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Trends in maternal mortality in Hungary between 1978 and 2010

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ABSTRACT

Objective: We evaluated the trends of the last decades in maternal mortality in Hungary and compared Hungarian results with those of other European countries.
Study design: Cases of maternal death in Hungary during the study period from calendar year 1978 to 2010 were analyzed in a retrospective manner to characterize mortality distribution and to identify potential clinical or demographic predictors. Data in all cases were extracted both from the national Obstetric Registry operated by the National Institute of Gynecology and Obstetrics, from the Hungarian Central Bureau of Statistics and from the National Public Health and Medical Officer Service. Detailed clinical data were obtained based on obligatory reporting by individual clinical institutions.
Results: The annual maternal mortality rate (MMR) was 26.7 per 100,000 live births in the period 1978–1987 and declined significantly to 10.9 per 100,000 live births in the period 1997–2010. In the period 1988–1996 (with missing associated clinical and demographic data) the MMR was 16.4 per 100,000 live births. The proportion of delivery-associated causes of death increased significantly between the two study periods from 49.4% to 62.9% ($p < 0.05$). Among obstetric causes of death, the rate of thromboembolism showed a significant increase, while there was a trend toward a decline in rate of maternal deaths attributable to hemorrhagic shock. Among medical causes of death not directly attributable to obstetric complications, the rate of renal and gastrointestinal etiologies declined significantly throughout the study periods.
Conclusions: We observed a marked decline in maternal mortality during the last few decades in Hungary. Recent changes in mortality distribution highlight current characteristics of pregnancy care in Hungary and may help identify strategies for future improvement.

1. Introduction

Maternal mortality is the death of women while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes [1]. Delayed maternal mortality is defined as maternal death after the 42nd postnatal day but within the first postnatal year.

In order to further refine this measure from the point of view of medical statistics, the maternal mortality ratio (MMR) has been introduced defined as the number of maternal deaths per 100,000 live births. Maternal mortality is classified by etiology as either directly attributable to obstetric conditions or attributable to other medical conditions not directly associated with obstetric complications. Maternal mortality due to other medical conditions may either result from a medical condition present before gestation exacerbated by the physiological processes occurring during pregnancy or it may develop de novo during the gestation period [2–4].

The Millennium Development Goals (MDG) program was established to find concrete solutions regarding five specific community health issues, three of which relate to improving maternal and perinatal fetal health [5,6]. The program highlighted the urgency of reducing the MMR within countries with less developed infrastructure. This recognition of urgency gave birth to the Countdown to 2015 Initiative [5], which focuses exclusively on community health issues directly related to maternal and fetal health.

It was recognized that in order to protect the health of the pregnant mother and to reduce maternal mortality, a medical database of obstetric data is necessary with precise parameters capable of being statistically evaluated. In 2005 the World Health Organization (WHO), United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA) and the World Bank

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established global parameters in order to standardize data reporting relating to maternal and perinatal fetal mortality in countries where these parameters remain unacceptably high [7,8]. At the same time, in more developed European countries the EURO-PERISTAT data processing system handles all obstetric statistical parameters including the ones related to maternal mortality [9].

The first Hungarian obstetric registry was founded in 1931 by Vilmos Tauffer, the medical director of the Second Department of Gynecology and Obstetrics in Budapest. As the first such data registry in the world, the Hungarian Obstetric Registry included data relating to several obstetric complications and described trends in maternal mortality [10]. In this study we analyzed trends in maternal mortality in the last few decades in Hungary. We also compared Hungarian results with those of other European countries.

2. Materials and methods

During the study period of 1978–2010, we analyzed the Hungarian obstetric registry data in a retrospective manner to evaluate trends in maternal mortality and of associated clinical and demographic parameters. There was a gap in data reporting between 1988 and 1996. In these years very significant political changes happened in Hungary, which have had also serious consequences on changes of the health policy of our country. Probably a suitable data reporting system of maternal death cases was not available in these years, and that may be the reason for the lack of adequate information from this period, when only the total number of maternal deaths was reported, with relevant clinical and demographic data missing. Due to this gap, our descriptive data are dichotomous, consisting of two separate periods, i.e. one before (1978–1988) and one after (1997–2010) the gap. Data in all cases were extracted both from the national Obstetric Registry operated by the National Institute of Gynecology and Obstetrics, from the Hungarian Central Bureau of Statistics and from the National Public Health and Medical Officer Service [11]. Detailed clinical data were obtained based on obligatory reporting by individual clinical institutions.

The following clinical parameters were included in our analysis: maternal age, parity, neonatal birth weight, cause of death and time of death. Time of death was defined as gestational age at death if the mother expired during pregnancy (in weeks), or time after delivery (in weeks) if maternal death occurred in the postnatal period.

Cause of maternal deaths was identified based on clinical diagnosis reported through diagnostic coding as per the 10th International Classification of Diseases (ICD10) system [1,12]. Cause of death was defined as a clinical condition occurring during gestation or during the first 42 days postnatally either associated with an obstetric complication or attributable to a pre-existing medical problem exacerbated during pregnancy. In the determination of cause of death, no consideration of length of gestation or localization of pregnancy (ectopic pregnancy) was made. Adverse events arising during an obstetric procedure or failure of performing an obstetric procedure in a timely manner were regarded as valid causes of maternal death [7,13]. Procedures associated with trauma cases were not included in this category.

Classification of causes of maternal mortality according to the ICD10 coding system was based on whether that death was the result of an obstetric complication or other medical condition [4,8]. The definitions are as follows. Direct obstetric cause: death of the mother results from obstetric complications of the pregnant state (pregnancy, labor, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above [1]. Indirect obstetric cause: maternal death results from previous existing disease or diseases that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by the physiologic effects of pregnancy [1].

In the group of direct obstetric causes, the obstetric conditions hemorrhagic shock, sepsis, preeclampsia, thromboembolism and death associated with general anesthesia were included. Deaths attributable to a pre-existing medical condition or a medical condition arising during pregnancy but not directly attributable to an obstetric cause were subsequently classified by organ systems in which the specific condition resulting in death was thought to originate as cardiovascular, neurological, pulmonary, gastrointestinal, renal, tumor-associated and miscellaneous organ system. Deaths associated with trauma and deaths from an unknown cause were classified as a separate category from either obstetric or medical causes and labeled as miscellaneous cause of death.

In situations where the cause of death could be attributed to multiple obstetric or medical conditions, the case was reviewed by a panel of clinicians to determine the primary cause of death, but in certain cases we had to take into consideration two or more causes of death due to the lack of a clinical basis to make a preference among them.

Cases of maternal mortality were divided into three groups based on maternal age: group 1 <30 years; group 2, maternal age 31–36 years; group 3, maternal age >37 years. In cases where maternal death occurred during pregnancy, three gestational age categories were created: <28 weeks; 28–37 weeks; >37 weeks.

SPSS statistical software was used for analysis of the data. Parameters of descriptive statistics and other clinical variables were categorized by calendar year. Only those cases were included in a given analytical procedure in which all relevant data could be extracted for the procedure.

Our study protocol was approved by the local research ethics committee at Semmelweis University (approval number: TUKEB 43349–2/2013/EKU(519/2013)).

3. Results

In the study period 1978–1987, a total of 358 maternal deaths occurred compared to only 151 in the study period 1997–2010; in both of these periods associated clinical and demographic data were available for evaluation. In the study period 1988–1996, however, the 167 deaths that were reported could not be analyzed due missing clinical and demographic data.

In the period 1978–1987, the median age of maternal mortality cases was 30.7 years with a range of 19–46 years. In the study period 1997–2010, the median age was 32.7 years with a range of 20–44 years. In the group of maternal mortality cases where death occurred during pregnancy, the median gestational age was 31.8 weeks with a range of 28–41 weeks in the former study period, whereas in the latter the median gestational age was 31.6 weeks with a range of 25–40 weeks. There was no significant difference between median values in the two study periods. In contrast, a significant difference in parity between the two study periods was found, with the period 1978–87 having a higher parity (2.62) compared to the study period 1997–2010 (2.23; $p < 0.05$). No significant difference was found in neonatal birthweight between the two study periods (2675 ± 416 g vs. 2594 ± 353). A significant reduction in MMR from 26.7/100000 live births in 1978–87 to 10.9/100000 live births 1997–2010 study period ($p < 0.05$) was observed (Table 1). In the period 1988–1996, i.e. the period with missing associated clinical and demographic data, MMR was 16.4/100000 live births ($MMR_{1978-1987}$ vs. $MMR_{1988-1996}$; $p < 0.05$; $MMR_{1988-1996}$ vs. $MMR_{1997-2010}$; $p > 0.05$).

There was no significant difference in maternal age distribution between the two study periods (1978–1987: <30 years 43.8%;