Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol.14 , Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Assessment of Maternal and Child Health Outcomes and Associated Risk Factors in Pakistan

Jai Dev Maheshwari[1], Sayed Khan[2*], Ammar Munawar[3], Muhammad Zarak Khan[4], Abbas Khan[5], Bilal Afzal[6]

[1]Assistant Professor, Department of Community Medicine, SMBBMC Lyari, Karachi, Pakistan

[2]Assistant Professor, Community Medicine, Gomal Medical College, Dera Ismail Khan, Pakistan

[3]Lecturer, Community Medicine, PIMC–Pak International Medical College, Peshawar, Pakistan

[4]Department of Community Medicine, Pak International Medical College, Peshawar, Pakistan

[5]PGR Paediatrics, Northwest General Hospital, Peshawar, Pakistan

[6]Lecturer Community Medicine, Pak International Medical College, Peshawar, Pakistan

***Corresponding author**:

Sayed Khan

Assistant Professor, Community Medicine, Gomal Medical College, Dera Ismail Khan, Pakistan

Cite this paper as: Jai Dev Maheshwari, Sayed Khan, Ammar Munawar, Muhammad Zarak Khan, Abbas Khan, Bilal Afzal (2025) Assessment of Maternal and Child Health Outcomes and Associated Risk Factors in Pakistan. Journal of Neonatal Surgery, 14, (32s) 10819-10826

ABSTRACT

Introduction: Maternal and child health is one of the biggest public health issues in Pakistan where vulnerable groups are still exposed to preventable morbidity and mortality. Socioeconomic inequalities, poor healthcare access, and ineffective antenatal care are also some of the factors that help increase adverse outcomes. The purpose of the given study was to measure maternal and child health outcomes and determine the risk factors related to these outcomes in Pakistan.

Methodology: The study was a community-based cross-sectional analytical research done between January and June 2025 in a group of 650 women aged 15-49 years who had given birth in the last five years. Multistage stratified sampling method was applied. Structured interviews were used to collect data. The sample size was computed on the basis of one population proportion formula with 95 percent confidence level and 5 percent margin of error. The descriptive statistics were calculated and Chi-square test, independent t -test, and ANOVA were used to evaluate the associations. When studying independent predictors, a multivariable logistic regression was conducted where p 0.05 was taken as statistically significant.

Results: Pregnancy-related complications were reported in 27.4% of women. Low birth weight (19.5%), incomplete immunization (23.8%), and stunting (31.7%) were common child health outcomes. Inadequate antenatal care, rural residence, low maternal education, high parity, and low household income were significantly associated with adverse maternal and child outcomes in multivariable analysis.

The incidence of pregnancy-related complications was 27.4 percent among women. The common child health outcomes were low birth weight (19.5%), incomplete immunization (23.8%), and stunting (31.7%). Poor maternal and child outcomes were closely linked with poor maternal and child health in multivariate analysis to poor antenatal care, rural dwellers, maternal low level of education, high parity, and poor household income.

Conclusion: Mother and child mortality rates and morbidity are also poor, especially in the socioeconomically disadvantaged and rural groups. It is important to enhance antenatal care coverage and deal with social determinants in order to enhance health outcomes.

Keywords: Mothers; child health; prenatal care; risk factors; low birth weight; immunization; Pakistan

INTRODUCTION

Maternal and child health (MCH) has been one of the major public health concerns in most countries including the low and the middle-income countries in the world as preventable morbidity and mortality has been a major challenge to the countries[1]. The World Health Organization (WHO) has established that maternal mortality and under-five mortality are some of the major indicators of healthcare performance and socioeconomic development of a given nation. Despite significant strides that have been made in the world under different programs like the Sustainable Development Goals.

(SDGs), a lot of countries, Pakistan being one of them, are still grappling with high maternal mortality ratios (MMR), neonatal mortality rates (NMR), and under-five mortality rates (U5MR) [2]. These poor outcomes can be usually attributed to the lack of quality access to quality antenatal, perinatal, and postnatal care services, which are aggravated by socioeconomic disparities and structural health care challenges

Pakistan is one of the most populous nations in South Asia where there is a long-standing problem related to the enhancement of maternal and child health. It is found that although the Government of Pakistan works, and used to cooperate with international agencies, the rates of maternal mortality remain far higher than the world ones. [3]. Low healthcare facilities in rural regions, lack of skilled birth attendants, culture, early marriages, high fertility rates, poor nutritional conditions, and low female literacy have been found to aggravate poor maternal and child health conditions. Also, urban-rural inequalities contribute to the further widening of the disparity in the access to the necessary healthcare services, including emergency obstetric care and immunization coverage [4].

Pakistan maternal health is closely connected with child health outcomes. In addition, the socioeconomic determinants like household income, maternal education, sanitation, and access to clean drinking water are also of significant importance to influence child survival and development [5].Moreover, maternal malnutrition, anemia, inadequate antenatal care visits, and pregnancy complications can directly influence the outcomes of children born either with low birth weight or preterm birth, and neonatal mortality. The causes of under-five mortality in a few parts of the country continue to be infectious diseases, malnutrition, and low vaccination rates.

Pakistan has both a public and a private healthcare delivery system, and the healthcare delivery system includes encompassing programs like Lady Health Worker (LHW) initiative, which aims at enhancing the outreach of primary healthcare services within underserved populations. Nonetheless, there are still weak points related to service quality, care continuity, and monitoring processes. Efficiencies in the healthcare system, geographical inaccessibility, financial limitations, and sociocultural factors have a tendency to slow the promptness of healthcare-seeking behavior in pregnant women and caregivers. All these factors negatively affect the process of attaining equitable maternal and child health outcomes across provinces [6].

Despite the national surveys and regional investigations that have been conducted in the past, there are still very limited studies that have yielded both maternal and child health indicators, as well as those studies that concurrently analyze both the maternal and child outcomes and the risk factors that are associated with both sociodemographic and behavioral risk factors and healthcare-specific aspects. Most of the studies are specific to a geographic region or isolated determinants and hence limit generalizability [7]. Moreover, the changes in demographic trends, urbanization and health system modification require new evidence to drive necessary interventions.

Research Gap and Objective

The review of the maternal and child health outcomes in Pakistan has to be integrated and updated to analyze the interplay of socioeconomic, demographic, and healthcare-related risk factors systematically. There is limited recent research where the maternal and child indicators are analysed holistically on a wider level of the population. Consequently, the purpose of our research is to evaluate the maternal and child health outcomes in Pakistan and the main risk factors associated with the outcomes, so as to be able to inform the development of evidence-based policies and specific population health interventions.

METHODOLOGY

Study Design and Setting: This was a cross-sectional analytical study that was carried out in Pakistan as a community-based study. The design was chosen because it creatively evaluated maternal and child health outcomes and evaluated related risk factors in sociodemographic variables, obstetric, and healthcare-related issues at a specific time. The research was conducted on a sample of urban and rural districts in various provinces to have a geographical and socioeconomic coverage. The collection of data was done between January 2025 and June 2025 a six-month period.

Study Population

The population in the study was the women of reproductive age (15-49 years) who had had at least one child who had been born within the last five years before the study. In case of child health assessment, the last live birth was used as the source of information. Permanent residents of the sampled households who gave informed consent were included in the sample of women. The study excluded women who were severely mentally ill or whose information could not be trusted.

Sample Size Determination

Single population proportion formula was used in calculating the sample size of the cross-sectional studies.

$n = Z^2 \times p\,(1 - p) / d^2$

As n denoted the sample size needed, Z was the standard normal variate of a 95% confidence level (1.96), p the estimated prevalence of adverse maternal or child health outcomes and d the margin of error.

Considering some national estimates of maternal and child health indicators in Pakistan in the past and assuming no exact combined prevalence of adverse outcomes, a conservative prevalence (p) of 50 percent was used to maximize the sample size. The margin of error was set at 5% (0.05).

$$n = (1.96)^2 \times 0.5 \times (1 - 0.5) / (0.05)^2$$
$$n = 3.8416 \times 0.25 / 0.0025$$
$$n = 384.16$$

384 participants was the smallest sample size that could be calculated The modified sample size takes into consideration a 1.5 design effect brought on by multistage sampling size became 576 Following a 10% increase in compensate The ultimate sample size for nonresponse was approximately 634 participants. Therefore, a total of 650 women were targeted and successfully enrolled in the study to ensure adequate statistical power.

Sampling Technique

A stratified sampling method was used in several stages. In the initial phase the stratification of the districts was based on province and urban rural distinction. Probably proportional to size sampling was used to select clusters (union councils or wards) in the second stage. At the last phase, systematic random sampling was used to select the households. Simple random selection was used to select one of the eligible women in case there was more than one eligible women in a household.

Data Collection Tool and Procedure

A structured and pretested questionnaire, based on the review of the related literature and national survey tools, was used to collect data. The questionnaire has been prepared in English, and translated into Urdu, and then it was back translated to maintain a constant. It included sections on sociodemographic features, obstetric history, the utilization of the antenatal and postnatal care, delivery information, maternal complications, immunization status, nutritional indicators, and child morbidity outcomes.

Face-to-face interviews were done on the homes of the participants by trained female data collectors to guarantee privacy and cultural sensitivity. The process of collecting data was monitored by supervisors in order to ensure quality and consistency. This was done by conducting a pilot study on 5 percent of the sample in a location not chosen to test the levels of clarity and reliability of the instrument and make suitable changes before the actual study.

Study Variables

Dependent variables were maternal health outcomes, which involve pregnancy complications, mode of delivery, anemia status, and postnatal complications, and child health outcomes, which involve low birth weight, preterm birth, immunization status, instances of diarrhea or respiratory infection, and nutritional status.

Maternal age, maternal education level, maternal occupation, household income, residence (urban/rural), parity, birth spacing, number of antenatal care visits, place of delivery, skilled birth attendance, and access to healthcare facility were considered as the independent variables.

Data Management and Statistical Analysis

Analysis was done by typing the data into Statistical Package of the Social Sciences (SPSS) version 26. Data cleaning and coding was done before statistically testing it. The descriptive statistics were calculated in order to outline the features of the studied population. Categorical variables were analyzed using frequencies and percentages whereas means and standard deviations were used to analyze the continuous variables.

There was a bivariate analysis of the relationships between independent variables and child and maternal health outcomes. Associations among categorical variables were determined using the Chi-square test. The means of the continuous variables between two groups were compared by the use of independent sample t-tests and when comparing more than two groups the one way analysis of variance (ANOVA) was used.

The bivariate analysis variables with a p-value of less than 0.20 were used in multivariate logistic regression models to determine independent predictors of adverse maternal and child health outcomes. Adjusted odds ratios (AORs) including 95% confidence interval were determined. A p-value that had a value below 0.05 was deemed as being statistically significant.

RESULTS

Sociodemographic Characteristics of the Participants

The total of women who took part in the study was 650. The average age was 28.9 ± 5.8 years (16-45 years). The majority of the participants (41.5%) had the ages of 25-34 years followed by 32.0%, 26.5, ≥ 35 years respectively. The rural residents formed 58.3% of the population. Only about one-third (34.6%) were not educated and 46.2 percent were living in low-income homes. Table 1 describes the sociodemographic profile in more detail.

Table 1. Sociodemographic Characteristics with Association to Maternal Complications (N = 650))

Variable	Category	Frequency (n)	%	χ^2	p-value
Age Group (years)	15–24	208	32.0	4.12	0.127
	25–34	270	41.5		
	≥35	172	26.5		
Residence	Urban	271	41.7	9.87	0.007*
	Rural	379	58.3		
Education Level	No formal education	225	34.6	16.42	0.002*
	Primary	194	29.8		
	Secondary	143	22.0		
	Higher	88	13.6		
Monthly Income	Low	300	46.2	8.76	0.032*
	Middle	228	35.1		
	High	122	18.7		

*Statistically significant ($p < 0.05$).

Table 1 indicates that low education levels and living in rural areas were the two outstanding characteristics in the study population.

Obstetric and Healthcare Utilization Characteristics

The mean parity was 3.1 ± 1.9 Multiparity (≥ 4 births) was found in 38.0% of the women. Reported visits were 54.8% means (≥ 4) those with inadequate visits were 45.2%. Well-trained birth attendance was observed in 68.6 percent of the births, and 63.5 percent institutional births. The 57.1 percent of the participants received postnatal care within 48 hours. Table 2 is a summary of these findings.

Table 2. Obstetric and Healthcare Utilization with Maternal Complications (N = 650))

Variable	Category	Frequency (n)	%	χ^2	p-value
Parity	<4 births	403	62.0	—	—
	≥4 births	247	38.0		
ANC Visits	≥4 visits	356	54.8	24.53	<0.001*
	<4 visits	294	45.2		
Skilled Birth Attendance	Yes	446	68.6	5.62	0.018*
	No	204	31.4		
Institutional Delivery	Yes	413	63.5	6.94	0.008*
	No	237	36.5		
Postnatal Care (48 hrs)	Yes	371	57.1	7.21	0.007*
	No	279	42.9		

As it is demonstrated in Table 2, a rather significant percentage of women received insufficient antenatal care and did not receive any postnatal follow-ups.

Maternal Health Outcomes

Women reported pregnancy-related complications in 27.4% of them. Anemia (18.3%) was the most common complication, followed by hypertensive disorders (6.8%) and postpartum hemorrhage (4.5%). Cesarean section deliveries accounted for 21.7%, and postnatal complications were observed in 12.6% of participants. These maternal outcomes are presented in figue 1

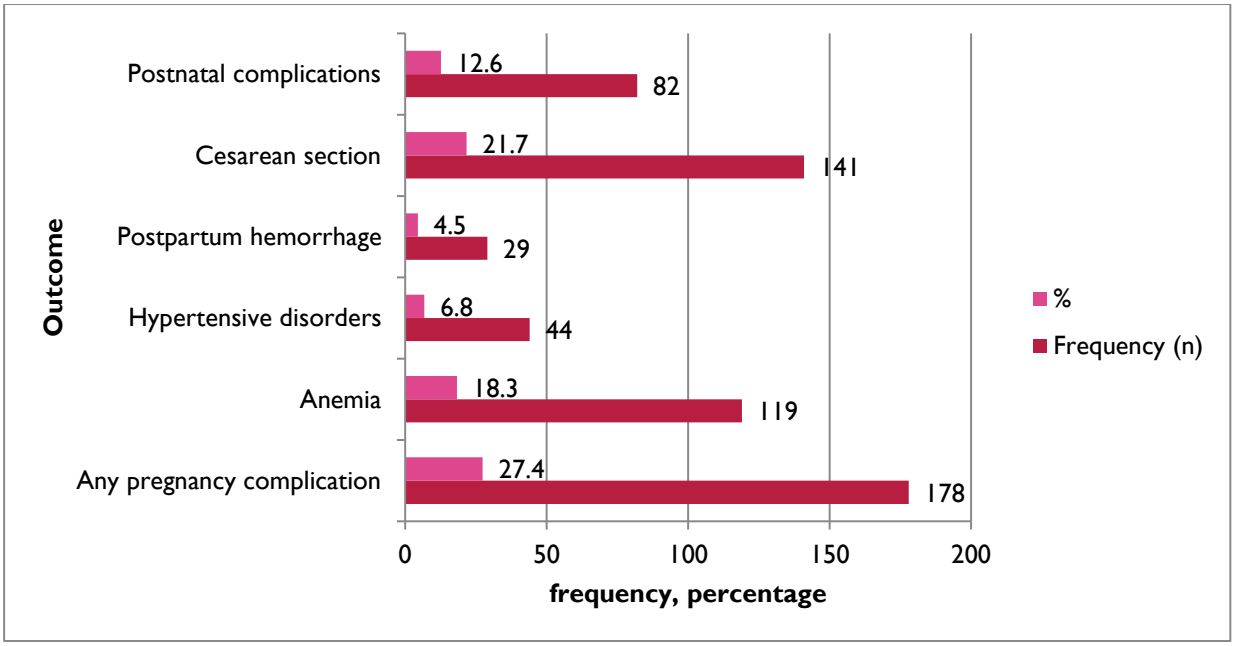

Figure 1 Maternal Health Outcomes with Statistical Associations (N = 650)

The chi-square tests indicated significant relationships between maternal education and pregnancy complications ($\chi^2 = 16.42$, $p = 0.002$), rural residence and pregnancy complications ($\chi^2 = 9.87$, $p = 0.007$), and lack of proper antenatal care and pregnancy complications ($\chi^2 = 24.53$, $p < 0.001$). The t-test for independent samples revealed higher mean parity among women with complications (3.6 ± 2.1) compared to those without (2.9 ± 1.7), which has significance testing($t = 4.21$, $p < 0.001$).

In multivariable logistic regression analysis, inadequate antenatal care (AOR = 2.14; 95% CI: 1.45–3.16; $p < 0.001$), rural residence (AOR = 1.68; 95% CI: 1.10–2.55; $p = 0.015$), low education (AOR = 1.92; 95% CI: 1.21–3.04; $p = 0.006$), and high parity (AOR = 1.59; 95% CI: 1.03–2.44; $p = 0.034$) were identified as independent predictors of adverse maternal outcomes.

Child Health Outcomes

Among the most recent live births, 19.5% had low birth weight, and 14.2% were preterm. Incomplete immunization was observed in 23.8% of children. Diarrhea (29.1%) and acute respiratory infection symptoms (26.4%) were commonly reported. Stunting affected 31.7% of children, and 18.9% were underweight. These findings are detailed in table 4

Table 4. Child Health Outcomes with Associated Risk Factors (N = 650)

Outcome	Frequency (n)	%	χ^2	p-value
Low birth weight	127	19.5	26.81	<0.001*
Preterm birth	92	14.2	10.54	0.005*
Incomplete immunization	155	23.8	12.33	0.002*
Diarrhea	189	29.1	9.41	0.009*
Respiratory infection	172	26.4	8.67	0.013*
Stunting	206	31.7	21.38	<0.001*
Underweight	123	18.9	11.02	0.004*

The results of the chi-square analysis showed that there were noteworthy connections between maternal education and low birth weight ($\chi^2 = 18.75$, $p = 0.001$), low household income and stunting ($\chi^2 = 21.38$, $p < 0.001$), and poor antenatal care and low birth weight (kh2 = 26.81, $p < 0.001$). The results of a one-way ANOVA revealed notable variations in mean birth weight across maternal education levels ($F = 6.47$, $p < 0.001$).Multivariable logistic regression identified inadequate antenatal care (AOR = 2.36; 95% CI: 1.54–3.62; $p < 0.001$), mother anemia (AOR = 1.89; 95% CI: 1.20–2.97; $p = 0.005$), poor income for families income (AOR = 1.74; 95% CI: 1.12–2.70; $p = 0.014$), rural residence (AOR = 1.83; 95% CI: 1.19–2.82; p =

0.006), and low maternal education (AOR = 2.07; 95% CI: 1.29–3.31; p = 0.002) as independent predictors of adverse child health outcomes.

Integrated Maternal and Child Health Risk Analysis

The joint analysis revealed that women with poor antenatal care were largely prone to maternal complications as well as poor child outcomes (AOR = 2.58; 95% CI: 1.67-3.99; $p < 0.001$). Combined adverse outcomes were found in households with low socioeconomic status (($\chi^2 = 28.94$, $p < 0.001$).

On the whole, the results were observed to be consistent by indicating that poor antenatal care, rural location, maternal poor education, high parity, and poor household income were key predictors of ill maternal and child health outcomes.

DISCUSSION

In the current study, maternal and child health outcome and risk factors that were associated with the outcome were evaluated in a representative group of risk-age women in Pakistan. The results indicated a significant adverse maternal and child health burden with the means of pregnancy-related complications (27.4%), low birth weight (19.5%), incomplete immunization (23.8%), and stunting (31.7%). Poor ante-natal care, rural living, low maternal education, large parity, and low incomes in the household were always noted to be the significant predictors during both bivariate and the multivariate analyses. These outcomes demonstrate the unchanged inequalities in the access to quality maternal and child healthcare services.

The rate of pregnancy-complicated medical issues in the current research can be compared to the national survey findings that state that maternal morbidity is still a relevant issue of the social health in Pakistan [8]. This close relationship between poor antenatal services and maternal complications is consistent with the research findings worldwide which indicate that antenatal care can enhance the early screening and treatment of anemia, hypertensive disorders, and other pregnancy related complications. The witnessed rate of cesarean section is 21.7 percent, which is within the current regional measurements indicating that institutional delivery rates are upsurging yet there is a possibility of an access imbalance between urban and rural populations [9].

Low birth weight (19.5%) is common among other low- and middle-income nations in South Asia, and in this study, malnutrition of the mother, anemia, and lack of antenatal care are still prevalent [10]. The findings of the major association between maternal anemia and low birth weight in the multivariate analysis also augment already available biological and epidemiological data concerning the poor maternal nutritional status as a predictor of the poor neonatal outcomes [11]. Likewise, the increased risk of low birth weight in women who had less than four antenatal visits is in line with the literature related to protective value of proper prenatal care.

Child health problems continue to be experienced through incomplete immunization (23.8) and stunting (31.7) as well. This interrelation between low household income and stunting is in line with the larger evidence showing that poverty affects child nutrition in the form of food insecurity, poor sanitation and poor access to healthcare [12]. Residing in the rural areas was also independently linked with incomplete immunization which reflects national demographic survey results with geographic differences on vaccination coverage [13]. The high effect of maternal education on various outcomes in this study is another strength towards the already known knowledge of the fact that educated mothers tend to pursue timely healthcare, complete immunization, and practice proper child feeding behaviors [14].

All in all, the findings of the study are in line with regional and international literature that highlights the significance of social determinants of health especially education, income, and geographic access in determining the outcome of mothers and children. The combined discussion that shows that poor antenatal care exposes mothers and children to poor health outcomes illustrates the interrelatedness of maternal and child health and justifies the rationale of continuum-of-care interventions [15].

LIMITATIONS

This research was limited in a number of ways. First, it was cross-sectional in nature, and thus, could not have been used to establish causal relationships between risk factors and outcomes. Second, the data were self-reported and therefore could create the issue of recall bias especially on obstetric history and child illness episodes. Third, despite the multistage sampling approach, some areas may not have been well covered, especially the remote or conflict-affected regions which can limit the generalizability. Also, no clinical checking of the reported complications and anthropometric measurements were done, and this could have compromised the accuracy of measurements.

FUTURE RECOMMENDATIONS

Future studies need to take into consideration longitudinal or cohort designs of research to help establish more causal patterns among maternal risk factors and child health outcomes better. The inclusion of objective clinical evaluations and biochemical tests (especially in regards to anemia and state of nutrition) would contribute to the accuracy of the data. Health system variables like quality of care, referral systems and service readiness should also be studied further to gain insight on structural impediments. The priorities of the policymakers would be to increase the coverage of antenatal care, rural healthcare

infrastructure, female education, and specific nutrition and immunization programs. The high-risk population-oriented integrated maternal and child health programs could lead to significant contributions on the enhancement of health outcomes and the attainment of national and global health targets.

CONCLUSION

This research paper established that there was significant adverse maternal and child health consequences in Pakistan, where the outcome of pregnancy complications, low birth weight, incomplete immunization, and stunting were still common. Poor outcomes were strongly predicted by inadequate antenatal care, rural, low maternal education, high parity and low household income. To enhance the maternal and child health indicators, the services of antenatal care should be reinforced, rural healthcare facilities should be accessible, and the inequality in socioeconomic status should be improved. There is need to have integrated and equity-based interventions to minimize preventable morbidity and facilitate sustainable health gains

REFERENCES

[1] Zakar R, Zakar NM, Shahzad R, Tekian A, Fischer F. Community health needs assessment: findings from a community-university partnership strengthening program on maternal and child health in Pakistan. BMC Public Health. 2025 Feb 17;25(1):654.doi.org/10.1186/s12889-025-21947-6

[2] Midhet F, Khalid SN, Baqai S, Khan SA. Trends in the levels, causes, and risk factors of maternal mortality in Pakistan: A comparative analysis of national surveys of 2007 and 2019. Plos one. 2025 Jan 13;20(1):e0311730.doi.org/10.1371/journal.pone.0311730

[3] Midhet F, Hanif M, Khalid SN, Khan RS, Ahmad I, Khan SA. Factors associated with maternal health services utilization in Pakistan: Evidence from Pakistan maternal mortality survey, 2019. Plos one. 2023 Nov 16;18(11):e0294225. doi.org/10.1371/journal.pone.0294225

[4] Anwar J, Torvaldsen S, Morrell S, Taylor R. Maternal mortality in a rural district of Pakistan and Contributing Factors. Maternal and Child Health Journal. 2023 May;27(5):902-15. doi.org/10.1007/s10995-022-03570-8

[5] Aziz, A., Saleem, S., Nolen, T.L. et al. Why are the Pakistani maternal, fetal and newborn outcomes so poor compared to other low and middle-income countries?. Reprod Health 17 (Suppl 3), 190 (2020). https://doi.org/10.1186/s12978-020-01023-5

[6] Asif MF, Ali S, Ali M, Abid G, Lassi ZS. The moderating role of maternal education and employment on child health in Pakistan. Children. 2022 Oct 14;9(10):1559.doi.org/10.3390/children9101559

[7] Aftab F, Ahmed I, Ahmed S, Ali SM, Amenga-Etego S, Ariff S, Bahl R, Baqui AH, Begum N, Bhutta ZA, Biemba G. Direct maternal morbidity and the risk of pregnancy-related deaths, stillbirths, and neonatal deaths in South Asia and sub-Saharan Africa: A population-based prospective cohort study in 8 countries. PLoS medicine. 2021 Jun 28;18(6):e1003644.doi.org/10.1371/journal.pmed.1003644

[8] Rasool MF, Akhtar S, Hussain I, Majeed A, Imran I, Saeed H, Akbar M, Chaudhry MO, Rehman AU, Ashraf W, Alqahtani F. A cross-sectional study to assess the frequency and risk factors associated with cesarean section in Southern Punjab, Pakistan. International journal of environmental research and public health. 2021 Aug 21;18(16):8812.doi.org/10.3390/ijerph18168812

[9] Sadia, A., Mahmood, S., Naqvi, F. et al. Factors associated with home delivery in rural Sindh, Pakistan: results from the global network birth registry. BMC Pregnancy Childbirth 22, 192 (2022). https://doi.org/10.1186/s12884-022-04516-2

[10] Farrar DS, Pell LG, Muhammad Y, Khan SH, Tanner Z, Bassani DG, Ahmed I, Karim M, Madhani F, Paracha S, Khan MA. Association of maternal, obstetric, fetal, and neonatal mortality outcomes with Lady Health Worker coverage from a cross-sectional survey of> 10,000 households in Gilgit-Baltistan, Pakistan. PLOS Global Public Health. 2024 Feb 27;4(2):e0002693.doi.org/10.1371/journal.pgph.0002693

[11] Wainwright E, Sheikh I, Qureshi R, Yousuf S, Khan R, Elmes M. Evaluating the effect of maternal non-communicable disease on adverse pregnancy outcomes and birthweight in Pakistan, a facility based retrospective cohort study. Scientific Reports. 2024 Jan 5;14(1):571.https://doi.org/10.1038/s41598-023-51122-z

[12] Atif, M., Farooq, M., Shafiq, M. et al. The impact of partner's behaviour on pregnancy related outcomes and safe child-birth in Pakistan. BMC Pregnancy Childbirth 23, 516 (2023). https://doi.org/10.1186/s12884-023-05814-z

[13] Kachoria AG, Mubarak MY, Singh AK, Somers R, Shah S, Wagner AL. The association of religion with maternal and child health outcomes in South Asian countries. Plos one. 2022 Jul 12;17(7):e0271165.doi.org/10.1371/journal.pone.0271165

[14] Ali A, Zar A, Wadood A. Factors associated with incomplete child immunization in Pakistan: findings from Demographic and Health Survey 2017-18. Public Health. 2022 Mar 1;204:43-8.doi.org/10.1016/j.puhe.2022.01.003

[15] Naz L, Patel KK, Dilanchiev A. Are socioeconomic status and type of residence critical risk factors of under-five mortality in Pakistan? Evidence from nationally representative survey. Clinical Epidemiology and Global Health. 2021 Apr 1;10:100670. https://doi.org/10.1016/j.cegh.2020.11.003.