



وزارة الصحة



National Maternal Mortality Report 2020



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Foreword

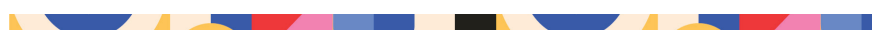


The State of Palestine is keen to achieve the third sustainable development goal “good health and well-being” and is also committed to implementing the Arab strategy for maternal health. In order to achieve the highest possible level of maternal health and reduce morbidity and mortality among women of childbearing age, the Palestinian Ministry of Health is working continuously, through the National Sexual and Reproductive Health Strategy, on improving the quality of pregnancy, childbirth and abortion healthcare services in Palestine.

Palestine has achieved a remarkable progress in maternal health compared to other countries. Yet maternal mortality reduction remains a priority, especially during the COVID-19 pandemic which has fronted the health system with additional challenges.

Revision of maternal deaths helps find out the leading causes of death and uncover the complex bundle of contributing factors, and hence facilitate drawing proper policies and drive evidence-based actions to mitigate these factors.

Under the support of the United Nation Populations Fund, the maternal mortality report 2020, has been developed by the teamwork of a national technical committee from Gaza and the West Bank headed by the Women’s Health and Development Unit. Therefore, we would like to thank all who participated and allowed the possibility to complete this work and bring it to light.



Dedication



This report and recommendations are dedicated to the families who were left behind after their loss of a wife, a mother, a sister or a daughter.

Table of Contents:

FOREWORD	3
DEDICATION	4
INTRODUCTION	8
GLOBAL TREND	8
NATIONAL TREND	9
PURPOSE AND OBJECTIVES	11
METHODS	11
RESULTS	13
MATERNAL CHARACTERISTICS	14
NUMBER AND PLACE OF ANTENATAL CARE	15
RESIDENCE	16
TIME OF DEATH	19
MODE OF DELIVERY	20
PLACE OF DEATH	21
CLINICAL CONDITION AT TIME OF HOSPITAL ADMISSION	21
MEDICAL PROBLEMS	23
CAUSE OF DEATH	24
DEATH PREVENTABILITY	25
COVID-19 RELATED DEATHS	29
DISCUSSION	31
LOGISTIC CHALLENGES	34
RECOMMENDATIONS	35
REFERENCES	36

Executive summary




Maternal death is a major global health concern. In the context of the Sustainable Development Goals (SDG), a recent target has been set “to accelerate the reduction of global maternal mortality by 2030 to 70 per 100,000 births, with no country having a maternal mortality rate of more than twice the global average”. Unexpectedly, the corona pandemic has resulted in worsened maternal and fetal outcomes worldwide, with considerable variations between high-income and low-income countries.

In Palestine, the estimated maternal mortality ratio in 2020 was 28.5 per 100 000 livebirths, an increase by 43.2% compared to 2019. COVID-19 infection was the leading cause of death contributing to 24.3% of all deaths. However, the corona pandemic has jeopardized maternal health outcomes per se, reflected in increased maternal death due to direct obstetric causes as well. This is attributed to several factors including lockdowns, closure of antenatal care and high-risk pregnancy clinics, refrain of women from seeking medical care due to fear from contracting the infection, relocation of health care providers to corona centers, financial hardship and shortage of medical equipment and supplies. However, it seems that the corona pandemic has limited the access to healthcare for women attending services at the public sector, and to a lesser extent for women who afforded for services at the private sector. This underlines the defect in the health system where vulnerable populations are more severed at times of crisis.

Differences in the leading causes of maternal death were observed between Gaza and the West Bank. The most common direct causes reported in Gaza were bleeding (50%) and sepsis (25%), whereas pulmonary embolism (31%) and preeclampsia (23%) were the major causes in the West Bank, somehow mimicking the causes in more developed settings. Such differences may reflect inequalities in access to quality health between Gaza and the West Bank, as well as disparities in the hospital preparedness, infrastructure, equipment, and medical supplies.

Most deaths (83.75) occurred inside hospitals, but 71% of women were classified as having severe or critical clinical conditions when they arrived the health facility. Yet, 29% women had an either good or moderate condition at time of hospital admission, meaning they had favorable indicators and their risk of death was not supposed to be high. This highlights the gaps in the intrahospital care which could be linked to several factors including infrastructure,



lack of medicines and equipment, but also reflected the suboptimal competency of healthcare providers in terms of underestimation of the clinical condition, insufficient knowledge or training in patient critical care, lack of specialized care and delayed referral due to limited options and lack of coordination and communication between healthcare providers.

The majority of deaths (78.4%) were preventable, either by potential interventions during the preconception period, antenatal care and inside hospitals.

Most women who died due to COVID-19 infection were more than 31 years old and in their third trimester. Forty four women underwent iatrogenic preterm termination of pregnancy by cesarean section to improve their clinical condition. About 67% women had pre-existing medical conditions like diabetes and bronchial asthma. According to the WHO classification criteria, 66.7% women presented with severe COVID-19 disease, and the most common cause of death was respiratory failure.

This report emphasizes the importance of developing a national SRH emergency action plan to ensure the continuity of maternal care during crisis to reduce maternal morbidities and mortalities, especially for vulnerable women and those living in remote areas. Capacity building of healthcare providers is also key for an improved quality of care. This includes promoting adherence to evidence-based practice as per national protocols and regular training to improve their theoretical and clinical skills, especially in management of obstetric emergencies and critical care during pregnancy. Pre-conception care should be properly adopted for better maternal and fetal outcomes. Linking the HIS at the primary and secondary care levels, as well as sharing patients' data between the private and public sectors, may reduce the risk of delayed diagnosis of certain maternal conditions and hence allows timely management. At last, activation of maternal mortality revision per hospital to highlight actions and inactions that contributed to maternal death as a lesson learning process, is recommended as a quality improvement intervention.

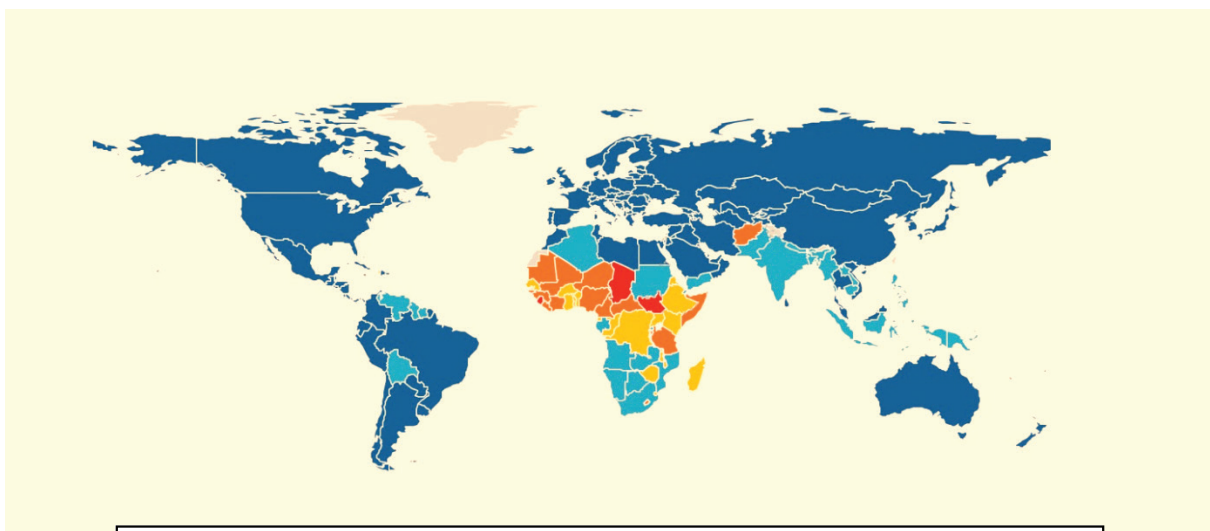


1. Introduction

Global trend

Maternal death is a major global health concern. In the context of the Sustainable Development Goals (SDG), a recent target has been set “to accelerate the reduction of global maternal mortality by 2030 to 70 per 100,000 births, with no country having a maternal mortality rate of more than twice the global average” [1]. Such target sounds too ambitious taking into account the wide variation in maternal mortality across the globe (figure 1). Despite the global 38% reduction in maternal mortality ratio (from 342 deaths to 211 deaths per 100,000 live births) between 2000 and 2017, maternal mortality remains a major issue in low and middle-income countries due to its magnitude and lower declining pattern. Low and middle incomes countries still bear 99% of the burden of maternal mortality and the majority of deaths occur in sub-Saharan Africa. In general, a woman’s lifetime risk of maternal death in low-income countries is 1 in 45 versus 1 in 4500 in high income countries[1].

Figure 1 Global ratios of maternal mortality



Source: World Health Organization, UNICEF, United Nations Population Fund and The World Bank, *Trends in Maternal Mortality: 2000 to 2017* WHO, Geneva, 2019.

● Very low <100 ● Low 100-299 ● High 300-499 ● Very high 500-999 ● Extremely high >1000

These alarming rates and their implications for poor maternal and infant outcomes with long term poor health consequences, highlight a critical need for surveillance with the goal of understanding how to prevent maternal mortality (MM) through quality improvement initiatives.

National trend

The reported MMR figure in Palestine in 2019 was below the SDG target at 19.9 per 100,000 live births. The overall MMR in both the WB and Gaza has improved, decreasing by around 48% from 38 per 100,000 live births in 2009 to around 19.9 in 2019. In 2017, there was a noticeable drop in MMR to 5.9 per 100,00 live births, followed by increases in 2018 and 2019 to 16.7 and 19.9, respectively (**Figure 2**)^[2,3].

Figure 2 MMR by Year in Palestine

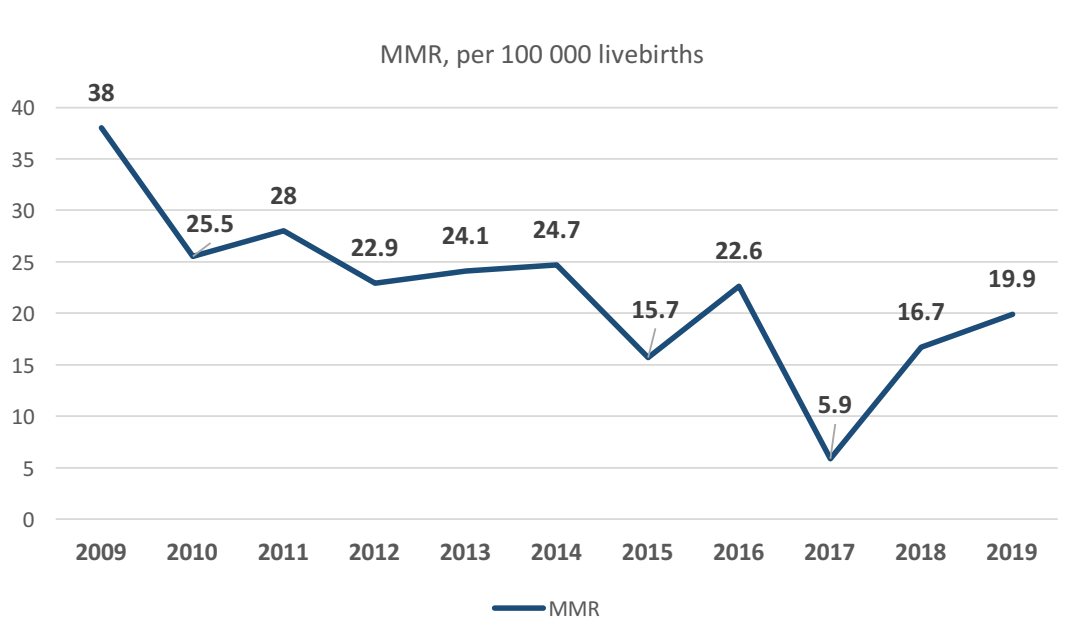
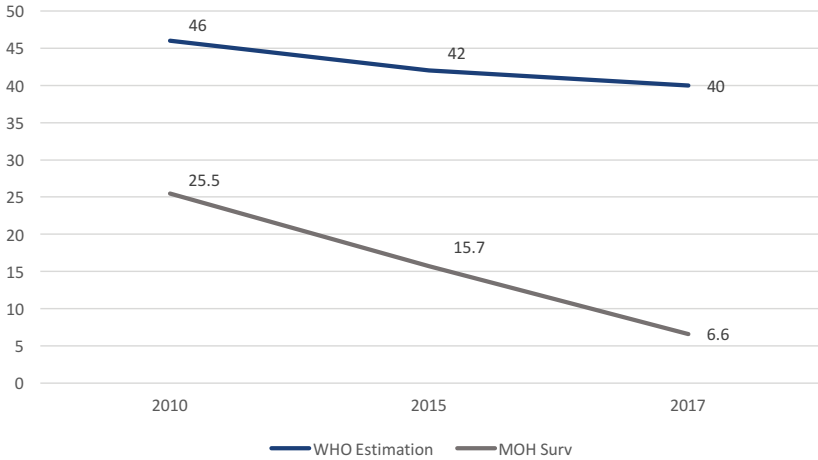


Figure 3 below shows a comparison between WHO MMR estimation and surveillance figures. A gap in MMR can be seen between the estimation and surveillance rates, which could indicate underreporting in surveillance and should be taken into consideration in decision making and policy development. The literature revealed that maternal mortality data underestimates the true magnitude by up to 30% worldwide and by as much as 70% in some countries. Therefore, regardless of the methods used to measure MM indicators, it is necessary to consider the substantial uncertainty resulting from underreporting, as it is more common than over-reporting ^[4].

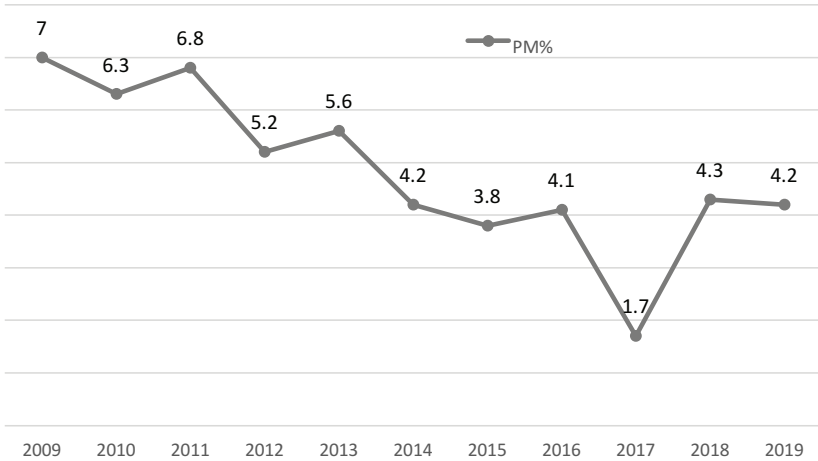


Figure 3 MMR Comparison between WHO Estimation and MOH Surveillance by Year



The proportion of maternal death out of all deaths of females of reproductive age (PM%) is another indicator used to measure the occurrence of MM from other causes of death among women between the ages of 15 and 49. The figure below shows that in general, there has been a reduction in PM% from 7% in 2009 to around 4% in 2018. Over the years, PM% varies, both increasing and decreasing. In 2010, the PM% was the same for the WHO estimation and MOH surveillance, however in 2015 and 2017, there was a gap between the two figures [2]. It is also worth mentioning that, according to the PNIPH report assessing the quality of cause of death registry data using the ANACONDA tool, the completeness of female death reporting was around 68% in the West Bank and 72% in the Gaza Strip in 2018 [5].

Figure 4 Proportion of Maternal Mortality (PM%) by Year in Palestine



2. Purpose and Objectives

Maternal mortality is a reflection of women's overall access to healthcare as well as the quality and responsiveness of the health care system to their needs. Therefore, analysis of maternal mortality is not only important for identifying the factors contributing to maternal mortality, but also for evaluating the existing interventional programs.

The objectives of this report are:

- 1.1 Explore clinical characteristics of maternal deaths.
- 1.2 Explore the underlying causes of maternal deaths.
- 1.3 Explore the factors contributing to maternal death.
- 1.4 Explore COVID-19 maternal deaths.
- 1.5 Form recommendations for corrective measures.

3. Methods

This report was developed by a national technical committee formed of obstetricians, midwives, experts in the field of maternal and child health from Gaza and West Bank.

Each maternal death was reviewed utilizing medical files, death notification forms and maternal mortality surveys.

Descriptive and crosstab analysis were performed. Data presented for Palestine as total and stratified per region into Gaza and West Bank.

Maternal condition upon arrival to hospital was classified according to the American Hospital Association Guidelines^[6]:

- Good condition; vital signs are within normal limits, patient is conscious and comfortable
- Moderate; Patient vital signs are stable and within normal limits. Patient is conscious but may be uncomfortable. Indicators are favorable, or may have minor complications, Outlook/indicators is favorable.



- Severe condition; Vital signs are unstable and not within normal limits. Patient is acutely ill. A chance for improved outlook
- Critical - Vital signs are unstable and not within normal limits. Patient may be unconscious, has multi-organ failure, indicators are unfavorable (Death may be imminent).

Severity classification of maternal clinical condition was determined based on:

1. Stability of vital signs
2. Level of consciousness
3. Normal or abnormal laboratory tests
4. Presence or absence of minor or major complications
5. Presence or absence of organ failure
6. Received critical intervention
7. WHO COVID-19 severity criteria* (annex)

Grauidity; primigravida ladies who are pregnant for the first time, multigravida are women who have been pregnant 1-4 times before the current pregnancy, grand multigravida are women who were pregnant five times or more.

Parity; primiparous ladies having no previous births. Multiparous; women who have 1-4 births and grand multiparous; women having ≥ 5 births.

Maternal death was defined based on the World Health Organization (WHO) definition, as female deaths from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) that occur during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy.

- Direct obstetric/maternal deaths are those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), and from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

- Indirect obstetric/maternal deaths are those maternal deaths “resulting from previous existing disease or disease that developed during pregnancy and not due to direct obstetric causes but were aggravated by the physiologic effects of pregnancy.

The WHO ICD-10 classification system was applied to classify causes of death (code O26.8 for direct obstetric causes and code O99.8 for indirect obstetric causes).

For the purposes of case assessment, **preventability of maternal death** is defined as “any action or inaction on the part of the health care provider, system, patient, or a combination of these factors that may have caused progression to more severe morbidity”^[6]. Death preventability was assessed through expert revision of medical files and utilization of the three-delay model approach^[7].

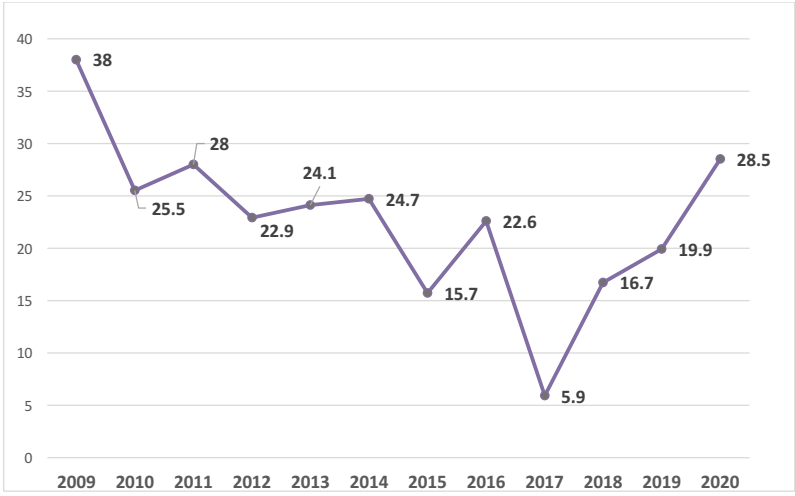
Maternal mortality ratio was computed by dividing recorded maternal deaths by total recorded live births in the same period and multiplying by 100,000.

4. Results

In 2020, there was an estimated 75,037 live births; 38,343 in the West Bank and 36,694 in Gaza. A total of 37 maternal deaths were reported; 24 deaths in the West Bank and 13 deaths in Gaza. Hence the estimated maternal mortality ratio (MMR) is 28.5 per 100 000 live births. Figure shows the trend of MMR in the years 2009- 2020.



Figure 5 Trend of MMR 2009- 2020, Palestine



Maternal Characteristics

Maternal age ranged from 19 years to 46 years (median 29, mean 30.88, standard deviation ± 6.84). About 62% of women were multiparous, 21.6% were grand multiparous, 46% were multigravida, 37.8% were grandmultigravida and 37.8% women had a history of at least one previous abortion.

Table 1 Maternal characteristics

Characteristics	West Bank		Gaza		Total	
	Number	%	Number	%	Number	%
(Age group (years						
20>	0	0	2	15.5	2	5.4
20-25	7	29.2	2	15.5	9	24.3
26-30	6	25.0	3	23.0	9	24.3
31-35	3	12.5	3	23.0	6	16.2
35<	8	33.3	3	23.0	11	29.7
Education						
Primary School	1	4.2	-	-		
Secondary school	14	58.3	-	-		

Diploma/University	9	37.5	-	-		
Primigravida	4	16.7	2	15.5	6	16.2
Multigravida	9	37.5	8	61.5	17	46.0
Grand multigravida (≥5 pregnancies)	11	45.8	3	23.0	14	37.8
Nulliparous	4	16.7	2	15.5	6	16.2
Multiparous	15	62.5	8	61.5	23	62.1
Grand multiparous (≥5 births)	5	20.8	3	23.0	8	21.6
Previous abortions	10	41.6	4	31.0	14	37.8

Number and place of antenatal care

All deceased women attended to ANC a least once during pregnancy. The most common places of receiving ANC were the private sector (27.0%), MOH+ private(21.6%) and MOH (19.0%). Table shows distribution of ANC place In Gaza and the West Bank.

Table 2 Number of women according to place of ANC

	West Bank	Gaza	Total
*Center of ANC	(%) N	(%) N	(%) N
Private	(33.3%) 8	(15.3) 2	(27.0%) 10
**MOH	(25.0%) 6	(07.8) 1	(19.0%) 7
Civilian organization	(16.7%) 4	0	(10.8%) 4
***UNRWA		(30.8) 4	(10.8%) 4



MOH+ Private	(16.7%) 4	(30.8) 4	(21.6%) 8
MOH+ UNRWA	(08.3%) 2	(15.3) 2	(10.8%) 4
UNRWA+ Private	(04.2%) 1	-	(2.7%) 1
UNRWA+ Private+ Civil organization	(04.2%) 1	-	(2.7%) 1

*ANC; antenatal care

**MOH; Ministry of Health

***UNRWA; United Nations Relief and Works Agency

In the West Bank, 13 (54.2%) women had 4 antenatal visits and 7 (29.2%) < 4 antenatal visits.

Five (71.4%) of the seven women who had less than four ANC visits, had received care at MOH centers, and the other two (28.6%) women received ANC at private sector. While for the 13 women who had 4 ANC visits, 4 (30.8%) women received care at private centers, 4 (30.8%) at both private and MOH centers, 2 (15.4%) at MOH centers, 1 (7.7%) at UNRWA, 1 (7.7%) at NGO (civilian) institution and 1 (7.7%) at MOH and UNRWA.

No data are available from Gaza on number of ANC visits.

Residence

This section presents the governorate/city where the deceased came from, not the place/hospital where the death has occurred.

In the West Bank, 11 (45.8%) women came from Hebron (Figure 6), but as MMR was estimated for each governorate, Qalqilya and Tubas governorates showed the greatest MMR; 85.4 and 66.0 per 100 000 livebirths, respectively (Table 3). In Gaza, proportions (%) of deaths in Gaza city, Khan Younis and Rafah were approximate (figure 6). Khan Younis governorate had the highest MMR (table 4).

Figure 6 Distribution of maternal deaths by governorate, West Bank

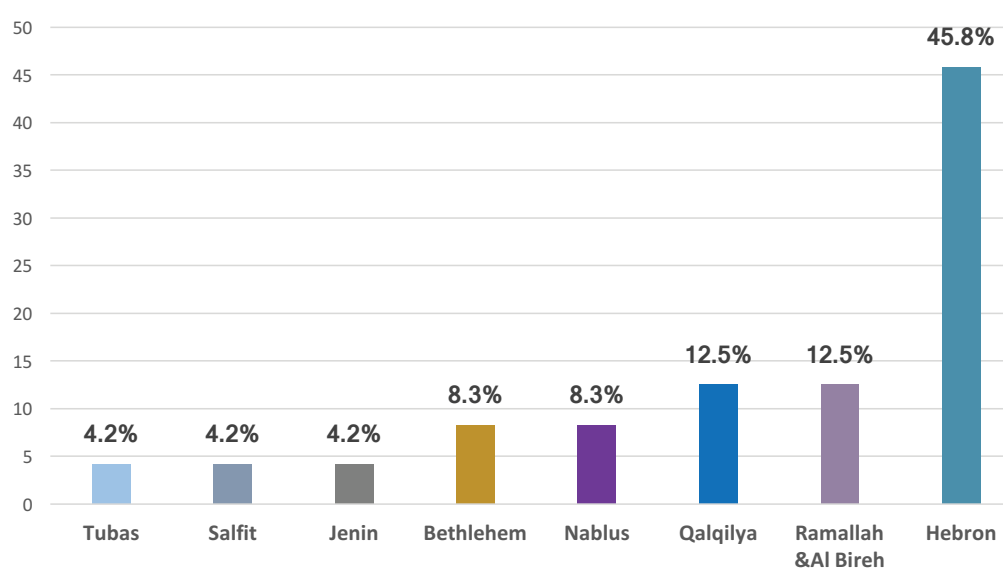


Table 3 MMR (per 100 000 livebirths) by governorate, West Bank

Governorate	Live births	Maternal deaths	Maternal mortality ratio
Hebron	25,508	11	43.1
Ramallah & Al Bireh	7,679	3	39.1
Qalqilya	3,511	3	85.4
Nablus	10,274	2	19.5
Bethlehem	6,690	2	29.9
Jenin	8,979	1	11.1
Salfit	2,261	1	44.2
Tubas	1,517	1	66.0



Figure 7 Distribution of maternal deaths by governorate, Gaza

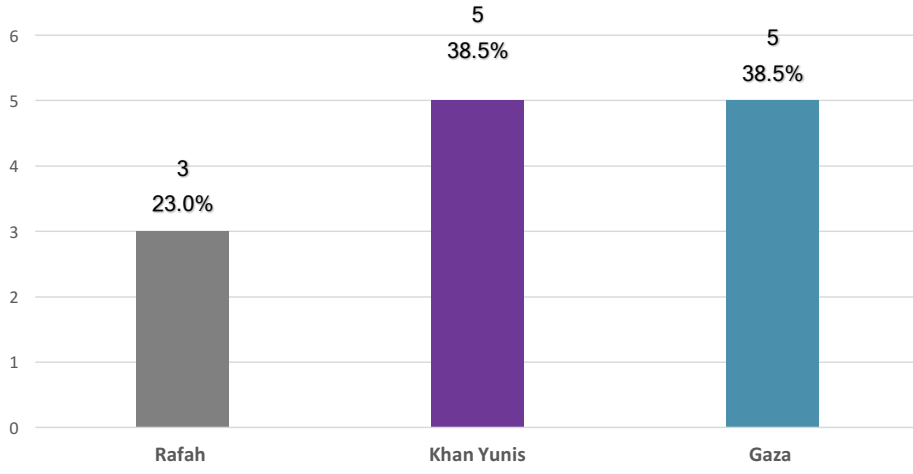


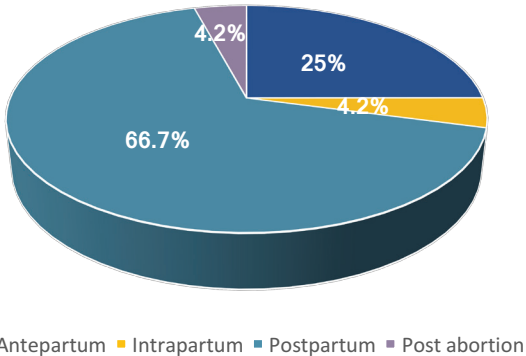
Table 4MMR (per 100 000 livebirths) by governorate, Gaza

Governorate	Live births	Maternal deaths	Maternal mortality ratio
Gaza	19820	5	25.2
Khan Yunis	10642	5	47.0
Rafah	6723	3	44.6

Time of death

Twenty-nine (78.4%) women died during the postpartum period. In the West Bank, 16 maternal deaths took place in the postpartum period, six during pregnancy/ antepartum period, one death during labor and one death post abortion. While in Gaza, all 13 deaths occurred during the postpartum period.

Figure 8 Timing of death, West Bank



Most antepartum deaths in the West Bank, took place during the third trimester (66.7%) which was twice as deaths occurring during the second trimester (33.3%), as shown in table 5.

Table 5 Pregnancy trimester for antepartum deaths, West Bank

Antepartum	West Bank	
	Number	%
First trimester	0	0
Second trimester	2	33.3
Third trimester	4	66.7
Total	6	100

Time points of onset of complications/events responsible for deaths that occurred postpartum, is presented in table 6.

Table 6 Onset of complications for postpartum deaths

Onset of complications	West Bank		Gaza		Total	
	Number	%	Number	%	Number	%
Antepartum	10	62.5	5	38.5	15	51.7
Postpartum	5	31.3	8	61.5	13	44.8
Unknown	1	6.2	0	0	1	3.4
Total	16	100	13	100	29	100

Mode of delivery

A total of 32 (86.5%) women gave birth before or around time of death. In the West Bank, 19 women had given birth; their pregnancy terminated. While in Gaza all women gave birth.

In the West Bank, most cesarean sections (8 out of 11, 72.7%) were performed to improve maternal respiratory condition (5 women) or facilitate CPR (3 women).

Mode of delivery is presented in table 7. Table 8 shows the indications for cesarean deliveries in the West Bank.



Table 7 Mode of delivery in women who gave birth (N=32)

Mode of delivery	West Bank		Gaza		Total	
	Number	%	Number	%	Number	%
Vaginal delivery	8	42.0	6	46.2	14	43.8
Cesarean delivery	11	58	7	53.8	18	56.3
Elective	1	5.2	2	15.4	3	09.4
Emergency	5	26.3	3	23.1	8	25.0
Cesarean hysterectomy	3	15.8	2	15.4	5	15.6
Perimortem cesarean	2	15.8	-	-	2	06.3

Table 8 Indications of cesarean delivery, West Bank

Type of Cesarean	Indications
Elective	Repeated CS
*Emergency	Improve maternal respiratory condition
Cesarean hysterectomy**	Placenta accreta
Perimortem cesarean	Facilitate cardiopulmonary resuscitation

**Improve maternal respiratory condition in four confirmed sever/critical COVID-19 cases*

***One cesarean hysterectomy was performed due to severe antepartum hemorrhage and one to improve maternal respiratory condition in a confirmed severe/critical COVID-19 disease*

Place of death

Six (16.2%) women arrived dead to the hospital; 31 (83.8%) deaths took place at hospital.

Table 9 Place of death

Place of death	West Bank		Gaza	
	N	%	N	%
Outside hospital	4	16.7	2	15.4
At hospital	20	83.3	11	84.6

Clinical condition at time of hospital admission

Six (19.4%) of the 31 women who died inside a hospital were in a general good condition at time of admission, 3 (9.7%) moderate, 13 (42.0%) severe and 9 (29.0%) in critical condition. Tables 1 and 2 show the condition at time of hospital arrival and the cause of admission in the West Bank and Gaza, respectively.



Table 10 Hospital arrival condition and cause of admission, WB



	Condition at hospital arrival	Cause of admission
 <p>20 hospital deaths</p>	<p>10 Severe</p> <p>50%</p>	<p>6 COVID-19 pneumonia</p> <p>1 Non-COVID-19 pneumonia</p> <p>1 Acute pancreatitis</p> <p>1 Diabetic ketoacidosis + COVID-19</p> <p>1 IUFD in labor</p>
	<p>4 Critical</p> <p>20%</p>	<p>1 Decompensated cardiomyopathy</p> <p>1 Diabetic ketoacidosis</p> <p>1 Labor</p> <p>1 Hemorrhagic shock</p>
	<p>2 Moderate</p> <p>10%</p>	<p>1 Acute pyelonephritis</p> <p>1 Antepartum hemorrhage</p>
	<p>4 Good</p> <p>20%</p>	<p>2 Labor</p> <p>1 Elective Cesarean</p> <p>1 Preterm premature rupture of membranes</p>

Table 11 Hospital arrival condition and cause of admission, Gaza

	Condition at hospital arrival	Cause of admission
 <p>hospital 11 deaths</p>	<p>3 27.3%</p> <p>Severe</p>	<p>1 postpartum preeclampsia</p> <p>1 DVT</p> <p>1 severe PIH</p>
	<p>5 45.4%</p> <p>Critical</p>	<p>2 Decompensated cardiomyopathy</p> <p>1 Acute MI</p> <p>1 Mitral Incompetence</p> <p>1 Hemorrhagic shock (APH)</p>
	<p>1 9.1%</p> <p>Moderate</p>	<p>1 Acute pylenonephritis</p>
	<p>2 18.2%</p> <p>Good</p>	<p>1 Labor</p> <p>1 Elective Cesarean</p>

Medical problems

A total of 17(46.0%) women had pre-gestational medical problems. Twenty (54.1%) women had free past medical history and 13 (35.1%) had obstetric complications during current pregnancy. In the West Bank, 10 (41.7%) women had antenatal obstetric complications. Thirteen (54.2%) women had a free past medical history, of which 9 (69.2%) had obstetric complications including preeclampsia, HELLP syndrome, gestational diabetes, twins pregnancy, IUGR, placenta accrete and fetal chromosomal anomaly. Eleven(45.8%) women had pre-gestational medical problems including 5 (20.8%) women who had both pre-gestational medical problems and obstetric complications (Table 12). In Gaza, 7 (53.8%) women had no past medical problems, of which three women had anemia. Six (46.2%) women had pre-gestational medical problems, including three (23.1%) who had both pre-gestational and obstetric conditions (Table 13).

Table 12 Pre-gestational medical and obstetric conditions, West Bank



	(Pre-gestational condition (N=11	Obstetric Complication present
 <p>46% 11 women</p>	2 18.2% Diabetes Mellitus with thrombophilia 1	One of the two women had anemia
	2 18.2% Cardiac Disease with thrombophilia 1	One of the two women had anemia
	2 18.2% Bronchial Asthma	One of the two women had twins and placenta accreta
	1 09.1% Morbid Obesity	Preeclampsia
	1 09.1% Biotin deficiency	No
	1 09.1% Corrected Scoliosis	No
	1 09.1% Acute Myeloid Leukemia	No
	1 09.1%	Secondary postpartum hemorrhage

Table 13 Pre-gestational medical and obstetric conditions, Gaza

 <p>46.1% women 6</p>	(Pre-gestational condition (N=6	Obstetric Complication present
	2 33.2% Cardiac Disease	One of the two women had anemia
	1 16.7% Chronic hypertension with thrombophilia	No
	1 16.7% Rheumatoid arthritis	Deep venous thrombosis and anemia
	1 16.7% Thrombocytopenia	Anemia
	1 16.7% Brain tumor & psychological disorder	No

Cause of Death

Cause of maternal death was identified based on verbal autopsy. In the West Bank, 15 (62.5%) women had no autopsy, one autopsy was confirmed but no data were available on whether autopsy was done or not one autopsy for the remaining 8 (33.3%) women.

Twenty-one (56.8%) deaths were attributed to direct obstetric causes and 16 (43.2%) to indirect causes. Indirect maternal deaths were slightly higher in the West Bank than Gaza owed to COVID-19- related deaths (45.8% versus 38.5%). Details on direct and indirect causes of death are presented in figures 9- 15 below.



Figure 9 Direct and indirect causes of death, Palestine (N= 37)

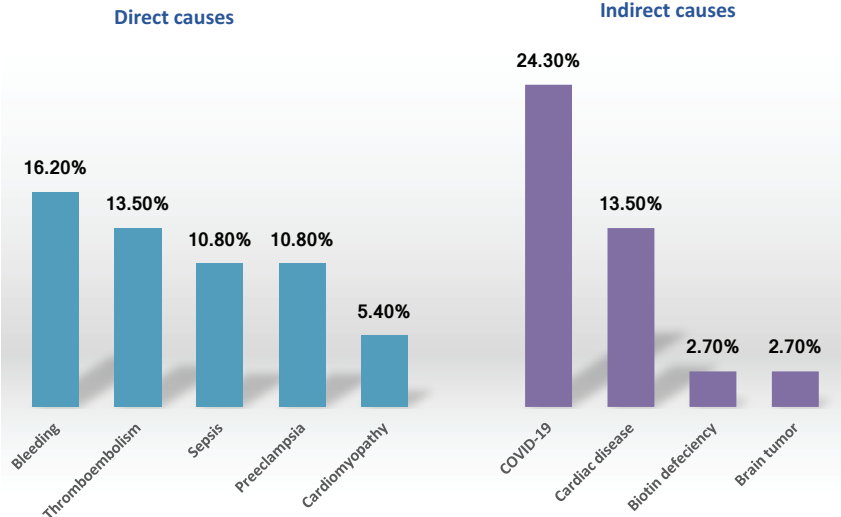


Figure 10 Direct versus indirect causes of death, West Bank

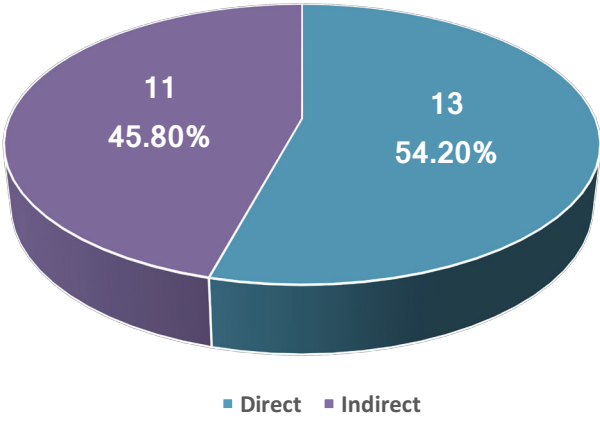


Figure 11 Direct versus indirect causes of death, Gaza

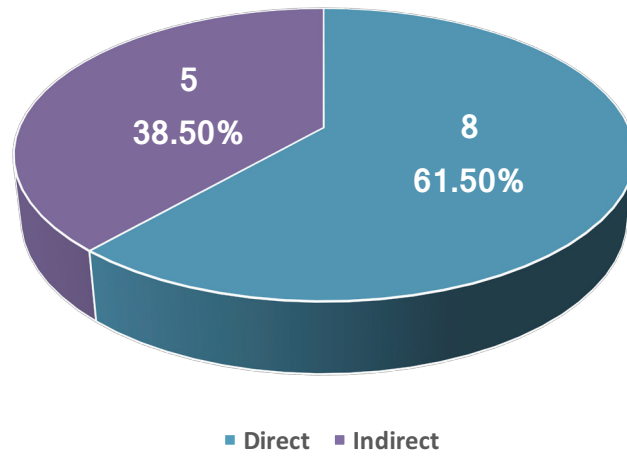


Figure 12 Direct death causes, West Bank

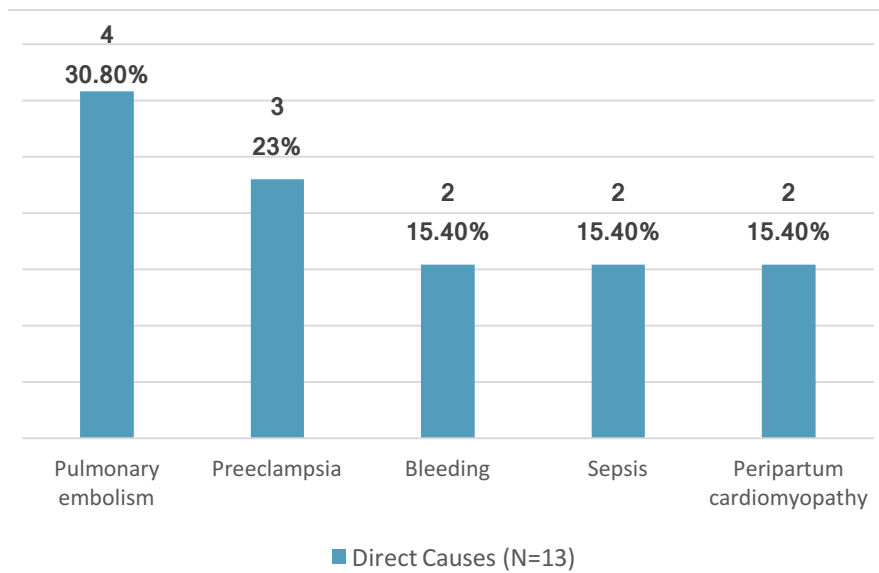


Figure 13 Indirect death causes, West Bank

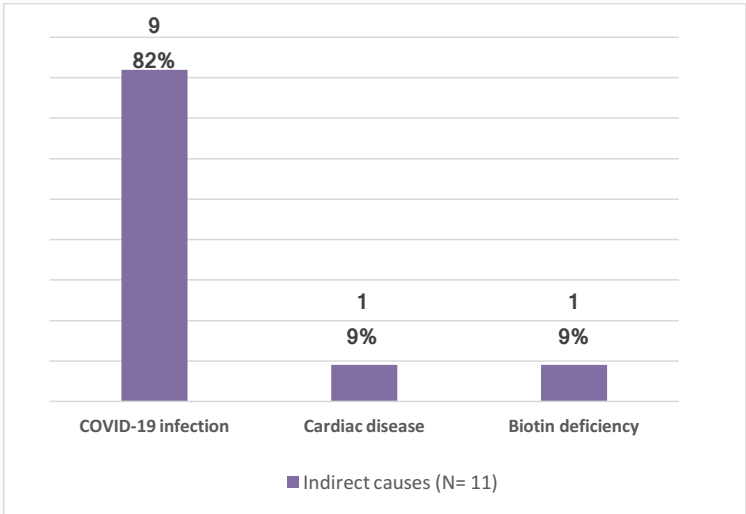


Figure 14 Direct death causes, Gaza

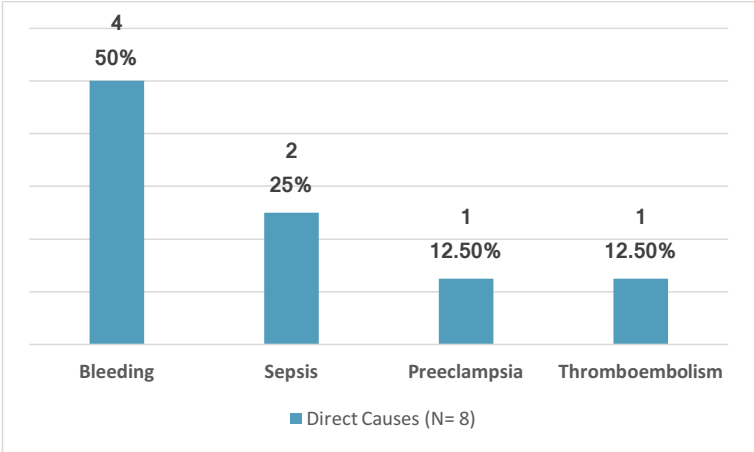
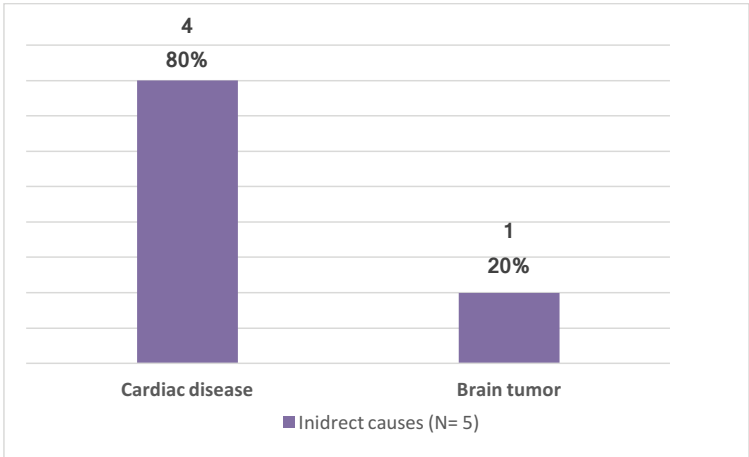


Figure 15 Indirect death causes, Gaza



Death preventability

A total of 29 (78.4%) maternal deaths were deemed preventable. Similar proportions were observed in Gaza and the West Bank as shown in figures 16 and 17.

Figure 16 Preventable versus unpreventable deaths, West Bank

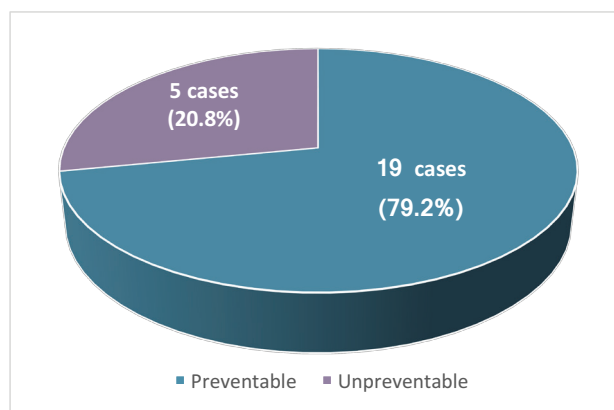
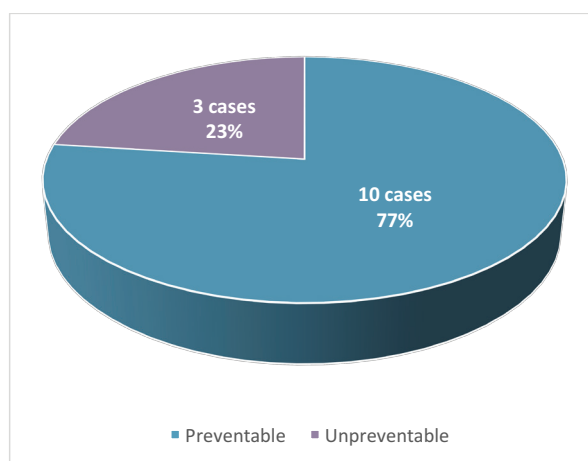


Figure 17 Preventable versus unpreventable deaths, Gaza



COVID-19 related deaths

Of all maternal deaths, 9 (24.3%) women died due to complications of COVID-19 disease. All COVID-19 related deaths were reported in the West Bank, none in Gaza. Table 14 presents the characteristics of COVID-19 related deaths in the West Bank. About 78% were multiparous women, 66.6% women were 31 years old and 44.4% were older than 35 years. One woman contracted COVID-19 infection postpartum. Of the 8 women who had the disease while pregnant, three women died during pregnancy and 5 women died postpartum, including 4 (44.4%) women who underwent iatrogenic preterm birth by emergency cesarean section, to improve their clinical condition/respiratory function.



Most women (77.8%) women got the COVID-19 infection during the third trimester of pregnancy. Six (66.7%) women had co-morbidities; 5 had them before conception and one during the current pregnancy. The most common clinical presentation was pneumonia (66.7%), and all women were classified as severe or critical disease at the time of hospital admission; 66.7% severe and 33.3% critical.

Table 14 Characteristics of COVID-19 related maternal deaths (N=9)

Characteristics	(%) N	Notes
Age group		
20-25	(22.2%) 2	
26-30	(11.1%) 1	
31-35	(22.2%) 2	
35<	(44.4%) 4	
Onset of COVID-19		
First trimester	0	
Second trimester	(22.2%) 2	
Third trimester	(66.7%) 6	
Postpartum	(11.1%) 1	
Parity		
Primiparous	(11.1%) 1	
Multiparous	(77.8%) 7	
Grand multipara	(11.1%) 1	
Mode of delivery		
Vaginal delivery	(22.2%) 2	
Cesarean delivery	(44.4%) 4	
Pregnancy not terminated	(33.3%) 3	Died during pregnancy
Co-morbidities		
No	(33.3%) 3	
Yes	(66.7%) 6	2 Pre-gestational diabetes 2 Bronchial asthma 1 SLE* 1 AML** during pregnancy
Clinical presentations		

Pneumonia	(66.7%) 6	
Diabetic ketoacidosis + respiratory distress	(22.2%) 2	
***Septic shock and DIC	(11.1%) 1	
**Condition at hospital arrival		
Severe	(66.7%) 6	
Critical	(33.3%) 3	
Main complication causing death		
Respiratory failure	(66.7%) 6	
Cardiac arrest	(22.2%) 2	
Sepsis	(11.1%) 1	
Preventable		
No	(44.4%) 4	
Yes	(55.6%) 5	

* SLE; Systemic lupus erythematosus

** AML; Adult acute myeloid leukemia

***DIC; disseminated intravascular coagulopathy

**Based on WHO severity classification for COVID-19 disease

5. Discussion

In Palestine, maternal mortality ratio has increased by 43.2% in 2020 compared to previous year. COVID-19 infection was the most common cause of death contributing to 24.3% of all deaths (80% of indirect maternal deaths in the West Bank). However, the corona pandemic has indirectly jeopardized maternal health outcomes, reflected in increased maternal death due to indirect and direct obstetric causes. In 2020, 28 non-COVID-19-related maternal deaths were reported (contributing to 75.7% of all deaths), compared to 17 deaths in 2019. This increase is attributed to several factors including lockdowns, closure of clinics providing ANC and other SRH services, refrain of women from seeking medical care due to fear from contracting the infection, relocation of health care providers to corona centers, financial hardship and shortage of medical equipment and supplies. The impact of the corona pandemic was not limited



to Palestine. Worsened maternal and fetal outcomes have also been reported globally, with considerable variations between high-income and low-income countries, something which highlights the gaps in maternal health care equitability and accessibility at times of crisis^[8].

The cause of death was identified based on the ICD-10 system, yet this relied almost entirely on verbal autopsy. Bleeding (16.2%) and thromboembolism (13.5%) followed by preeclampsia (10.8%) and sepsis (10.8%) remain the leading direct causes of maternal death in Palestine. However, when stratified per region, a noticeable variation is observed between Gaza and the West Bank. The most common reported cause of death in Gaza and the West Bank were bleeding and pulmonary embolism, respectively. Bleeding contributed to half of all direct causes in Gaza versus 15.4% in the West Bank. Sepsis was the second most common cause of death in Gaza; 25% versus 15.4% in the West Bank. While preeclampsia was the second most common cause in the West Bank; 23% versus 12.5% in Gaza. The higher number of maternal deaths due to bleeding and sepsis in Gaza may reflect inequalities in access to quality health between Gaza and the West Bank, as well as disparities in the hospital preparedness, infrastructure, equipment and medical supplies. Death due to cardiac conditions has also become an alarming concern. In the West Bank, peripartum cardiomyopathy, a direct cause of death, was as common as sepsis and bleeding (15.4%). Whereas in Gaza, it was reported that 80% of indirect maternal deaths were attributed to unspecified cardiac disease. The variation in causes of death between Gaza and the West Bank needs further assessment. However, it is speculated that such discrepancy can be linked to the differences in clinical practice and the socioeconomic and political contexts.

The most common sites where the deceased received ANC were at the private sector (33.3%) and MOH centers in the West Bank, and UNRWA (30.8%) and “MOH+ Private” centers (30.8%) in Gaza (table 2). This highlights the importance of assessing the effectiveness and quality of care at all sites including the private sector, and emphasizes the need for unification of the clinical guidelines and protocols at national level. Moreover, it implies that receiving care by multiple providers may result in missed diagnosis and delayed detection of serious pregnancy complications, especially when patients’ information and medical files are not shared between the different care providers. In the West Bank, most women (71.4%) who had less than four ANC visits, received care at MOH centers. This likely reflects the impact of the corona pandemic on the continuity of service

delivery. According to the MOH annual health reports 2019 and 2020, the number of beneficiaries who received ANC at MOH clinics, decreased by half during 2020^[2,9]. For those who had the financial capability, it was possible to access health care at private sector, but this was not the same for poorer women, or those living in remote areas, something that highlights the defect in the health system where the vulnerable are left behind at times of crisis.

The corona pandemic has limited the access to healthcare for women attending ANC at public sector but not for those capable to afford for a private service.

The health system should take into account poorer women, or those living in remote areas to ensure that the vulnerable are not left behind at times of crisis.

Most deaths (78.4%) occurred in the postpartum period. Yet, 38% of women who died postpartum had their onset of death-triggering complications while they were pregnant. About 46% of women had pre-gestational medical conditions and 35% had obstetric complications. This again raises the question whether the health care was adequate and of good quality, but also emphasizes the importance of integration of preconception care services at a national scale to optimize maternal health condition before pregnancy.

The “Three Delays” model proposes that pregnancy-related mortality is due to delays in: (1) deciding to seek appropriate medical help; (2) reaching an appropriate health facility; and (3) receiving adequate care when a facility is reached^[7]. The six women who died before arriving the hospital, resemble an example of the first two delays. All six women died in the postnatal period, which probably indicates the interrupted and inadequate health care after childbirth, especially for high-risk women. Still, this necessitates a thorough investigation of the circumstances and contributing factors that undermine the timely access of mothers to healthcare.

Of all maternal deaths, 78.4% were recognized as preventable, according to the definition of preventability of maternal death “any action or inaction on the part of the health care provider, system, patient, or a combination of these factors that may have caused progression to more severe morbidity”. Maternal condition at time of hospital admission can be utilized as an indicator of medical care status within the health facility. Out of 31 women who were admitted to hospital, 9 (29.0%)



were in moderate and good conditions; 9.6% moderate and 19.4% good condition. Based on international criteria, the indicators in this group of women are supposed to be favorable. However, their condition has deteriorated within the health facility, which reveals a delayed and suboptimal quality of intra-hospital medical management (i.e., the third delay). Such delay was associated with several factors including, underestimation of the severity of the condition, insufficient knowledge or training in patient critical care, lack of specialized care and delayed referral due to limited options and lack of coordination and communication between health care providers.

COVID-19 related deaths were only reported in the West Bank. The most common age in this group was >35 years. About 67% had co-morbidities and the majority were in their third trimester of pregnancy. Although 66.7% were classified as having severe COVID-19 disease, 55.6% were recognized as having had a chance for improved outlook with optimal and timely interventions. However, it is known that the course of COVID-19 disease can be unpredictable and sudden deterioration can happen unexpectedly. Yet, a good antenatal control of co-morbidities like diabetes plays a role in reducing mortalities triggered by COVID-19 infection.

Logistic challenges

1. Protracted maternal death notification system.
2. Maternal death review and analysis is a long and straining process. Maternal mortality surveys do not always provide reliable and complete data. Collecting data from medical files is another challenge, especially with the currently used hospital health information system (HIS) which has a number of limitations. The HIS is a purchased system and its license is owned by an external organization. Certain modifications/additions in the system require a charged access gained from the owner company. Also, retrieving data from the HIS is difficult because a great part of the medical notes are written in text, so many of the required variables will need to be searched manually by reviewing each medical file separately, a time and effort consuming process.
3. Some data are not available, like data on course of antenatal care or other medical services received outside MOH. Also, some data are not available for maternal deaths in Gaza.
4. Many women are assigned multiple or uncertain causes of death.

Recommendations

1. A national SRH emergency action plan should be prepared to ensure continuity of maternal care during emergencies and crisis, including activation of mobile clinics, home visits or virtual care visits.
2. Sharing of data and figures related to SRH including maternal health, and communication of the importance of continuity of maternal health services at all times to policymakers, healthcare providers, women and community.
3. Capacity building of healthcare providers for an improved quality of care. This includes enhancing knowledge, promoting adherence to evidence-based practice as per national protocols (i.e. preconception care, ANC, postnatal, emergency obstetric, COVID-19 infection in pregnancy protocol, etc.) and regular training to improve their clinical skills, especially in management of obstetric emergencies (e.g. bleeding) and critical care of ICU patients.
4. Activation of maternal mortality revision per hospital to highlight actions and inactions that contributed to maternal death as a lesson learning process.
5. Revise the maternal death notification flow system and update maternal death surveillance.
6. Integration and expansion of pre-conception care for improved maternal and fetal outcomes.
7. Improving coverage and quality of postnatal care.
8. Proper patient counselling and education on signs and symptoms necessitating seeking medical care.
9. Improved coordination, communication and sharing of patients' information between different health providers and linking medical files between MOH primary health clinics and hospitals.
10. Booking of pregnant women at the hospital where childbirth is expected to allow adequate preparation and planning for birth.



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