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Maternal mortality in the city of Berlin: consequences for perinatal healthcare

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Abstract

Objectives: The fifth of the United Nations' Millennium Development Goals proposed for 2000–2015 was to improve maternal health, which has only partially been achieved. Worldwide, the maternal mortality ratio is currently estimated at 216/100,000 livebirths, compared to 380/100,000 in 1990. As yet, there has been no published comprehensive analysis of maternal mortality data as it pertains to Berlin and by extension Germany. Aim of the study was to evaluate and analyze the maternal mortality rate of Berlin as a result of shortcomings in healthcare provision and identify possible solutions.

Methods: The Institute for Quality and Transparency in the Healthcare Sector sourced external quality control from the Qualitätsbüro Berlin to provide maternal mortality data from Berlin hospitals from 2007 to 2020.

Results: Nineteen maternal deaths were registered between 2007 and 2020 in total. Case analysis shows that two main events occur: thrombosis and hemorrhage at 31.6%, respectively, followed by hypertensive disorder (15.8%), and sepsis (15.8%). After detailed analysis of each case report, we determined 8/19 (42.1%) maternal deaths as being potentially preventable given slightly altered circumstances.

Conclusions: The system of registration of perinatal data in Germany does not allow for a comprehensive recording of maternal death and requires alteration to provide a more accurate picture of the phenomenon of maternal mortality; presumably, there exist twice as many unreported cases.

Symptoms, risks, and primary prevention tactics of thromboembolism during pregnancy and birth should be imparted to every licensed professional in individual hospital settings, along with evidence-based simulation training for the event of obstetric or peripartum hemorrhage.

Keywords: Berlin; hemorrhage; maternal mortality; preventative strategies; thromboembolism.

Introduction

The worldwide maternal mortality ratio was 216/100,000 livebirths in 2015 [1, 2]. This varies heavily depending on the country's income level. An average of 13 deaths/100,000 livebirths are recorded in high-income countries, 180/100,000 in middle-income countries and 479/100,000 in low-income countries [3].

Maternal death presents as a disastrous situation for everyone involved; the newborn and other family members are especially affected. However, this occurrence can also take a considerable emotional toll on the treating staff, consisting often of junior obstetricians, midwives, anesthesiologists, surgeons and nurses. The question always arises if each maternal death could not have been prevented.

Number 5 of the Millennium Development Goals (MDGs) instated by the United Nations between 2000 and 2015 was to improve Maternal Health [4, 5]. One of the subtargets was the reduction of the maternal mortality ratio by three-quarters between 1990 and 2015. Based on the evaluation in 2015, considerable improvement was achieved; the maternal mortality rate fell by 47% globally. However, the goal as such was only partly achieved. Further efforts are necessary in order to fully effectuate the UN's MDGs.

On the topic of maternal mortality, there is often an association with developing or low-income countries, largely as a result of inequalities with regard to access and use of health services. Although the maternal mortality rate is considered low in high-income countries, this event still occurs, most likely with a high number of unidentified cases. The Federal Statistical Office of Germany defines maternal death as the occurrence of death within the

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normal pregnancy time (39 weeks) and the puerperium (42 days postpartum in total). A differentiation is made between direct and indirect causes of death, direct being as a result of the pregnancy itself and indirect relating to pre-existing conditions (e.g. heart disease, cancer, tuberculosis, HIV) or unforeseen circumstances (e.g. accidents) [6].

Representative of the maternal death situation in Germany, the objective of this small review is to illuminate the handling of this catastrophic incident in Berlin 2007–2020 by examining the documentation of these adverse obstetric outcomes and the consequences for healthcare provision.

History of German quality assurance

Quality assurance and all statistical data on obstetrics are collected at a provincial level in Germany. The “Perinatologische Arbeitsgemeinschaft München”, based out of Bavaria, one Germany’s 16 federal provinces, collected the first perinatal outcome data of 26 gynecology departments and seven pediatric units as of January 1st, 1975. By 1977, all of Bavaria had been integrated into this perinatal statistic system, before other provinces followed (Deutsches Ärzteblatt 4/2017; Perinatalerhebung: “Mutter” der QS-Maßnahmen). Germany pioneered this idea, which was then implemented by other European countries. Law-makers took over this process from 1989 onwards and required that all provinces take part in this new system of quality assurance. The independent IQTIG (Institute for Quality and Transparency in the Healthcare Sector) was established in Berlin in 2015. This institute has been assigned to analyze and review data to improve quality of perinatal healthcare for both mother and child. On behalf of the Federal Joint Committee (gemeinsamer Bundesausschuss, GBA) the IQTIG has furthermore been enlisted to develop measurement instruments for general quality assurance in the obstetric field. Naturally, the data evaluated depends on the accuracy of its input, normally recorded by junior doctors during their nightshifts which may lead to inconsistencies or incompleteness.

Materials and methods

A formal request to the IQTIG was necessary to obtain data on maternal death in Berlin between 2007 and 2020. As a result of the low case number, data protection laws required that we receive official approval to retrieve ‘structured dialogue’ data. This means that each obstetric unit that reported a case of maternal mortality was ordered by the external quality agency (QBB) to submit commentary on the case. Following the acquisition of these hospital reports and exchange

of correspondence, these documents were only available for the aforementioned 14-year period.

A single-case analysis was performed once the confidential data had been received. This analysis allowed for a classification of causes of maternal death and furthermore a comparison of these reasons to the situation in low-income countries. Graphic analysis was performed using GraphPad Prism software (Version 9.1.0 [216], March 15, 2021).

Results

Nineteen maternal deaths were registered by the IQTIG in Berlin between 2007 and 2020 in total. Data up to this point since the reunification of Germany in 1989 is not available. Maternal mortality during this time period ranges from 0 to 9.34 per 100,000 live births. The structured dialogue records allowed a single-case analysis for 18 patients. Due to special circumstances in the responsibility field of one hospital, there is data missing for one mother so that she could not be considered as a structure-dialogue patient. Among the absolute number of maternal deaths from 2007 to 2020, the number of autopsies performed on the women studied came to a ratio of 5/19; 26.3%. Cause analysis, aided by the correspondence letters we were able to access is illustrated in Figure 1. Two main causes of death occur: thrombosis at 31.6%, hemorrhage at 31.6%, followed by hypertensive disorder at 15.8% and sepsis at 15.8%. After detailed analysis of each case report we could ascertain that 8/19 (42.1%) of the maternal deaths we studied could have been prevented under other circumstances (Figure 2).

Discussion

Between 2007 and 2020 19 cases of maternal death were recorded in Berlin. The most internationally comprehensive catalogue of maternal mortality from 1990 to 2013 shows Germany with a rate of 6.5/100,000 live births [7]. Maternal causes of death are only registered as German perinatal statistics if one can maintain that the child (a) weighs > 500 g, (b) has reached 22–24 weeks and/or (c) shows signs of life upon delivery. Statistics evaluated solely on the basis that these criteria are met result in an inaccurate picture of the phenomenon of maternal death. These are recorded by on-call doctors and then passed on to the IQTIG quarterly. However, all cases of maternal death that occur before a woman is admitted to an obstetric department remain unaccounted for. This applies, too, after women have been released from the hospital, including for the duration of the puerperium.

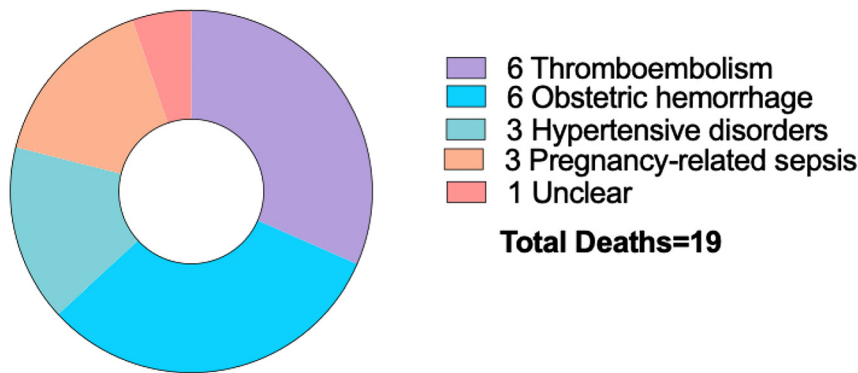


Figure 1: Absolute causes of maternal death in Berlin 2007–2020.

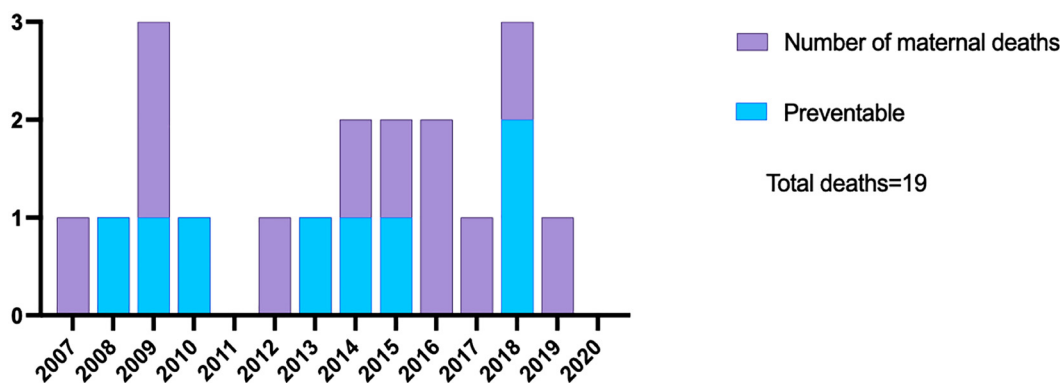


Figure 2: Presumably preventable/unpreventable deaths 2007–2020.

The total number can only be accurately recorded if all death certificates that are handed off to the civil registration office within a municipality are carefully inspected. This is almost impossible to achieve, both because of the time required, as well as it breaching European data protection laws. The only known successful implementation of this effort was undertaken by Welsch years ago, regionally limited to Bavaria, however [8, 9]. By evaluating all Bavarian death certificates of young women in relation to pregnancy he found a significant decrease of maternal mortality from 11.3/100,000 live-births (recorded 1983–1988) to 5.4/100,000 livebirths (recorded 1995–2000). He distinguished between direct vs. indirect, differentiating between coincidental deaths, especially accidents and suicides.

Although two cases of maternal death were registered 2016 in Berlin, open communication with colleagues of other obstetric departments, information gleaned from the press, and investigations at different emergency rooms of revealed another three cases of maternal death. This underlines the high number of unreported cases. If these are considered as part of the live birth data for that year, this would uncover a new dimension of maternal death

(12.16 per 100,000 live births) that may reveal a hidden truth about maternal mortality in other years.

Worldwide, stark differences can be observed in comparison to our findings in Berlin, especially in low-income countries. Analysis undertaken by the World Health Organization (WHO) in 2014 showed obstetric hemorrhage (27%), hypertensive disorders (14%), pregnancy-related sepsis (11%), abortion (8%), embolism (3%), other direct causes (10%) as well as indirect causes including HIV-related maternal deaths (28%) as leading causes of death among mothers worldwide [10] (Figure 3).

Using the example of the United States, similar to findings made in other high-income countries with ethnicity and immigrant status included in their national health monitoring systems [11–19], there exist social differences relating to ethnic background in the causes of maternal death: Black women owed a higher proportion to thrombotic or pulmonary embolism, hypertensive disorders, and cardiomyopathy while white women suffered more deaths from hemorrhage and hypertensive disorders [15, 16]. The greatest difference to Germany is socialized healthcare, which is available to all documented residents including refugees under specific circumstances.

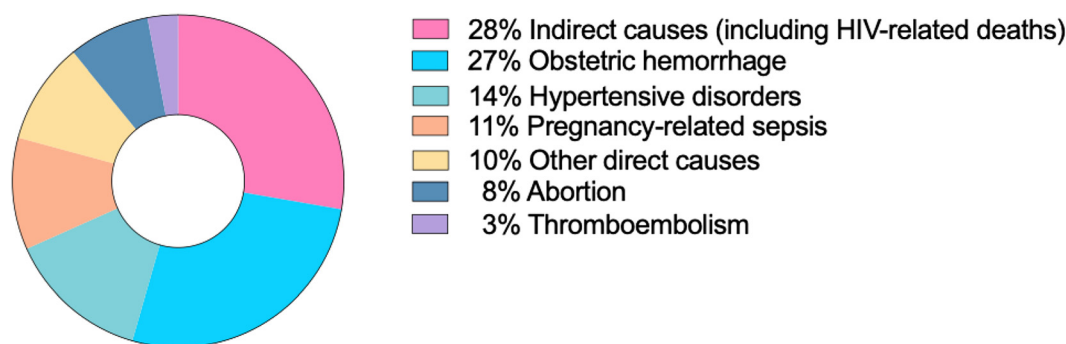


Figure 3: Causes of maternal death according to the WHO (2014).

Globally 60% of maternal deaths are described to be preventable [20–23]. General interventions and primary prevention strategies are considered to be effective according to one report [24] including, but not limited to: Family planning with birth spacing and contraception, safe abortions, hemorrhage prevention and treatment, timely delivery by caesarean section, prevention of eclampsia, and treatment of hypertensive disorders. However, these are goals that would benefit low-income countries to a greater extent than, say, Germany.

In considering our example of Berlin, representing a high-income country, we must focus on thromboembolism and hemorrhage, seeing as they are recorded as the primary causes of maternal death in the cases reported and studied thus far. There are other factors that can additionally be taken into account in high-income countries as contributing negatively to the maternal mortality rate. Failures in teamwork and communication are described as a critical factor by the American College of Obstetricians and Gynecologists (ACOG) and the Institute of Medicine [25–27]. Measurement tools like the adverse outcome index (AOI) may be useful here. This index is defined as the number of patients with an identified adverse outcome divided by the total number of deliveries [28]. Adverse outcome includes maternal death, uterine rupture, unplanned admission to an intensive care unit, unplanned return to the operating room, blood transfusion, and third or fourth degree vaginal lacerations. A reduction in AOI after the creation of standardized protocols, simulation training, for example MedTeams training [29, 30] modelled after aviation crew management experiences (communication, situation monitoring, mutual support, and leadership) is observed in large studies [31, 32]. In a systematic review including nine trials in five countries with 3,047 health-care providers covering 107,782 deliveries, simulation-based teamwork training improves team performance in 100% of cases, though it shows limited

evidence as yet because no direct conclusions can be drawn to reducing maternal mortality [32].

Implementing evidence-based individualized practices in obstetric departments may provide an avenue of heightened technical skill, such as cardiopulmonary resuscitation training simulations and drills which would be revisited regularly. Seeing as there are more than 650 obstetric units in Germany it is often challenging to realize comparable practice standards because of the differing staffing levels, interdisciplinary departments, as well as equipment and facilities.

It may be beneficial to establish an advisory board to independently and anonymously analyze all cases of suspected maternal death in Germany. Instead of accusatory critique, this group of experts would foster a culture of constructive criticism to improve treatment pathways in affected obstetric departments. This initiative would most likely reduce the number of unreported or as yet undiscovered cases by a large margin.

In order to reach the United Nations' new proposed goal to reduce maternal mortality to 70/100,000 by 2030, awareness of this issue must persist in a clinical setting.

Conclusions

The system of registration of perinatal data in Germany does not allow for a complete recording of maternal death and should therefore be restructured on a larger scale. According to the registered causes of maternal death in the city of Berlin as representative for Germany, thromboembolism is one of the most relevant events. Often combined with obesity, primary prevention must begin here, i.e. by implementing regular exercise and dietary counseling as routine practices.

The event of obstetric hemorrhage as the second most common cause of maternal death in our data could and

should be trained regularly in an interdisciplinary setting with all professional groups that contribute to the field of perinatal medicine. There is a substantial need for systematic training pathways in order for the aforementioned causes of maternal death to be reduced in Germany.

Even in a high-income country and the microcosmic setting of a capital city such as Berlin, the need to continue the fight against maternal death remains.

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Ethical approval: The local Institutional Review Board, in this case the IQTIG Lenkungsausschuss, deemed the data considered in this study not to infringe on EU data protection laws and has given clearance for publication.

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