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POSTPARTUM HEMORRHAGE IN ASIAN COUNTRIES: AVAILABLE DATA AND INTERPRETATION

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INTRODUCTION

Asia is one of the world's largest continents, stretching from the Arctic Ocean to the Equator and from Sumatra and Borneo in the south-east to the Suez Canal in the south-west. Its north-western boundary comprises the Ural Mountains and the Ural River. As such, Asia is home to approximately two-thirds of the world's population, contains its two largest nations (China and India), is home to three of the longest rivers in the world (Ob, Yangtze and Amur) and comprises deserts as well as paddy fields and coconut plantations.

Within Asia, postpartum hemorrhage is a significant cause of maternal mortality and morbidity, although sharp differences exist across Asian countries in the maternal mortality ratio, which is itself a measure of socioeconomic well-being[1]. The major causes of maternal mortality and the manner in which the maternal mortality ratio has fallen also vary between Asian countries. Obstetric hemorrhage is often the most common cause of maternal deaths within Asia. The recognition of this fact and improvements in care, targeted at the management of women with hemorrhage, are both important challenges facing governments as well as medical authorities.

A striking feature about Asia in recent decades is the increase in the gross domestic product of most nations, and the fact that this advance was not always accompanied by a decrease in maternal deaths from hemorrhage. Even in Japan, which has a modern and mature economy, obstetric hemorrhage is the most common cause of maternal mortality, and inadequate obstetric services have been blamed for maternal deaths[2]. In stark contrast, the gross domestic product of Hong Kong increased 14-fold between 1966 and 1985[3], while the maternal mortality ratio dropped nine-fold between 1961 and 1985[4].

In September 2000, representatives from 189 nations met at the United Nations Millennium Summit in New York and endorsed the Millennium Declaration with its eight goals. The Millennium Declaration represents a global agenda for the start of the twenty-first century to promote human development and to reduce global inequalities. Goal number 5 was to improve maternal health. Some Asian countries, such as Thailand and China, have already published progress reports on their achievement of the Millennium Development goals[5,6]. Since that time, there have been encouraging signs in the management of postpartum hemorrhage in Asia. Two issues are very clear. First, Asian countries are making strident efforts to control maternal mortality due to postpartum hemorrhage. Second, it is clear that both the Asian gross domestic product and population numbers will continue to rise. How these obviously intertwined phenomena will affect maternal deaths from hemorrhage will depend on factors other than the gross domestic product alone.

KEY ISSUES

The definition of postpartum hemorrhage varies. The standard definition is blood loss in excess of 500 ml or more within 24 h after delivery. However, *Global Burden of Disease 2000* defines postpartum hemorrhage only when the blood loss exceeds 1000 ml or more[7]. In Thailand, Prasertcharoensuk and colleagues studied 228 pregnant women and reported that

the actual incidence of primary postpartum hemorrhage (defined as a blood loss in excess of 1000 ml) was 3.51% by direct measurement of the blood loss[8]. Other authors, however, report that visual estimation of blood loss would have identified postpartum hemorrhage correctly in only 0.44% of patients[8]. An earlier report from Asia demonstrated significant differences between measured and estimated blood loss at normal deliveries[9]. In a study on normal patients who received standard antenatal care in Hong Kong, blood loss during normal delivery was measured in 37 primiparas and 25 multiparas. In primigravidas, the mean estimated blood loss was 260 ml and the mean measured blood loss was 401 ml. In multiparas, the mean estimated blood loss was 200 ml and the mean measured blood loss was 319 ml. In both groups, the mean estimated blood loss was significantly lower ($p < 0.05$) than the mean measured blood loss. The size of the discrepancy between measured and estimated blood loss was proportional to the measured blood loss (Figure 1). This study highlights the fact that blood loss during a so-called normal delivery may be considerable. Using the standard definition of primary postpartum hemorrhage, 11 out of 62 patients (17.4%) had unnoticed primary postpartum hemorrhage and six women (10%) developed postpartum anemia.

Studies on postpartum hemorrhage are limited by variations in the definition, differences between visual estimation and measured blood loss, and (in many countries) the sheer difficulty of collecting data from widespread and remote areas. Many papers report the incidence and management of obstetric hemorrhage, but include antepartum hemorrhage, postpartum hemorrhage and secondary postpartum hemorrhage. The widespread lack of a confidential system of enquiry into maternal death with published findings adds to the difficulty of ascertaining accurate figures in many Asian countries.

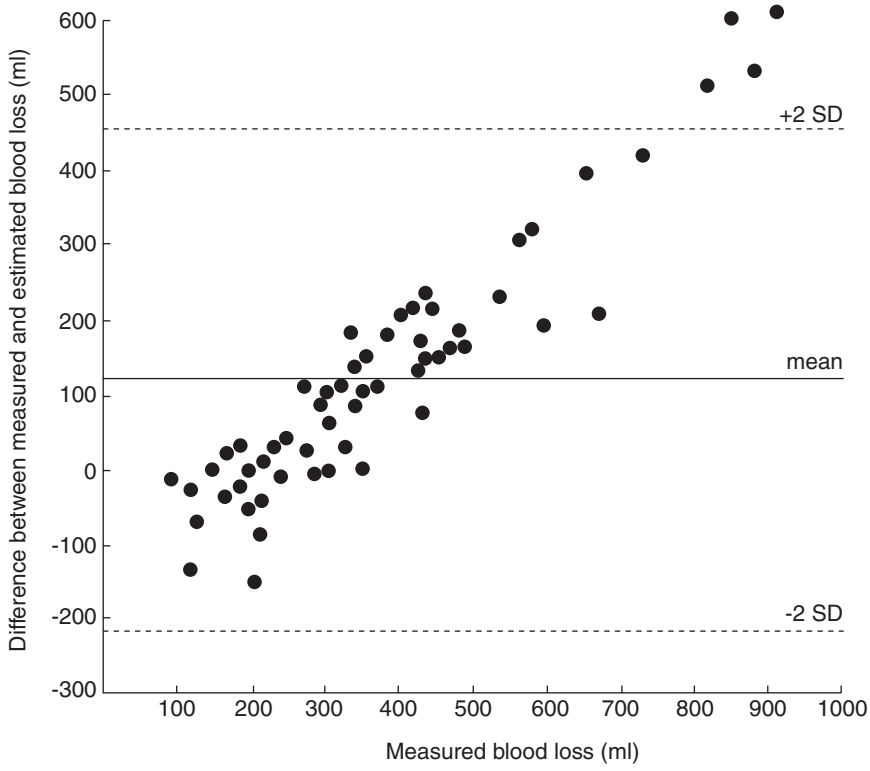

Figure 1 Plot of the difference between measured and estimated blood loss against the measured blood loss. Reprinted from Duthie SJ *et al. Eur J Obstet Gynaecol Reprod Biol* 1990;38:119–24, with kind permission of Elsevier[9]

ASIAN DATA

As postpartum hemorrhage continues to be a major cause of maternal death in the developing and the developed world[10], this section details available data (in no particular order).

Japan

Japan has the largest and most sophisticated economy in Asia and a medical system that was substantially revised after World War II. Despite these advantages, the number of maternal deaths from postpartum hemorrhage increased in number from four to 17 between 1995 and 2003[11]. More importantly, as a percentage of causes of maternal mortality, postpartum hemorrhage increased from 4.7% to 24.6% between 1995 and 2003 (Figure 2). During the same period of time, obstetric embolism (amniotic fluid, air and septic embolism as well as pulmonary embolism) decreased in incidence as a cause of maternal mortality.

Nagaya and colleagues studied 219 cases of maternal death in Japan between 1991 and 1992[2]. The purposes of this study were to identify causes of maternal mortality, examine attributes of treating facilities associated with maternal mortality and assess the presence of preventable factors. Of the 230 maternal deaths

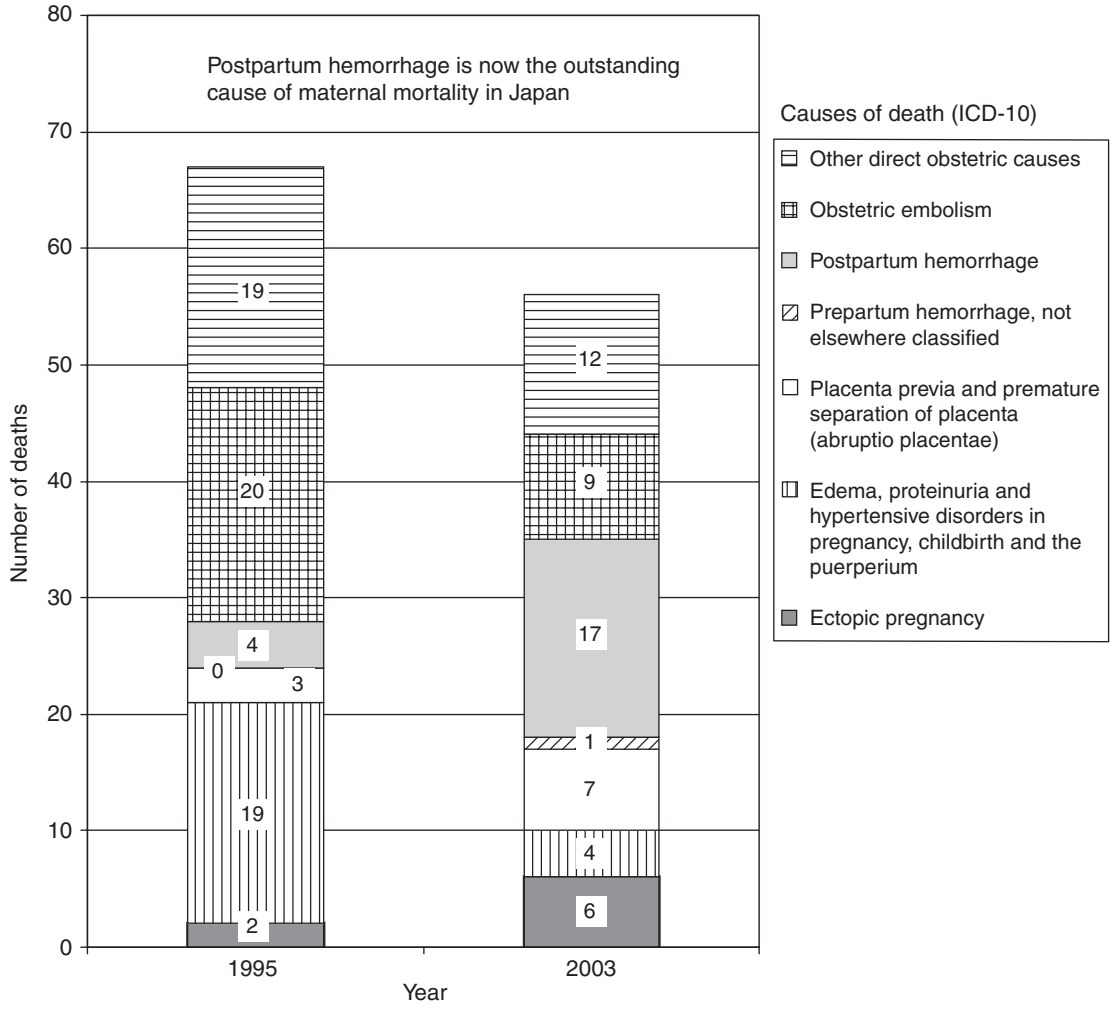

Figure 2 Maternal deaths and percentages by main causes, 1995–2003 (Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labor and Welfare of Japan)

which were identified, 197 women died in the hospital and had medical records available for review, 22 died outside of a medical facility but medical records were also available, and, for 11 women, no records were available. Hemorrhage was identified as the most common cause of these deaths, occurring in 86 (39%) of the 219 women for whom records were available. The overall maternal mortality ratio was 9.5 per 100 000 total births, a figure more than double that reported from Hong Kong for the period 1986–1990 (4 per 100 000 total births[12]). Nagaya and colleagues found that 37% of the maternal deaths occurring in health-care facilities were deemed preventable and another 16% possibly preventable. Among the preventable deaths, most were attributed to the fact that only one physician worked both as the obstetrician and anesthetist. Nagaya and colleagues conclude that inadequate obstetric services are associated with maternal mortality in Japan.

Hong Kong

Data from Hong Kong covering the period 1961–1985 show that the major cause of maternal death was hemorrhage during pregnancy and childbirth (ICD Ninth Revision 640,641,666). Of the 438 maternal deaths during the study period, 150 (34%) were due to hemorrhage. This compares with 89 (20%) due to gestational proteinuric hypertension and 60 (14%) due to ectopic pregnancy. Comparison of the distribution of maternal deaths by cases between two periods (1961–1965 (inclusive) and 1981–1985 (inclusive)) showed an 86% reduction in deaths due to hemorrhage[4]. Pulmonary embolism was not a major cause of maternal mortality between 1981 and 1985. Further data from Hong Kong on obstetric hemorrhage and pulmonary embolism reveal an interesting observation (Figure 3). During the time period 1986–1990 (inclusive), the most common cause of maternal death was pulmonary embolism[12]. Although hemorrhage during pregnancy and childbirth accounted for the same proportion (34%) of maternal deaths during both time periods, it was no longer the most common cause of maternal mortality in Hong Kong. However, it is still a cause for concern that the proportion of deaths due to hemorrhage had not diminished.

These are important lessons for the rest of Asia, and indeed for the rest of the world. The experience in Hong Kong between 1961 and 1985 clearly shows that, as the gross domestic

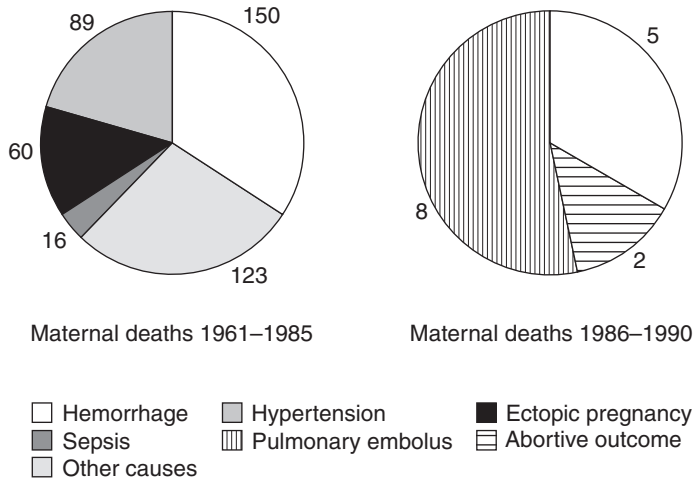

Figure 3 There were no maternal deaths from either hypertension or ectopic pregnancy between 1986 and 1990 in Hong Kong. This is a significant achievement compared with the previous 25 years. Hemorrhage during pregnancy and childbirth (ICD 640, 641, 666) remains a significant cause of maternal mortality, whereas the most common cause of maternal mortality during the study period was obstetric pulmonary embolism (ICD 673). Reproduced from Duthie SJ *et al. Br J Obstet Gynaecol* 1994;101:906–7, with the kind permission of the Royal College of Obstetricians and Gynaecologists

product of Hong Kong rose, the maternal mortality ratio fell. The exact number of deaths due to pulmonary embolism during 1961–1985 was unavailable[4], but it was recognized as a significant cause of maternal mortality in Hong Kong, indeed more common than hemorrhage between 1986 and 1990[12]. It is important to ask why pulmonary embolism has overtaken hemorrhage as the main cause of maternal mortality in Hong Kong. Part of the answer may well be due to a change in civil practice. Since 1986, all maternal deaths were investigated by a coroner's post-mortem. In many parts of Asia, this is not possible, and thus it is very difficult to obtain a perspective on individual cases of fatal postpartum hemorrhage.

India

Chhabra and Sirohi studied trends in maternal mortality specifically due to hemorrhage over 20 years in rural India[13]. Obstetric hemorrhage was the contributory cause of maternal mortality in 19.9% of the cases, and the leading cause of fatal hemorrhage was postpartum hemorrhage due to an atonic uterus. Other causes included ruptured uterus, placental abruption and retained placenta. It is reasonable to ask why so many women died due to an atonic uterus. The answer could be as simple as the high number of home births (60%) and the lack of medical attention and/or use of uterotonic agents.

A study carried out in Calcutta, India between 1995 and 1997 (inclusive) identified a maternal mortality ratio of 686.67 per 100 000 births, and hemorrhage was the second most common cause (16.75%), with toxemia as the leading cause (53.2%) of maternal mortality[14].

Several reports from India describe hemorrhage as the leading cause of maternal death in specific regions of the country. Comparison of two quinquennia, 1987–1991 and 1992–1997, shows that the number of deaths due to hemorrhage has increased and hemorrhage has increased as a proportion of direct causes of maternal mortality[15]. The data from a government hospital in Peninsular India show that the main causes of maternal death were hemorrhage and sepsis. Between 1987 and 1991, sepsis accounted for 47 out of 105 maternal deaths (31%), whereas hemorrhage accounted for 36 out of 105 (25.4%). However, in the succeeding quinquennium, 1992–1997, sepsis only accounted for 22 out of 107 deaths (13.5%) and hemorrhage increased to 45 out of 107 (28%). Hemorrhage was also shown to be the leading cause of maternal mortality at a hospital in West India, where 24.6% of maternal deaths were due to hemorrhage[16]. Data from north-eastern India, covering a 5-year time period between June 1998 and June 1993, also identified hemorrhage as the most common cause of maternal mortality, accounting for 27.65% of deaths[17]. In a detailed and critical analysis, Mukherji and colleagues show that 58.0% of the cases of maternal death due to hemorrhage were actually due to postpartum hemorrhage, mainly stemming from the lack of provision of emergency transport at community level[17].

Pakistan

Evidence from Pakistan identifies hemorrhage as being the most common cause of maternal mortality in many regions. In one study, direct causes of maternal death accounted for 78.1% of cases and the most common cause was hemorrhage[18]. A study in a tertiary care hospital in Pakistan also identified hemorrhage as the most common cause of maternal mortality[19]. One-third of the cases of maternal mortality were due to hemorrhage (nine out of 26), and the authors conclude that most maternal deaths were preventable.

Thailand

Data from Thailand show that the maternal mortality ratio in a government hospital in Thailand was 19.18 per 100 000 births between 1985 and 1998 (inclusive). The most common cause of death was identified as hemorrhage and the authors concluded that a significant number of maternal deaths were preventable[20].

Indonesia

Between 1995 and 1999, a district-based audit of maternal deaths in South Kalimantan, Indonesia demonstrated that 41% of cases of maternal death were due to hemorrhage[21]. Supratikto and colleagues provide a searching discussion of

some of the key issues. Their audit of maternal death in South Kalimantan led to changes in the quality of obstetric care in the district, by developing the concept of accountability of both health providers and policy-makers. Supratikto and colleagues also underlined the need to incorporate scientific evidence to the review process. These are important points as there is ample evidence from some parts of Asia that maternal mortality is not always investigated robustly[22].

Malaysia

A report from Malaysia with a 10-year study period between 1981 and 1990 demonstrated a maternal mortality rate of 74 per 100 000 births[23]. The most common cause of maternal death was hemorrhage. Other causes included hypertension, embolism and sepsis during the decade between 1981 and 1990. Risk factors from maternal deaths were lack of antenatal care, maternal age above 40 years, grand multiparty, and Indian ethnic origin. A postmortem examination was performed in only 8.2% of the women who died.

Similarly, a report from Malaysia describes postpartum hemorrhage, obstetric embolisms, trauma and hypertensive disorders of pregnancy as the main causes of 131 sudden maternal deaths[23]. The sudden maternal deaths comprised 20.6% of all maternal deaths. Twenty mothers died after a Cesarean section and the need for training in the emergency care of women who collapse is emphasized.

China

Data from China also underline the contribution of postpartum hemorrhage to maternal mortality. A case-controlled study of maternal mortality that was conducted in two rural provinces of China (Henan and Jiangsu) identified postpartum hemorrhage as the major cause of maternal death in both provinces[24]. Here, the large proportion of deaths occurred during the journey between the woman's home and the health-care facility, a fact not well emphasized in reports from other countries. A study carried out in Myiun County in China estimated that 27.3% of maternal deaths were unreported[25]. The leading causes of maternal deaths were hemorrhage followed by postpartum infections and pregnancy-induced hypertension. Over the 3 years between 1985 and 1988, improvements in the health-care system were achieved in terms of strengthening referrals between village health stations and township hospitals, establishment of case management procedures for caring for women with postpartum hemorrhage, severe pregnancy-induced hypertension, amniotic fluid embolism, shock and neonatal asphyxia. These improvements were followed by significant reductions in the maternal mortality ratio in pilot areas[25].

Saudi Arabia

In Saudi Arabia, the leading cause of maternal death was hemorrhage in 43.75% of patients at a university hospital between 1983 and 2002[26]. The authors carried out a detailed analysis of the underlying cause of each maternal death and analyzed potentially avoidable factors. Risk factors for maternal death were maternal age in excess of 35 years, a parity of 5 or greater, and iron deficiency anemia[26]. The main avoidable factors were identified as the failure of patients to seek timely medical advice and to follow medial advice.

Sri Lanka

Although hemorrhage is the leading cause of maternal death in several Asian reports, it must be emphasized that it is not always the major cause of maternal mortality. In Sri Lanka, for example, a study covering an 11-year period identified 103 maternal deaths and the main causes were genital tract sepsis (26%), hypertension in pregnancy (24%) and obstetric hemorrhage (20%)[27]. Care was considered to be substandard in 79% of the deaths, and the substandard care was felt to have influenced the outcome of maternal deaths in 7% of the cases.

Bangladesh

Here also, hemorrhage did not head the list of causes of maternal death. Eclampsia (34.3%) was first and hemorrhage (27.9%) second in a study of 8562 maternal deaths[28].

Singapore

The situation in Singapore is encouraging, in that a close scrutiny of maternal deaths in that highly industrialized and compact country shows that most maternal deaths were not due to the traditional direct causes of hemorrhage, sepsis, embolism or hypertensive disease[29]. Over a 7-year period between 1986 and 1992, the maternal mortality rate at the National University Hospital in Singapore was 34.4 per 100 000 births, including incidental deaths. Most of the women who died had underlying medical disorders that placed them at high risk of mortality.

INTERPRETATION

Postpartum hemorrhage is a significant cause of maternal mortality in Asia, regardless of occasional exceptions. The numbers are large and generally on a downward trend. However, some regions still have an extremely high maternal mortality ratio. A direct comparison between different countries and the regions within each country is not feasible for the following reasons:

(1) There is a variation in the definition of postpartum hemorrhage;

(2) Different data are not necessarily matched over the same time frame;

(3) There are major differences in the sizes of the study group in different papers;

(4) Obstetric hemorrhage is not divided into antepartum, postpartum and secondary postpartum hemorrhage in many papers;

(5) Some studies rely on indirect observations and verbal autopsies, whereas other studies involve detailed analysis of individual maternal deaths;

(6) The depth of discussion on preventable factors varies between reports.

The study from Japan[2] investigated preventability of maternal deaths as determined by a 42-member panel of medical specialists. This was a well-organized and robust study. On the other hand, several reports rely on estimates and speculation. In Hong Kong, the total number of births per annum and birth rate dropped, whereas the population size and the number of legal abortions rose over the period 1961–1985. Therefore, parity among Hong Kong women fell during this period[4]. Studies carried out in Hong Kong showed that maternal mortality rates vary greatly by parity, i.e. 41 per 100 000 total births if the parity was zero, and 82 per 100 000 total births if the parity was more than 5[30]. These observations support the speculation that the fall in parity contributed to the fall in maternal mortality rate, but the available data cannot show that it was the high-parity women who were the major group who died from hemorrhage in 1961, and who were no longer present in 1985[4].

Once a maternal death takes place, significant differences in practice are present in different parts of Asia. In Hong Kong, for example, all maternal deaths have been investigated by a coroner's post-mortem since 1986[12]. By contrast, Abdullah and Raj-Hasim pointed out that a post-mortem examination (of any type) was carried out in only 8.2% of cases of maternal death in a university obstetric unit in Malaysia over a 10-year study period between 1981 and 1990[22]. It is also important to note that the data from many countries are already several years old. Medical practice, changes in gross domestic product and the health of individual women have altered in recent years and all these issues have an impact on postpartum hemorrhage and its consequences.

A common theme in most of the Asian papers is that postpartum hemorrhage and its sequelae are preventable. Education of both the health-care workers and the women themselves is emphasized. This leads to two questions:

(1) How can matters be improved further?

(2) Once postpartum hemorrhage is controlled as a cause of maternal death, will other causes of maternal death become more significant?

In order to reduce the incidence and consequences of postpartum hemorrhage, it is essential to obtain precise data. It is of concern that a significant number of women die outside the medical facility and a significant number of maternal deaths did not have records available for scrutiny in a country as technologically

advanced as Japan[2]. Japan has a low maternal mortality ratio, a high gross domestic product and a high rate of female literacy. Although the data indicate that Japan is ahead of most other Asian countries, there is still room for improvement. The rise in maternal deaths due to postpartum hemorrhage in Japan is a major cause for concern. In Hong Kong and Singapore, the maternal mortality rates have fallen to admirably low levels. However, a system of confidential enquiries into maternal deaths is long overdue in Hong Kong[12].

Thailand reported a large reduction in maternal mortality ratio between 1990 and 1999[6]. The proportion of deaths due to hemorrhage has also fallen sharply. Similarly, China has reported a sharp reduction in the maternal mortality ratio between 1990 and 2001, thereby demonstrating China's progress to achieving Goal number 5[5]. Nevertheless, the report from China highlights the differences in the maternal mortality ratio between western China, with a relatively low stage of development, and the more advanced eastern provinces, including Hong Kong. In India, the maternal mortality ratio and proportion of deaths due to postpartum hemorrhage remain unacceptably high.

In Hong Kong, hemorrhage was the most common cause of maternal mortality between 1961 and 1985. However, pulmonary embolism was the most common cause of maternal mortality between 1986 and 1990[12]. This leads to the interesting question as to whether or not other Asian countries that follow Hong Kong's development would face a similar change in the causation of maternal mortality.

RECOMMENDATIONS

It is crucial that progress be made beyond the stage of simply acknowledging the problem, describing it and emphasizing that the problem must be resolved. In practical terms, the first step is to provide adequate training and education of health-care personnel in each country. The systems that provide emergency obstetric care to women with postpartum hemorrhage must be in place within the frame work of clinical governance. Professional responsibility and accountability must be established. The next step would be to ensure that each and every maternal death is certified, investigated and discussed. Analysis of death certificates is useful, but is simply not enough. The practice in Hong Kong whereby the coroner investigates maternal deaths is an example to follow. Once an adequate investigation is carried out, each maternal death (whether due to postpartum hemorrhage or other causes) must be the subject of a multidisciplinary meeting. The appropriate conclusions and areas for improvement must be disseminated within the health-care system. Journals that publish articles on maternal mortality and postpartum hemorrhage must be encouraged to do so only if the authors meet strict criteria of definition, sources of data and an analysis of preventable factors with robust recommendations for change. There is no doubt that the problem of postpartum hemorrhage has been tackled throughout Asia. However, there remains a need for education, certification of deaths, uniformity of definition and critical incident review. There is a significant rise in the gross domestic product of most Asian counties and the benefits should be seen in terms of a reduction in the incidence and fatal consequences of postpartum hemorrhage. The progress achieved so far shows that we need not despair but we should not be complacent.

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