is the highest in Niger, at 7.1 during the study period. Also, large multiparous women are more predisposed to parturition and postpartum hemorrhages [12] [13], which are among the leading direct causes of maternal death [9]—some authors such as Grover et al. In the PUNJAB in India [14], in 2023, there was a predominance of maternal deaths of multiparous women in their series compared to parities.

4.3. Periods of Maternal Deaths

In our studies, 69.65% of patients died in the postpartum period. Our result is higher than those of Garba M. *et al.* [4] and Philemon *et al.* [9] who found 60.1% and 58.88% of patients died in the postpartum period, respectively. Of these patients who died postpartum, 148 had given birth vaginally (56.06%) and 107 (40.53%) had given birth by caesarean section. The main causes of caesarean sections were eclampsia (48.60%), followed by retroplacental hematoma (24.30%). Laparotomy was performed in 9 patients (3.41%). Authors had reported higher rates of caesarean section among deceased patients ranging from 63.8% [15] to 66% [7]. But the link between caesarean delivery and the increased risk of maternal mortality compared to vaginal delivery had not been established. This high rate of caesarean sections is related to the severity of the maternal condition following the pathology that caused the death. In our series, a high percentage of women (24.27%) died during the antepartum period. This situation could be attributed to various factors, including delayed care-seeking, living in remote areas,

and lack of awareness.

4.4. Causes of Death

In our study, direct causes accounted for 56.73% of deaths, which is lower than the rates reported by Garba and Coll [4] and Badis Foughali [7], who found 62% and 75.4% respectively. The WHO's database for the period 2000 to 2020 shows that 75% of maternal deaths were due to direct causes. In developed countries with improved management of obstetric complications, maternal mortality has shown an increase in deaths from indirect causes compared to direct causes [7]. For example, in the UK, deaths from indirect causes (56.4%) exceeded those from direct causes (47.3%) [16]. The predominance of direct causes of maternal death in our study reflects sub-optimal management of obstetric complications in developing countries. Our analysis of the causes of death in our cohort shows a predominance of bleeding (19.78%), followed by hypertensive states (19.26%). These results are consistent with other studies that also found bleeding to be the primary direct cause of maternal death [4] [7] [17]. In our study, indirect causes accounted for a high percentage (43.27%) of maternal deaths, with anemia being the dominant cause at 31.66%, followed by malaria at 9.24%. The prevalence of anemia in our study can be attributed to the low socio-economic status and inadequate diet of the population, leading to chronic anemia during pregnancy. This anemia often results from undiagnosed bleeding, included in the anemia count at the time of death. Additionally, Niger is a country where malaria is endemic, with multiple consequences during pregnancy, including anemia. Regarding the length of stay before death, our study found that 49.86% of maternal deaths occurred within 24 hours of admission. This high rate can be attributed to the patients' advanced deterioration upon reaching the referral center. This situation results from the oftencircuitous patient journey, referral conditions, and especially the delay in seeking healthcare. Several authors have also reported the short time frame between admission and death, with very high proportions of fatalities (sources: [4] [11] [14]). In our series, 69% of our patients came from rural areas and the distances covered by all patients varied from 4.4 to 164 km with an average distance of 84.6 km. This long circuit travelled by our patients before coming to the reference center could be a contributing factor in maternal deaths and also in the high proportion of deaths within 24 hours of admission.

5. Conclusion

Maternal mortality remains a significant challenge for developing countries in view of its magnitude and its timid decline. Many efforts and efficient strategies must be made to reduce the number of patients in the circuit and increase their chance of survival after each referral. This requires adequate awareness at the community level and quality prenatal consultation to reduce the decision-making time to consult health services. Reference conditions should also be improved by strengthening agents' skills, providing ambulances at all levels, and improving the state of the roads and the technical platform of our reference services.

Conflict of Interest

The authors declare no conflict of interest in relation to the publication of this article.

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