

ORIGINAL ARTICLE

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Analysis of pregnancy-related death reasons in a province from Türkiye over 20 years

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Abstract

The aim of the present study was to calculate maternal mortality rates by analyzing pregnancy-related death cases in Samsun over the last 20 years, to identify causes of death and preventability, and to examine the change over the years. The Samsun Provincial Health Directorate's pregnancy-related mortality data from 2002 to 2021 were examined retrospectively. Causes of maternal death were classified as direct, indirect, undecided, and incidental. The maternal mortality rate was calculated as the number of maternal deaths per 100,000 live births. Between 2002 and 2021, Samsun experienced a total of 344,324 live births juxtaposed with 79 pregnancy-related deaths. The computed maternal mortality rate is 19.16 per 100,000 live births across the two-decade span. Detailed analysis reveals that 30 deaths (38%) were attributable to direct causes, 31 (39.2%) to indirect causes, 13 (16.5%) were incidental, and 5 (6.3%) remained inconclusive post-autopsy. A breakdown of the direct causes unveils obstetric bleeding as the primary culprit (18.2%), trailed by cardiovascular diseases (13.6%). Moreover, incidental causes, represented by traffic accidents, account for a 7.6% fatality rate. While the observed decline in maternal deaths, particularly from preventable direct causes, over the previous twenty years signifies the efficacy of the instated health policies, the persistent mortality underscores the imperative for ongoing research and strategy recalibration. Identifying fluctuations in causative factors through comparative analyses is pivotal in strategizing future preventive studies on pregnancy-related deaths. The results advocate a pronounced emphasis on continuous professional development to curtail mortalities from avoidable sources, especially postpartum hemorrhage, thereby fortifying existing health policies with reinforced, data-driven interventions.

Keywords: Health policies, pregnancy-related death, maternal mortality, maternal mortality rate

Introduction

The demise of a woman during any stage of pregnancy is not only a tragedy for her immediate family but also a significant loss for society at large. Over the past two decades, while there have been commendable advancements, maternal mortality continues to be a pressing issue. In 2017, a daily estimate of 810 women and an annual total of approximately 295,000 succumbed during pregnancy, childbirth, and the postpartum period globally. A staggering ninety-four percent of these deaths transpire in low and middle-income countries, with the majority being preventable [1]. According to the estimates of the United Nations Children's Fund (UNICEF), United Nations Population

Fund (UNFPA), World Health Organization (WHO), World Bank and United Nations in the report published in 2019, the world average of maternal mortality rate was 211 per 100,000 live births in 2017. This rate was 232 in developing countries, 12 in developed countries and 17 in Türkiye [1].

A study spanning 25 years, which scrutinized data from 183 countries, revealed a decline in the global maternal mortality rate from 385 deaths per 100,000 live births in 1990 to 216 in 2015 – translating to a 43.9% decrease. This is congruent with the studies focusing on the Sustainable Development Goal 2030 targets. However, notable disparities exist even within the same geographical area, for example, Sub-Saharan Africa reported

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546 deaths per 100,000 live births, starkly contrasting Sierra Leone's staggering 1,100 deaths per 100,000 live births [2]. In regions with less development, elevated risks of death during childbirth prevail due to inadequacies in health services and personnel, amplified by heightened pregnancy and birth rates [3]. Consequently, the death risk during pregnancy is notably accentuated; in 2015, one in 41 women in low-income countries perished due to pregnancy-related causes [4].

Excessive blood loss, infection, high blood pressure, unsafe abortion, and obstructed labor stand out as the most prevalent direct causes of maternal death globally. Meanwhile, indirect causes encompass conditions like heart diseases, anemia, and malaria [1]. From 2015 to 2030, the Sustainable Development Goals aim to reduce maternal mortality to less than 70 per 100,000 live births and to eliminate preventable maternal deaths [5]. In this context, appropriate care provided by trained health personnel during pregnancy, at birth, and in the postpartum period can help to prevent many maternal deaths. According to global data (https://www.who.int/healthinfo/mortality_data/en/) from 2014 to 2019, it is an important development that 81% of births were performed by trained health personnel, as this rate was 64% between 2000 and 2006.

In Türkiye, the National Maternal Mortality Surveillance program has been in operation by the Ministry of Health since 2007 [6]. A province-specific commission, comprising specialized physicians (including an obstetrician, perinatologist, anesthesiologist, internal medicine specialist, and additional relevant specialists), meticulously scrutinizes each maternal death case. This commission strives to pinpoint the causes of deaths, ascertain their preventability, and evaluate the quality of the healthcare rendered [7].

The underpinning aim of this study is to ascertain maternal mortality rates by appraising pregnancy-related death cases in Samsun over the preceding 20 years, identifying the causes of death and their preventability, and scrutinizing temporal variations.

Material and Methods

All pregnancy-related deaths that occurred in health institutions under the jurisdiction of the Samsun Provincial Health Directorate between 01.01.2002 and 31.12.2021 were studied retrospectively. Causes of pregnancy-related deaths were determined based on the total number of live births and maternal deaths over the last 20 years.

In our study, the diagnosis of causes of death was classified according to the ICD-10 definitions of the WHO. Pregnancy-related death was defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, regardless of the cause of death. This definition includes direct and indirect causes of maternal death as well as incidental causes. Maternal death was defined as the death of a woman between the beginning of her pregnancy and the 42nd day after delivery for any reason other

than accidental or coincidental causes related to or aggravated by pregnancy or pregnancy management. The maternal mortality rate was calculated by dividing the number of maternal deaths by 100,000 live births. Direct maternal death was identified as deaths caused by obstetric complications as a result of interventions during pregnancy, neglect, improper care or the chain of events mentioned, and indirect maternal death was classified as deaths due to a disease or diseases that existed in the pregnant woman before (pre-pregnancy) and as deaths occurring from causes that developed but were not of obstetric origin, but were exacerbated by the physiological effect of pregnancy. Incidental deaths were identified as deaths that occurred within 42 days of pregnancy, birth, or postpartum and were not caused by direct or indirect obstetric causes. Late maternal deaths were defined as deaths that occurred between 42 days and one year after birth. These deaths were not included in the study. A death was considered preventable if there was a chance of at least some degree of prevention of the death by one or more reasonable changes to preventability, patient, family, caregiver, facility, system, and/or community factors [8-9].

Necessary permissions for the study were obtained from the local ethics committee (OMU KAİK 2022/54) and Samsun Provincial Health Directorate.

Descriptive statistics were applied in the evaluation of the data, and the SPSS 22.0 statistical program (SPSS Inc., Chicago, IL, USA) was used.

Results

In our study, we presented a total of 79 cases, encompassing maternal deaths and birth-related fatalities, believing that descriptive narratives are crucial, especially when each subgroup is being explained in case presentations. We opted to present our findings not as averages or medians but with individual data to lay out a clear tableau concerning maternal deaths. Nevertheless, should the esteemed reviewer request adjustments in this regard, it will be promptly re-applied.

It was determined that 79 pregnancy-related deaths occurred in a total of 344,324 live births in Samsun between 2002-2021. Of these, 13 (16.5%) were defined as incidental deaths and the number of maternal deaths was determined as 66 (83.5%). Maternal mortality rate in 20 years was calculated as 19.16 per 100 thousand live births. The median age at which pregnancy-related deaths occurred was 30 (min: 17 - max: 43) years. Annual maternal mortality rates for the last 20 years are presented in Table 1.

When the classification of maternal deaths was made according to the definition of WHO, it was determined that 30 (38.0%) cases died from direct causes, 31 (39.2%) from indirect causes, and 13 (16.5%) from incidental causes; it was also determined that 5 (6.3%) cases could not be decided by autopsy results (Figure 1).

The most common direct causes of 66 maternal deaths with an

identifiable cause were bleeding (n:12, 18.2%) and hypertensive diseases during pregnancy (n:7, 10.7%). Cardiovascular diseases (n:9, 13.6%) and systemic diseases (n:7, 10.6%) were the most common indirect causes of maternal death (Table 2).

When the distribution of 13 incidental deaths was examined, it was revealed that the most common causes were traffic accidents (6/79) and murder (4/79) (Table 2).

According to the age group evaluation, 2 (2.5%) maternal deaths occurred in the <20 age group, while 22 (27.8%) occurred in the ≥35 age group. One of the maternal deaths aged <20 years was accidental (traffic accident) and the other was indirect (cardiovascular-cardiomyopathy) death. In the 20-34 age group, 40% of deaths were due to direct, 32.7% due to indirect, 18.2% due to incidental deaths, while 9.1% were maternal deaths whose cause could not be determined. Direct maternal deaths accounted for 36.4% of maternal deaths in the ≥35-year-old age group, indirect deaths accounted for 54.5%, and incidental deaths accounted for 9.1%.

When all deaths were assessed for preventability, 23 (29.1%)

were found to be preventable; however, 16 (69.5%) of preventable deaths were direct maternal deaths, while 7 (30.5%) were indirect maternal deaths (Table 3). According to age groups, 40% of the deaths in the 20-34 age group and 27.3% of the deaths in the ≥ 35 age group were considered preventable.

In the study, it was also determined that 3 (4.5%) maternal deaths in 2021 were recorded as indirect maternal death due to COVID-19.

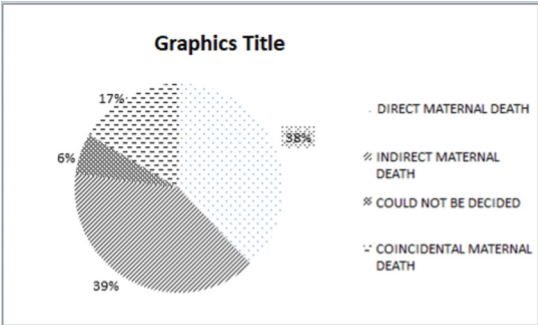


Figure 1. Distribution of pregnancy-related deaths for the years 2002-2021 (n:79)

Table 1. Pregnancy-related death. maternal mortality, number of live births and, comparison of maternal mortality rates by years

Years	Pregnancy-related death (number)	Maternal death (number)	Live birth (Number)	Maternal mortality rate	Direct maternal death (number)	Indirect maternal death (number)	Incidental maternal death (number)	Undiagnosed (number)
2002	2	2	19.601	10.2	0	1	0	1
2003	4	3	18.588	16.13	1	2	1	0
2004	5	5	16.919	29.55	2	2	0	1
2005	10	9	17.569	51.22	6	3	1	0
2006	3	3	17.762	16.88	3	0	0	0
2007	7	6	18.801	31.91	2	4	1	0
2008	9	9	18.916	47.57	4	4	0	1
2009	6	3	18.903	15.87	1	2	3	0
2010	3	2	16.769	11.92	1	0	1	1
2011	2	2	16.557	12.07	0	2	0	0
2012	2	2	17.954	11.13	0	2	0	0
2013	1	0	17.293	0.0	0	0	1	0
2014	3	1	17.483	5.71	1	0	2	0
2015	2	2	17.127	11.67	2	0	0	0
2016	6	5	16.921	29.54	2	2	1	1
2017	2	2	16.807	11.89	2	0	0	0
2018	4	4	16.550	24.16	2	2	0	0
2019	4	2	15.652	12.77	1	1	2	0
2020	0	0	14.410	0.0	0	0	0	0
2021	4	4	13.742	29.1	0	4	0	0
Total	79	66	344.324	19.16	30	31	13	5

Table 2. Distribution of pregnancy-related deaths (n: 79) and maternal deaths (n: 66) between 2002-2021 by causes

Pregnancy-related causes of death				
	Diagnosis	n	Pregnancy-related death %	Maternal Death %
Direct causes		30	38	45.5
	Bleeding	12	15.2	18.2
	Preeclampsia, hypertension	7	8.9	10.6
	Thromboembolism	6	7.6	9.1
	Direct infection	5	6.3	7.6
Indirect causes		31	39.2	46.8
	Cardiovascular	9	11.4	13.6
	Systemic diseases	7	8.9	10.6
	Cerebrovascular causes	5	6.3	7.6
	Infections	8	10.1	12
	Other infections	3	3.8	4.5
	COVID 19	3	3.8	4.5
	H1N1	2	2.5	3
	Psychiatric reasons	1	1.3	1.5
	Neoplasms	1	1.3	1.5
Undiagnosed		5	6.3	7.6
Random		13	16.5	0
	Traffic accident	6	7.6	0
	Poisoning	1	1.3	0
	Sudden death	1	1.3	0
	Asphyxia (foreign object)	1	1.3	0
	Homicide	4	4	0
Total		79	100	100

Table 3. Distribution of the causes of maternal deaths by preventability (n: 79)

	Direct maternal death	Indirect maternal death	Incidental	Undiagnosed	Total
Preventable	16 (69.6)	7 (30.4)	0	0	23 (29.1)
Unpreventable	14 (27.5)	24 (47.1)	13 (25.5)	0	51 (64.6)
Undiagnosed	0	0	0	5	5 (6.3)
Total	30 (38)	31 (39.2)	13 (16.5)	5 (6.3)	79 (100.0)

Discussion

Maternal mortality represents a pivotal health metric, reflecting a nation's socioeconomic and healthcare status. Globally, efforts spearheaded by the United Nations Millennium Development Goals aim for a 75% reduction in maternal mortality rates. Notably, Türkiye has surpassed this, achieving an 83.5% reduction, spotlighting significant progress in managing maternal healthcare [7,10].

Our analysis over a 20-year span in Samsun revealed an average MMR of 19.1 per hundred thousand, exhibiting stark yearly fluctuations and occasionally surpassing national averages. This may stem from the MMR calculation methodology, given our province's relatively low live birth rates, causing each maternal death to significantly impact the MMR.

Scrutiny of 34 studies exposed substantial regional variances in maternal death causes [11]. While bleeding predominantly caused deaths in Africa and Asia, hypertensive disorders were more prevalent in Latin America and the Caribbean. A notable differentiation was also observed in deaths from abortion and sepsis among regions. Our findings echoed that bleeding and hypertensive disorders are paramount causes of maternal mortality in developing nations [12-16].

An intricate relationship exists between maternal age and mortality, wherein both early and advanced maternal age have been associated with escalated risks [17-20]. Our findings reflected that indirect cause deaths were more prevalent in the ≥35 age group, aligning with existing literature.

A juxtaposition with national data from Türkiye in 2005 and

subsequent years revealed fluctuating proportions between direct and indirect maternal death causes, with bleeding and hypertensive disorders persistently emerging as primary causes [22-24]. Notably, our study also identified a decline in direct cause rates over two decades, underscoring a vital area for continued research and intervention.

Amid these findings, the application and impact of health policies, such as preventing unplanned pregnancies and enhancing emergency obstetric care, are noteworthy and warrant thorough exploration to decipher their roles in the nuanced landscape of maternal mortality.

Meeting the WHO's Sustainable Development Goal, aiming for an MMR below 70 per 100,000 by 2030, mandates an actionable, multi-faceted approach [5]. Implementing focused interventions, prioritizing family planning, safe abortion, bleeding management, and strategically employed cesarean sections, alongside preeclampsia prevention and management, emerges as paramount [25-27]. Our study underscored that 29.1% of all deaths were preventable, providing a compelling argument for the targeted, pragmatic strategies to mitigate maternal mortality.

A comparative analysis with a study by Yanik et al. in Samsun affirms a reduction in preventable direct causes like preeclampsia, from 29.9% to 8.9%, and miscarriage and infection-related deaths from 26.4% to 6.4% [24]. This evokes optimism for the efficacy of local preeclampsia treatments and prevention strategies. However, obstetric hemorrhages, prevalent worldwide, have arisen as a critical concern in our locale, underscoring the need for enhanced expertise among healthcare personnel regarding postpartum hemorrhage.

Practical implications

This research proffers vital insights, especially in unraveling the mosaic of direct and indirect maternal death causes, thereby facilitating targeted interventions and policy enactments. Future research might pivot towards understanding the underlying mechanisms driving the observable trends and developing tailored, context-specific interventions to alleviate maternal mortality further.

Strengths and limitations

While our study paints a comprehensive picture of maternal mortality trends and causative factors in Samsun, limitations persist, such as potential data incompleteness or variances in cause categorization. The inherent heterogeneity in global studies might also pose challenges in drawing congruent conclusions. Nevertheless, the longitudinal scope and in-depth exploration of cause dynamics stand as key strengths of our investigation, illuminating pivotal areas for strategic healthcare interventions.

Conclusion

The diminishing prevalence of preventable direct causes like obstetric-related infections and hypertensive diseases in our province signals the efficacy of enacted health policies.

Identifying and comprehensively understanding maternal death causes, and engaging in comparative studies are imperative, to stride towards the United Nations' Sustainable Development Goals by 2030. Nonetheless, accentuating healthcare personnel's proficiency and awareness regarding indirect pregnancy-related death causes and postpartum hemorrhage is paramount to further safeguard maternal health and steadfastly progress towards our global targets.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

Necessary permissions for the study were obtained from the local ethics committee (OMUKAEK 2022/54) and Samsun Provincial Health Directorate. All the study procedures were approved by the Human Research Ethics Committee (OMUKAEK 2022/54) of Ondokuz Mayıs University.

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