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MATERNAL MORTALITY AFTER CESAREAN SECTION IN IRAQ

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ABSTRACT

The aim of this research studying the association between maternal mortality and mode of birth, although this topic remains of importance, given the changing patterns in the mode of birth with increasing cesarean section rates in most countries. Purpose of this study was to examine the incidence of the cesarean section related maternal mortality in the Iraq and association of surgery with the chain of morbid events leading to death. Compared to vaginal birth, maternal mortality after cesarean section was three times higher following the exclusion of deaths that had no association with surgery. In approximately one in ten deaths after cesarean section, surgery did, in fact, initiate the chain of morbid events.

KEYWORDS: Maternal mortality, cesarean section.

INTRODUCTION

Cesarean section rates have increased worldwide, despite several recommendations by the World Health Organization (WHO) to curb this increase.[1] A WHO ecological study found that rates above 10% are not associated with a reduction of maternal and perinatal mortality.[2] Cesarean sections carry short- and long-term risks for index and subsequent births.

Death of a woman during pregnancy, childbirth or puerperium has become a rare event in high-resource settings.[3] This makes examining the association between maternal mortality and mode of birth difficult. Previous facility-based studies comparing maternal mortality after cesarean and vaginal birth have shown inconsistent results. Comparisons are hampered by indication bias, limited power, and absence of uniform categorization of cesarean sections.

Only a few studies have assessed cesarean section-related mortality on a nationwide scale.[4] Iraq has seen an increase in the cesarean section rate from 10.8% in 2000 to 16.6% in 2015, although still lower than in almost any other high-income country at that time.[5] Confidential Enquiries into Maternal Deaths revealed that the maternal mortality ratio (MMR) rose from 9.7 to 12.1 per 100,000 live births between the time frames 1983-1992 and 1992-2005. This rise was attributed to a changing risk profile, since advanced maternal age, pre-existing medical conditions and non-resident status increased among pregnant women. In 1983-1992, maternal mortality was found to be seven times higher following cesarean section compared to vaginal birth.[6]

The aim in any obstetric unit should be to reduce the mortality from obstetric causes to nil, as there should be no wastage of maternal lives in a physiological process of reproduction. No health problem can be of greater consequence to a nation than maternal and infant welfare. The maternal mortality rate is an important indicator of the quality of obstetric care in a community directly reflecting the utilization of health care services available.[7] It differs from place to place, country to country and institute to institute reflecting the type of care provided and health status of the region. Maternal mortality has been higher in developing countries than in developed countries. Pregnancy-related deaths and disabilities result not only in human suffering but also in losses to social and economic development. Pregnancy is not a disease. These deaths and disabilities are preventable through primary health care and with the attainable simple and cost-effective intervention of the more than 500,000 women who die each year as a result of complications arising during pregnancy.[8]

In 2005, the global estimate for MMR was 402 maternal deaths per 100,000 live births, with 99% of the burden borne by developing nations. Maternal Deaths WHO defines maternal death as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[9] We express maternal deaths as the ratio of deaths to 100,000 live births, rather than as a rate per 100,000 pregnancies. The latter might seem more logical since many maternal deaths occur in the absence of alive birth, but is not possible because pregnancies are not registered.[10]

By contrast, the maternal mortality rate (MM Rate) is defined as the number of maternal death in a population divided by the number of women of reproductive age, reflecting not

only the risk of maternal death per pregnancy or per birth (live birth or stillbirth), but also the level of fertility in the population.[11] In addition to the MMR and the MM Rate, it is possible to calculate the adult lifetime risk of maternal mortality in the population the probability of dying from a maternal cause during a woman's reproductive periods[12].

The WHO has published the underlying causes in many developing countries include lack of access to contraception, unsafe abortion, lack of primary care or transport facilities. only 55% of deliveries within the developing world are attended by a trained attendant and only 37% of deliveries occur within health facilities.[13] There is general agreement to classify maternal death as:

Direct Deaths It includes the following causes.

Hypertensive Diseases of Pregnancy.

They represent a major cause of death in low-income countries.[14]

The 98% fall in hypertensive disease of pregnancy (HDP) related mortality in the UK and Sweden over fifty years.[15] Suggests that HDP related deaths are highly avoidable. The fall in mortality from HDP has been largely attributed to a reduction in the number of cases of eclampsia, while the incidence of pre-eclampsia has been more resistant to change. The package of interventions that have caused this drop is not known with certainty, but antenatal screening for high blood pressure and proteinuria in the second half of pregnancy, with early delivery through induction of labor or cesarean delivery in women diagnosed with pre-eclampsia, is thought to be the main reason.[16]

The routine introduction of MgSo4 for the treatment of pre-eclampsia and eclampsia in more recent years is likely to have further reduced mortality in high-income countries today.[17] Amniotic Fluid Embolism (AFE) Amniotic fluid embolism is rare, with an incidence of 1 in 80 000 pregnancies.

However, due to its high mortality rate of 80%, it is a restively common cause of maternal mortality, with eight women dying from this condition in the last maternal mortality report. Early Pregnancy Deaths Deaths before 24 week's gestation now full in this category (formerly the upper limit was 20 weeks.[18]

The commonest early pregnancy complication of spontaneous miscarriage occurs in approximately 15 20 % of all pregnancies, as recorded by hospital episode statistics. The

actual figure, from community-based assessment, may be up to 30%, as many cases remain unreported to hospital.[19] Abortion was until recent years, one of the most important causes of maternal mortality. Many of deaths were associated will illegal abortion. The causes of death in abortion were sepsis, hemorrhage, and complication of the interference (e.g over vigorous dilatation, perforation).

Since the 1967 abortion act, there was an acceleration in the decline in maternal deaths despite an increased number of death following legal abortion. With in vitro fertilization (IVF) and other assisted reproductive technologies (ART), the risk of ectopic pregnancy increases substantially, and the location of those ectopic implantations changes.[20] The most recent confidential Enquiry into maternal deaths conclusively demonstrates that mortality from ectopic pregnancy has not declined and is still on the increase compared to rates described 10 years ago.[21]

A substantial reduction in maternal deaths can be achieved if complications due to abortion are prevented or recognized early and treated appropriately.[22] Hemorrhage It is still one of the leading causes of maternal mortality, with postpartum hemorrhage playing a significant role in the deaths.[23] Postpartum hemorrhage is still a cause of maternal mortality and active management of the third stage of labor decreases the risks of postpartum hemorrhage with accurate estimation of blood loss is essential, acute management requires a multidisciplinary approach with the involvement of senior clinicians, It's important to monitor central venous pressure in severe cases and early transfusion and correction of coagulopathies are fundamental.[24]

Antepartum hemorrhage is one of the commonest reasons for admission in pregnancy. It affects approximately 4% of all pregnancies and is associated with an increased rate of fetal and maternal morbidity and mortality.[25] Placenta prairie and abruption together account for 50% of bleeding and represent the greatest threat to the fetus and mother.[26] Thus all APH must be taken seriously.[27] Maternal Sepsis Is a general term which has been used to include various obstetric and genitor-urinary tract infections introduced into the mother.[28] The World Health organization ranks maternal sepsis as the sixth leading cause of disease burden for women aged 15 44 years, after the depression, HIV / AIDs, tuberculosis, abortion, and schizophrenia. As many as 5.2 million new cases of maternal sepsis are thought to occur annually and an estimated 62,000 maternal deaths will result from the condition.[29] A specific form of maternal sepsis is known as puerperal sepsis, an infection which is

introduced during childbirth but manifests in the postpartum period within the first 42 days after delivery. It is special importance because it is a serious, life-threatening disease of the mother with infection of the womb and abdominal cavity, bloodstream infection, fever and pain.[30] In industrialized countries, puerperal sepsis is rare, causing 2.1% of maternal deaths. In developing countries, It is the second commonest cause of maternal mortality after hemorrhage, causing 9.7% and 11.6% of deaths respectively.[31]

Uterine Rupture Uterine rupture, or a tear in the uterus, usually happens due to a previous uterine injury.[32] It is rare, occurring with an incidence of 0.03 0.3 %. Uterine rupture may be spontaneous, traumatic, or associated with a prior uterine scar, and it may occur during or before.

Labor as at the time of delivery. Impending rupture may be heralded by hyperventilation, restlessness, agitation, and tachycardia. A high index of suspicion is required. Immediate laparotomy is essential.[33]

Delay in management places both mother and child at significant risk. Although the associated maternal mortality rate is now 35 years with a history of thrombophilia, obese (> 80Kg) Previous thromboembolism, severe varicose veins, smoker, malignancy and those with multiple gestations, pre-eclampsia, grand multiparity, sepsis and with prolonged bed rest. It is crucial to recognize PE, as missing the diagnosis could have a fatal implication. The most common presentation is of mild breathlessness, or inspiration chest pain, in a woman who is not cyanosed but may be slightly tachycardia (> 90 bpm) with mild pyrexia (37.5 C). Rarely massive PE may present with sudden cardiorespiratory collapse. So rapid treatment of suspected VTE in pregnancy should be commenced while waiting for a diagnosis. Other Direct Causes Hydatidiform mole, Hyperemesis gravidarum, vaginal wall hematoma, acute fatty liver of pregnancy and obstructed labor.[34]

MATERIALS AND METHODS

The classifies underlying causes of death, mode of death and audits substandard care factors. All patient records are anonymized and kept in a secured database that can only be accessed after approval.

Records for all maternal deaths following cesarean section were accessed and information about the maternal history and current pregnancy extracted. Maternal death was defined

according to the WHO's International Classification of Diseases, tenth revision (ICD10). Late maternal deaths – occurring longer than 42 days but within one year after delivery - and deaths unrelated to pregnancy, e.g. traffic deaths were excluded from calculations and analysis. After an in-depth examination of case files, deaths were categorized according to the relation with the mode of delivery as directly related, associated and not associated with cesarean section. A pre-specified set of criteria was used to categorize deaths according to the relation with surgery. Death was defined to be directly related to surgery if the chain of events leading to death started during or within 24 hours after surgery and the cause or mode of death was the direct results of surgical or anesthetic complications.

In addition, death was also categorized as directly related to surgery, if the chain of morbid events started with uterine scar rupture resulting from a previous cesarean section. Deaths were categorized to be associated with surgery if a cesarean section was assessed to have contributed to the chain of morbid events that had already started prior to surgery. Such deaths 'associated with cesarean section' occurred in women with already complicated pregnancies or labor, but in whom surgery or anesthesia was deemed to have contributed to the fatal outcome, as assessed by the audit panel. Deaths were categorized as not associated with the cesarean section if surgery had not contributed. These deaths included women who had given birth by perimortem cesarean section during cardiopulmonary resuscitation and women with advanced stages of obstetric or non-obstetric illness, in whom cesarean section was done to save the life of the fetus with poor chances of a woman's survival.

For deaths in which there was a discrepancy between these two investigators, a second round was conducted after an additional inquiry into the woman's medical records. In this round, a third.

We calculated the overall MMR for the study period and risk of death following cesarean section and vaginal birth before and after excluding cases with no association between surgery and mortality. MMR was defined as the number of maternal deaths per 100.000 live births. Cesarean sections were classified into 'primary or elective' in cases where vaginal birth had never been intended even if the woman presented in labor, and 'secondary' when the decision for cesarean section was made during labor. This classification is not meant to reflect a sense of emergency surrounding the procedure and is based on the intention to treat principle. Pre-existing morbidity was defined as any medical or obstetric condition, or any pregnancy-related complication present before birth, which had a significant impact on the

pathophysiological pathway leading to death. Often, these complications were the indication for cesarean section. Obesity was defined as a body mass index of 30kg/m2 or more, or when body mass index was unknown when obesity was explicitly stated in the maternal charts. The total number of live births, for calculation of MMR, was extracted from Statistics National numbers for cesarean sections and vaginal births were collected from the Perinatal Registry, in which approximately 95.5% of all births with a gestational age of at least 22 weeks were recorded before 2011, and since that year more than 99%.

Statistical analyses were performed using IBM SPSS for Windows version 21 (SPSS). A two-sided $p < 0.05$ was considered statistically significant.

BACKGROUND

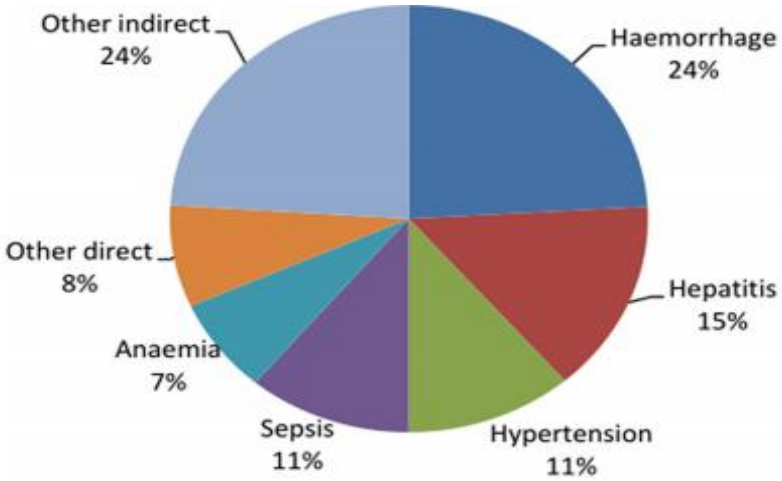
Every day almost 800 women die globally due to pregnancy or childbirth complications. Ninety percent of maternal deaths occur in Africa and Asia; the risk of a woman dying from maternal causes in Sub-Saharan Africa is 1 in 39, accounting for 56% of global maternal deaths.[35] Thus, the reduction of maternal mortality in Africa is a major concern for national and global health planners.

It is recognized that the implementation of MDGs and achieving could not be achieved by poor countries alone, because of a lack of resources and funding. There was a great interest among the developed countries to support developing countries to achieve MDG goals. As per the MDG 8, many developed countries contributed funds to help poorer countries in achieving their MDG. Unfortunately, the funds have not been utilized appropriately for implementing the MDGs by many low-income countries.

More than half went for debt payments and much of the remainder towards natural disaster relief and military aid, rather than further development.

As stated by the World Health Organization (WHO) in its 2005 World Health Report, the major causes of maternal deaths are severe bleeding/hemorrhage (25%), infections (13%), unsafe abortions (13%), eclampsia (12%), and obstructed labour (8%), according to the most recent local maternal mortality report (2012)[36], maternal mortality ratio (MMR) was 189 per 100,000 live births in 2012, compared to 186 in 2011 and 209 in 2010. It is worth noting that in the most recent report e still unpublished e the MMR is 127 per 100,000 live births. Fig. 1

shows the most prevalent causes of maternal mortality. Obstetrical hemorrhage heads the list, followed by liver disease “hepatitis/jaundice”, hypertensive disorders, and sepsis.



RESULTS

Results Over the fifteen-year study period, 269 deaths (excluding deaths unrelated to pregnancy) were reported to the MS MAC. Of these 269 deaths, 32 were late deaths and therefore excluded, leaving 237 maternal deaths for further analysis. Eighty-six women (36.3%) died following cesarean section, 88 (37.1%) following vaginal birth, 55 (23.2%) undelivered and eight (3.4%) following complications of abortion, miscarriage or ectopic pregnancy. Overall MMR was 8.3 per 100,000 live births (237/2,841,663). Risk of maternal mortality following cesarean section was 21.9 per 100.000 cesarean sections (86/393,443) versus 3.8 per 100,000 vaginal births (88/2,291,503) (Relative Risk [RR] 5.7; 95% Confidence Interval [CI].

Women who died after cesarean section had a mean age of 31.9 years (standard deviation 5.6). The majority (n=59; 68.6 %) had preterm births. Twenty-four women (27.9%) were of no-Iraqi origin. Eleven (12.8%) had had a cesarean section in a previous pregnancy. At their initial antenatal visit, 50 women (58.1%) were booked as ‘high-risk’ for obstetric care, while 36 (41.9%) started as ‘low-risk’ in primary midwifery care and were referred during pregnancy or labor.

At the time of surgery, 70 women (81.4%) had one or more pre-existing morbidities: 32 (37.6%) hypertensive disorders of pregnancy, 11 (12.8%) cerebrovascular disorders (meningitis, encephalitis, epilepsy, neurological tumor, intracranial hemorrhage), ten (11.6%) cardiovascular disorders (severe hypertension, dilated aorta, aortic dissection,

cardiomyopathy or mechanical heart valve), ten (11.6%) sepsis and ten (11.6%) other obstetric and non-obstetric conditions (liver cirrhosis, psychiatric conditions, morbid obesity, abnormally invasive placenta, history of severe thromboembolism, acute fatty liver of pregnancy).

Of all cesarean sections, 58 (67.4%) were 'primary or elective' and 28 (32.6%) 'secondary'. Most frequent indications for cesarean section were hypertensive disorders in 30 women (34.9%), followed by 'severe non-obstetric medical condition' in 22 (25.6%) and fetal distress in 12 (14%). Commonest underlying causes of death were hypertensive disorders (n=25; 29%), cardiovascular disease (n=11; 12,8%) and cerebrovascular disease (n=10; 11,6%). Compared to 1983 – 1992, combined risk of maternal mortality directly due to or associated with cesarean section decreased from 28 to 13 per 100,000 operations (RR 0.47; 95%CI 0.3 – 0.74).14 Risk of maternal mortality directly related to surgery or anesthesia decreased considerably from 13 to 2 per 100,000 (RR 0.16; 95%CI 0.07 – 0.38). Deaths due to anesthesiology-related complications decreased from 3.7 to 0.3 per 100,000 surgeries (RR 0.07; 95% CI 0.008-0.62).

Today, the desire to show progress in reducing the burden of mortality is universal: across developing and developed countries; at international, national and local levels; and for all causes and conditions.(56)We attribute the MMR in Thi_Qar, to several factors, the first of which is that our study is a hospital-based study and in such a study, maternal mortality usually under- or overestimates real levels, depending upon patient population and coverage. The second cause is that many of our patients give birth under the supervision of untrained personnel (days). causes of increased maternal deaths include deficient antenatal care, deficient emergency obstetrics, an increase in the rate of Caesarean sections and absence of therapeutic protocols. We conclude that vital managerial change is required; including formulation of therapeutic protocols for primary obstetric health care services. Without these, our efforts will be useless, with little impact on saving women s live.[37]

The decrease in anesthesiology-related deaths is in line with results from the United Kingdom and may be due to improved care and procedures for women before, during and after surgery.[38] Hypertensive disorders remain the predominant underlying cause of death in our study.[39] This underlines the fact that preeclampsia poses women at increased risk of hemorrhage and that cesarean section may contribute to this risk. 28 Finally, even though the percentage of women with a non-native background is comparable to the general population

during the study period (19.5% in 2006 increasing to 25.7% in 2013), this does not apply to women from sub-Saharan Africa and Suriname or the Dutch Antilles, who were over-represented.

This supports previous literature that non-native background or immigrant status is a risk factor for maternal mortality and morbidity and that risk factors differ importantly between different non-native groups Comparison with previous studies from France and Brazil is hampered by variations in study design and setting.[40] Maternal deaths with obstetric or non-obstetric morbidity present before birth and multiple gestations were excluded in those studies in order to correct for indication bias. We purposely did not exclude women with pre-existing maternal morbidity or multiple gestations because also in these women, mode of birth may contribute to the chain of events leading to death. Only by including these cases can the actual incidence of surgery-related death be calculated. The accuracy of comparisons of underlying causes of death between different countries has been questioned since classification is not uniform.22 A major strength of our study is its nationwide coverage. Categorization of association of cesarean section with maternal death was performed by two independent investigators, and in multiple rounds in case of discrepancy in order to minimize interpretation bias. We excluded cases in which cesarean section did not contribute to death, avoiding overestimation. Completeness of case files was exceptionally high for a retrospective study covering 15 years and allowed categorization in all but one woman.

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