

# Risk Factors Associated with Infant Mortality in Punjab, Pakistan

Article by Mohammad Nasir Alvi Public Health, Pakistan E-mail: nsralvi@yahoo.com

#### Abstract

Pakistan was among the pioneers in the developing world to introduce national programs in maternal and child health (MCH) and family planning. However, the pace of development in the social sector could not be maintained over decades of political instability within the country and the perpetually volatile geopolitical situation outside the country.

Despite advances in medical science, infant mortality continues to Pakistan. Given the paucity of reliable information this study was undertaken to examine risk factors associated with infant mortality in Punjab, Pakistan.

A total of 240 respondents (health workers) were recruited for the study using simple random sampling from selected public hospitals in Punjab, Pakistan. These hospitals were selected applying a purposive sampling approach and were used as a study site.

A formal request was made to the authorities of the hospital's understudy for the recruitment/inclusion of respondents (health workers) in the study in order to obtain data.

A pre-tested structured questionnaire was administered to the respondents for primary data collection. The questionnaire was formed under three subheadings: pre-pregnancy factors, antenatal factors and post-natal factors.

Presentation and analysis of data is done using descriptive statistics and chi-square test. Results obtained showed the existence of a highly significant difference between the parameters that were considered in this study. Therefore, it is surmised that the parameters studied under prepregnancy, antenatal and post-natal risk factors contribute to infant mortality in Punjab, Pakistan.

Keywords: Infant Mortality, Risk Factors, Pregnancy, IMR.

# Introduction

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Mothers and children constitute a priority group in any community. In sheer numbers, they comprise approximately 70 per cent of the population of the developing countries. Just by virtue of their numbers, mothers and children are the major consumers of health services, of whatever form. Besides being large this group is also a "vulnerable" or special-risk group. The risk is associated with child-bearing in the case of women; and growth, development and survival in the case of infants and children.

Infant mortality is defined as the death of an infant before his or her first birthday <sup>[2]</sup> and is a useful indicator on the nation's health because it is often associated with other health factors such as maternal health, quality and accessibility of medical care and socioeconomic conditions <sup>[2]</sup>. The infant mortality rate is commonly included as a part of the standard of living evaluations in economies <sup>[3, 4, 5]</sup>. The infant mortality rate is used internationally as the indicator that best shows the stage of economic and social development of a country or region, especially because it has a direct relationship with socioeconomic variables, and, therefore, is sensitive to their variations.

There are many frameworks with which the impact of various determinants on childhood mortality may be considered.

Demographic studies have identified socio-economic (exogenous) and biomedical (endogenous) factors. The effect of these exogenous variables is said to be indirect as they operate within the endogenous biomedical factors called proximate determinants <sup>[6]</sup>. Although, several studies by health actuaries exist on child mortality, evidence on why the rates are still high in Pakistan in spite of various action plans and interventions made remain sparse.



The problems affecting the health of the child are multifactorial. Despite efforts, the health of mother and child is still one of the most serious health problems affecting the community, especially in the developing countries.

In developing countries like Pakistan, 1:8 children do not live to see his first birthday due to avoidable environmental threats, resulting in a large number of avoidable childhood deaths yearly<sup>[8]</sup>.

#### Infant mortality in pakistan

Pakistan is still among high infant mortality rate countries. Infant mortality rate according to Pakistan Demographic and Health Survey (PDHS) Islamabad report 2017 - 2018 <sup>[18]</sup> indicates as 74 per 1000 live births. Whereas, the world FactBook June 2018 indicates infant mortality in Pakistan as 52.1 deaths/1,000 live births.

#### Mortality pattern

**Age:** About 50 per cent of infant deaths occur within the first month (neonatal period) of life. Among these, more than half may die during the first week of birth. The risk of mortality is greatest during the first 24-48 hours after birth. The problem is more acute in rural areas because of scarcity of expert obstetric care.

**Sex:** In developed countries, male death rates are higher than female deaths. In Pakistan after the age of one month (post-neonatal period) female deaths are invariably higher than male deaths. Social scientists have attributed this phenomenon to social factors unfavourable to females in Pakistan.

## **Predisposing factors**

All those factors which have a bad effect on the health of the mothers have a bad effect on the health of the infants also. Those who survive in the bad environments they usually develop chronic illness.

#### **Biological factors**

- a. *Birth Weight:* Birth weight is a major determinant of infant and perinatal mortality and morbidity. Babies of low birth weight (under 2.5 kg) and high birth weight (over 4 kg) are at special risk.
- b. *Age of the mother*: There is a definite relationship between the age of the mother and the fate of the child. Infant mortality rates are greater when the mother is either very young (below the age of 19 years) or relatively older (over 50 years). Very young mothers also tend to be poorer and less educated.
- c. *Birth order:* The highest mortality is found between the first born and the lowest among those born second. The risk of infant mortality escalates after the 3<sup>rd</sup> birth.
- d. *Birth spacing:* Repeated pregnancies exert a great influence on infant mortality. They cause malnutrition and anaemia in the mother, again predispose to low birth weight, which results in infant death. Early pregnancy displaces youngest baby from the breast and prematurely weaned
  that baby is more prone to develop (a) protein-energy malnutrition (b) diarrhoea and dehydration, both of which cause increased mortality in infants and young children.

e. *Multiple births:* Infants born in multiple births face a greater risk of death as compared in single births due in large part to the greater frequency of low birth weight among the former.

f. *Family size:* Studies show the mortality increases with family size. The number of episodes of infectious diarrhoea, the prevalence of malnutrition, and severe respiratory infections has been found to increase with family size.

g. High Fertility: High fertility and infant mortality go together.

## **Economic factors**

One of the most important variables affecting infant mortality rates both directly and indirectly is socio-economic status. The availability and quality of health care and the nature of the child's environment are closely related to socio-economic status. Studies have shown that infant mortality rates are highest in the slums and lowest in the richer residential localities.

# Cultural and social factors

- a. Breast Feeding: Infant health is related to breastfeeding because of the nutritional content and natural immunizing agents contained in breast milk. Early weaning and bottle-fed infants living under poor hygienic conditions are more prone to die than the breastfed infants living under similar conditions.
- b. Religion and caste: The differences are attributed to the socio-cultural pattern of living, involving age-old habits, customs and traditions affecting cleanliness, eating, clothing, childcare and almost every detail of daily living.
- c. Early marriages: The baby of the teenage mother has the highest risk for neonatal and postneonatal mortality.
- d. Gender of the child: Statistics show that female infant mortality is higher than male infant mortality. But when the total infant mortality is split into neonatal and post-neonatal deaths, the picture gets reversed i.e. neonatal death rate is higher for males than for female infants; the post-neonatal death rate is higher for female infants than male infants.
- e. Quality of mothering: The art of childcare has to be learnt. Even in situations of extreme poverty children could reasonably survive if they had an efficient mother. Thus "quality of mothering" helps reduce infant mortality.
- f. Maternal education: Illiteracy is the greatest barrier to any improvement in health conditions. Level of mother's education even within the same socio-economic class is a key determinant of their children's health. Women with schooling tend to marry late, delay childbearing and are more likely to practice family planning.
- g. Quality of health care: The percentage of deliveries attended by untrained persons or relatives is very high in rural Pakistan. Shortage of trained personnel like midwives and health visitors is another determinant of high infant mortality in Pakistan.
- h. Broken Families: Infant mortality tends to be high where the mother or father has died or separated.
- i. Illegitimacy: A child born out of wedlock is generally unwanted both by the mother as well as society. Consequently, such a child does not receive the care in terms of nutrition and medical care that it needs.
- j. Brutal Customs and Habits: Certain age-old traditions and believes e.g. depriving the baby of colostrum, repeated purgation, branding the skin, faulty feeding practices and early weaning greatly influence infant death.
- k. Indigenous Dai: The untrained midwife (Dai) is greatly responsible for the high infant mortality in Pakistan. She is usually an illiterate person devoid of all knowledge of rules of hygiene.
- 1. Bad Environmental Sanitation: Infants are highly susceptible to bad environmental sanitation. Lack of safe water supply, poor housing conditions, bad drainage, over-crowding, and insect breeding all increase the risk of infant mortality.
- a. Poverty associated customs and traditions
- b. Hot/Cold foods
- c. Home deliveries if conducted under unsatisfactory conditions
- d. Decreased or shorter interval between two pregnancies increase infant mortality
- e. Lack of preparation of mothers for birth? Feeding bonding and superstitious beliefs
- f. Poor environmental sanitation resulting in GIT upsets

# **Determinant factors of infant mortality**

IMR is an accepted global indicator of the health and socioeconomic status of a given population [19]. Neonatal health is said to be dependent on healthcare services, and postneonatal health is dependent on environmental factors. Hence, a high infant mortality rate is an indicator of unmet health care needs and unfavorable environmental factors.

In a study significantly more deaths occurred during the rainy season than in the dry season, suggesting environmental factors play a role in neonatal deaths. The most common cause of death in

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the neonatal period was due to complications of LBW (low birth weight), while in the postnatal period it was due to infection.

From the literature review infections (environmental factors), low birth weight-prematurity, birth asphyxia, tetanus and malnutrition were leading factors of infant mortality rate, indicating an urgent need for efficient prenatal care and public health services in the country.

Maternal education has been reported as the most significant determinant in child survival rates. In other words, child survival and mothers' education are directly proportional. [20].

Environmental risk factors e.g. Poor domestic and human waste disposal, poor sanitation, overcrowding in homes, poor basic health facilities or no breastfeeding in infancy leads to increased exposure to infections. Such synergisms are leading risk factors of high infant mortality rate.

# Infant mortality and the millennium development goal

The poor level of maternal, newborn and child health shows that Pakistan needs focusing on Millennium Development Goals. A total of eight goals were listed in this resolution of which Goals 4 and 5 directly address the issues of infant and maternal mortality respectively.

The current rates of maternal and newborn mortality put Pakistan off-track to achieve Millennium Development Goals 4 & 5.

#### **Prevention and medical treatments**

Reductions in infant deaths are possible in any stage of a country's development. Rate reductions prove that a country is advancing in human knowledge, social institutions and physical capital. Governments can reduce the mortality rates by resolving the issue of combined need for education, nutrition, and access to basic maternal and infant health services.

A policy focus has the potential to aid those most at risk for infant and childhood mortality allows rural and poor populations. Reduction in cases of babies born at LBWs (low birth weights) and contracting pneumonia can be accomplished by improving air quality. The results of other studies confirm this, as LBW is the underlying factor in most other disorders and paediatric diseases. [3].

Improving hygiene can prevent infant mortality. Working on preventing preterm and low birth weight deliveries throughout all populations can help to eliminate cases of infant mortality and decrease health care disparities within communities.

#### **Economic policies**

As the economy rises, so do technological advances and thus, medical advances in access to clean water, health care facilities, education, and diet. These changes may decrease infant mortality. A study carried out in Bangladesh also revealed significant high infant mortality among mothers who belonged to poor wealth status than middle and rich. [8]

Governments could reduce infant mortality economically by building and strengthening capacity in human resources. Increasing human resources such as physicians, nurses, and other health professionals will increase the number of skilled attendants and the number of people able to give out immunization against diseases such as measles. Maternal, infant, and childhood mortality is negatively correlated with increase in the number of skilled professionals. IMR will reduce by thirty percent with the addition of one physician to every one thousand persons in a population.

#### Aim of the study

To study the Risk factors associated with infant mortality in Punjab, Pakistan.

## **Research methodology**

The research was a cross-sectional study in which primary data pertinent to factors associated with infant mortality were obtained and analyzed.

# Study setting

This study was designed to collect data from Two hundred and forty (240) health workers employed in ten public tertiary healthcare facilities of Punjab, Pakistan.

The sampling technique used to collect primary data in this study was simple random sampling (probability sampling technique).

The population (N) was 600 health workers employed in the hospitals under study. So, our sampling frame was 600. Working with a 95% confidence level and expecting an error of 5% the Sample size (n) was calculated as follows.

# Study site

Above mentioned public hospitals/medical institutes of various cities of Punjab including Lahore, Multan, Islamabad and Rawalpindi were included in the study.

## **Research design**

For this study, the descriptive research method was used.

#### Sample size

The population sample comprised of Two hundred and forty (240) health workers randomly selected from the hospitals included in the study. Forty (40) health workers were not spared by the hospital authorities so, they did not take part in the study right from the beginning.

#### **Data collection tool**

Well-structured questionnaire was used to collect data as the research instrument. The questionnaire was formed under three subheadings as follows.

#### **Pre-pregnancy factors**

Pre-pregnancy factors were malnutrition before pregnancy, level of mother's education, previous number of children, birth spacing, previous birth complications, and previous caesarian section.

#### **Antenatal factors**

Parameters considered under antenatal factors were low birth weight, gestational diabetes, and failure to receive tetanus toxoid vaccine, congenital malformation, smoking or staying near a smoker, malaria in mother and child, and feeding habit of a pregnant woman.

#### **Postnatal factors**

Postnatal factors were overweight of the baby, place of delivery, birth attendant, preterm birth, placenta abnormalities, caesarian section, failure to have a well-baby check and jaundice.

In all the sections, respondents were asked to fill the blank spaces or tick against the alternative that best described their opinion about each of the issues raised.

The tool (structured questionnaire) used in this study is highly reliable as it is free from participant error or participant bias and researcher error or bias. The tool is construct valid and fulfills requirements of validity as well. Moreover, same tool has been used in similar studies in other part of the world with similar outcomes.

#### **Ethical permission**

As there is no designated ethical committee in the hospitals under study, ethical permission was obtained from the hospital management prior to data collection. Informed consent was also obtained from the voluntary participants/respondents.

# Data presentation and analysis

The data were presented in tables. Data analysis of was carried out using statistical method; percentages, and chi square at a confidence interval of  $p \le 0.01$ .

# Results

Identified risk factors associated with infant mortality in Punjab, Pakistan are shown in Tables below.

# **Pre-pregnancy factors**

The pre-pregnancy factors that are associated with infant mortality in Punjab, Pakistan are shown in Table 1 below.

Number (%) of responses				
ITEM	NO	YES	NOT IN ALL CASES	
Previous number of children	38 (19)	100 (50)	62 (31)	
Birth spacing	40 (20)	104 (52)	56 (28)	
Previous birth complications	24 (12)	176 (88)	0 (0)	
Malnutrition before pregnancy	30 (15)	170 (85)	0 (0)	
Level of Mother's Education	26 (13)	144 (72)	30 (15)	
Previous caesarian section	54 (27)	56 (28)	90 (45)	

Table 1. Pre-pregnancy factors that contribute to infant mortality.



Figure 1. Pre-pregnancy factors that contribute to Infant Mortality.

n= (200)

# **Pre-pregnancy maternal health problems**

Pre-pregnancy health issues that contribute to infant mortality are shown in Table 2 below.

ITEM	FREQUENCY
Asthma	110
Epilepsy	134
Hypertension	182
Anaemia	194
Heart problem	110
Thyroid problems	100
Depression	138
Anxiety	76
Mean	65.3
St. D	20.26
%CV	31.05

Table 2. Pre-Pregnancy Maternal health problems that contribute to IM

# CV: coefficient of variation



Figure 2. Pre-pregnancy maternal health problems that contribute to IM

n= (200)

## **Antenatal factors**

The antenatal factors that are associated with infant mortality in Punjab,

Antenatal Factors.

The antenatal factors that are associated with infant mortality in Punjab, Pakistan are shown in Table 3 below.

Number (%) of Responses	NO	YES	NOT IN ALL CASES
ITEM			
Low birth weight	10 (5)	98 (49)	92 (46)
Gestational diabetes	4 (2)	168 (84)	30 (15)
Failure to receive tetanus toxoid	28 (14)	172 (86)	0 (0)
vaccine			
Congenital malformation	20 (10)	180 (90)	0 (0)
Smoking or staying near a smoker	30 (15)	170 (85)	0 (0)

Table 3. Antenatal factors that contribute to Infant Mortality

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Obesity	40 (20)	40 (20)	120 (60)
Feeding habit of a pregnant woman	22 (11)	178 (89)	0 (0)



Figure 3. Antenatal factors that contribute to Infant Mortality

n= (200)

# **Post- natal factors**

The postnatal factors that are associated with infant mortality in Punjab, Pakistan are shown in Table 4 below.

Number (%) of Responses	NO	YES	NOT IN ALL CASES
ITEM			
Over weight of a baby	54 (27)	80 (40)	66 (33)
Place of delivery	20 (10)	180 (90)	0 (0)
Birth attendant	18 (9)	182 (91)	0 (0)
Preterm birth	10 (5)	130 (65)	60 (30)
Length of labour	22 (11)	140 (70)	38 (19)
Placenta abnormalities	10 (5)	190 (95)	0 (0)
Caesarian section	82 (41)	118 (59)	0 (0)
Failure to have a well-baby check	20 (10)	180 (90)	0 (0)
Jaundice	0 (0)	200 (100)	0 (0)

|--|



Figure 4. Post-natal factors that contribute to infant mortality

n= (200)

# Hypothesis testing

Ho: Risk factors associated with infant mortality do not contribute to infant mortality. Ha: Risk factors associated with infant mortality contribute to infant mortality.

Table 5. Hypothesis testing

Factors	χ2cal	χ2tab	<b>Confidence Interval</b>	Hypothesis
Pre-pregnancy	324.72	32	p = 0.01	Ha accepted
Antenatal	712.2	32	p = 0.01	Ha accepted
Post-natal	642.2	32	p = 0.01	Ha accepted

Ha = Alternative hypothesis HO = Null hypothesis  $\chi$ 2cal = chi-square calculated  $\chi$ 2tab = chi-square tabulated

Decision rule:  $\chi 2$  cal >  $\chi 2$  tab.

Hence, the null hypothesis was rejected.

## Discussion

The findings from this survey using questionnaires are discussed below and recommendations made.

## **Pre-pregnancy factors**

From the Statistical analysis of the results (Table 5), on pre-pregnancy factors that contribute to infant mortality, a high significance difference at  $p \le 0$ . 01 was observed, indicating that prepregnancy factors contribute to infant mortality. The study revealed 03 of the pre-pregnancy factors having high contributions (above 70%) to infant mortality; previous birth complication, malnutrition before pregnancy and the level of mother's education as opined by 72% of the respondents.

The previous caesarian section may not always be implicated as risk factors to infant mortality in Punjab as it received less than 50% from the respondents. However, previous studies, have reported that there is an association between infant mortality and previous caesarian section. Maternal health problems such as asthma (10.5%), Epilepsy (12, 8), hypertension (17.4%), anemia (18.6%), heart problem (10.5%), thyroid problem (9.6%) depression (13.2%), anxiety (7.3%) were revealed as risk factors (at varying levels) associated with infant mortality.

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## **Antenatal factors**

From Table 5, statistical analysis showed that antenatal factors studied significantly contribute to infant mortality in Punjab, Pakistan ( $p \le 0.01$ ). All the respondents (100%) agreed that malaria in mother and child can contribute to infant mortality. The other top (above 70%) category of antenatal risk factors implicated were: congenital malformation, feeding habit of a pregnant woman, failure to receive TT vaccine by pregnant women, smoking or staying near a smoker during pregnancy corroborating the findings of [19] as well as Gestational diabetes confirming earlier reports [1].

The result of this study indicates that Obesity does not always contribute to infant mortality in Punjab, Pakistan as opined by 60% of respondents.

## **Post-natal factors**

Statistical analysis of results showed a highly significant difference as  $p \le 0.01$  indicating that the postnatal factors studied greatly contributes to infant mortality in Punjab, Pakistan. All respondents agreed that Jaundice is a serious risk factor that contributes to infant mortality as opined by 100% of the respondents.

In the opinion of over 70% of the respondents, the following postnatal factors pose great risks to infant mortality in the study area; abnormalities of placenta was agreed by 95% of the participants as a risk factor associated with infant mortality. The result of this study also indicated that, the caesarian section is a risk factor associated with an infant. Delivery place and failure to have a well-baby check contribute to infant mortality as agreed by 90% of the respondents. Length of labour was opined by 70% of the respondents as a risk factor associated with infant mortality. Sixty-five per cent of the respondents agreed that a birth attendant and preterm birth are risk factors for infant mortality. The weight of a baby is also indicated as one of the risk factors though at a low rate (less than 50%). Studies have reported low birth weight as a contributory to infant mortality [17, 18]. Neonatal/infant diseases such neonatal tetanus (12.3%), malaria (12.1%), diarrhoea (12.1%), bronchopneumonia (11.7%), measles (11.2%), tuberculosis (10.8), acute respiratory infection (10.1%),), whooping cough (10.1%), and meningitis (9.6%) were also identified as risk factors associated with infant mortality. Neonatal tetanus seems to be the most implicated while meningitis is the least implicated. These findings are also confirmed from a similar study carried out in Southeastern Nigeria [13] and Brazil [9].

The percentage coefficient of variation (%CV) of the child health problems associated with infant mortality was 9.16%. This figure implies that there is a moderate variation among the child health problems that contribute to infant mortality in Punjab, Pakistan.

# Implications

The main implication derived from this study relates to the deliberate public awareness programme adequately addressing people's beliefs and behavioral practices as well as the policy on measures to limit these risk factors should be put in place and enforced.

Government can reduce the mortality rates by resolving the issue of combined need for education, nutrition, and access to basic maternal and infant health services. A policy focus has the potential to aid those most at risk for infant mortality allows rural, poor and migrant populations.

# Recommendations

The results of this study indicate that a deliberate public awareness programme adequately addressing people's beliefs and behavioral practices as well as the policy on measures to limit these risk factors should be put in place and enforced. Government can reduce the mortality rates by resolving the issue of combined need for education, nutrition, and access to basic maternal and infant health services.

These are expected to reduce IMR drastically in the province and country as a whole.

# Conclusion

This study has shown that there is quite a high level of significance of various pre-pregnancy, antenatal and post-natal factors and it is obvious that these factors contribute to IM in Punjab, Pakistan.

However, these findings of the study are based on tertiary level public hospital/institutes of Punjab and cannot be generalized to the whole population.

The same study needs to be conducted in community with advanced tools in all over the country to see if there are any similarities with the factors that are associated with infant mortality.

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