

Original Research Article

A Review of Maternal Deaths at Douala General Hospital, Cameroon: the Referral System and other Contributing Factors.

Abstract

One of the objectives of the fifth Millennium Development Goal [MGD] is to decrease annually by 5.5% the maternal mortality so as to attain a three- quarter's reduction of the world's burden by the year 2015. The health care referral system has been shown to play an important role if this objective is to be attained. The aim of this study was to evaluate the referral system and other contributing factors to maternal deaths. This was a retrospective, descriptive study carried out in the Douala General Hospital, a tertiary referral hospital in Douala, Cameroon. The records of cases of maternal deaths that occurred between 1st January, 2002 and 31st December, 2011 were reviewed. Patients who died on arrival at the hospital were excluded from the study. Data was collected using pre-structured questionnaire and analyzed with EPI-Info version 3.5.1. There were 25 maternal deaths during this period with a maternal mortality ratio of 275 per 100.000 live births. Sixteen (64%) maternal deaths were referred cases from; government health institutions 4 (25%) and private 12 (75%) hospitals in Douala. Most of the patients were between 30-40 years 12 (48%), married 17 (68%), primigravida 12 (48%). The triad of hemorrhage 12 (48%), hypertensive disease in pregnancy 10 (40%) and infection 3 (12%) was responsible for the maternal deaths. Using two indicators to evaluate the referral system, it was observed that only 3 (18, 8%) exploited the referral information system and barely 4(25 %) were transported to the hospital by an ambulance. Maternal mortality remains high in our setting. Most of the causes of maternal death are due to direct obstetric causes which are preventable. The role of referral system in providing health care is poor. Therefore, this aspect of providing health care has to be properly implemented if it is to make an impact in reducing maternal morbidity and mortality.

Key words; Referral system, maternal mortality ratio, Douala General Hospital, Cameroun.

1. Introduction

Maternal deaths and disabilities are leading contributors in women's disease burden with an estimated 275,000 women dying each year in childbirth and pregnancy worldwide [1]. These deaths and morbidities can be attributable to factors that occur separately or in combination [2].

31 In Cameroon, the maternal mortality ratios were 669 and 690 per 100.000 live births in 2004 and
 32 2010 respectively [3, 4]. This evolution of maternal mortality ratio in Cameroon doesn't tie with the
 33 programs at the national level and worldwide in view of decreasing maternal deaths [5].
 34 It has been shown that a substantial reduction of the maternal mortality can be achieved by
 35 implementing a good system of referral in the provision of health care [6]. However, the existence
 36 and follow-up of the effectiveness of a system of this nature with its prerequisites remains a
 37 challenge in a low income country like Cameroon. The aim of this study was to have an overview in
 38 every case of a maternal death that occurred during the period of study, the contributory role of the
 39 referral system and other factors.

40 **2. Methods**

41 **2.1 Study Area**

42 This was a retrospective descriptive study that reviewed cases of maternal death that occurred
 43 between 1st January, 2002 and 31st December, 2011 in the Douala General Hospital (DGH),
 44 Cameroon. This tertiary hospital serves as a referral centre for Douala with a population 3 million
 45 and the Central African sub Region. It has facilities and trained personnel for critically ill patients.
 46 It's Obstetric and Gynaecology department has 6 obstetrician-gynaecologists, a 40 bed capacity, two
 47 surgical theatres with an average of 1100 deliveries annually.

48 **2.2 Data collection and Management**

49 All registers of the obstetrics and gynaecology, intensive care, general and emergencies services of
 50 the DGH were reviewed and cases notes of maternal deaths were identified in the archives. Those
 51 that fulfilled the recruitment criteria were subsequently considered for review. Case files of patients
 52 who died on arrival at the emergency department were excluded.

53 From the files obtained from the aforementioned services that fulfilled the inclusion criteria, data
 54 were collected using a pretested structured questionnaire. Information was obtained on the
 55 following variables; socio-demographic characteristics, follow-up of pregnancy, sequence of the
 56 events and actions preceding the death and probable cause(s) of maternal death. Furthermore,
 57 information was also obtained on the modes and conditions of transfer of the patients referred to the
 58 hospital, continuation of management of the condition that prompted referral and content of referral
 59 letter when available

60 The data were entered using EPI Info version 3.5.1 (CDC/WHO, Atlanta, USA) and systematically
 61 checked for errors during data entry by using legal values and specified ranges in Epi-info. In

62 addition, 50% of the questionnaires were doubled-checked by a co-investigator, different from the
63 original data entry person. Prior to proper analysis, the frequencies and ranges of every variable
64 were verified for consistency with the study population. Three maternal deaths that occurred before
65 arrival of the patients at the emergency service were excluded from analysis. Data were analyzed
66 with EPI info version 3.5.1. For descriptive analysis of socio-demographic data quantitative
67 variables were summaries by means and standard deviations, categorical ones by proportions.

68 **2.3 Limitation of Study**

69 This being a retrospective study meant that important information on the causes of maternal death
70 were missing in some case files. The small number of maternal deaths did not permit an exhaustive
71 review or a comparative analysis between the referred and non-referred patients to help elucidate
72 whether the cause of death was linked mainly to referral and not to contributory factors like
73 management protocols in the hospital.

74

75 **3 Results**

76 **3.1 Maternal Mortality**

77 During the study period, there were 9104 live births in DGH. Twenty-five maternal deaths occurred
78 during the same period giving a maternal mortality ratio of 275 per 100, 000 live births. There was
79 much variability in the annual maternal death toll, no maternal death occurred in 2007. The
80 maximum number of maternal deaths was recorded in 2010 (**Figure 1**).

81 **3.2 Socio-Demographic and Obstetric characteristics**

82 Seventeen (68%) patients were married women. Concerning the level of education, 21 (84%) of the
83 women had at least a secondary level and none of the patients was illiterate. The age group of 30-40
84 years recorded 12 (48%) maternal deaths. Nine (36%) deceased patients' initial treatment was pre-
85 financed by the hospital. Other socio-demographic characteristics are shown in (**Table 2**).

86 The majority of the patients 12 (48%) were at their first pregnancy. Nine (36%) of the twelve
87 nulliparous patients had intrauterine foetal death during current pregnancy. The two others died
88 from abortion related complications. Fourteen (56%) reviewed left orphans (**Table 2**).

89 Two patients (8%) had pneumonia and pyelonephritis during their present pregnancy. Six (12%) of
90 the deceased patients were Rhesus negative. Twenty-two (88%) maternal deaths occurred during the
91 third trimester of pregnancies.

92 **3.3 Causes of Maternal Deaths**

93 The causes of maternal mortality in the DGH were haemorrhage 12(48%), complications of
94 hypertensive diseases in pregnancy 10 (40%) and infections 3 (12%) (**Figure 2** and **Table 3**).

95 Among those patients who died as a result of haemorrhage, 6 (50%) had a coagulopathy secondary
96 to PPH and abruptio placenta, while 6 (50%) others were due uterine atony 2 (16.7%), retention of
97 placenta secondary to placenta accreta and on a molar pregnancy 2 (16.7%), uterine rupture 1(8.3)
98 and placenta praevia 1(8, 3%). Eight of the twenty five cases died of renal insufficiency after
99 eclampsia.

100 **3.4 Referral of Patients**

101 Sixteen (64%) of the deceased patients had been referred by other health institutions in Douala or
102 from the neighbouring cities (**Table 2**). Of the 16 referred patients, three were from government
103 health institutions, 13 from 9 private health facilities among which five were authorized health
104 facilities and 4 unauthorized at the level of the health districts concerned.

105 Of the 14 referred patients who had prenatal consultations, 6(42.9%) were by nurses. The majority
106 however, had their antenatal visits and evaluation in health centres or clinics. Nine patients (64.3%)
107 did not undergo the minimum of the four antenatal evaluations recommended by W.H.O (**Table 4**).
108 One patient had been referred for a high risk pregnancy; the others were all emergency referrals
109 (**Table 4**).

110 Twelve (75%) of the referred patients had not been transferred to the Douala General hospital by
111 ambulance. Furthermore, none of the patients received any form of treatment during their transfers
112 even the 4 (25%) that were transported by ambulance (**Table 5**).

113 **3.5 Delay in referral, management on arrival and between arrival to death.**

114 Seven patients (43.8%) out of 16 arrived the DGH in the first 6 hours from the moment the decision
115 for referral was made, 7 (43.8%) others arrived between the sixth hour and the twenty fourth, while
116 2 (12.4%) arrived after 24 hours.

117 All the deceased patients were treated on arrival as there are no financial barriers as a prerequisite
118 for treatment in cases of emergencies in DGH. Eight (50%) maternal deaths occurred beyond
119 24hours after admission of the patients in one of the aforementioned services after referral.

120 Four of the six indicators used to assess the efficiency of the referral system (initial communication,
121 adequacy of the initial management, existence of the letters of counter referral and monitoring of the

referring structures) were not exploited by the referring health facilities and the DGH. For the two other indicators used, only 3 (18, 8%) exploited the information available before referral while only 4 (25%) used the ambulance services. (Table 5).

4. Discussion

4.1 Maternal Deaths

The maternal mortality ratio (MMR) was 275 per 100,000 live births in DGH. This ratio is lower than those found during the demographic health surveys of 2004 and 2011 where maternal mortality ratio were 669 and 876 per 100,000 live births respectively [3, 7]. Most maternal deaths in our study population occurred in 2010 (MMR of 507 per 100,000 live births) but this figure remains lower than those cited in recent studies in Cameroon [8-10]. Our MMR are also lower than those obtained in similar tertiary hospitals in Cameroon and other African countries [11, 12]. However, a long strive has to be made when MMR in our setting is compared with that documented in Egypt. This country is now considered an African model concerning the fight against maternal mortality with a ratio of 45/100,000 live births in 2008 [3].

The years 2007 and 2010 are peculiar in our study because the MMR reached its peak (507/100,000 live births) during this period. A possible explanation for this marked increase in the MMR, was the drastic drop in the number of anaesthetists and specialists in emergency medicine who left the hospital for academic or administrative reasons. Since most of the patients who had severe complications in pregnancy or in the immediate postpartum period were managed in the intensive care unit, it can be readily understood why the lack of trained staff during this period resulted in an increase MMR.

4.2 Socio - Demographic and Obstetric Characteristics

Patients' mean age was 33, 1 years (SD 3.4). This age range is superior to the 28,2 years reported by Fomulu et al in CHUY[9] and 30,8 years by Kouatchouang at Hopital Laquantinie Douala (HLD) in 2011[10].

Teenage and pregnancies in patients above 40 years constituted 20% of the maternal deaths. The greatest number of deaths 12(48%) occurred in the 30-40 year age group. These values are different from those obtained during the national demographic survey in 2011 where extreme ages (<19 and >40 years) and women between 30-40 years constituted 46, 9% and 39, 9% of maternal deaths respectively [7].

Sixty eight percent of deceased patients were married. This finding differs from that of Nafissatou in his study in Hopital General de Yaoundé (HGY) were 71, 4 % of the deceased were unmarried [8]. Like Nafissatou [8] most studies in Africa reveal that, the risk of maternal mortality in the unmarried woman is higher because of her psychological and financial instability [13]. Our findings were probably due to selection bias because this DGH is not readily accessible to patients of a low socio-economic status on the erroneous basis that it is too expensive.

Eighty four percent of the patients who died had at least a secondary school level of education. This value is a paradox in comparison to most surveys which show that the maternal death is greatest in the uneducated woman [8, 9]. According to the latter, education allows the woman to have a greater spending power and is better informed on the management of their pregnancy. The association between and the level of education was not analysed in our study. However, 44% of deceased patients were well educated while 48% were either students or uneducated housewives. In the latter group, their social status probably didn't allow them to have any substantial economic independence, so they probably had to rely on their partners and family members before seeking medical assistance.

Concerning the mode of payment, 9 (36%) of the patients needed an emergency voucher from the hospital to have access to the first line of treatment, while 4 (16%) were insured. (Table 1). The necessity of a system of mutualisation and financing of care is certainly an aspect to improve in the fight against maternal mortality. This is documented in Huntington et al study [14], where the allowance and the better management of the finances allocated to the maternities of the province of Sorgon in Philippine improved on the MMR compared to the neighbouring provinces where this facility did not exist.

4.3 Causes of Maternal Deaths

Direct obstetric causes were responsible for all the maternal deaths in our study population. In similar studies in Cameroon, direct causes of maternal deaths were documented in 75% - 89, 7% of cases [9, 10, 15].

Haemorrhage was the first cause of maternal death in 12 (48%) patients. This is lower than 56,4% in Fomulu et al study in CHUY [9], higher as compared to 32% in South Asian study by Aurin et al [16]. However it is similar to 51% by Keita and Hizozy in Donka, Guinea [17].

As shown in **Table 3**, in the majority of cases that culminated with coagulopathies 6 (50%), this was due to poor management like; underestimation of blood loss, delayed diagnosis of placenta retention, lack of platelet concentrates and fresh frozen plasma. This poses the problem of the

follow-up, assessment of the basic obstetric care and a functional blood bank which are the essential aspects in the management of post- partum haemorrhage.

Hypertensive disorders in pregnancy especially when complicated by eclampsia were responsible for 40% of maternal death in our survey, unlike in a study carried out in South Asia where it was the second cause of maternal deaths in 17% of cases [16]. On the contrary, Fomulu et al [9] found that it was the third direct obstetric cause of maternal mortality after infection in 15,4% of deceased patients.

Infections were the third cause of deaths in 3(12%) patients, 2(8%) died from abortion related complications. This value is close to the one reported in South Asia (9%), but lower than 13% reported in low income countries [18]. Therefore, putting in place appropriate management strategies for abortion related complications will reduce maternal morbidity and mortality.

In our survey, we did not find indirect causes of maternal deaths contrary to similar studies where these accounted for 10,3% - 25% of maternal deaths [10, 16, 17]. This is because all the cases were obstetric emergencies. The notion of indirect and direct causes of maternal mortality deserves to be reviewed. Indeed from the remarks of a committee that reviewed the WHO classification of the maternal morbidity and mortality in 2009 [2] and in comparison to the article published lately by a team from the centre of maternity and neonatology in Tunisia [18], it is evident that it would be necessary in addition to the direct and indirect reasons, to take into consideration, a third group which is the unforeseen complications of the management or the iatrogenic causes of maternal deaths. In our study, we identified a case where complications developed due to the management strategies used, this in addition to the direct cause contributed to the death of the patient. We were therefore not able to dissociate these complications from the initial direct cause and give an appropriate classification. This explains why all our cases of maternal deaths were considered as being due to direct causes.

4.4 Referral of Patients

Sixty four percent of the deceased patients had been referred from health institutions in Douala and the neighbouring towns. (**Table 2**). Twelve (75%) patients were referred from private health institutions. This predominance of referred patients from private health institutions was reported by Kouatchouang [10] at the HLD where they constituted 60% of cases in the same city. In our survey four of these nine health institutions were not legalised health facilities in the District health service. This raises the question of the still unclarified situation of the creation and the functioning of the health centres in the city of Douala, Cameroon where there is a plethora of the 'health facilities' commonly named "CIG HEALTH" which carry out unauthorized curative health activities that

account for an important percentage of late referrals in moribund state or who died before arriving the emergency service.

Among the deceased referred patients, 87, 5% had a document showing that they had some form of antenatal care. However, this antenatal care was provided in 42, 9% of cases by mainly nurses and 28, 6% by general practitioners (**Table 4**). One of the most important principles of a prenatal consultation is its quality. If a good number of our patients referred came from unconventional centres (four out of the nine health institutions), it was difficult for us to appreciate whether the norms were respected by the practitioners in these centres. Nevertheless, we noted that 64, 3% of the patients had less than four recommended antenatal visits. This is indicative of the quality of care that was offered to these patients, poor evaluation of the risks factors leading to a wrong timing of referral.

Vangeenderhuysen et al. [19] reported that the risk of mortality is 14 times higher in patients referred to tertiary because these are the most serious cases of the city and its vicinities. However, it is clear that the time decision taken to refer, lack of good surveillance of labour and non-use of partographs in good number of health institutions [9, 13] and conditions of transfer which did not respect the norms in our study worsened the prognosis of these patients on arrival. Most of our patients 12 (75%) resorted to the public transportation after referral, implying that there was no adequate care during the transfer. Nine ((56.3%) patients arrived DGH more than six hours after the decision to transfer was taken probably because of the difficulties the families or those assisting them had in organising for transportation.

Independent of their financial status, all our deceased referred patients were managed on arrival. However, lateness in management was often attributed to the lack of finances in other studies [10], but this assertion cannot be justified in our case where patients could be managed as emergencies and be allowed to pay their bills subsequently. It certainly explains why in most studies [10,11, 17], the referred patients died in the first three hours unlike 50% of maternal deaths that occurred 24 hours after admission in our hospital.(**Figure 3**). The technical facilities that are available in the DGH, it being a tertiary centre rated among the best in Cameroon could also account for this finding.

4.5 Management of Referred Patients

None of the four indicators used to evaluate the system of referral [6]; communication, adequacy of initial management, exploitation of information and monitoring of the referring health institutions was used as a guiding principle for better management in all cases that culminated in a maternal death. (**Table 5**). This highlights the problem of effective monitoring of the neighbouring first

category hospitals and health centres in our health system. Indeed, although recommended, the implementation and assessment of the activities of the district hospitals and other health institutions by the tertiary hospitals has not been effective. It partly explains the lack of coordination as regards the timing of referral of patients and their subsequent management thus culminating in an increase maternal morbidity and mortality.

5. Conclusion

The maternal mortality ratio at the DGH is low when compared to other tertiary institutions in the country. However, it remains high if the objectives of the fifth MDG are to be attained. The triad of haemorrhage, hypertensive disorders in pregnancy and infection were the causes of maternal death. The referral system is non-functional between peripheral structures of lower categories and DGH. There is need for an indebt evaluation of the referral system in our health system between first category and tertiary hospitals. The improvement of the system of collection of blood and its derivatives for transfusion and their utilisation as most maternal deaths are caused by haemorrhage. There is need in setting up of commissions of maternal mortality audit and the implementation of their resolutions.

Ethical Issues

Ethical approval and administrative clearance for the study were obtained from the ethical committee of the Douala General hospital and the medical directors of the referring hospitals.

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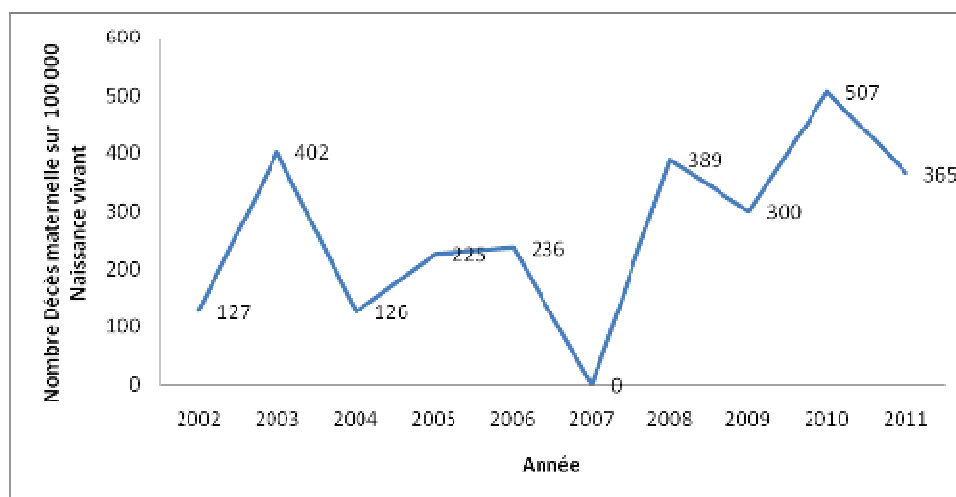


Figure 1. Yearly maternal mortality ratio at the DGH

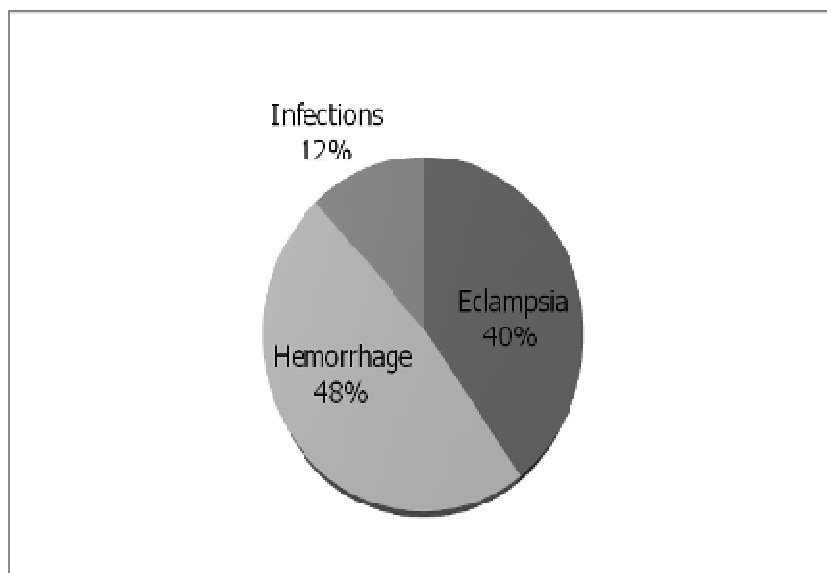
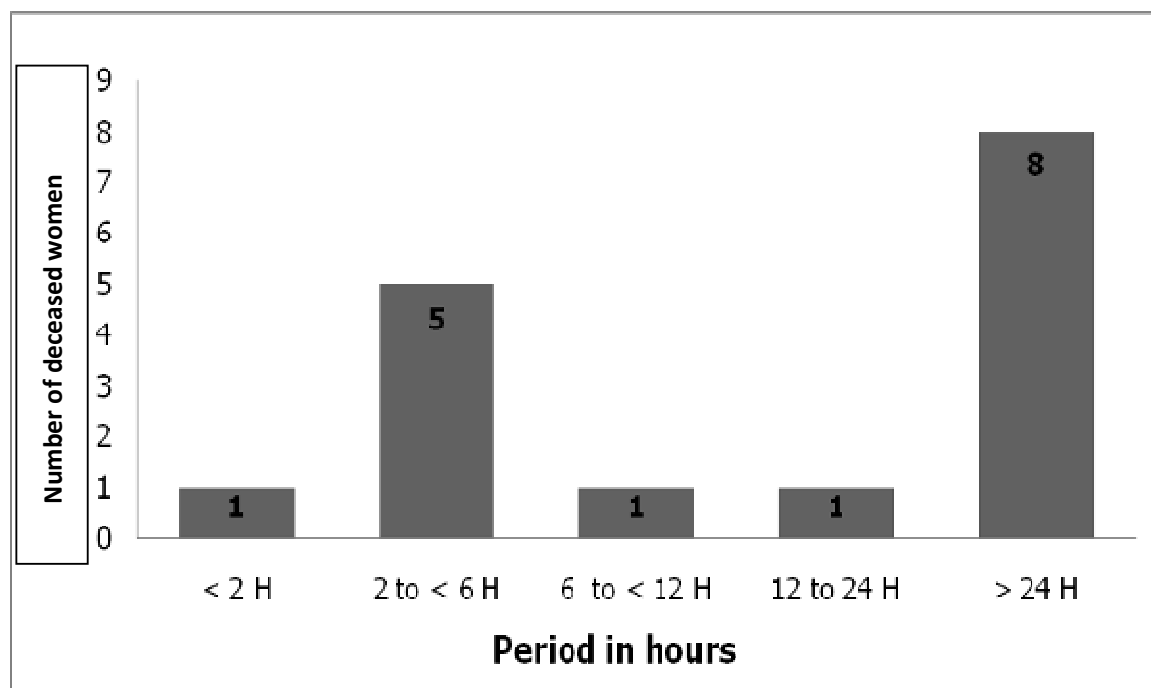


Figure 2. Causes of maternal deaths in DGH



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329 **Figure 3.** Time between arrival and death of referred patients at the DGH.

330 **Table 1:** Socio-demographic characteristics of deceased patients 2002 to 2011 at DGH

Variables	Categories	Number	Frequency (%)
Matrimonial Status	Single	8	32
	Married	17	68
Total		25	100
Level of education	Primary	4	16
	Secondary	10	40
	University	11	44
Total		25	100
Women's profession	Merchant	3	12
	Student	7	28
	Private Employee	7	28
	Civil servant	3	12
	Housewife	5	20
Total		25	100
Modality of payment	Insurer interested party	4	16
	Emergency cash voucher	5	20

	(unpaid)		
	Emergency cash voucher (paid)	4	16
	Cash prepaid	12	48
Total		25	100
Age ranges (years)	≤19	3	12
	20-29	8	32
	30-40	12	48
	>40	2	8
Total		25	100

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332 **Table 2. Clinical characteristics of deceased pregnant women at DGH.**

Variable	Categories	Number	Frequency (%)
Gravidity	1	12	48
	2- 5	11	44
	> 5	2	8
Total		25	100
Parity	0- 1	15	60
	2 à 5	10	40
	>5	00	00
Total		25	100
Number of living children	0	11	44
	1- 2	6	26
	≥3	8	30
Total		25	100
Existence of underlying pathologies	Yes	2	8
	No	23	92
Total		25	100
Rhesus factor	Positif	22	88
	Negative	3	12
Total		25	100

Was the patient referred	Yes	16	64
	No	9	36
Total		25	100
Age of pregnancy at death	< 28	3	12
	28-36	10	40
	≥ 37	12	48
Total		25	100

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334 **Table 3. Frequencies of the aetiologies of maternal death in DGH.**

Direct causes	Specific causes	Number	Frequency (%)
Haemorrhage	Coagulopathy (secondary to Abruptio/PPH)	6	50
	Uterine atony	2	16,7
	Placenta retention *	2	16,7
	Uterine rupture	1	8,3
	Placenta praevia	1	8,3
Total		12 (48%)	100
Infection	Post-abortion infection	2	66,7
	Post-partum infection	1	33,3
		3 (12%)	12
Eclampsia	Renal failure	8	80
	CVA	1	10

	APO	1	10
Total		10 (40%)	40

* Placenta accreta plus molar pregnancy; CVA = Cerebro-vascular accident;

APO = Acute pulmonary oedema

Table 4. Clinical characteristics of referred patients to DGH.

Variable	Categories	Number	Frequency (%)
ANC consultation	Yes	14	87,5
	No	2	12,5
	Convulsions	7	43,8
	Vaginal bleeding	5	31,3
	Hypertension	4	25,0
Reason for consultation	Infection	3	18,8
	Intrauterine foetal death	2	12,5
	renal Insufficiency	1	6,3
	High risk pregnancy	1	6,3
	Gynaecologist/obstetrician	4	28,6
*Provider of ANC	General practitioner	4	28,6
	Nurse	6	42,9
	General practitioner/Nurse	2	14,3
*Site of ANC	Private Clinic	5	35,7
	Dispensary/health Centre	6	42,9
	House	1	7,1
*Number of ANC	<4	9	64,3

	≥ 4	5	35,7
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336 **Table 5. Appreciation of the indicators of the system of referral and counter referral**

Indicators of referral system	Yes	%	No	(%)
Initial communication	0	0	16	100
Adequacy of initial management	0	0	16	100
Exploitation of information in referral letter	3	18,8	13	81,2
Transportation by ambulance	4	25	12	75
Existence of letters of counter referral	0	0	16	100
Monitoring of referring structures	0	0	16	100

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