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A glance into the hidden burden of maternal morbidity and patterns of management in a Palestinian governmental referral hospital

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ABSTRACT

Background: Little is known about the burden and patterns of maternal morbidity during childbirth, particularly in the Middle East Region. Investigating the patterns of maternal morbidity can be useful in guiding improvement in the quality of maternal services, and informing policy debates on women's health.
Objective: To examine the incidence, types and patterns of management of severe and non-severe maternal morbidities of Palestinian women during pregnancy, labour, delivery and up to seven days postpartum in one Palestinian hospital.
Methods: A prospective hospital-based study was conducted for a 3-month period in 2011–2012, reviewing hospital records for all pregnant women (1.583) admitted to the governmental hospital in Ramallah, Palestine.
Findings: Of all pregnant women included in this analysis (1.558), 419 (26.9%) women experienced one or more maternal morbidities and 15 (0.96%) women survived a life-threatening complication (near miss). Of all women who suffered morbidities, 69 (16.5%) had vaginal deliveries, 61 (14.6%) had cesarean sections, 179 (42.7%) had abortions/miscarriage, and 110 (26.3%) experienced complications during pregnancy or the post-partum. Hemorrhage during pregnancy, birth or postpartum was the most common morbidity. Of those who gave birth, women who gave birth by cesarean sections were three times more likely to suffer from morbidities than those who had vaginal delivery.
Conclusions: The burden of maternal morbidity for Palestinian women between the ages of 16 and 48 is high. In Palestine, maternal morbidity can be prevented by promoting a rational use of cesarean section, avoiding unnecessary medicalization, reducing unwanted pregnancies and updating practices of providers related to abortion/miscarriage care.

1. Introduction

While maternal health is considered a priority in the Middle East Region, little is known about the burden and patterns of maternal morbidity that are an integral part of women's lives.[1] In Palestine, as in many other countries in the region, the coverage of antenatal care and childbirth in hospitals is almost universal and service utilization is high. Midwives attend the majority of vaginal births. However, practices during childbirth are not consistent with current evidence.[2] These practices include routine amniotomy, augmentation of labour, episiotomy, and intravenous fluids, frequent vaginal examination and restrictions on mobility, and on drinking liquids. Maternal morbidity data can provide indicators of the burden and management of disease. Improving quality of care has been shown to be a complex process in all environments, but in contexts with on-going political and economic instability, barriers to building a healthcare system and strengthening institutions is even more daunting.

Currently, the only two national indicators collected in Palestine on hospital-based deliveries are cesarean section (CS) (with no indications) (20.3%) and maternal deaths (24.1 per 10,000). Maternal mortality is a rare incident and is likely to be underreported even in developed countries[3] and country-specific

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maternal morbidity data (other than self-reporting) is difficult and costly to obtain. Currently, only 57% of married women aged 15–49 years use family planning methods, and the intrauterine device is the most common method (26%).[4]

Research on maternal morbidity has suffered from the use of different definitions and criteria (disease-specific, management, or organ system dysfunction).[5] A recent WHO scoping exercise emphasized the need for including non-life threatening maternal morbidities in assessments,[6] in addition to near-miss cases, defined as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy".[7] In the past decade, studies by the Choices and Challenges in Changing Childbirth research network in four Arab countries were focused on normal childbirth and showed that, births occur primarily in hospitals, with skilled birth attendants, yet practices during normal labour are not according to the best available evidence.[2,8] These studies documented overuse of unnecessary interventions during normal labour, escalation in the CS rate[9,10] and challenges in the existing health systems.[11] On the other hand, little is known about the magnitude of maternal morbidities.[12] A recent cross-sectional study in Marrakech showed that 44% of postpartum women reported at least one morbid event, including vaginal discharge, hemorrhoids, breast, episiotomy and anal problems, prolapse, bleeding, urinary problems and others.[12] A study in Qatar found that housewives and pregnant women with low monthly household income suffered higher risk of complications during pregnancy, primarily from gestational diabetes, hypertension, hemorrhage and anemia.[13] A prospective study from six public hospitals in Iraq studied the quality of care provided for women with severe complications reported suboptimal use of magnesium sulfate for preeclampsia and oxytocin for prevention of postpartum hemorrhage (PPH).[14]

With the aim of improving maternal and neonatal health care in a major public referral hospital in the West Bank of Palestine, the authors participated in a WHO funded four hospital comparative study of maternal and neonatal near-miss cases in Lebanon, Syria, Egypt and Palestine. This article presents the medical record review data analysis from the formative phase of this study in Ramallah Hospital, Palestine. In order to provide a broad snapshot of maternal morbidity, we decided to select not only the near-miss cases when women survive life-threatening conditions (i.e. organ dysfunction), but to include additionally less severe morbidities which may affect the quality of life of the woman and the family for years to come.[15] This information should be useful in understanding Palestinian women's needs during the reproductive years, guiding improvement in the quality of maternal services, and informing clinical and policy debates on women's health in the country. This facility-based data, which was rigorously and systematically collected and analyzed, can provide indications for urgently needed interventions in women's health. Stimulating debate is important not only for women's physical and psychological well-being, but also for the survival and development of the child and entire family,[15] in a context lacking social services, where women assume the role of caretakers of family members of all ages and disabilities.[16]

The aim of this study is to examine the incidence, types and patterns of management of severe and non-severe maternal morbidities of Palestinian women during pregnancy, labour, delivery and seven days postpartum in one major Palestinian referral government hospital in the West Bank.

2. Methods

This prospective study conducted in the public hospital in Ramallah, Palestine between September 25, 2011 and January 6, 2012 was based on medical records review of all admissions to the maternity ward. The data was collected as part of a multi-country study of maternal and neonatal near-miss women in four hospitals (Lebanon, Syria, Egypt and Palestine) using the WHO standard form (Individual Form HRP A65661).[17] Since it was difficult to identify women who experience a near-miss event among admissions to the hospital (eligibility criteria for the WHO standard form), we chose to fill the form for all pregnant women admitted to give birth, to be observed or treated for pregnancy complications or complaining of signs of abortion/miscarriage or ectopic pregnancy as well as postpartum women with complications (the first seven days after giving birth), and maternal deaths. The maternal outcome, gestational age and neonatal outcome were also collected during the hospital stay. We also collected data on the coverage of selected evidence-based interventions used for prevention and treatment of (PPH), severe preeclampsia, eclampsia, use of antibiotics for prevention of infection during CS and treatment of sepsis and preterm labour.

2.1. Study setting

The study was conducted in Ramallah Hospital, a general referral public hospital in Ramallah governorate that serves 75 localities and 6 refugee camps. In 2011, 4517 deliveries took place in the maternity ward and the CS rate was 21.4%. The maternity ward consists of 28 beds and offers free services covered by the local health insurance, including the neonatal intensive care unit. The hospital is a main teaching hospital for Palestinian medical, nursing and midwifery students.

2.2. Data collection

The data was collected by a midwife and a nurse trained by the principal investigator (PI) on the data collection tool, data extraction through record review and identification of complications and near-miss cases (WHO definition). The data was collected on a daily basis from the medical records that are not yet computerized, for all eligible women admitted over 24 h, regardless of gestational age, up to 7 days postpartum. The hospital discharge register was used to identify all women as it was the most accurate and complete register. We cross-checked women who gave birth with the birth register every day. We reviewed the medical records of all women for registration, history, physicians' orders, nurses' notes, observation, surgery notes, medication sheets and laboratory results. Women who were identified as near-miss cases or with severe complications were verified by a senior obstetrician.

2.3. Data analysis

The data was entered into CsPro software,[18] which helped to ensure high quality data entry and quality checks on data entry. Data analysis was performed using IBM SPSS (version 19). Descriptive statistics, frequency counts and percentages were produced for all women and then stratified by parity and mode of delivery. We created the maternal morbidity variable from the data set and accounted for all women who suffered from any of the following conditions: obstetric or maternal complications (direct and indirect causes), related procedures/interventions, and life-threatening complications. Descriptive analysis was also performed for perinatal outcomes of pregnancy and stratified by morbidity. Independent *t*-test was used to test the difference between means, and Chi-square and Fisher's exact statistics were used to compare proportions. *P*-values of less than 0.05 were considered significant.

Table 1
Definition of direct and indirect causes of maternal morbidity and maternal near-miss.[20,49]

Direct causes of maternal morbidity	-Hemorrhage: hemorrhage occurred during pregnancy, labour, delivery or postpartum including postpartum hemorrhage and other obstetric hemorrhage related to abortion, ectopic pregnancy, placenta previa, accreta/increta/percreta placenta, abruptio placenta, ruptures uterus -Infection: abortion related infection, puerperal endometritis, pyelonephritis, other systemic infections/sepsis -Preeclampsia/eclampsia.
Indirect causes of maternal morbidity	-Chronic hypertension defined as blood pressure >140/90 mmHg before 20 weeks of gestation -Other conditions such as HIV/AIDS, influenza-like illness, anemia (defined as hemoglobin <7%, g), malaria, embolic disease, cancer, heart, lung, renal or hepatic disease -Coincidental condition such as violence, accidents, poisoning, and self harm
Maternal near miss	All women that survived a severe life threatening complication during pregnancy, childbirth, or within seven days of termination of pregnancy such as: organic dysfunction of the cardiovascular, respiratory, renal, coagulation, hepatic, neurologic or uterine body systems

2.4. Variables and definitions

Our operational definition of maternal morbidity included all women who suffered any of the following conditions: complications classified into direct and indirect causes, life-threatening complications (near miss event) during pregnancy, childbirth, or within seven days of termination of pregnancy, and intervention/procedure-related morbidity (if the woman received any interventions during the hospital stay for the followings conditions: manual removal of retained products or placenta, or blood products given without being documented as a complicated or a near miss condition.)[19] Preterm birth was defined as any birth that occurred before 37 weeks of gestation.

We defined direct causes of complications as conditions related directly to pregnancy or childbirth, listed in the WHO data collection form. Indirect causes relating to pre-existing or newly developed disease during pregnancy were also retrieved from the WHO data collection form (Table 1). We defined maternal near-miss according to the WHO definition.[20]

2.5. Ethical approval

The study protocol was approved by the WHO Research Ethics Review Committee, the Institutional Review Board at the American University of Beirut and the Institute of Community and Public Health Ethical Review Committee of Birzeit University in 2011. The research team participated in an online course on ethics by the National Institute of Health office of Extramural Research. All data collected was secured in the PI office and all computers used for data entry and analysis were secured by passwords.

3. Results

3.1. Women's characteristics

Among the 1583 eligible women, data on a total of 1558 women were included in the analysis after excluding multiple births (Fig. 1). A total of 1209 (77.6%) women gave birth, and 349 (22.4%) women were classified as cases of abortion/miscarriage or complication during pregnancy or postpartum. About one third of the primiparae women were young (below age of 20) and 153 (16%) of multiparae women were above 35 years old (Table 2). The proportion of primiparae women whose deliveries were induced was twice that of multiparae women. With the exception of two women, all women admitted with "no labour" gave birth by cesarean section. In addition, the cesarean section rate was higher in the primiparae women compared to multiparae women (Table 2).

There were 196 (12.6%) women admitted as abortion/miscarriage cases. Among those, 144 (73.6%) women were multiparae and 52 (26.4%) were primiparae. The mean age of these women was 28.7 years and the mean gestational age on admission was 10.7 weeks. The majority of these women 179 (91.3%) received medical methods for uterine evacuation (primarily medications

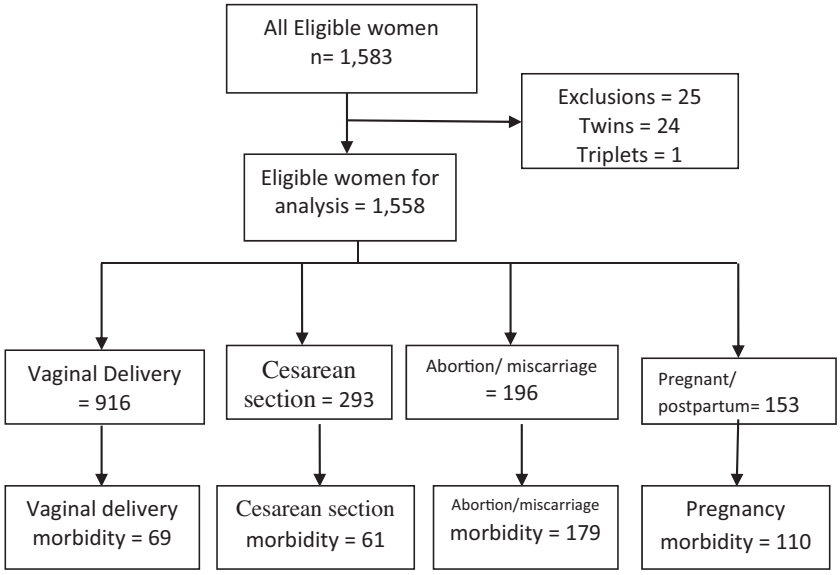

Fig. 1. Distribution of women and women with morbidities.

Table 2
Demographic and obstetric characteristics of women who gave birth by parity ($n = 1209$).

Characteristics	Primipara $N = 253$	Multipara $N = 956$	*P*-value
	N (%)	*N* (%)	
Age in years (mean, SD)	(23.4, 5.05)	(28.7, 5.4)	<0.0001
16–20	82 (32.4)	28 (2.9)	
21–34	158 (62.5)	771 (80.6)	
35–48	13 (5.1)	153 (16.0)	
Gestational age in weeks (mean, SD)	(38.4, 2.9)	(38.7, 2.1)	0.092
25–36 weeks	28 (11.1)	98 (10.3)	
37–42 weeks	223 (88.5)	858 (89.8)	
Onset of labour			
Spontaneous	179 (70.8)	756 (80.9)	0.19
Induced	48 (19.0)	83 (8.7)	
No labour	26 (10.3)	117 (12.2)	
Mode of delivery			0.680
Vaginal delivery	189 (74.7)	727 (76.0)	
Cesarean section	64 (25.3)	229 (24.0)	
Fetal presentation at delivery			0.384
Cephalic	240 (94.9)	918 (96.0)	
Breech	11 (4.3)	28 (2.9)	
Other	2 (0.8)	10 (1.0)	
No previous CS delivery	253 (100)	746 (78)	
1 Previous one CS delivery	0	135 (14.1)	
2 or more previous CS deliveries	0	75 (7.8)	

like synthetic prostaglandin analog, such as misoprostol) or curettage (Fig. 2).

Pregnant women not in labour but who experienced complications accounted for 153 (10%) women from our sample with a mean age of 26.8 years. Among these women with complications, 49 (32%) were primiparae. These women were admitted for treatment or observation of specific morbidities such as bleeding, preeclampsia/eclampsia, infection or other medical conditions. Among them, 110 (71.9%) suffered co-morbidities and one woman was classified as near-miss cases according to WHO criteria (Table 3).

3.2. Incidence and types of maternal co-morbidities

Out of the 1558 women, a total of 419 (26.9%) women experienced one or more maternal co-morbidities and 15 women survived a life threatening complication (near-miss) (Table 2). Of all women, 343 (22%) suffered one type of morbidity, 64 (4.1%) women suffered two to three morbidities, and 12 (0.8%) women suffered four to 12 morbidities. Of those who experienced morbidities, 69 (16.5%) women had vaginal delivery, 61 (14.6%) had cesarean sections, 179 (42.7%) had abortions, and 110 (26.3%) were pregnant or in their postpartum period (Fig. 1). Abortion/miscarriage-related hemorrhage was the most common complication documented for women with morbidities (Fig. 2). The curettage procedure was utilized for 22 women (Fig. 2).

Among the 1209 women who gave birth, 130 (31%) had morbidities and 12 had near-miss events (Fig. 1). The women who had cesarean sections were three times more likely to experience morbidities than those who had vaginal delivery (20.8% vs 7.5% respectively). The most frequent complications were hemorrhage, pre-eclampsia/eclampsia, and indirect causes (Table 3).

More than a quarter 110 (26.3%) of the morbidities women incurred were due to complications during pregnancy or postpartum and the most common complications among these women were hemorrhage (28.1%), infection (19.6%) and pre-eclampsia/eclampsia (12.4%) (Table 3).

Approximately, a quarter of all women 387 (24.8%) suffered from direct causes of maternal morbidity and 35 (2.2%) from

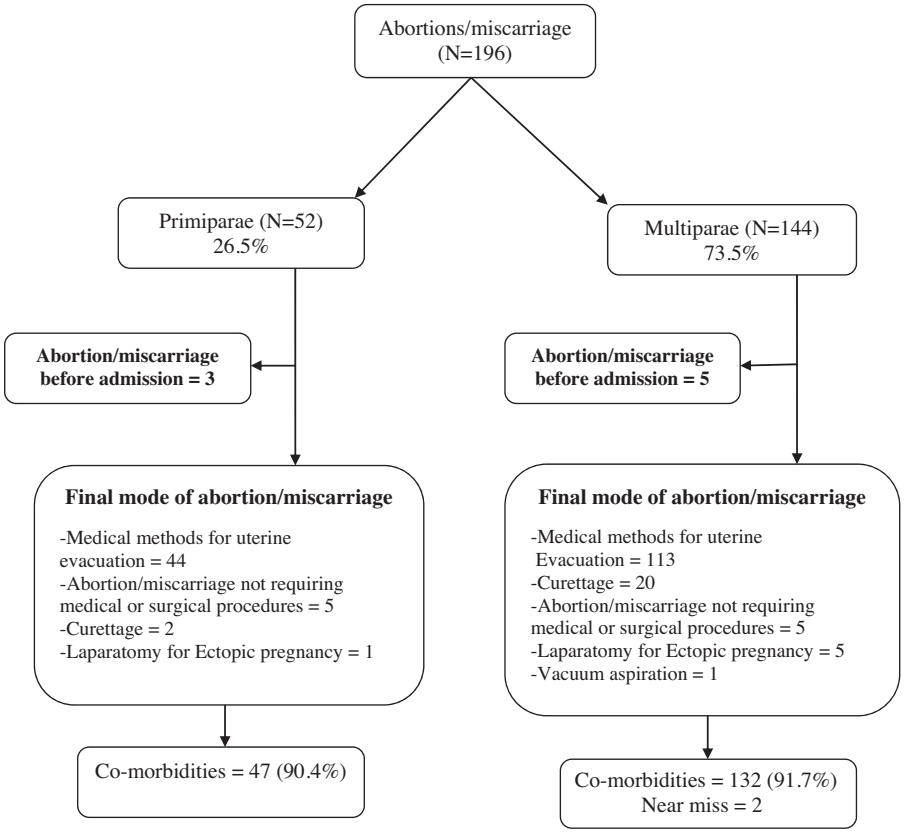

Fig. 2. Characteristics of women admitted as abortion/miscarriage.

Table 3
Incidence of women who suffered maternal morbidities[a] during pregnancy and childbirth by mode of delivery in the study group.

Type	Underlying cause of morbidity	VD	CS	Abortion	Pregnant/Postpartum[b]	Total
All women		916	293	196	153	1558
		N (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)
Direct	Postpartum hemorrhage	22 (2.4)	9 (3.1)	0	0	31 (2.1)
	Other obstetric hemorrhage	20 (2.2)	17 (5.8)	176 (89.8)	43 (28.1)	256 (16.4)
	Preeclampsia/Eclampsia	19 (2.1)	27 (9.2)	0	19 (12.4)	65 (4.2)
	Infection	5 (0.5)	2 (0.7)	0	32 (19.6)	39 (2.5)
Indirect	Other systems	4 (0.4)	14 (4.8)	2 (1)	15 (9.8)	35 (2.2)
Others	Intervention related	24 (2.6)	18 (6.1)	10 (5.1)	7 (4.6)	59 (3.8)
Near miss	Massive transfusion of blood or red cells (≥5 units)	3 (0.3)	5 (1.7)	1 (0.5)	0	9 (0.6)
	Hysterectomy	1 (0.1)	3 (1)	0	0	4 (0.3)
	Other organic dysfunctions	1 (0.1)	1 (0.3)	1 (0.3)	1 (0.3)	4 (0.3)
	ICU admission	2 (0.2)	6 (2.0)	1 (0.5)	0	9 (0.6)
	Any morbidity (women)	69 (7.5)	61 (20.8)	179 (91.3%)	110 (71.9)	419 (26.9)
	Maternal near-miss	4 (0.4)	8 (2.7%)	2 (1.0%)	1 (0.7%)	15 (1)

Other obstetric hemorrhage includes: Abortion related hemorrhage, ectopic pregnancy, placenta previa, accreta/increta/percreta placenta, abruptio placenta, ruptures uterus, any other obstetric hemorrhage not including postpartum hemorrhage.
Infection includes: Abortion related infection, puerperal endometritis, pyelonephritis, influenza-like illness, other systemic infections/sepsis.
Other systems includes: chronic hypertension, HIV/AIDS, anemia, malaria, embolic disease (thrombo/emniotic/air embolism), cancer, heart disease, lung disease, renal disease, hepatic disease, coincidental conditions (includes violence, accident, poisoning, self-harm).
Intervention related: include removal of retained products, manual removal of placenta, blood products (<5 units) and not documented as suffering a complication or near miss.
Any morbidity: Any woman who suffers at least one morbidity related to direct, indirect, near-miss condition, or received intervention to treat morbidity and not explicitly documented as a complication or near miss.
Maternal near-miss: a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy. Maternal near-miss: according to the WHO criteria included: Other organic dysfunctions: Includes all conditions of organic dysfunction (cardiovascular, respiratory, renal, coagulation, hepatic, neurologic) without hysterectomy and massive transfusion of blood or red cells (>5 units). Women who received Massive transfusion of blood or red cells (>5 units) and hysterectomy are counted as near miss according to WHO criteria.
[a] Women suffered at least one maternal morbidity
[b] There was only one postpartum woman suffered near miss event included in this category.

indirect causes. The most common direct causes were hemorrhage 287 (18.4%) and pre-eclampsia/eclampsia 65 (4.2%). Two women had a ruptured uterus, one after vaginal birth and the second after CS and neither had had a previous cesarean section. Twenty-four women gave birth vaginally and received treatments, but surprisingly no complication was mentioned in their records, (i.e. received blood with no mention of hemorrhage). Massive interventions to treat morbidities such as large transfusion of blood or red cells (more than five units), hysterectomy, and ICU admission were more frequent in women after cesarean section as shown in Table 3.

3.3. Patterns of medical management for selected morbidities

3.3.1. Hemorrhage

Oxytocin was administered after birth to prevent PPH in 88% of women who gave birth vaginally and 98% of women who had CS. In addition, there were 179 (24.6%) women who received other uterotonic medications (Ergometrine and/Misoprostol) routinely after vaginal birth and 282 (92%) women after cesarean section. All (100%) women who had PPH after vaginal birth received routine oxytocin after birth, but only seven out of nine women who had PPH after CS received routine oxytocin after delivery to prevent PPH. Of all women who had PPH ($n = 31$), five women (16.1%) received more than five units of blood to treat PPH, three underwent a hysterectomy, and four were admitted to the ICU.

There were 37 (3.6%) women who suffered from other obstetric hemorrhage during labour/delivery. The coverage of oxytocin to prevent PPH was 82.4% and 100% after vaginal delivery and cesarean section, respectively. Of all women who suffered hemorrhage during childbirth ($n = 68$) (Table 3), 11 women experienced organ dysfunction (near-miss). Moreover, a total of 99 women were treated for hemorrhage during/after delivery/abortion by medications or other methods such as balloon or condom temponade, removal of retained placenta, blood transfusion or laparotomy. However, it was not documented that these women experienced hemorrhage.

Table 4
Selected perinatal outcomes of women.

Perinatal outcomes	Women with morbidity *N* (%)	Women without morbidity *N* (%)
Total women	419 (26.9)	1139 (73.1)
Total newborns delivered	130	1079
Live birth	124 (95.4)	1071 (99.3)
Stillbirth	6 (4.6)	8 (0.74)
Early neonatal death[a]	8 (6.5)	13 (1.2)
Cesarean section	61 (46.9)	232 (21.5)
Birth weight		
<2500 g	27 (20.8)	79 (7.3)
2500–4000 g	96 (73.9)	926 (85.8)
>4000 g	7 (5.4)	74 (6.9)
Selected intervention for newborn[b]		
Admission to NICU	22 (17.7)	73 (6.8)
Intubation	7 (5.7)	14 (1.3)
Cardiopulmonary resuscitation	2 (1.6)	4 (0.4)
Corticosteroids for fetal lung maturity	31 (25)	21 (1.95)

[a] Early neonatal death represents only total newborns died until day 7 after birth.
[b] Neonatal interventions were calculated from total live births.

3.3.2. Induction of labour

Out of 1209 women who gave birth, 131 (10.8%) women had labour induced. Among these 48 (36.6%) women were primiparae, six women had a previous cesarean section and 31 (23.7%) gave birth by CS. Of all women had labour induced, 23 (17.6%) had some kind of morbidity and two women were identified as near-miss cases. The most frequent morbidities found in this group of women were, hemorrhage (10 (8%) women), removal of retained products (2 women), blood transfusion (5 women), laparotomy (2 women), and one woman had a hysterectomy and was admitted to the ICU. It is also worth noting that 55 (42%) women had labour induced before 40 weeks of gestation, 11 women had preeclampsia, 5 newborns were stillbirths, 12 (9.2%) newborns suffered a complication and six newborns were admitted to the NICU.

3.3.3. Hypertensive disorders (preeclampsia/eclampsia)

Among all women, 62 (4%) women had preeclampsia and three women were diagnosed with eclampsia. Among these 65 women, 46 (71%) gave birth, 19 (29%) pregnant women were discharged. Among all women who had preeclampsia/eclampsia, only 13 (20%) women received magnesium sulfate, three (5%) women were admitted to the ICU, and 27 (41.5%) gave birth by cesarean section.

3.3.4. Preterm labour

Of all women, 126 (8.1%) were admitted for preterm labour (gestational age 25–36 weeks). Among the women with suspected preterm labour who gave birth, 77 (61%) delivered vaginally, 48 (38%) delivered by CS, and one had an evacuation of pregnancy using medical methods at 27 weeks gestation. Of the 126 women, only five (4%) women gave birth within the first 3 h of arrival. Four (3%) of these women ended up as near-miss cases.

The most frequent documented modes of management for these women were bed rest 28 (22.2%) and hydration 23 (18.3%). Betamimetics were administered only for two women to suppress labour. Eleven (8.7%) of these women were classified as preeclampsia/eclampsia cases, five (4%) women had chronic hypertension, eight (6.3%) suffered hemorrhage during or after delivery, three women were admitted to the ICU, and one had a hysterectomy. Eight (6.4%) newborns were delivered stillborn, and 14 (11.2%) newborns died before discharge from the hospital. There were 47 (40.2%) newborn admitted to NICU, six (5.1%) died after NICU admission and corticosteroids were only administered to 52 (41.3%) women.

3.3.5. Cesarean section

Among the 1209 women who gave birth 293 (24.2%) had a CS. The mean (SD) age of these women was 29.2 (6.1) years, and the mean (SD) gestational age was 37.9 (2.6) weeks. Of the 293 women, half of them had no previous CS (64 primiparae and 82 multiparae); 72 (24.6%) women had one previous CS, 63 (21.5%) women had 2–3 previous CS, and 12 (4.1%) women had more than three CS (ranged from 4 to 6 CS). In addition, of all women who gave birth by CS (n = 293), 31 (10.6%) women were induced for labour, about half of the women 141 (48.1%) were admitted with no labour and 263 (90%) women received prophylactic antibiotics. The women who delivered by CS suffered various morbidities and eight (2.7%) were classified as near-miss according to WHO criteria. Of the most frequent morbidities, 27 (9.2%) women had preeclampsia/eclampsia, 26 (8.9%) women had hemorrhage during or after delivery, 18 (6.1%) women received blood products, four women had laparotomy and three had hysterectomies. On the other hand, of all vaginal births (n = 927), 63 (7%) women successfully delivered vaginally after a previous CS. Of all newborns delivered by CS, there were five stillbirths (3 fresh and 2 macerated), 44 (15%) newborns were admitted to the NICU, and nine newborns died before discharge from the hospital (by day 7) (Table 4).

4. Discussion

This is the first report on types of maternal morbidities, the patterns of hospital-based management of these conditions and selected newborn outcomes using a comprehensive framework including near miss events. The main findings of this study indicate that more than a quarter of Palestinian women experienced various morbidities (severe/non-severe) during pregnancy and childbirth, mainly related to abortion and childbirth. Although the incidence of each specific type of maternal morbidity seems low, the burden of total morbidities is high.

The morbidity rate of life-threatening near-miss conditions was 1% using the WHO criteria,[20] about half of the rate found in a retrospective study of near miss cases in four Palestinian hospitals[21] using different criteria. Out of more than a quarter of Palestinian women experiencing at least one morbidity, the largest proportion were women who had abortions while the most common complication was abortion-related hemorrhage. In Palestine, despite the awareness, availability and accessibility of family planning services, the reported unmet need in 2010 was 15.6%[22] which is higher than that of Jordan (14%), Egypt (11.5%), and Israel (9.1%).[23] This suggests that there is a proportion of "unwanted"/"unintended" pregnancies. In 2006, about 40% of a national sample of Palestinian pregnant women reported their pregnancy as "unintended"[24] which could be attributed to the limited access to or inadequate family planning services.

In our sample, 12.6% of women had a miscarriage/abortion, falling within the estimated range by the WHO of abortions due to unwanted/unintended pregnancies. Globally, in 2011, 5–20% of unwanted pregnancies resulted in miscarriage, stillbirth or abortion.[25] In Palestine, abortion is illegal by law and is not accepted by the Islamic society for religious reasons except to save the mother's life, which increases the burden of maternal morbidity related to abortion on the health system.[25] Moreover, in cases of unwanted pregnancies, women seek abortions either in private clinics or use traditional methods at home which may result in abortion-related hemorrhage and ultimately women with such cases show up at the hospital complaining of hemorrhage.[26] The most common forms of management were medical methods followed by curettage, which are unsafe practices as complications are 2–3 times higher than vacuum aspiration method and more costly.[27] Providers must be trained on evidence-based practices and safe abortion care.

In this study, complications during pregnancy included antepartum hemorrhage, preeclampsia/eclampsia, infection and indirect cases which is consistent with reports from other studies.[14,28] Hemorrhage during pregnancy mainly due to placenta conditions such as praevia, abruption or accreta, raises questions related to increasing rates of cesarean deliveries in Palestine. High risk pregnancies place heavy burdens on the health system. Although coverage of antenatal care in Palestine is high, little is known about the quality of antenatal care. Additionally, that calls for the availability and accessibility to an effective continuous and essential quality obstetric care from early pregnancy onward and timely interventions to manage complications in Palestinian hospitals.

The two most common causes of maternal morbidity in this hospital were hemorrhage (17.8%) and preeclampsia/eclampsia (4.2%) similar to findings from another Palestinian study[21] and elsewhere.[14] The incidence of preeclampsia/eclampsia in our study was double the incidence reported from Palestine in the WHO multi-country survey (4.2% vs 2.4%).[29] Consequently, strategies must be developed to allow early identification and effective antenatal treatment for women suffering from preeclampsia/eclampsia, to provide proper management during childbirth and prevent life-threatening complications.

Magnesium sulfate is the medicine of choice to reduce risks of severe pre-eclampsia and eclampsia.[30] In this study, it was administered to only 13 (20%) of women with pre-eclampsia/eclampsia, contrary to reports in the WHO survey (100%)[29] and less than reports from Iraq.[14] Previous research in this hospital[31] indicates that barriers to usage of magnesium sulfate for pre-eclampsia included lack of availability, insufficient knowledge, and weak bedside nursing due to high workload and insufficient staff.[32]

Hemorrhagic disorders were the most common complications among women (18.4%), which is lower than those reported in similar facility-based studies.[33] PPH is one of the most frequent causes of maternal death in Palestine.[34] In our study, the incidence of PPH falls within the expected rate by the WHO (2%),[35] which is much lower than the prevalence reported from Africa (6%),[36] and

much lower than the rate reported in the Palestinian retrospective near-miss study (2% vs 18.4%). However, since there were women who were treated for hemorrhage, but were not clearly documented in the records, we believe that the incidence of PPH in our study could be underestimated due to inadequate documentation. Inadequate documentation was also acknowledged in the Palestinian retrospective study.[21] Despite this fact, the coverage of uterotonics for prevention of PPH by oxytocin was high, similar to findings from Iraq,[14] and higher after vaginal deliveries than cesarean sections. This could be because midwives who assist most vaginal deliveries are keen to follow the standards to prevent PPH i.e. active management of third stage of labour. However, CS occur in the main operating theatre, where it is likely that nurses are busy with other tasks and are unable to monitor and give oxytocin IM for each woman after the operation in a timely manner. On the other hand, when PPH occurred after CS, coverage rates for uterotonics was 100%, including misoprostol. Some women received more than one uterotonic including ergometrine and misoprostol for prevention of PPH which is contrary to the WHO recommendations.[37]

Our findings revealed that some women suffered morbidities that were not explicitly documented in their medical records. This reflects the insufficient documentation and information system. A woman who received two or three units of blood (a special sticker fixed inside the file from the given unit of blood), or who had a laparotomy (from the operative sheet) most likely suffered from hemorrhage, but it was not explicitly documented in physicians' or nurses' progress notes. In addition, manual removal of placenta is significantly associated with morbidities such as endometritis.[38]

About one quarter of women delivered by CS, and half of them were primary CS (CS for the first time), exceeding the average national rate of CS deliveries (20.3%).[4] In Palestine, where the fertility rate is 4.1,[4] women who have had primary CS will most likely continue to have operative deliveries in the future, with the subsequent risks in each additional pregnancy and delivery. CS rates have almost doubled in the last two decades in Palestine.[9] In 2011, the CS rate has reached 32% in a governmental hospital[39] and maternal mortality in Palestine was significantly associated with CS.[40] Reasons for this escalation in CS rates include a decrease in vaginal births after cesarean (VBAC), increased number of high-risk expectant mothers due to primary CS, and the changes in obstetrical environment and provider practices.[41,42] Unlike some countries where maternal request has been given as a justification for CS, Palestinian women prefer to give birth vaginally.[42] However, women may not ask about the exact indications, available alternative management or potential risks once a CS is decided for them. Additionally, we found that preeclampsia could have been an indication for 9% of women who were delivered by CS, which is consistent with literature from other countries.[43] On the other hand, the evidence that supports CS as a mode of delivery of choice for women with preeclampsia is weak.[44]

Our study revealed that women who gave birth with CS experienced various morbidities such as hysterectomies, blood transfusion and near-miss three times more than women who gave birth vaginally. Studies have shown that cesarean deliveries increase the risk of hysterectomies, blood transfusions, adhesions, placenta praevia, abruption, accreta, surgical injury[45] and postpartum complications such as endometritis and death.[46] The escalation of CS rates in many countries has been considered a serious public health dilemma, increasing risks of maternal and newborn morbidities, disabilities and death and causing a heavy financial burden on the health system.[47] This emphasizes the need for promoting normal childbirth and eliminating unnecessary interventions for low risk women, particularly in this context where parity is high. Strategies for maternal health should focus on supporting the role of midwives in assisting women during childbirth as well as strengthening their capabilities and self-confidence in leading a non-interventionist approach in hospitals, thus enabling obstetricians to focus on the high-risk cases and complications.

Inappropriate use of induction of labour has been associated with maternal and neonatal morbidities, including PPH.[48] In our study, induction was more frequent before term. Of all women induced before term, 11 women had preeclampsia, which could be a reason for induction. Women who underwent induction experienced a variety of complications such as, PPH, hysterectomy, laparotomy, blood transfusion, retained placental products and admission to the ICU and NICU, and could represent a heavy financial burden on scarce resources. The prevalence of induction of labour in our study was lower than rates reported from Asia, but higher than rates reported from Africa.[48] However, the prevalence of women who successfully gave birth vaginally after induction of labour was lower than reports from both Africa and Asia[48] (76% of women had labour induced in this study gave birth vaginally vs 83% in Africa and 81% in Asia).

This study has several limitations. The data collection was from one hospital. However, this hospital is one of many operating under the same health system and the findings are likely to be similar to other governmental hospitals. Another limitation was that we could not identify more details on abortions/miscarriages. The study could not identify all morbidities related to abortion as many women prefer to seek care for abortion/miscarriage in private clinics/hospitals. This leads us to believe there could be underreporting or misclassifications of abortion cases. Furthermore, the data lacks demographic information as hospital does not collect this data routinely (i.e. education, employment, place of residence), information about indications of augmentation and induction of labour and cesarean sections to judge the rationale for the use of these invasive procedures and estimate rates of obstructed labour and determinants. The limited number of women with complications during the postpartum period makes one wonder whether women with perineal problems and other complications were lost to follow-up. Finally, we tried to be as specific as possible with the records that were available; we recognize that in some cases the data was not comprehensive, but it contributes to the dearth of information on maternal morbidities in this context.

5. Conclusion

The burden of maternal morbidity for Palestinian women is relatively high which suggests a problem of substandard quality of care. Our findings should prompt adoption of best practices during the continuum of care for maternal and newborn healthcare. There are many challenges to the organization and implementation of quality care hindered by political instability and restrictions on movement in this occupied country. Despite the courage and commitment of Palestinian health providers, much can still be done at the local policy and health service level to improve the outcomes of women and newborns. Morbidity related to cesarean sections is a serious public health problem that requires national strategies to promote a strong rationale for use of such procedure. It is worth investing in improving the care of midwives and obstetricians to assist women during birth with appropriate evidence-based practices, avoiding unnecessary medicalization and treating complications effectively without delays. Abortion related morbidity can be prevented by reducing unwanted pregnancies, improving the quality of family planning services and training/updating practices of providers related to abortion care particularly in vacuum aspiration procedures and medical procedures given the frequent complications related to abortion. Further studies are needed to address health system barriers to accurately document and monitor maternal morbidities including

the lack or insufficient maternal audits, the rational use of CS delivery and induction of labour, as well as enabling midwives and physicians to assist normal childbirth confidently while avoiding interventions as much as possible. Finally, rigorous and routine documentation of the details of childbirth events is necessary to identify maternal morbidities, disabilities, and suffering in order to inform policy makers and develop strategies to allocate resources to assist in reducing maternal morbidities and death. This analysis provided only a glimpse into the burden of maternal morbidity. Further studies are needed to estimate the incidence, trends, and management of maternal morbidity at the national level and to explore women's perspectives and views about unintended pregnancies, trends and management of abortion-related complications.

Authors' contribution

All authors contributed to the conception and design of the whole research. SH and LW supervised the field work. SH trained the field workers on data extraction, closely monitored data collection and entry, conceptualized this paper, analyzed the data, and drafted and revised the manuscript. LW and JD reviewed and critically commented on the manuscript. JD supervised the multi-country study. All authors read and approved the final version.

Conflict of interest

The authors declare that they have no competing interest.

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