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Why & Where of Perinatal Deaths: The Trends and Determinants in Pakistan

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Abstract

Background: Perinatal mortality rate is a proxy indicator of healthcare quality for mothers and newborns. Unfortunately, Pakistan is facing poorest pregnancy outcomes, significantly worse than many other low-resource countries worldwide. Realizing the set targets under Sustainable Development Goal 3 demands substantial reduction in perinatal mortality in Pakistan.

Methods: SPSS data files of Pakistan Maternal Mortality Survey (PMMS) 2019 with the sample of 136,226 households was used. The PNMR was computed by urban and rural areas for the regions and provinces of Pakistan and for each category of the common risk factors (independent variables). We applied Chi-squared test to find if the correlations between the PNMR and independent variables were statistically significant. Finally, binary logistic regression analysis was conducted using SPSS version 19.0 for computing adjusted odds ratio (AOR).

Results: The PNMR for the entire sample was 70.1 per 1000 live births. The geographical differences were not statistically significant, with the exception of Gilgit-Baltistan (GB) region with lower PNMR. We found the lowest PNMR among the highest quintile, primigravida, having 3-5 pregnancies, mothers aged 24-35 years, with education 10 years or higher, who had adequate antenatal care and those who delivered at home without skilled birth attendants. Binary logistic regression analysis showed two-fold risk among lowest wealth quintile, 1.37 times among women aged >35 years and 1.5 times among women who had skilled birth attendance. After adjusting for the socioeconomic and demographic variables, parity and antenatal care were found to have no association with perinatal deaths.

Discussion Conclusion: We found no increase in risk of PNMR among women younger than 25 years and using antenatal care while other studies reported higher risk of PNMR among younger and adolescent mothers. It is therefore recommended to have more robust primary studies to determine the association of the key variables with perinatal mortality in Pakistan.

Keywords: Perinatal Mortality; Risk Factors for Perinatal Mortality; Causation of Perinatal Deaths

Introduction

Perinatal mortality rate (PMNR) is a litmus test for availability and quality of the healthcare for mothers and newborns. According to the World Health Organization (WHO), perinatal mortality is the death of a baby between 28 weeks of gestation onwards and before the first 7 days of life [1]. It may be calculated as total number of perinatal deaths (still births + early neonatal deaths) divided by the total number of births (still births + live births)), or by total number of live births only, and reflected as per 1000 [2].

The day of birth is the most dangerous time for both the mother and the newborns [3]. It has been estimated that each year, more than 1 million newborns die on the day they are born [4] and 1·3 million stillbirths occur during labour and birth [5], while 46% of maternal deaths also occur around the same time [6].

Globally, perinatal mortality accounts for three-quarters of the neonatal mortality and is one of the major challenges for under-five mortality. It remains a devastating pregnancy outcome for millions of families in low-and-middle-income countries [7]; 97% of globally reported stillbirths and 98 % of neonatal deaths are reported in the developing countries [8]. PMNR and intra partum stillbirths are reportedly 5 and 14 times higher in the developing regions compared with developed regions [9].

[10] Pakistan is facing the poorest pregnancy outcomes worldwide, significantly worse than many other low-resource countries in the world [11]. Pakistan falls among the top ten countries accounting for the highest numbers of perinatal deaths worldwide; the country ranks 2nd for numbers of stillbirths and ranks 3rd for numbers of neonatal deaths [12].

Pakistan Maternal Mortality Survey (PMMS) 2019 included information on stillbirths and neonatal deaths. An in-depth analysis of the data was needed to identify the causes and associated risk factors of perinatal deaths so that specific interventions and preventive measures can be devised and implemented. This paper will determine the association of socio-demographic and service utilization factors that are associated with perinatal mortality in Pakistan. The findings will be used to guide the national policies, programmers and further research.

Data and Methods

We used the SPSS data files of Pakistan Maternal Mortality Survey (PMMS) 2019, which are available from the Demographic and Health Surveys (DHS) website as well as from the National Institute of Population Studies (NIPS) in Islamabad. PMMS 2019 was a nationwide household survey, which covered the four provinces and the territories of Gilgit Baltistan (GB) and Azad Jammu & Kashmir (AJK).

PMMS was implemented by NIPS under the aegis of Ministry of National Health Services, Regulations and Coordination (MoNHSR&C) from 15 January 2018 through 30 September 2019[1]. PMMS is the first national survey conducted exclusively on maternal mortality in Pakistan. The sample included 136,226 households in the four provinces, AJK, and GB. Births and deaths of last three years were recorded, and 1,177 deaths of women in 15-49 years age-group were investigated to identify maternal deaths.

In a 10% sub-sample of households, 14,703 ever-married women aged 15-49 years were interviewed to identify complications of and health services utilization in pregnancy, delivery, and postpartum in the last three years. Further details of the survey methodology are available in the PMMS 2019 final report[2].

1. Funding for the PMMS was provided by the United States Agency for International Development (USAID); the United Nations Population Fund (UNFPA); Foreign, Commonwealth & Development Office (FCDO-UK); and the Bill and Melinda Gates Foundation (BMGF). Technical support was provided by Demographic and Health Surveys (DHS) Program (ICF-USA).
2. National Institute of Population Studies (NIPS) Pakistan and ICF-USA. Pakistan Maternal Mortality Survey 2019. Islamabad Pakistan and Rockville, MD, USA.

We used the questionnaires from the back of the PMMS 2019 final report to identify the variables of interest for this project. We created a binary dependent (outcome) variable called perinatal death by assigning a code of 1 to the pregnancies that resulted into a fetal death after 28 weeks of gestation (reported as stillbirth) and the infants who were born alive but died during the first seven days of birth (early neonatal deaths within 0-6 days after birth), and a code of 0 to all live births that survived beyond the first seven days of birth. The perinatal mortality rate (PNMR) was calculated using the following formula:

$$\text{PNMR} = \left(\frac{\text{Stillbirths} + \text{Early neonatal deaths}}{\text{Total live births}} \right) \times 1000$$

The PNMR was computed for the entire sample and separately for the urban and rural areas, as well as for the regions and provinces of Pakistan. PNMR was then computed for each category of the common risk factors (independent variables) including the mother's age at birth, parity, education, previous history of lost pregnancies, and socioeconomic status (wealth quintile). We applied Chi-squared test to find if the correlations between the PNMR and independent variables were statistically significant. Finally, binary logistic regression analysis was conducted, whereby perinatal death/survival (0,1) was the outcome variable and the independent variable listed above were included as independent variables and covariates. Using SPSS version 19.0, we computed the adjusted odds ratios (AOR) reflecting the association between perinatal death and each of the maternal and socioeconomic risk factors, after controlling for the effects of all other independent variables.

Results

Pakistan Maternal Mortality Survey (PMMS) 2019 interviewed ever-married women of reproductive ages (15-49 years) about their pregnancy, childbirth, and postpartum experiences in terms of any stillbirths, early neonatal death during the last three years. Out of the 14,703 women who were interviewed, 8,822 reported having either a live birth, a stillbirth or an early neonatal death during the past three years. From the total respondents, 93.2% (8224) reported having a live birth, 3.3% (293) reported having a stillbirth and 3.5% (305) reported having a neonatal death.

The PNMR for the entire sample was 70.1 per 1000 live births, which was significantly higher than the PNMR reported in the last Pakistan DHS (2017-18), which was 57 per 1000 live births. There was no difference between urban and rural areas in the PNMR (Table 1).

Table 1: PNMR estimated for the entire national sample and urban/rural areas.

	PNMR/1000 live births
Pakistan (all regions and provinces)	70.1
Pakistan (Urban)	70.5
Pakistan (Rural)	69.9

The differences between provinces and regions in the PNMR were not statistically significant, with the exception of Gilgit-Baltistan (GB) region, where the estimated PNMR was significantly lower than the provinces (Table 2). However, among the four provinces, the estimated PNMR was the highest in Sindh and the lowest in KP.

3. Wealth quintiles are computed in PMMS 2019 on the basis of the total value of the assets owned by the households, including car/motorcycle, television, radio, mobile phones, etc.

Table 2: PNMR by province/region

Province/Region	PNMR/1000 live births
Azad Jammu & Kashmir (AJK) region	64.6
Gilgit-Baltistan (GB) region	47.3*
Balochistan province	79.9
Khyber Pakhtunkhwa (KP) province	63.7
Sindh province	87.7
Punjab province	67.1

*P<0.05 (Chi-squared test)

The estimated PNMR by the wealth quintiles[3] showed a trend of being the lowest in the highest wealth quintile (the richest 20% households in the sample) and highest in the lowest wealth quintile (the poorest 20% households in the sample). The differences were statistically significant (P < 0.05).

Table 3: PNMR by wealth quintile (entire sample)

Risk Factor	PNMR/1000 live births
Wealth Quintile*:	
Richest (highest quintile - Q-5)	45.4
Fourth quintile (Q-4)	63
Middle quintile (Q-3)	67.7
Second quintile (Q-2)	70.6
Poorest (lowest quintile - Q-1)	93.7

*P<0.05 (Chi-squared test)

The estimated PNMR varied significantly by socio-demographic characteristics of the mother (Table 4):

PNMR was the lowest among mothers whose age at pregnancy was 25-34 years, compared to both the younger women (<25 years) and the older women (> 35 years).

PNMR was about 20% lower among the women who received adequate antenatal care (at least four visits to a skilled health-care provider, with the first visit being in the first trimester) than those women who did not receive adequate antenatal care.

The differences in PNMR by parity followed the same pattern as those by age at pregnancy: the PNMR was the lowest among women have 3-5 live births and highest among women having six or more live births.

This pattern did not persist when PNMR was computed by gravidity, whereby PNMR was the lowest among the primi-

gravid women and the highest among women having six or more pregnancies.

The variation in PNMR by mother's education level followed the same pattern as observed in the socioeconomic level (wealth quintiles); the PNMR was significantly lower among women having 10th grade of schooling or above, while it was the highest among women having no schooling at all.

Finally, the PNMR was higher among births occurring in a health facility (due to selective referral of high-risk pregnancy to the health facilities) compared to the births occurring at home. However, this difference was not statistically significant.

Table 4: PNMR by selected maternal and sociodemographic risk factors

Risk Factor	PNMR/1000 live births
Mother's age at pregnancy*:	
< 25 years	82.1
25-34 years	59.5
35 + years	82.6
Antenatal care[1] received*:	
No	72.7
Yes*	58.4
Parity*:	
1-2 prior live births	65.3
03-May	54.3
6+	79.5
Gravidity (number or pregnancies)*:	
Nulligravida	58.2
1-5 prior pregnancies	65.8
6+ prior pregnancies	98.6
Mother's education*:	
10th grade or higher	46.9
0-9 years of schooling	63.5
No schooling	83.6
Delivery in a health facility:	
No	65.6
Yes	72.3

*P<0.05 (Chi-squared test)

4. Four or more visits to a skilled healthcare provider, the first visit being in the first trimester.
5. Adjusted for all the variables shown in this table and for urban/rural residence.

Table 5 presents the results of the binary logistic regression analysis showing adjusted odds ratios for selected socioeconomic and demographic variables. The risk of a pregnancy ending in a perinatal death (stillbirth or early neonatal death within 0-6 days after birth) was about twice among the poorest wealth quintile compared to the richest wealth quintile (the reference category) (P <0.001). This result was after controlling for the effects of urban/rural residence, the mother's age at birth, parity, mother's schooling, antenatal care received during pregnancy and the delivery by skilled birth attendant.

The mothers whose age at pregnancy was > 35 years were at a slightly higher risk of having perinatal death than the mothers who were in the 25-34 years age group (reference category). The adjusted odds ratio was 1.37. On the other hand, the mothers in the youngest age group (< 25 years) at pregnancy were not at a greater risk than the reference category (Table 5).

After adjusting for the socioeconomic and demographic variables listed above, it was found that parity and antenatal care had no role to play in the causation of a perinatal death, as the adjusted odds ratios for these risk factors were not statistically significant (Table 5).

Women who delivered under care of a skilled birth attendant were at about 1.5 times greater risk of having perinatal death than the women who did not have their baby delivered by a skilled birth attendant. This reflects the risk due to selective referral of high-risk pregnancies to health facility for delivery, and this risk persists even after adjusting for the other socioeconomic and demographic variables (Table 5).

Table 5: Adjusted odds ratio (AOR) depicting the risk of perinatal death, by selected socio-demographic risk factors.

Risk Factor	AOR[1]	95% CI of AOR	P-value
Wealth Quintile:			
Lowest	2.1	1.40 – 3.12	<0.001
Second	1.47	1.10 – 2.21	0.04
Middle	1.23	0.86 – 1.78	0.26
Fourth	1.29	0.90 – 1.83	0.17
Highest (Ref.)	-		
Parity:			
01-Feb	1.18	0.87 – 1.61	0.28
03-May	0.88	0.68 – 1.14	0.34
6+ (Ref.)	-		
Mother's age at pregnancy:			
< 25 years	1.03	0.82 – 1.31	0.76
25-34 years (Ref.)	-	-	-
≥ 35 years	1.37	1.07 – 1 .74	0.01
Mother's schooling:			
No schooling	1.63	1.19-2.21	0.002
0 – 9 years of schooling	1.35	0.99-1.83	0.057
10 grade or higher (Ref.)			

Adequate antenatal care received:			
Yes	0.93	0.70 – 1.21	0.58
No (Ref.)			
Delivery conducted by skilled birth attendant:			
Yes	1.52	1.24 – 1.87	<0.001
No (Ref.)			

Discussion and Conclusions

In this study, we found that perinatal mortality rate (PNMR) was not statistically different among the four provinces and two regions except that Gilgit-Baltistan region had the lowest PNMR in the country. It was found to be lowest among primigravida while highest among women having 6 or more pregnancies.

The overall odds ratios in this study analysis demonstrated the association of perinatal mortality with younger and older age women, low level or no maternal education and lowest wealth quintile. But the perinatal mortality was not influenced by parity or antenatal care after adjusting for the key socioeconomic and demographic variables. Women delivering at facility with skilled birth attendants were having higher risk of having perinatal death than those delivering at home without skilled birth attendants. This is most probably due to the preponderance of complicated delivery cases being managed at the facilities by skilled birth attendants. Similar findings are also reported from other research studies [13].

Among the sociodemographic factors, maternal age ≥35 years had higher risk of perinatal mortality than the reference range of 25-34 years. Our study showed no increase in risk of PNMR among women aged <25 years while some studies have reported higher incidence of perinatal mortality among mothers aged <20 years [14-16]. [1-3] Other studies have also reported women with high parity being at greater risk of perinatal mortality than women with low parity [17-20]. We found 20% lower PNMR among the women who received adequate antenatal care (at least four visits to a skilled healthcare provider, with the first visit being in the first trimester) than those women who did not receive adequate antenatal care. However, the multivariate analysis showed no role of antenatal care in reducing risk of perinatal mortality. Contrast, there is evidence showing that women having at least one ANC visit experience a 58 %–66 % lower perinatal mortality [21]. The use of ANC visits provides an opportunity to mothers to receive health education and also make them aware of the danger signs for supporting the decision to seek healthcare at the right time. The low levels of maternal education and belonging to lower wealth quintile may also be contributing to the low utilization of ANC visits [22-24]. Berhan et al have reported similar results to ours that no or low maternal education is associated with higher PNMR. [25-27]. However, they also reported no association of PNMR with household wealth quintile which is in contrast to the finding in our study and similar other researches where PNMR is the highest among the women from lowest wealth quintile [28-30].

Several limitations will need to be recognized in the analysis or interpretation of these results. By design, our study data was collected for five years preceding the survey which induces the chance of recall bias. It may be higher in the uneducated respondents from rural areas which leads to under-reporting of perinatal deaths from the rural areas. It is well documented that majority of perinatal deaths in developing countries remain unaccounted and undocumented due to sub-optimal reporting and higher prevalence of home births [31,32]. The survey was conducted before the COVID-19 pandemic. However, the disruption in essential healthcare services was restored after the early lockdown measures and we believe that there have been no major changes in health service provision and these results will still be relevant to the current status.

In conclusion, the findings did not demonstrate a strong association of perinatal mortality with some key selected variables like adequate use of ANC and skilled birth attendance. Therefore, more robust primary studies will be required to determine the true associations of these key variables with perinatal mortality in the country.

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