

# Maternal Mortality in the Islamic Republic of Iran: On Track and in Transition

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**Abstract** The Maternal Mortality Ratio is an important public health indicator that reflects both the quality of a health care system and the role of women within that society. In September 2000 the United Nations Millennium Declaration outlined the eight Millennium Development Goals (MDGs) that set targets to be achieved by 2015. MDG 5 focused on improving maternal health. It had two clear subgoals: to reduce maternal mortality globally by three quarters between 1990 and 2015 and to obtain universal access to reproductive health for women. Despite a global trend of declining maternal mortality only a handful of nations are currently ‘on track’ to achieve their MDG targets by 2015. The Islamic Republic of Iran is one of these nations. In just over three decades, Iran has undergone demographic transition with significant reductions in total fertility and population growth rates. In concert with this transition, Iran has achieved a dramatic decline in the maternal mortality ratio that has fallen to a rate comparable with developed nations. Significantly Iran has also experienced a paradigm shift in its major causes of maternal mortality from those characteristic of developing nations (postpartum haemorrhage, infection) to causes more commonly seen in developed nations (pulmonary embolus, stroke). There is no single explanation that may account for this transition, rather it is the product of a number of different initiatives that have incorporated family planning, grass roots focus and wider improvements within the health care system of Iran over the past three decades. However

the experience of this nation may provide a useful example to other developing countries looking to reduce maternal mortality.

**Keywords** Maternal mortality · Iran · Reproductive health · Islamic nations · Education and policy · Demographic transition

## The Global Picture of Maternal Mortality

There were an estimated 546,000 maternal deaths worldwide in 1990 [1]. Maternal health consequently became the focus of one of the eight Millennium Development Goals adopted at the United Nations Millennium Summit of September 2000 [2]. MDG 5 aimed to reduce maternal mortality by three quarters by 2015. Since this time despite a global pattern of declining maternal mortality an estimated 400,000 women still die annually from pregnancy related complications with the majority of these deaths occurring in developing countries [1, 2].

The countries with the highest numbers of maternal deaths in 2008 were India (63,000), Nigeria (50,000), the Democratic Republic of the Congo (19,000) and Afghanistan (18,000) [2]. As countries with larger populations have a proportionately larger number of births, the Maternal Mortality Ratio (MMR) which is the ratio of the number of maternal deaths per 100,000 live births is a more sensitive indicator on a risk-per-birth basis. Globally the MMR ranges from less than 10 in developed countries such as Greece (2/100,000), Denmark (5/100,000), Sweden (5/100,000) and Australia (8/100,000) to greater than 500 in developing countries such as Kenya (530/100,000), Zimbabwe (790/100,000), Somalia (1,200) and Afghanistan (1,400) [2].

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## Maternal Mortality in Iran

Maternal mortality rates in Iran have declined dramatically in the 33 years since the Islamic Revolution of 1979. In 1975 Iran's MMR was 274 deaths per 100,000 live births [3]. This fell to 150/100,000 in 1990 and continued to decline to 94 in 1995, 38 in 2005 to 30 in 2008, a figure comparable with developed nations [4].

Iran is not alone in this experience. A similar pattern has been seen in Sri Lanka and Malaysia. In Sri Lanka the MMR fell from an estimated 520 in 1990 to 39 in 2008 [5]. In these countries a decline in maternal mortality appears to have been facilitated by a twofold approach. Initial investments in nationwide health services (*general* and *global*) such as reducing communicable diseases, improving hygiene and nutrition and improving quality, quantity and accessibility of health services, followed by focused investments in area health services, policies and systems (*specific* and *local*). In the Sri Lankan example this was achieved through the creation of area health unit systems with allocated public health midwife (PHM) areas for obstetric care [5]. However this twofold approach did not operate in a vacuum, it was combined with many other factors such as an increasing status of women, improved provision of education and greater acceptance of contraceptive methods and choices [6].

Iran is complex as there have been a number of policy changes and upheavals in the three decades since the Islamic Revolution [7]. There have been some general improvements in line with the Sri Lankan experience, including investment in infrastructure and health care services, increased training of midwives and health care providers and universal access to antenatal care [7]. All of these factors are focused on breaking the vicious cycle outlined in the delay model of Thaddeus and Maine: delays in *recognising*, *reaching* and *receiving* appropriate health care [8]. More significantly Iran has implemented a number of highly successful policies relating to population control and family planning that have resulted in a dramatic decline in the total fertility and crude birth rates over the past three decades [9].

## Population Control and Family Planning

During the decades surrounding the Islamic Revolution the population of Iran increased substantially from 21.5 million in 1960 to 33.2 million in 1975 to 47.1 million in 1985, reflecting an annual growth rate in excess of 3.0 % [10]. The reason for this rapid population growth is multifactorial however a fundamental factor was the continued high *total fertility rate* of the nation, combined with a gradually declining crude death rate reflective of general

improvements in health status and longevity characteristic of a developing country undergoing demographic transition [9].

In 1960 Iran had one of the highest total fertility rates in the world with an estimated 7.0 births per woman [11]. This remained relatively stable over the next 15 years despite the gradual decline in crude death rate. In 1975 the total fertility rate was 6.4 births per woman and the population had increased to 33.2 million [9, 12].

Prior to 1979 a number of family planning initiatives had been commenced. However these policies were ceased following the Islamic Revolution [13]. The total fertility rate thus continued at this rapid level and by 1985 the population had expanded to 47.1 million. Eventually this population growth was felt to be unsustainable and it led to the re-establishment of a number of policies and initiatives that were outlined in the nation's First (post Revolution) Development Plan [12]. These policies were in line with the recommendations of the Bali Declaration on Population and Sustainable Development and received endorsement from the religious authorities [13]. These new policies and practices focused on the family unit at a basic level and had considerable impact over the next few decades. They introduced mandatory pre-nuptial education for couples that included contraception counselling. They also endorsed several family planning practices designed to promote smaller families such as the concept of birth-spacing (3 years between each child) and limiting family size to three. They also encouraged women to restrict their child-bearing to between the ages of 16 and 35 [11].

These policies proved to be extremely effective and led to a significantly reduced growth rate as well as a decline in the total fertility rate over the next two decades [14]. By 1995 the total fertility rate had dropped to 3.2 births per woman and it continued to decline to 1.8 in 2008, a figure comparable with total fertility rates seen in developed countries [15]. Following on from this decline in total fertility rate and reduced population growth, a subsequent fall in maternal mortality was observed [16]. From 274 deaths per 100,000 in 1975, Iran's MMR fell to levels comparable with the developed nations of around 30 per 100,000 live births [2].

## Shifting Causes of Maternal Deaths

During this period of demographic transition a further shift in the landscape of maternal mortality was observed, a shift in the *major causes* of maternal mortality [17]. In 1975 principle causes of maternal deaths in Iran were similar to those characteristic of developing countries such as anaemia, infection, obstructed labour and post partum haemorrhage

[2]. As Iran's MMR declined the relative proportions of deaths due to these causes also declined [18]. Deaths from infection and sepsis fell as a result of improvements in medical care with quicker recognition of serious illness and more rapid intervention and institution of antibiotic treatment. Cephalopelvic disproportion and obstructed labour were reduced as they were increasingly able to be resolved with surgical delivery. More recently with a maternal mortality of less than 30 deaths per 100,000 live births, the main contributors to maternal mortality in Iran are quite different and include pulmonary embolism, hypertensive disorders such as pre-eclampsia and eclampsia, amniotic fluid embolus and the catastrophic outcomes from these conditions such as disseminated intravascular coagulation, stroke, hypoxic brain injury and multiple organ failure [18]. These principle causes of maternal mortality are comparable with causes observed in developed nations indicating that Iran has undergone demographic transition.

An early study on maternal mortality in Iran reviewed all cases of maternal deaths on which autopsies had been performed at Saadi Hospital, Shiraz during the period from 1963 to 1969 [18]. The study found 73 % of the women who died were from a rural area, none of the women had received any level of antenatal care and that *infection* was the primary cause of maternal deaths. Other major causes of maternal deaths in Iran during this earlier time included obstructed labour, post partum haemorrhage and complications relating to malnutrition and anaemia [19]. In many developing countries such outcomes may be attributed to poor overall pregnancy healthcare, poor antenatal coverage and inadequate recognition of critical conditions of pregnancy. Sepsis, infection and postpartum haemorrhage which together accounted for the largest proportion of maternal deaths, often occur within a vital 7 day period following childbirth. As large numbers of women delivered in the home, failure to recognise complications and lack of access to medical care often resulted in large numbers of preventable maternal deaths. Women from rural areas faced additional difficulties as medical coverage of rural areas was often scanty, clinics were understocked and crucial time was lost if urgent referral to a larger medical facility was deemed necessary [20].

### Present Causes of Maternal Deaths

Current causes of maternal deaths in Iran include pulmonary embolism as well as complications arising from pregnancy induced hypertension and gestational diabetes [20]. While maternal deaths due to infection, obstructed labour and postpartum haemorrhage have declined dramatically there has been an increase in the relative proportion of maternal deaths due to indirect and incidental

factors such as cardiorespiratory complications and neoplasms, injuries and accidents [20].

Factors accounting for these changes are also multifactorial and are connected to the shifting political, social and cultural landscape of Iran which has occurred over the past three decades. Currently the number of women choosing to deliver in hospitals instead of the home has increased substantially and is estimated to be over 90 %. Routine antenatal care has become widely available and is accessed by the majority of women. For women living in rural areas the introduction of numerous satellite medical centres which were developed in the post-Revolutionary era have provided a vital service [21]. These centres have the ability to provide antenatal care to women from these areas and more significantly are able to recognise complications of pregnancy during the early stages, implement basic treatment and refer to larger medical centres if necessary.

The incidence of caesarean delivery has increased dramatically, mirroring the situation in much of the developed world. Underlying factors include earlier initiation of caesarean delivery in the first instance of difficulty encountered in a primary trial of labour as well as a policy of mandatory scheduled caesarean for each delivery following primary caesarean delivery [22]. It is generally accepted that maternal mortality resulting from surgical delivery is greater than from vaginal delivery however there is no evidence relating this pattern of increased caesarean delivery to an increase in maternal deaths in Iran. Indeed it appears to have contributed to an increased survival of a cohort of women who may have died from obstructed labour and cephalopelvic disproportion without surgical intervention.

Another factor underlying the shift in primary causes of mortality in Iran is the changing risk profile of women becoming pregnant. Many women are delaying childbearing, leading to an older cohort of women becoming pregnant and at an increased risk of maternal death from different health-related causes. With advances in technology an increasing number of women who previously were unable to have children because of infertility or complex medical problems are now having children [23]. It is generally felt that more investigation is required into the policies and practices that have been implemented since the Islamic Revolution as large structural changes have occurred over a short period of time and the wider impact of these newer models of care on maternal health remains largely unevaluated [23].

### Improving the Quality of Maternal Health Care

A number of barriers prevented the successful implementation of strategies that may have led to earlier

improvements in the quality of maternal health care in Iran. Large numbers of patients and overwhelming workload, insufficient economic and human resources in many rural areas, upheaval and changes in government which led to frequent changes in health policies as well as the poor social status of women particularly in more conservative, provincial areas. Furthermore a mismatch existed between the training which medical practitioners received and the training which would have been more appropriate for addressing Iran's health problems such as more extensive training in family planning, infectious diseases and maternal and child health. For instance as Iran is an Islamic nation, only female medical students are given practical training in obstetrics and gynaecology [24].

## Conclusion

Iran has achieved dramatic improvements in maternal mortality over a short period of time. There are a number of elements that may have contributed to this success, from general and global improvements in health infrastructure to focused and local policy changes, compounded with an extremely successful approach to family planning and population control. In addition a vital *third tier* to this twofold approach was the contribution of societal shifts such as an increasing status of women, a focus on education and the implementation of policies that had full endorsement from the religious authorities. This third tier of sociocultural elements is integral to ensuring that any higher level policy changes are implemented at the ground level.

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