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CLINICAL ARTICLE

Insights into maternal mortality in Madang Province, Papua New Guinea

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ABSTRACT

Objective: To assess the frequency, causes, and reporting of maternal deaths at a provincial referral hospital in coastal Papua New Guinea (PNG), and to describe delays in care. *Methods:* In a structured retrospective review of maternal deaths at Modilon General Hospital, Madang, PNG, registers and case notes for the period January 2008 to July 2012 were analyzed to determine causes, characteristics, and management of maternal death cases. Public databases were assessed for underreporting. *Results:* During the review period, there were 64 maternal deaths (institutional maternal mortality ratio, 588 deaths per 100 000 live births). Fifty-two cases were analyzed in detail: 71.2% (n = 37) were direct maternal deaths, and hemorrhage (n = 24, 46.2%) and infection (n = 16, 30.8%) were the leading causes of mortality overall. Women frequently did not attend prenatal clinics (n = 34, 65.4%), resided in rural areas (n = 45, 86.5%), and experienced delays in care (n = 45, 86.5%). Maternal deaths were underreported in public databases. *Conclusion:* The burden of maternal mortality was found to be high at a provincial hospital in PNG. Most women died of direct causes and experienced delays in care. Strategies to complement current hospital and national policy to reduce maternal mortality and to improve reporting of deaths are needed.

1. Introduction

Reducing maternal deaths remains a global health priority, particularly as maternal death rates are disproportionately higher in low- and middle-income countries [1,2]. The disparity between the frequency of maternal deaths in low- and middle-income countries and that in high-income nations indicates that most deaths are preventable. Millennium Development Goal 5 (MDG5) was established to reduce maternal mortality by three-quarters by 2015 [3], particularly in low-income countries.

In the South Pacific region, maternal deaths are frequent in Papua New Guinea (PNG), a low-income country with a population of 7 million [4,5]. The national maternal mortality ratio (MMR) is high (773 deaths per 100 000 live births in 2007, 312 in 2008, and 230 in 2010 [1,6,7]), as are fertility rates (4.4 births per woman) [4]; by contrast, contraception use and prenatal clinic attendance are low, and most deliveries are unsupervised [8]. There is evidence that for some of these indicators significant rural–urban differences exist [7]. It remains a matter of debate whether the downward trend in recent mortality figures is due to an actual reduction in maternal deaths, or simply a result of variations in the methodology and data sets used to derive them [9].

Up-to-date regional information on maternal mortality is scarce [9,10]. In a hospital in the PNG Eastern Highlands, half of maternal deaths were attributed to overwhelming sepsis (puerperal or after abortion) [9]. By contrast, hemorrhage accounted for 65% of deaths in Milne Bay Province, coastal PNG, and delays in seeking and obtaining appropriate pregnancy care were found to be common [10].

Modilon General Hospital (MGH) is situated in Madang on the north coast of PNG. It is the principal referral center for the Madang provincial population (which is estimated at 490 000 and largely resides in rural areas) and manages approximately 2500 deliveries annually. MGH provides family planning, prenatal care, and comprehensive emergency obstetric care (EmOC).

Institutional reviews of maternal death can assist with identifying targets for intervention to reduce maternal mortality at an institutional, provincial, and national level, and can provide data to determine the burden and potential underreporting of maternal deaths [11]. The aim of the present study was to assess the frequency, causes, and reporting of maternal deaths at MGH, and to describe delays in pregnancy care, thereby generating data to inform policy to reduce maternal mortality.

2. Materials and methods

In a descriptive data review, registers from the labor ward, obstetrics and gynecology ward, and emergency department of MGH, Madang, PNG, were searched for maternal deaths that occurred during the period January 1, 2008, to July 31, 2012. Ethical approval for the study was obtained from the MGH directorate. Informed consent was not required.

At MGH, prenatal care and comprehensive EmOC are provided. Blood transfusion services rely on patients' relatives as donors. HIV testing has formed part of routine prenatal care at MGH since 2007:

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approximately 1.1% of women presenting for prenatal care are HIV-positive. Malaria is endemic, and pregnant women are provided with intermittent preventive treatment for malaria (single dose of sulfadoxine/pyrimethamine and weekly chloroquine before 2012, 3-monthly doses of sulfadoxine/pyrimethamine since 2012).

Maternal deaths at MGH are reviewed by clinical staff and discussed. Mortality and delivery figures are reported to provincial and national health information offices, and detailed maternal death reports are also sent to the lead obstetrician in Port Moresby, PNG. Of note, the hospital did not have a specialist obstetrician from mid-2008 to December 2010.

In the present study, each case of maternal death was allocated a unique identification number, ensuring anonymity. Charts were obtained when possible, and relevant information was extracted and analyzed. Medical causes of death were categorized by 2 clinicians (J.W.B. and H.W.U.) using established definitions [11–14].

Hindrances to women accessing and receiving the care that they needed were evaluated via the "3-delays model" [15]. Phase-1 delays were defined as delays in seeking medical help by the women. Phase-2 delays were defined as delays in reaching the health center and/or hospital after a decision to seek care had been made (including delayed transfers from health centers to MGH). Phase-3 delays were defined as delays in receiving timely and appropriate care at aid posts and at hospital. Institutional delivery data were obtained from the labor room register.

The numbers of maternal deaths and deliveries at MGH were subsequently compared with data registered with the Provincial Health Information Office (PHIO) in order to assess the adequacy of reporting. Because patient identifiers were unavailable for the PHIO data, a capture–recapture analysis was not possible, and the assessment of potential underreporting was restricted to a simple comparison of summative statistics.

Data are reported as number (percentage), mean ± SD, or median (interquartile range). Statistical analysis was performed using Stata version 12.0 (StataCorp, College Station, TX, USA).

3. Results

During the study period, there were 64 maternal deaths and 10 891 live births at MGH, resulting in an institutional MMR of 588 per 100 000 live births (Table 1). Twelve women were excluded from detailed analysis owing to a lack of case notes. Limited information in registers indicated that these maternal deaths were caused by obstetric hemorrhage (n = 8), sepsis (n = 3), and ruptured ectopic pregnancy (n = 1). As a result, data from 52 women were analyzed in detail.

The mean ± SD age of the women who died was 28 ± 6.4 years (Table 2). Most were married and lived in rural areas. Two-thirds of patients (n = 33) lived 3 hours or more in travel time distance from MGH. Twenty-five percent of women (n = 13) were nulliparous, and 17.3% were grand multiparous (Table 3). Among parous women (71.2%), the median parity was 3 (IQR, 1–4.5, range 1–10). Twelve (23.1%) had a previous obstetric complication. Only 18 women (34.6%) had attended prenatal care in the index pregnancy.

Table 2
Background characteristics of maternal death cases (n = 52).

Characteristic	Values[a]
Age, y	
Mean ± SD	28 ± 6.4
Median (interquartile range)	28 (19–38)
Range	17–42
Marital status	
Married	46 (88.5)
Single	1 (1.9)
missing data	5 (9.6)
Employment	
Housewife	15 (28.9)
Subsistence farmer	14 (26.9)
Formal employment	3 (5.8)
Missing data	20 (38.4
Religious affiliation	
Catholic	15 (28.9)
Lutheran	6 (11.5)
Other	4 (7.7)
Missing data	27 (51.9)
Region of origin	
Madang/Morobe	42 (80.8)
Sepik	5 (9.6)
New Britain	3 (5.8)
Highlands	2 (3.8)
Rural/urban	
Rural	45 (86.5)
Urban	7 (13.5)
Residence district	
Bogia	11 (21.2)
Madang	17 (32.7)
Middle Ramu	5 (9.6)
Rai Coast	4 (7.7)
Sumkar	5 (9.6)
Usino Bundi	10 (19.2)
Traveling time to hospital[b]	
≤1 h	13 (25.0)
1–3 h	6 (11.5)
3–6 h	11 (21.2)
6–12 h	14 (26.9)
12–24 h	1 (1.9)
≥24 h	7 (13.5)
Referred from health center	
Yes	40 (76.9)
No	12 (23.1)

[a] Values are given as number (percentage) of women unless stated otherwise.
[b] Estimates were made on the basis of geographic distance and transport available for travel from residence to hospital.

Most cases were direct maternal deaths (n = 37, 71.2%) (Table 4, Supplementary Material S1), and hemorrhage (owing to a range of underlying causes) was a prominent factor in these cases. Uterine rupture secondary to prolonged obstructed labor was common. Of the indirect maternal deaths (n = 15, 28.8%), non-pregnancy-related infection was the most common cause (n = 11, 21.2%). There was 1 death in early pregnancy owing to septic abortion.

Table 1
Comparison of maternal deaths, live births, and MMR between Modilon General Hospital data and Madang PHIO data 2008–2012.

Year	Modilon General Hospital (review)			Modilon General Hospital (PHIO)			Madang Province (PHIO)[a]		
	Maternal deaths	Live births	MMR	Maternal deaths	Live births	MMR	Maternal deaths	Live births	MMR
2008	14	1633	857	4	501	798	13	17543	74
2009	8	2043	392	4	569	703	19	18098	105
2010	23	2669	862	6	526	1141	34	18513	184
2011	15	2753	545	5	552	906	28	19010	147
Total 2008–2011	60	9098	660	19	2148	885	94	73164	128
2012[b]	4	1793	223						
Total 2008–2012	64	10891	588						

Abbreviations: MMR, maternal mortality ratio; PHIO, Provincial Health Information Office.
[a] Includes data from Modilon General Hospital.
[b] January 1 to July 31, 2012; PHIO data for 2012 unavailable.