

Association between maternal age and pregnancy outcome: implications for the Pakistani society

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Abstract

Maternal age at conception has long been demonstrated to have a significant correlation with pregnancy outcome and maternal health. Classically, very young (<20 years old) and old (= or >35 years) women have been classified as high-risk categories for child bearing. Recently, career, education, financial, and other goals have coerced women to delay childbearing all over the world. This trend is also becoming apparent in Pakistan, especially in the upper middle class, wealthy and educated women, as they become increasingly empowered. This review presents the association between maternal age and pregnancy outcome, particularly in the context of statistics of Pakistan, and its possible repercussions. On one hand, physicians need to develop effective counseling strategies for their patients in this regard, and on the other, more studies are required to ascertain the attitudes of Pakistani women, particularly those belonging to the upper and middle classes, regarding delayed childbearing, that can aid physicians in formulating effective counseling strategies.

Keywords: Maternal age, advanced maternal age, high-risk maternal age, pregnancy outcome.

Introduction

Since a couple of decades, the world is witnessing remarkable advancements in science, literature, arts, and virtually every other field of life. While on one hand, many such advancements, especially in science and technology have unquestionably created great ease for the human race, on the other, this has coerced human beings to struggle more and more to establish a career prior to marriage, in order to earn a decent living to support a spouse in raising a family. This has led to a worldwide trend of an increasing age of marriage and conception, which is particularly more marked in females.^{1,2} Moreover, industrialization and consequent generation of employment opportunities, along with a herd of other factors has led to an increasing number of women acquiring jobs, and hence delaying conception because of preoccupation with work outside the home. Often married females choose to practice contraception to prevent the troubles and complications of pregnancy and delivery from interfering with their professional careers, until their careers become well settled.² This trend is also becoming discernible

in Pakistan, especially in urban areas, where the new generation of the upper and middle socioeconomic class is becoming increasingly career-oriented.

The object of this review is to assess the association between maternal age at childbearing and pregnancy outcome in light of the Pakistan Demographic and Health Survey 2006 - 2007³ and other studies conducted worldwide, and thereby highlight the long term implications that the trend of increasing maternal age has for the Pakistani society.

Methods

A thorough study of pertinent researches conducted worldwide and other literature available on the subject was done. Most of the review however, is based on the findings of the Pakistan Demographic and Health Survey 2006 - 2007 (DHS),³ which is considered among the most comprehensive and reliable sources of such data in Pakistan today. Pregnancy outcome has been considered in terms of the baby that is delivered, and its maternal consequences, that is, complications during pregnancy, delivery, and the postnatal period. A discussion on the relevance of the topic at hand to our society has been presented at the end.

Statistics and Discussion

I. Trends of maternal age at first birth in Pakistan

According to the Pakistan Demographic and Health Survey of 2006-2007, the average median age at first birth of women is equivalent to 21.68 years.³ slightly higher than the average median age of 21.52 in the 1990-1991 survey⁴. The greatest increase in the median age since 1990-1991 is in the 25-29 age group (1.7), while the last three age groups have all witnessed a decline, the greatest being in the 45-49 group (1.1). Furthermore, examining data of the percentage of women who have given birth by particular ages, 15, 18, 20, 22, and 25, reveals that older women (30-49 years) generally had their first birth at younger ages, for instance around 54.2% of 45-49 year olds had given their first birth by 22 years, while only around 45.4% of their 25-29 year old counterparts had given birth by the same age.

In Table-1,³ the median age at first birth has been classified according to the demographics and socioeconomic status of the women. The table demonstrates that women in urban areas tend to have their first child slightly later than their rural counterparts. Interestingly, in the 1990-1991 survey, the average age in rural and urban women was the same (21.3).⁴ Maternal age at first birth has also been shown to exhibit a direct relationship with education level and wealth status, with more educated and wealthy women displaying a greater age. In the provincial categorization, Punjabi and Balochi women exhibit significantly higher ages than those in Sindh and N.W.F.P. Furthermore, in the vast majority of categories, older women (40 -45 years) had their first child at a younger age than those of the youngest category, which corroborates the finding present above. The most striking difference is that observed in women in major urban cities and those of the highest wealth quintile that present a difference of 3.0, and 3.3 respectively.

The trends in the median age of the first marriage of women,³ which is the primary indicator of maternal age at conceiving the first child, are parallel to those described above, as one would expect. It is higher in urban residents, and in educated and wealthy women. Furthermore, women in Punjab and Balochistan tend to marry at a greater age, which is also consistent with the data mentioned above. It is also noteworthy, that on average, women had their first child 2.7 years after their marriage.

Very young (under 20 years) and old (over 35 years) women are considered 'high-risk' categories for child bearing. Age specific fertility rates in Pakistani women belonging to the two high-risk groups are 55, and 117 respectively,³ demonstrating that more births occur in the old high-risk category. According to the Federal Bureau of Statistics, the absolute number of births to teenage women in the year 2007 was 132,579, while that to old women was 659,427, around 5 times more.⁵

II. Impact of maternal age on:

1. Perinatal mortality:

According to the World Health Organization, "the perinatal period commences at 22 completed weeks (154 days) of gestation and ends seven completed days after birth."⁶ However, researchers have differed on the exact periods of this definition. In DHS, on which the subsequently presented data is based, it has been defined as "pregnancy losses occurring after seven completed months of gestation (stillbirths) plus deaths of live births within the first seven days of life (early neonatal deaths)".³ Thus, perinatal mortality includes foetal mortality, referring to stillbirth, and early neonatal mortality, referring to the mortality of neonates delivered live.

Figure-1³ presents the statistics of perinatal mortality



Figure-1: Perinatal mortality rate by maternal age.

in Pakistani women, classified according to maternal age. These statistics show that mothers conceiving at late age, i.e. 40- 49 years have a significantly greater risk of perinatal mortality, more than 50% greater than that of the 20-29 age group. Similarly mothers in the 30- 39 age group are at greater risk than the group preceding them. Very young mothers (< 20 years), also have a high rate, second only to that of the 40-49 age group.

The increased incidence of perinatal mortality in women aged 35 or more may be correlated to the increased probability of chromosomal errors with advancing age,⁷ for many genotypes that would be generated as a result may be incompatible to life. This has been elaborated in a subsequent section on congenital anomalies.

One study conducted in an European country documents that "Women in the 30-49 year age group have a 1.4-1.5 times higher risk of stillbirth, a 2.0-2.4 times greater risk of perinatal mortality, and a 2.6-4.3 times higher risk of infant mortality than women 20-29 years old. The risk of spontaneous abortion is 1.7 times higher for those 30-34 years old, 2.8 times higher for mothers 35-39 years of age, and 16.4 times higher for those 40-49 years old than for those in the optimal 20-29-year age range."⁸

2. Neonatal, Infant and Child Mortality:

Neonatal mortality is defined as the probability of dying within the first month of life; infant mortality as the probability of dying before the first birthday; and child mortality as the probability of dying between the first and fifth birthdays.³ Figure-2³ displays the incidence of neonatal,

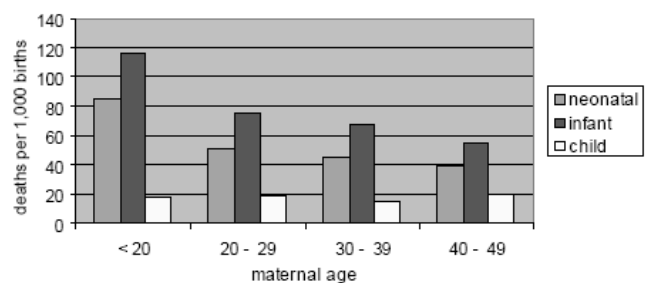


Figure-2: Mortality at first birth by maternal age.

Table-1: Median age at first birth according to demographic and socioeconomic characteristics (Pakistan, 2006-07).

Background characteristic	Age					Women age 25- 49
	25- 29	30- 34	35- 39	40- 44	45- 49	
Residence						
Total urban	23.9	22.4	20.9	21.7	21.3	22.2
Major city	24.4	22.8	20.8	21.7	21.4	22.4
Other urban	23.3	22.1	20.9	21.7	21.3	22
Rural	22.1	21.1	21.4	21.3	21.6	21.5
Province						
Punjab	23.2	22.1	21.7	21.6	21.5	22.1
Sindh	21.6	21	20.1	21.2	21.2	21.1
NWFP	22.3	20.9	20.4	20.9	21.7	21.2
Balochistan	22.7	21.7	22.2	21.9	23	22.3
Education						
No education	21.2	20.6	20.9	21	21.3	21
Primary	22.5	21.3	21.5	21.8	21.6	21.8
Middle	24.3	23	20.4	20.6	-20.7	22.3
Secondary	-23.5	23	21.9	22.7	-23.1	23
Higher	*	26.2	23.8	26.1	-26.4	+
Wealth Quintile						
Lowest	20.7	19.9	21.3	20.2	21.8	20.7
Second	21.5	21.4	21.3	21.2	21.2	21.3
Middle	22.7	20.8	20.9	21.6	21.7	21.5
Fourth	23.2	22.1	21.2	21.7	21.4	22.1
Highest	24.6	23.4	21.5	21.7	21.3	22.8
Total	22.7	21.6	21.2	21.4	21.5	21.8
Number of women++	2,500	1,916	1,705	1,343	1,225	8,689

Note: numbers in parentheses are based on 25-49 unweighted women;

*= represents a figure based on fewer than 25 unweighted women that has been suppressed.

+= omitted because less than 50 percent of the women had a birth before reaching the beginning of the age group

++= reported in a separate table in DHS

[reproduced with permission from MEASURE DHS, ICF Macro4]

infant and child mortality as a function of maternal age. According to this data, while child mortality displays no clear trend, neonatal and infant mortality is roughly inversely related to maternal age, with mortality highest in mothers younger than 20 years, and gradually diminishing with higher age groups. This trend is most marked in neonatal mortality, with values declining from 85 in the >20 age group to 39 in the 40- 49 age group. This leads to the inference that children born to younger mothers are at a greater risk, whereas those born to older mothers are not at much risk. However, it seems that mortality is not independently related to maternal age, but is the product of the interplay of other factors also. For example, older women have already delivered more children before, so because of their multiparity, their subsequent children are at a lesser risk of mortality. Hence, it is probable that if this factor was controlled, that is, if two groups of younger and older mothers were each giving birth to their first child, child mortality would be the same in both groups, or younger mothers may be at a greater advantage. This is further corroborated by the findings of DHS that reveal that neonatal and infant mortality is the greatest at birth order 1, and lowest at birth order 4-6.³

It should be also pointed out that this finding of mortality being inversely related to maternal age, is in fact

inconsistent with other researches worldwide that have studied the relationship between these two variables. Such studies have generally revealed a U-shaped relationship, with the youngest (younger than 15) and oldest (aged 40 and older) being at greater risk compared to the middle aged ones.^{9,10}

3. Child's birth weight and size:

The weight and size of children at birth are amongst the most important indicators of their health, mortality and cognitive development. According to the World Health Organization, low birth weight is defined as a birth weight of less than 2500 grams.¹¹ Birth size has been classified on a three-point scale as very small, smaller than average, and average or larger. Statistics show that young (<20) and old (35-49) mothers are more susceptible to give birth to children of low birth weight and size, with the middle-aged group being the more advantaged category.³ Interestingly, birth size is also a determinant of neonatal and infant mortality. Small/very small infants have an astounding 53% and 68% greater risk of neonatal and infant mortality than those with an average birth size.³

Advanced maternal age (equal to, or greater than 35) is also a risk factor for pre term delivery, in particular, medically indicated preterm delivery, the risk for which is

Table-2: Pregnancy complications (Pakistan, 2006-07).

Mother's age at birth	Complication/ Problem				
	Severe headaches	Blurred vision	Swelling of hands	Swelling of face	Vaginal bleeding or spotting
<20	47.0	27.2	21.9	18.5	5.7
20 - 34	47.1	27.9	26.7	23.5	7.9
35 - 49	52.4	38.0	27.0	25.1	8.0
	Fits or convulsions	Epigastric pain	Any problem	Any severe problem*	Number of women
<20	2.4	28.3	65.7	21.4	460
20 - 34	3.5	31.5	68.2	23.0	4,303
35 - 49	5.3	31.9	68.6	25.9	915

*= Refers to the question as to whether any of the problems were "so severe you thought you might die"
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Table-3: Complications during delivery and post natal period (Pakistan, 2006-07).

Mother's age at birth	Percentage who experienced					
	Severe headaches	Blurred vision	Swelling of hands	Swelling of face	High fever	Fits or convulsions
<20	30.8	17.9	5.5	5.0	23.9	2.5
20 - 34	36.3	19.6	9.9	9.4	25.8	3.3
35 - 49	40.8	26.9	12.3	12.4	30.3	4.8
	Labour for more than 12 hours	Baby's feet came first	Placenta came first	Continuous urine dribbling	Bad smelling vaginal discharge	Inability to control bowel motions
<20	20.7	3.1	0.9	3.5	8.6	1.8
20 - 34	16.7	2.0	1.0	3.9	9.7	4.1
35 - 49	16.6	1.9	0.6	5.2	10.8	4.8
	Heavy vaginal bleeding	Any problem	Any severe problem*	Number of women		
<20	10.3	53.8	19.6	460		
20 - 34	7.7	57.1	18.6	4,303		
35 - 49	7.2	57.4	19.5	915		

*= Refers to the question as to whether any of the problems were "so severe you thought you might die"
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increased by 3.79 times.¹² Gestational age, in turn is a determinant of the weight and size of children at birth. In addition, foetal growth retardation has also been indicated to be linked to maternal age,¹³ but evidence concerning this has been disputed.¹⁴

4. Congenital anomalies:

Controlled studies documenting the effect of advanced maternal age on congenital anomalies in children in Pakistan could not be retrieved. However, it has been the subject of an enormous number of researches conducted worldwide that have unambivalently concluded that the risk of congenital anomalies, particularly neural tube defects, Down's Syndrome, and cleft lip and/or palate is significantly greater with advanced maternal age.^{15,16} In fact, the association between Down's Syndrome and advanced maternal age has been recognized since the 1930's.¹⁷ The increased risk of these anomalies with advanced maternal age, besides being evident through studies of live born infants with these anomalies, has also been demonstrated through cytogenetical studies on human oocytes, cleavage-stage embryos and spontaneously aborted fetuses.^{8,18,19} Historically, because of its relatively high prevalence, and extensively studied association to maternal age, the

cytogenetics of Down's syndrome has been thoroughly investigated. A manifestation of trisomy 21 in the majority (nearly 95%) of subjects, the disease has been recognized to result from chromosomal non-disjunction during meiosis.²⁰ One investigation on 1,700 karyotyped products of conception found that in women less than 24 years of age, 14% of pregnancy losses were due to a trisomy, while in their counterparts of the 40-44 age group, it increased to around 38%.²¹ Similarly, a recent investigation by Park IY²² et al. 2010 on Korean women demonstrated that "the incidence of aneuploidies increased exponentially with maternal age." Hence, it is now generally accepted that that the increased frequency of aneuploidy is among the most potent causes of reduced implantation, and spontaneous abortions, and thus reduced fertility in females with advancing age.²³

5. Pregnancy complications:

Table-2³ presents pregnancy complications as a function of maternal age, and shows the most striking association. Younger women, including those of the <20 age group are least likely to suffer each of the 7 categories of complications, as well as severe problems. Concomitantly the complications of each category are the most prevalent in women of the eldest group 35 - 49.

6. Complications during delivery and postnatal period:

These are presented in Table-3 as a function of maternal age. All of the following complications depict a clear association with maternal age, younger women being less susceptible to suffer from them than their older counterparts: severe headaches, blurred vision, swelling of hands, swelling of face, high fever, fits or convulsions, continuous urine dribbling, foul smelling vaginal discharge, inability to control bowel motions, and high vaginal bleeding. Conversely, >24 hour labour and feet first delivery (footling breech) have an inverse relation, while placenta first delivery does not show any clear association. Hence, an overwhelming majority of these problems are associated with advanced maternal age.

This finding is consistent with numerous other studies done worldwide of the subject.^{24,25} A recent investigation for instance, demonstrated that, "the risks for most (pregnancy) outcomes paralleled increasing maternal age including prolonged and dysfunctional labour, excessive labour bleeding, breech and malpresentation, and primary Caesarean delivery."²⁵ Advanced maternal age has also been indicated as a risk factor for maternal mortality.²⁶ According to DHS, the pregnancy related mortality rate is the highest in women aged 35 - 39, a staggering 8 times more than the youngest group.³

II. Implications for the Pakistani woman:

As pointed out in the statistics of maternal age at first birth in Pakistan, the number of births that occur in the old high-risk category is a lot more than those in the very young category. Several NGOs are working in Pakistan in collaboration with the Ministry of Health, to discourage early marriages, to help decrease maternal mortality and improve pregnancy outcome. However, this strategy is counterproductive, because if marriages are delayed, and women produce the same number of children, with the same or increased birth spacing (as is also being advocated), more children will be born in the old high risk category, which ironically deserves more concern. Hence, while on one hand it may help overcome the complications of the very young high-risk category, it may pose a greater challenge to NGOs, the Ministry of Health and various other stakeholders to deal with the escalated old high-risk category. Also noteworthy is the fact that, as pointed out in the statistics and discussion above, congenital anomalies, pregnancy complications, and complications during delivery, and the post natal period are only associated with the old category, and bear no association to young high risk women, so it is the former that is worthy of greater concern. In fact, pregnancy complications, and complications during delivery, and the post natal period have a even a lower incidence in the <20 group than in those age

groups that are considered to be the ideal reproductive period. It seems therefore, that in order to reduce the burden on the country's meagre health resources, the government and NGOs need to reset their priorities, and devise a more effective strategy to improve maternal and child health.

Delayed marriage has also been indicated to be a factor contributing to non-marital childbearing, in particular to the steeply increasing non-marital fertility rate in the United States and Europe.^{27,28} Indeed, the report for the United States Congress on the trends, reasons, and public policy interventions concerning non marital childbearing identifies increased age at first marriage first among the reasons contributing to the escalating non marital fertility in the area, followed by the trend of married couples postponing childbearing, and increased couple separation.²⁹ Extrapolating the evidence, it seems reasonable to expect that delayed marriages may also escalate the prevalence of illegitimate pregnancies in our own communities. Many of these pregnancies undergo unsafe abortion,³⁰ the complications of which are well documented, ranging from maternal mortality to (which in and of itself is very high; studies have documented rates as high as around 25%), to complications such as toxic high fever, wound infection, intra- abdominal abscess, deep venous thrombosis, septicaemia, peritonitis, perforated and/ or gangrenous uterus, gangrenous/ perforated gut, rectal injury, urinary bladder injury and several other severe complications.³¹ It is obvious that those illegitimate pregnancies that do eventually deliver will not have received adequate prenatal care, nor will they be safely delivered at a health facility because of the cultural and religious taboo associated with illegitimate sexual relationships. As a consequence, child health and mortality will bear grievous effects. Children who are delivered safely are many at times left at garbage dumps at the outskirts of cities, in sanitary drains or in 'jhoolas' (baby cradles) set up at the network of Edhi Centers across the country. Children left at garbage dumps are often bitten by stray dogs or die of starvation before they are reported at the Edhi Foundation.³² The Foundation claims that so far around 15,000 children have been abandoned in cradles, and almost double that number have been found dead.³³

As for the average Pakistani woman, at present the average median age at first birth (21.68 years)³ is well within the ideal reproductive period of a woman's life, and she is hence expected to bear many, if not most, of her children during that period, and thus may not be subject to significant repercussions of the effect of advanced maternal age. However, maternal age at first birth is considerably higher in the urban, wealthier and more educated residents, because as women become more and more empowered they chose to delay childbearing until they have achieved their career, financial and other goals. It is to these categories that the

repercussions are considerably pertinent. Physicians catering to these classes must counsel their clients on the possible risks associated with delayed childbearing in terms of its effects on the health on the mother and her child. This can aid couples in their decisions on when to have a child. Similarly, parents and grandparents should be counselled to get their children married as soon as they (their children) are financially and socially fit to do so. Even though, apparently, many obstetricians in the setup of our current hospitals do counsel patients on the ideal reproductive age, it is uncertain as to how appealing and effective it is. Community Medicine and Behavioural Sciences curricula of undergraduate medical education also need to be re-devised to include such counselling.

It is also noteworthy that in developed countries, volumes of research have been dedicated to determining the interplay between advanced maternal age, pregnancy outcome, and a herd of other influences. Such papers with statistics from our country are nearly non-existent. Besides, in developed countries, an increasing number of research papers are being published lately, that primarily aim to assess the knowledge of women regarding the risks associated with delayed childbearing, the characteristics of women who are more unaware than others, and the factors that coerce them to delay childbearing. One such study, published in the Canadian journal of public health, (2006), entitled "What do women know about the risks of delayed childbearing?" sought two of the aforementioned aims. The study concluded that women were generally unaware of the potentially adverse effects of advanced maternal age; the report documents, "the proportion of women aware of specific childbearing risks associated with advanced maternal age were as follows: conception difficulties (85.3%), multiple birth (24.0%), caesarean section (18.8%), preterm delivery (21.8%), and LBW (11.2%)."³⁴ Another study, also conducted in Canada, and published in the maternal and child health journal presented similar conclusions.³⁵ Considering the level of literacy of women in Pakistan, how much more so then, would the unawareness in them be.

Data on the trends and attitudes of women in Pakistan concerning childbearing is essentially lacking. Further studies, particularly targeting the susceptible class, are required to ascertain the attitudes of would-be mothers concerning juggling their careers, jobs, and education with their traditional role in society as child bearers. These studies can aid physicians in formulating effective counselling strategies for their patients. This will in turn help avert the long-term repercussions that the trend of increasing maternal age may have, if left unchecked.

Conclusion

Pakistan, like countries all over the world, is

witnessing a trend of increasing maternal age at conception. This may lead to an increasing number of infants born to mothers in the old high-risk category, which can have adverse long-term implications on the maternal and child health status of the country.

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