

ARTICLE ORIGINAL/ORIGINAL ARTICLE
MATERNAL MORTALITY RATIO IN LEBANON IN 2008
A Hospital-Based Reproductive Age Mortality Study (RAMOS)

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ABSTRACT • INTRODUCTION AND OBJECTIVES : International agencies have recently assigned Lebanon to the group H of countries with “no national data on maternal mortality,” and estimated a corresponding maternal mortality ratio (MMR) of 150 per 100,000 live births. The Ministry of Public Health addressed the discrepancy perceived between the reality of the maternal mortality ratio experience in Lebanon and the international report by facilitating a hospital-based reproductive age mortality study, sponsored by the World Health Organization Representative Office in Lebanon, aiming at providing an accurate estimate of a maternal mortality ratio for 2008. The survey allowed a detailed analysis of maternal causes of deaths.

METHODS : Reproductive age deaths (15-49 years) were initially identified through hospital records. A trained MD traveled to each hospital to ascertain whether recorded deaths were in fact maternal deaths or not. ICD10 codes were provided by the medical controller for each confirmed maternal deaths.

RESULTS : There were 384 RA death cases, of which 13 were confirmed maternal deaths (3.39%) (numerator). In 2008, there were 84,823 live births in Lebanon (denominator). The MMR in Lebanon in 2008 was thus officially estimated at 23/100,000 live births, with an “uncertainty range” from 15.3 to 30.6. Hemorrhage was the leading cause of death, with double the frequency of all other causes (pregnancy-induced hypertension, eclampsia, infection, and embolism).

CONCLUSION : This specific enquiry responded to a punctual need to correct a clearly inadequate report, and it should be relayed by an on-going valid surveillance system. Results indicate that special attention has to be devoted to the management of peri-partum hemorrhage cases.

Keywords: Arab, postpartum hemorrhage, development, pregnancy management, verbal autopsy

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RÉSUMÉ • INTRODUCTION ET OBJECTIF : En 2005, l'Organisation mondiale de la santé a considéré le Liban comme faisant partie des pays « sans données nationales sur la mortalité maternelle » et lui a attribué un ratio de mortalité maternelle (RMM) élevé de 150 par 100 000 naissances vivantes. Le ministère de la Santé publique a facilité une étude basée sur les données hospitalières pour parvenir à une première estimation précise du RMM pour 2008.

MÉTHODES : Les mortalités en âge de reproduction ont été initialement identifiées à partir des registres hospitaliers. Chaque cas a été individuellement évalué pour vérifier s'il s'agissait bien d'une mortalité maternelle ou non.

RÉSULTATS : Trois cent quatre-vingt-quatre cas de mortalité en âge de reproduction ont été retrouvés dont 13 morts maternelles confirmées. Le ratio de mortalité maternelle au Liban a donc été estimé à 23/100,000 naissances vivantes, avec un intervalle de confiance compris entre 15,3 à 30,6 selon la méthodologie RAMOS, définie par l'Organisation mondiale de la santé.

CONCLUSION : Cette correction souligne l'importance de maintenir une surveillance précise des mortalités maternelles. Une attention particulière doit être accordée à la prise en charge des hémorragies en péri-partum qui constituent 38,5% des morts maternelles.

Mots-clés : Arabe, hémorragie du post-partum, développement, prise en charge de la grossesse, autopsie verbale

INTRODUCTION

“Improving maternal health” is one of eight development goals of the Millennium Declaration, signed by 189 countries [1]. Maternal death is the best indicator to judge progress towards this goal [2]. It serves also as an indicator of wider development issues especially on poverty, education, and gender equality. Reducing maternal mortality (MM) has been integrated as a priority in governmental policies of several countries. For instance, France integrated MM since August 2004 among indicators for the monitoring of the health status of the population [3]. The valid measurement of MM requires the existence of a system of recording and analysis of cause-of-death in women in reproductive ages (RA), as established by death

certificates. In the absence of such a system, alternative approaches have to be developed to obtain a reliable figure for MM. These have included: community-based maternal deaths reviews (verbal autopsies: collecting data through interviews with family or community members, where medical certification of cause of death is not available), facility-based maternal deaths reviews, reproductive age mortality surveys (RAMOS), and confidential enquiries into maternal deaths.

Rationale

The complexity of ascertaining maternal deaths makes it difficult for many low income countries to measure maternal mortality, hence the lack of valid data on such deaths which should for the most be avoidable. A report prepared by a consortium of international agencies [4] has recently assigned Lebanon to the group H of countries with “no national data on maternal mortality.” As a result, an arbitrary equation was used to determine that Lebanon’s maternal mortality ratio (MMR) in 2005 was 150 per 100,000 live births. The Lebanese government disputed this classification and its consequences. Its position was premised on the MMR values reported for Arab Gulf countries whose antenatal care is at par with that of Lebanon. Those countries, classified as “providing data” to international agencies (group E) have been assigned MMRs lower than 25 per 100,000 in most cases (Table I).

The Ministry of Public Health (MOPH) addressed the discrepancy perceived between the reality of the MMR experience in Lebanon and that reported in international figures by facilitating a field effort aiming at providing an accurate estimate of this indicator for the year currently under reporting (2008). This project was sponsored by the World Health Organization (WHO) Representative Office in Lebanon. The approach selected for this field project in Lebanon was a hospital-based RAMOS [4]. This paper presents findings from that project, conducted in November-December 2009. The exercise conducted in this project will launch an ongoing hospital-based surveillance system for reproductive age causes-of-death which will allow Lebanon to move to group E in the future [4].

Background

Fragmented data provide some evidence to back the controversy around the MMR assigned to Lebanon.

The 2004 Lebanon Family Health Survey or PAFAM [5] reported an MMR of 86/100,000 based on verbal autopsies. In 2008, an MOPH-sponsored review of deaths among 15- to 49-year-old females was conducted in three districts of northern Lebanon which include about 18% of the entire Lebanese population. These districts were among the highest fertility, lowest socio-economical development in Lebanon. Even in these high-risk areas, the survey did not detect any pregnancy-related death through verbal autopsies (unpublished data). On the basis of the existing 2004 PAFAM, Lebanon should be classi-

fied for now at least as a group G country in which “punctual MMR reports exist.” [4].

Status of data sources relevant to the assessment of MMR

Lebanon is a middle-income country with a population of about 4 million. Until very recently there were no published governmental health statistics. The conflicts that ravaged the country between 1975 and 1991 exacerbated the chaotic nature of official documentation. Causes of death (COD) are supposed to be obtained from death certificates. However, as of 2012, there are still no coding procedures or computerization for the information on death certificates.

Episodic analysis of hard copies of death certificates shows that major deficits exist also in the quality of recorded information [6]. The reported CODs can be very general, e.g. “natural death,” “old age” or “cardiac arrest.” Some are indicated in Arabic, others in English or French. Defects in recorded CODs are more likely in deceased persons aged between 15 and 44, female deaths, when delays in registration exceeded six months, and for persons who had been living outside the capital Beirut, particularly those who had been living farthest away [6]. The defects in death certificates reflect the reality that physicians and the population at large have no appreciation of their importance [7-8]. All these defects render the utilisation of death certificates in their present status very limited for evidence-based public health policy. In particular, it has been impossible to study COD in RA women routinely using official figures from death certificates. However, women who die in reproductive ages rarely escape being brought to a hospital either before death, or

TABLE I
MATERNAL MORTALITY RATIOS FOR SELECTED ARAB COUNTRIES

Country	Year	MMR (maternal deaths/100000 live births)	Range of uncertainty over MMR estimates	
			Lower estimate	Upper estimate
FROM CIVIL REGISTRATION				
Bahrain	2001	32	21	42
Qatar	2004	12	8	16
RAMOS				
Egypt	2000	130	84	170
Jordan	1996	62	41	82
SPECIAL STUDIES				
Saudi Arabia	2000	18	12	24
PMDF STATISTICAL MODEL				
Lebanon	2005	150	41	500
Syrian Arab Republic	2005	130	40	370

PMDF: Proportion of maternal among female deaths.
World Health Organization. Maternal Mortality in 2005. Estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva, 2007

while dying, or immediately after death. Consequently, these deaths are normally recorded in hospital rosters with their immediate and sometimes underlying and/or contributing COD. The fraction of reproductive age mortality that occurs outside the hospital is considered to be negligible as indicated by the 2008 MOPH verbal autopsy survey mentioned above.

The denominator of live births necessary to calculate the MMR is fortunately readily available at the website of the Central Administration for Statistics (CAS) [9]. CAS-published birth data are believed to be complete because no baby is allowed to leave the hospital before the birth has been declared to Vital Statistics, and less than 3% of deliveries in Lebanon occur in homes [5].

METHODS

Definition of terms

In this analysis, a maternal death is defined as “death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause (directly or indirectly) related or aggravated by the pregnancy or its management, but not from accidental or incidental causes” (ICD10) [10]. For the purposes of this survey, a more conservative definition of maternal deaths was adopted which included any death occurring between 42 days postpartum and the end of year 2008.

Identification of maternal deaths

RA deaths (15-49 years) were initially identified through hospital records.

- Following a letter from MOPH and the Syndicate of Hospitals in Lebanon, forms were sent out via all available media to all hospitals in Lebanon, to be completed for each RA death. Hospitals that did not respond within the specified period of time were contacted again several times until all forms were finally collected.
- A trained MD traveled to each hospital that had either reported any reproductive age death, or had not provided an information sheet despite repeated calls. The aim of the field visit was to ascertain whether recorded deaths were in fact maternal deaths or not.
- Inconclusive deaths were investigated, when possible, through verbal autopsies conducted by phone or face-to-face with next-of-kin. These interviews were conducted either by the visiting MD, or by the public health officer in the corresponding district (“*caza*”). At times, the research team had to go back to the death certificate at the local vital statistics registrar to retrieve information on the deceased person’s family phone and/or address.
- All data were channeled back to a central repository in Beirut where they were entered and analyzed in preparation of a report to be submitted by MOPH to international agencies.

Variables recorded

For each nominal reproductive age death recorded in 2008, the following variables were obtained inasmuch as they were actually available: full name (nominal data was required to allow the cross-referencing of cases, the names were treated in confidentiality and replaced by initials in public reports), age at death, citizenship (all deaths were included regardless of nationality), area of usual residence, and marital status at time of death. After the COD had been ascertained by the medical controller, each case received the following identifier:

- Maternal death: definitely yes or definitely no. Inconclusive deaths were investigated through the multiple channels described above. It was initially decided that when uncertainty on COD could not be cleared in few cases, they would be conservatively considered as maternal deaths. At the end of the process, no such “uncertain” case remained.
- ICD10 codes were provided by the medical controller for each confirmed maternal deaths, and later approved by an adhoc MOPH expert committee.

Plan of analysis

All data were entered on an Excel sheet. The number of confirmed maternal deaths found was divided by the total number of births recorded in the CAS 2008 report. According to RAMOS standard methodology, the ratio obtained is considered the lower limit of an estimation interval, in which the upper limit is double that amount, and the reportable estimation is the mean between the lower and upper limits [4]. In addition to estimating the MMR and its interval as specified, all MM cases were described by demographic variables and ICD10 classification.

RESULTS

Throughout Lebanon in 2008, a total of 69 out of 139 concerned hospitals (50%) reported managing deaths or receiving “dead on arrival” (DOA) cases of women in the RA group. Those were 384 cases, of which 13 were confirmed cases of maternal death (3.4%). All those confirmed cases, except one that was Palestinian and another whose nationality was unknown, were Lebanese citizens. A series of 17 DOA cases with no details on circumstances of death recorded in the hospital were investigated through verbal autopsy with relatives either by telephone or directly at their homes. None of these cases had been pregnant or had delivered in the six weeks preceding death. RA deaths recorded in *caza* death registrars in 2008 but not reported through hospitals were investigated. Those women had either died outside Lebanon or had been victims of homicides or accidents.

The mean age of confirmed cases was 35.9 years (SD = 5.5), with a median of 36 years. Cases resided in all districts except the capital city Beirut, and two cases were of unknown place of residence. The distribution by

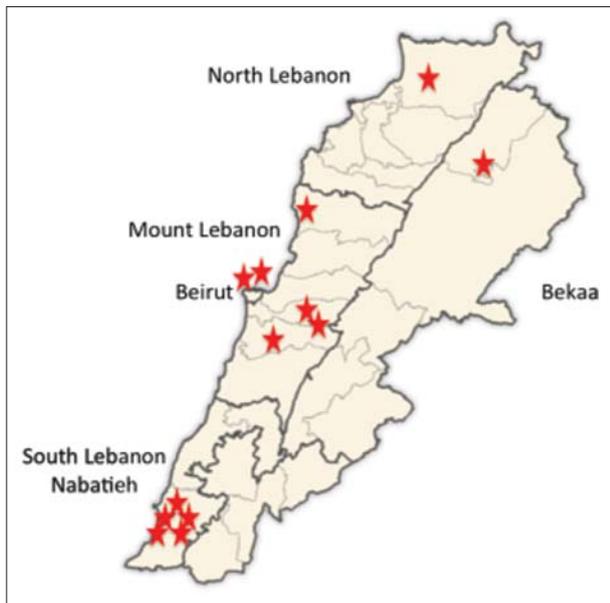


FIGURE 1. Distribution of cases following place of death.

place of death is illustrated in figure 1. Hemorrhage, including postpartum hemorrhage, placenta praevia, ectopic pregnancies, and disseminated intra-vascular coagulation, was responsible for 5 (38.5%) cases, followed by 2 (15.4%) cases for each of pregnancy-induced hypertension (PIH), embolism, and infection. COD was undefined in two cases: a DOA in her 8th month of pregnancy, and a death with no documented cause recorded, which occurred 10 days after delivery (Table II).

In 2008, there were 84,823 live births in Lebanon [9]. With a numerator of 13 confirmed pregnancy-related deaths, the MMR in Lebanon in 2008 was estimated at 23/100,000 with an uncertainty range from 15.3 to 30.6, according to the WHO-defined RAMOS methodology [4].

DISCUSSION

This hospital-based RAMOS represents the first and only available valid effort to document MM in Lebanon to date. Prior to this fieldwork, while hospitals had been mandated to report all in-house deaths with their causes directly to MOPH, no effort had been done to identify specifically RA mortality, nor did the reporting include DOA cases. The data thusly accumulated at MOPH was not complete enough to allow a valid and immediate reporting of MMR in Lebanon to relevant international agencies. This specific enquiry responded to a punctual need to correct a clearly inadequate report, which impacted negatively on the perceived health status of the country. However, this effort has triggered a reform in the death reporting system that will allow a more stable surveillance of RA deaths in the future, which will preclude the need for field surveys.

A literature review revealed that the MMR estimate of

23/100,000 was comparable to those generated by reliable statistical models such as the “*generalized negative binomial regression and the log of the maternal death rate with ordinary least squares (OLS) and robust regression*” used by Margaret Hogan and colleagues and recently published in the *Lancet*. That article, using the same vital statistics as ours, calculated an MMR for Lebanon of 24 per 100,000 [11]. A sensitivity analysis was conducted to assess the possible effect of missing pregnancy deaths which may not be reported to hospitals. At the upper level of uncertainty allowed by the RAMOS of 30.6/100,000, the number of deaths missed would have been equal to that included in the count, a highly unlikely event by the expert consensus of demographers and health authorities consulted during this survey.

The relatively older mean age of index cases (36 years) is in concordance with previous publications in which older women were at a higher risk of morbidity and mortality during the period going from conception to postpartum [12]. There are no clear indications that risk is associated with place of residence. To study reliable percentages and distribution of cases, a larger number of cases would have been required. The map of place of death indicated a cluster in Tyre, the main city of South Lebanon (Figure 1). However, this is an artifact due to

TABLE II
MATERNAL MORTALITY CASES RECORDED
in the LEBANESE REPUBLIC in 2008 (N = 13)

VARIABLES	n (%)
Age in years	
≤ 34	4 (30.8)
> 34	9 (69.2)
<i>Mean 35.9 (SD 5.5); Range 26-47; Median 36</i>	
Area of Residence	
Beirut	0
Mount-Lebanon	3 (23)
North-Lebanon	1 (7.7)
South-Lebanon/Nabatieh	4 (30.8)
Bekaa	3 (23.0)
Unknown	2 (15.4)
Marital Status	
Married	8 (61.5)
Unknown/Unrecorded	7 (53.8)
Causes of death*	
Hemorrhage	5 (38.5)
Eclampsia	2 (15.4)
Infection	2 (15.4)
Embolism	2 (15.4)
Unknown	2 (15.4)
Preventable deaths**	3 (23.0)

*The condition that started the sequence of events leading to death.
**Two cases of hemorrhage were judged preventable had they been treated in a tertiary center, and one case of eclampsia should have been detected and controlled earlier.

the fact that only a few major hospitals in South Lebanon, most of which are located in Tyre, drain all complicated pregnancy cases in South Lebanon (26 medical centers), whereas there are several hospitals of reference in other districts (49 hospitals in Mount-Lebanon and 20 in Beirut alone). The above assumption can be made since there are no large distances in Lebanon which would render access to a hospital difficult in an emergency case. Increasing tertiary centers outside the main city of Tyre may provide larger opportunities for intervention on cases where good management can save lives in the South.

This RAMOS, besides correcting the national MMR, provided an opportunity to analyze those few uncertain MM cases and determine the possibility of excluding them based on the nature of the cause leading to death. This may allow the health care system in Lebanon to further reduce the MMR, and to move nearer to those reported in some countries of the region such as Kuwait, Qatar, and Saudi Arabia, with MMR of 4, 12, and 18 respectively in 2005 [4].

Hemorrhage is the first COD in the series of 13 deaths identified in this RAMOS, and it was twice more frequent than all other CODs. This fact might be reassuring since hemorrhage is still the number one COD of MM in more advanced nations such as France [13], although its higher frequency relative to other COD reproduces figures reported in advanced nations in the early 1980's [14]. In these nations adequate follow-up of pregnancies and management of associated conditions have successfully reduced the incidence of postpartum hemorrhage. Hemorrhage according to several papers is classified as the most preventable cause of MM [13, 15]. Moreover, at least one recent study has indicated that health care providers were responsible of 87% to 93% of all MM cases considered as preventable [16]. In the Lebanese health care system, efforts should be made therefore to ensure that all impending hemorrhages in pregnant women should be managed rapidly and aggressively.

Other COD included PIH, embolism (amniotic fluid embolism and thrombo-embolism), and infection. The latter is also another highly preventable COD [13, 15]. However, the timing of presentation and the etiology of infection in two cases in our series had a significantly low rate of preventability; one patient presented with already diffuse methicillin-resistant *Staphylococcus aureus* myocarditis and died of heart failure, while the second went into coma on her first day of admission and eventually died of meningitis. Little can be done to prevent embolism [13, 15], but PIH should not lead to death given proper case management.

A more detailed understanding of etiologies most implicated in pregnancy-related conditions in Lebanon would require a larger case series. Such an analysis would probably need to recruit "near-miss" cases where the patient could have died, or was severely affected but not likely to die [16]. The main challenge in the study of "near-misses" is to identify these cases. Methodological

alternatives include the retrospective study of MM cases over longer periods of time, or identifying a cohort of women for longitudinal follow-up, to study their pregnancy outcomes.

The analysis of COD in this series strongly suggests a serious if not very large gap in the current pregnancy-related health care. Anecdotal evidence indicates that pregnant Lebanese women may be negligent in attending antenatal care visits adequately for several personal and organizational reasons. Of the latter, financial factors and poor access to health care are prominent, and they render women of lower socioeconomic status and/or those living in remote areas more vulnerable to pregnancy-related morbidities. A reproductive health intervention in Wadi-Khaled, a poorly developed rural area on the northern border with Syria, showed that the systematic provision of free and close follow-up of pregnant women can result in no MM occurring despite adverse contextual conditions [17].

CONCLUSION

The MMR in Lebanon (2008) has now been reduced to an official, evidence-based figure of 23 per 100,000 live births. This number is relatively low and comparable to that of neighboring countries.

A similar ratio, 26/100,000, was assigned to Lebanon in a report on 2010 global estimates of maternal mortality of year 2011. It may indicate the existence of a well-developed reproductive health care system in the country, although gaps have to be addressed concerning more socially vulnerable or remote sub-groups of the population. Avenues of surveillance and research mentioned in this context will have to be revisited in the coming few years.

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