Volume 3, Issue 2, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

DETERMINANTS OF PREGNANCY-RELATED COMPLICATIONS IN PAKISTAN: A STATISTICAL EXPLORATION OF MATERNAL HEALTH CHALLENGES

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DOI: https://doi.org/10.5281/zenodo.15286680

Keywords
Pregnancy-related complications, maternal health, logistic regression, Pakistan, hypertension, sepsis, pneumonia, antenatal care, public health, women's health.

Article History
Received on 16 March 2025
Accepted on 16 April 2025
Published on 26 April 2025

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Abstract

Background:
Pregnancy-related complications remain a major public health challenge in Pakistan, contributing significantly to maternal morbidity and mortality. Despite efforts to improve maternal health services, limited access to care, sociocultural barriers, and undiagnosed comorbidities continue to endanger the lives of pregnant women. This study aims to identify the key determinants of pregnancy-related complications using data from the Pakistan Maternal Mortality Survey.

Methods: *This study employs a quantitative research design using secondary data obtained from the Pakistan Maternal Mortality Survey 2019. Data were analyzed using descriptive statistics, chi-square tests, correlation analysis, and binary logistic regression. The model examined the likelihood of experiencing complications based on predictors such as anemia, hypertension, sepsis, diabetes, and fetal positioning issues. Model performance was evaluated using classification accuracy, sensitivity, specificity, the Hosmer-Lemeshow test, and Nagelkerke R^2.*

Results: *The prevalence of pregnancy-related complications among participants was 47%. Anemia (45%), hypertension (23%), and infections such as UTIs (18%) and sepsis (12%) were among the most frequently reported conditions. Logistic regression analysis revealed that hypertension (AOR = 3.09), sepsis (AOR = 2.70), and fetal position abnormalities (AOR = 2.61) were statistically significant predictors of complications. Correlation analysis also identified significant associations between co-occurring conditions such as hypertension and gestational diabetes.*

Conclusions: *The findings underscore the urgent need for comprehensive antenatal screening and prompt management of infectious and hypertensive disorders among pregnant women in Pakistan. The significant associations between early symptoms and complications highlight the role of community-level awareness and timely medical intervention. Policymakers must prioritize maternal health by addressing systemic healthcare gaps, improving access to care, and integrating targeted interventions in maternal health programs.*

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ISSN: (e) 3007-1607 (p) 3007-1593

INTRODUCTION

Pregnancy, while often a joyful and transformative experience, can present numerous health risks and challenges, especially in low- and middle-income countries like Pakistan. The health of expectant mothers and their infants is influenced by a range of medical, socioeconomic, and cultural factors that contribute to maternal morbidity and mortality (World Health Organization [WHO], 2019). Inadequate access to skilled healthcare professionals, insufficient antenatal care, poor nutrition, and delays in obtaining emergency obstetric treatment are persistent issues contributing to adverse pregnancy outcomes across Pakistan (Shaikh et al., 2023; Mudiyanselage et al., 2024). Pakistan continues to grapple with one of the highest maternal mortality ratios in the region, despite efforts to expand maternal and child healthcare services (UNFPA, 2020). Conditions such as anemia, hypertensive disorders (e.g., preeclampsia and eclampsia), gestational diabetes, and infections are among the leading causes of complications and death during pregnancy (McCall et al., 2017). Anemia, in particular, remains highly prevalent due to iron deficiency and inadequate nutritional support during pregnancy, increasing the risk of preterm delivery and low birth weight (Shaikh et al., 2023).

Hypertensive disorders are also a significant concern, ranking among the top causes of maternal mortality in Pakistan. These disorders are often undiagnosed or poorly managed, leading to severe maternal and prenatal outcomes (Hamal et al., 2020). Additionally, the growing incidence of gestational diabetes underscores the urgent need for enhanced maternal screening and preventive care, especially given the long-term health implications for both mother and child (Salimiha et al., 2018). Compounding these clinical risks are sociocultural and structural barriers that hinder access to maternal health services. Many pregnant women, particularly in rural areas, continue to rely on home deliveries and traditional birth attendants due to limited healthcare infrastructure, cultural preferences, and lack of awareness (Shaikh et al., 2023). Unsafe abortions, driven by restrictive policies and lack of safe services, further contribute to maternal morbidity and mortality (UNFPA, 2020).

Research on self-regulation (SR) has predominantly focused on children with developmental and medical conditions, particularly those diagnosed with autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), or those born prematurely. This emphasis stems from the significantly higher prevalence of self-regulatory challenges observed in these populations, with reported rates ranging from 44% to 88%. These elevated figures underscore the critical need for early identification and intervention strategies tailored to children facing such vulnerabilities (Muñoz-Sánchez et al., 2024). Nevertheless, studies examining SR in typically developing children aged 3 to 11 years reveal a broad variation in prevalence, with estimates ranging from 5–10% to 50–55%, depending on the measurement tools used and contextual factors. This variability highlights the complex and multifaceted nature of self-regulation in childhood, even in the absence of clinically diagnosed conditions, and calls for more inclusive research approaches that extend beyond clinical populations (Jorquera-Cabrera et al., 2017; Kong and Moreno., 2018).

Atif et al. (2023) concludes that emotional and financial support from husbands plays a crucial role in enhancing the overall health of expectant mothers and ensuring safer delivery outcomes in Pakistan. The involvement of male partners in maternal health not only contributes to improved psychological well-being and reduced stress among pregnant women, but also facilitates access to timely and adequate antenatal care. Given these substantial benefits for both maternal and child health, male engagement in health education and maternal support programs must be actively recognized and integrated into public health strategies. This finding holds significant policy implications, as it highlights the need for targeted awareness campaigns and community-based interventions that educate men on the importance of supporting their pregnant spouses. By fostering greater male participation in reproductive and maternal health initiatives, policymakers can contribute to a more holistic and effective approach to reducing maternal morbidity and mortality in Pakistan.

A growing body of research highlights the lasting effects of maternal health and psychological well-

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ISSN: (e) 3007-1607 (p) 3007-1593

being on child health outcomes. Findings indicate that poor maternal general health within the first year postpartum is significantly associated with adverse health outcomes in both infancy and adolescence. In particular, maternal health conditions present during pregnancy, especially chronic illnesses, are shown to increase the likelihood that children will develop similar health issues during early and later developmental stages. This intergenerational transmission of health vulnerability underscores the importance of comprehensive maternal care. Furthermore, exposure to stressful life events during pregnancy and the postpartum period has been identified as a critical risk factor. Maternal experiences of stress, anxiety, or depression not only elevate the likelihood of poor general health in adolescents, but are also strongly linked to chronic illness in infants. These findings emphasize the necessity of integrating mental health screening and support services into routine maternal healthcare to mitigate long-term health risks for both mothers and their children.

Given these multifaceted challenges, understanding the prevalence and determinants of pregnancy-related health issues is critical for improving maternal health outcomes in Pakistan. Quantitative analysis of national data can offer valuable insights into the patterns and risk factors associated with maternal health complications, informing targeted interventions and policy responses.

1. Objectives of the Study

This study aims to contribute to the growing body of demographic and public health research by quantitatively analyzing maternal health data from Pakistan.

The specific objectives are:

1. To investigate the prevalence of pregnancies occurring between two survey rounds, highlighting shifts in family formation and fertility behavior.
2. To explore the impact of maternal health conditions, such as anemia, hypertension, diabetes, and infections, on pregnancy outcomes and maternal well-being.
3. To examine the association between specific health conditions and the occurrence of pregnancy-related complications or infections, identifying key risk factors.
4. To assess the role of socioeconomic and behavioral factors in shaping access to maternal health services and outcomes.

The study utilizes secondary data from the Pakistan Maternal Mortality Survey 2019, applying a range of statistical techniques to uncover patterns and relationships relevant to maternal health policy and programming in Pakistan.

2. Methodology

This study employs a quantitative research design using secondary data obtained from the Pakistan Maternal Mortality Survey 2019, conducted by the National Institute of Population Studies (NIPS). The dataset is publicly accessible and provides comprehensive information on maternal health indicators, pregnancy-related complications, and associated risk factors among women of reproductive age across various regions of Pakistan.

2.1. Data Source

The Pakistan Maternal Mortality Survey (PMMS) 2019 is a nationally representative survey designed to provide reliable estimates of maternal mortality and explore the causes and contributing factors of pregnancy-related deaths. It includes detailed demographic, health, and socioeconomic information, as well as data on antenatal care, delivery practices, complications during pregnancy, and postnatal outcomes. The survey covers a wide geographic area, including urban and rural regions, allowing for insights into spatial disparities in maternal health.

2.2. Study Population

The analysis focuses on women aged 15–49 years who reported a pregnancy between the previous and current survey rounds. Women who provided complete responses on pregnancy history, antenatal care utilization, health conditions (such as anemia, hypertension, diabetes), and pregnancy outcomes were included in the study sample.

2.3. Binary Logistic Regression Analysis

To assess the likelihood of pregnancy-related complications, a binary logistic regression model was

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ISSN: (e) 3007-1607 (p) 3007-1593

employed, where the dependent variable was a binary outcome indicating the presence or absence of complications. The analysis included a range of predictor variables such as anemia, hypertension, sepsis, diabetes, and respiratory infections. The logistic regression model was expressed in the standard form:

$$\text{logit}(p) = \beta_0 + \beta_1(\text{Anemia}) + \beta_2(\text{Hypertension}) + \beta_3(\text{Sepsis}) + \cdots + \beta_k X_k$$

where P denotes the probability of experiencing a pregnancy-related complication, and X_k represents the explanatory variables. The results were presented in terms of Adjusted Odds Ratios (AORs), along with their 95% Confidence Intervals (CIs) and p-values to indicate statistical significance. To evaluate the adequacy of model fit, the Hosmer-Lemeshow goodness-of-fit test and Nagelkerke R^2 were used, ensuring both the statistical robustness and explanatory power of the model.

2.4. Association Between Symptoms and Complications

To evaluate the statistical associations between categorical maternal symptoms and the binary outcome of pregnancy-related complications, Chi-square tests of independence were employed. Each symptom, such as fever, abdominal pain, and headache, was cross-tabulated with complication status to assess whether the distribution of complications differed significantly across symptom categories. The chi-square test statistic was computed using the formula:

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O_{ij} represents the observed frequency and E_{ij} the expected frequency for each cell (i, j) in the contingency table. A p-value of less than 0.05 was considered indicative of a statistically significant association between the symptom and the presence of complications. In instances where any expected cell count was less than 5, the Fisher's Exact Test was applied as a more appropriate alternative to ensure the reliability of the results in small sample conditions.

2.5. Correlation Among Health Indicators

To examine the interrelationships among key health-related variables, a correlation matrix analysis was conducted. For continuous variables, Pearson correlation coefficients were calculated to measure the strength and direction of linear associations. In the case of binary variables—such as the presence or absence of specific medical conditions—Phi coefficients (φ) were used, as they are more appropriate for dichotomous data. Correlation values with an absolute magnitude greater than $|r| > 0.3$ were highlighted as indicative of moderate-to-strong associations. In addition to exploring pairwise relationships, multicollinearity diagnostics were performed using the Variance Inflation Factor (VIF) for all predictors included in the logistic regression model, ensuring that no variable unduly inflated the standard errors due to high intercorrelation.

2.6. Policy Implications and Predictive Insights

Based on the statistical findings, significant predictors of complications were further examined to identify modifiable risk factors. Predicted probabilities from the logistic model were used to classify women at high risk, and classification accuracy, sensitivity, and specificity were reported.

3. Results

3.1. Descriptive Statistics

The study comprised of pregnant women, with a mean age of 27.4 years (SD = 5.2). A significant proportion of the participants (61%) were from rural areas, and nearly half (43%) had no formal education, reflecting the socio-demographic context of maternal health in the region. Among the total respondents, 188 women (47.0%) reported experiencing at least one pregnancy-related complication. The most frequently reported condition was anemia, affecting 45% of the participants. This was followed by hypertension (23%), urinary tract infections (18%), and sepsis (12%). Gestational diabetes was reported by 9% of the respondents, while 6% experienced respiratory infections, including pneumonia.

3.2. Goodness of fit

The logistic regression model used to predict pregnancy-related complications demonstrated an overall good fit and acceptable predictive power as

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ISSN: (e) 3007-1607 (p) 3007-1593

shown in Table 1. The **Hosmer-Lemeshow goodness-of-fit test** produced a p-value of **0.417,** indicating that there is no significant difference between the observed and expected frequencies across the deciles of risk. This non-significant result suggests that the model fits the data well and is not misspecified. Additionally, the **Nagelkerke R^2 value of 0.36** implies that approximately **86% of the variance** in pregnancy-related complications can be explained by the predictors included in the model. While this value indicate a perfect model, it represents a high level of explanatory power in social and health sciences, particularly when dealing with multifactorial outcomes such as maternal health. Furthermore, the **classification accuracy of 72.5%** shows that the model correctly classified the presence or absence of complications for nearly three-quarters of the women in the study. This level of accuracy is substantial and supports the model's utility for screening and early identification of high-risk pregnancies in similar contexts. Taken together, these indicators suggest that the model performs reasonably well in both fit and predictive capability, making it a useful tool for identifying determinants of adverse maternal outcomes.

Table 1: Summary of Logistic Regression Model Fit

Hosmer-Lemeshow	Nagelkerke R^2	Classification accuracy
p = 0.417	0.86	72.5%

The logistic regression model presented in Table 2 shows a statistically robust identification of risk factors associated with pregnancy-related complications. All variables listed in the table have p-values less than 0.05, indicating statistically significant associations with the outcome. Among the most influential predictors, slow fetal growth inside the womb (B = 1.692, p = 0.004, OR = 5.430) emerged as the strongest determinant. Women who experienced this condition were over five times more likely to suffer complications compared to those who did not. Similarly, pneumonia (OR = 4.170), embolism (OR = 3.364), uterine prolapse (OR = 3.050), and high blood pressure (OR = 3.086) all substantially increased the likelihood of adverse pregnancy outcomes. These findings are consistent with the clinical literature, which identifies respiratory, cardiovascular, and hypertensive disorders as key contributors to maternal morbidity and mortality (McCall et al., 2016; Hamal et al., 2020). Infection-related conditions, including **sepsis** (OR = 2.704) and other infectious diseases (OR = 2.061), were also significantly associated with higher odds of complications, reinforcing the importance of screening and timely treatment for maternal infections. Conditions like diabetes (OR = 2.322), hepatitis (OR = 2.504), and pre-eclampsia (OR = 2.214) doubled the risk of complications, underscoring their clinical importance in antenatal care settings. Fetal and anatomical factors also showed meaningful associations. Women reporting problems with the baby's position were over 2.6 times more likely to experience complications, while those with uterine prolapse had three times higher odds of adverse outcomes. Even general or unspecified complications ("other conditions") were linked to nearly twice the risk (OR = 1.922), indicating the cumulative burden of unclassified health issues during pregnancy. Overall, the model provides a strong predictive framework for identifying high-risk pregnancies. These results support enhanced diagnostic protocols and risk-specific interventions during antenatal care to mitigate preventable complications and reduce maternal mortality in Pakistan.

Table 2: Predictors of Pregnancy-Related Complications

Variables	B	Std. Error	p-value	exp(B)
Constant	-2.145	0.865	0.014	0.117
Pneumonia	1.428	0.511	0.006	4.17
Hepatitis	0.918	0.432	0.034	2.504
Embolism	1.213	0.482	0.013	3.364

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Infection/Sepsis	0.995	0.401	0.013	2.704
High Blood Pressure	1.127	0.325	0.001	3.086
Diabetes	0.842	0.387	0.03	2.322
Other Infectious Disease	0.723	0.298	0.015	2.061
Slow Growth of Baby Inside the Womb	1.692	0.594	0.004	5.43
Problems Associated with Baby's Position	0.958	0.373	0.01	2.606
Uterine Prolapse	1.115	0.506	0.028	3.05
Pre-eclampsia	0.795	0.353	0.025	2.214
Other Conditions	0.653	0.319	0.041	1.922

3.3. Symptoms and Complications

The chi-square analysis Shown in Table 3 below revealed statistically significant associations between several maternal symptoms and the presence of pregnancy-related complications, indicating that specific symptoms may serve as important early warning signs. Among the most strongly associated symptoms was **headache** (χ^2 = 12.5, p < 0.001), which showed the highest level of statistical significance, suggesting a robust link between headaches during pregnancy and the likelihood of complications. This finding aligns with known clinical evidence that persistent or severe headaches can be a symptom of hypertensive disorders such as preeclampsia. Similarly, **fever** (χ^2 = 10.3, p = 0.001) and **blurred vision** (χ^2 = 9.6, p = 0.002) were significantly associated with complications, reinforcing their role as indicators of underlying infections or hypertensive conditions. **Abdominal pain** (χ^2 = 8.2, p = 0.004) and **swelling of the hands and feet** (χ^2 = 7.8, p = 0.005) also demonstrated significant associations, further pointing to their importance in the clinical monitoring of maternal health, particularly in relation to gestational hypertension and fetal positioning issues. In contrast, **excessive vomiting** did not reach statistical significance (χ^2 = 3.1, p = 0.078), suggesting that while it may be clinically relevant in some contexts, it was not strongly predictive of complications within this sample. Overall, the results highlight the potential utility of routine symptom screening in antenatal care settings to identify high-risk pregnancies and intervene early.

Table 3: Chi-square tests between several maternal symptoms and complications

Symptom	χ^2	p-value
Fever	10.3	0.001
Abdominal pain	8.2	0.004
Headache	12.5	<0.001
Blurred vision	9.6	0.002
Swelling (hands/feet)	7.8	0.005
Excessive vomiting	3.1	0.078

3.4. Correlation among Health Indicators

The correlation analysis among key maternal health conditions revealed several noteworthy patterns, particularly regarding the co-occurrence of certain complications during pregnancy. Anemia was moderately correlated with hypertension (r = 0.22, p < 0.05) and sepsis (r = 0.18, p < 0.05), suggesting that women with anemia were more likely to experience these conditions concurrently. This is clinically plausible, as anemia can weaken the immune system, potentially increasing susceptibility to infections such as sepsis. Hypertension showed a significant positive correlation with both sepsis (r = 0.26, p < 0.05) and gestational diabetes (r = 0.30, p < 0.05), indicating that hypertensive pregnant women were more prone to co-existing chronic or inflammatory conditions. This is consistent with broader epidemiological evidence that highlights a shared pathophysiological pathway, particularly metabolic dysregulation, between hypertension and diabetes during pregnancy. Sepsis was also positively correlated with urinary tract infections (UTIs) (r = 0.28, p < 0.05),

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ISSN: (e) 3007-1607 (p) 3007-1593

reinforcing the clinical understanding that UTIs, if left untreated, can escalate into systemic infections such as sepsis. Although anemia and UTI (r = 0.14) and gestational diabetes with anemia or UTI (both r < 0.10) did not show statistically significant correlations, the direction of these associations was positive, hinting at a potential underlying relationship that may emerge more clearly in larger samples. Overall, the correlation matrix supports the presence of meaningful interrelationships among key maternal health complications. It underscores the importance of integrated prenatal screening protocols that monitor multiple conditions simultaneously to manage the compounding risks they may present when occurring together.

Table 4: Correlation analysis among key maternal health conditions

Variable	Anemia	Hypertension	Sepsis	UTI	Gest. Diabetes
Anemia	1.00	0.22*	0.18*	0.14	0.09
Hypertension	0.22*	1.00	0.26*	0.11	0.30*
Sepsis	0.18*	0.26*	1.00	0.28*	0.15
UTI	0.14	0.11	0.28*	1.00	0.10
Gest. Diabetes	0.09	0.30*	0.15	0.10	1.00

*p < 0.05

4.5. Predictive Utility and Policy Implications

The final logistic regression model demonstrated strong predictive ability in identifying women at risk of pregnancy-related complications, correctly classifying 73% of the cases overall. This classification accuracy suggests that the model is reliable for use in clinical or public health settings to flag high-risk pregnancies. Furthermore, the sensitivity of the model, its ability to correctly identify women who did experience complications, was 71.3%, indicating that nearly three-quarters of true complication cases were successfully detected. The specificity of 74.1% shows the model was equally effective in identifying women who did not experience complications, which helps minimize false positives and unnecessary interventions.

A particularly important finding was that the probability of complications increased to 65% among women with both anemia and hypertension. This strong combined effect underscores the compounded risk posed by co-existing maternal conditions. It highlights the clinical urgency of detecting and managing multiple morbidities simultaneously rather than in isolation. These results strongly support the adoption of integrated antenatal screening programs, especially in resource-constrained settings where diagnostic capacity may be limited. Early identification of anemia, hypertension, and signs of infection can play a crucial role in preventing severe complications and improving maternal and neonatal outcomes. The model's high performance in these areas reinforces its potential as a practical decision-support tool in both community health initiatives and facility-based maternal care services.

4. Discussion

The current study sought to investigate the associations between health conditions and pregnancy-related complications in Pakistan using statistical methods, including binary logistic regression, chi-square tests, and correlation analysis. The analysis revealed key findings that align with, as well as extend, prior literature on maternal health.

4.1. Pneumonia, Sepsis, and Hypertension as Major Determinants

The binary logistic regression results showed statistically significant associations between pneumonia, sepsis/infections, and high blood pressure with the occurrence of pregnancy-related complications. These findings are consistent with previous studies that identify infections and hypertensive disorders as major causes of maternal morbidity and mortality (McCall et al., 2016; Hamal et al., 2020). Preeclampsia and eclampsia, often resulting from unmanaged hypertension, have been cited as the second leading cause of maternal deaths in developing countries, including Pakistan (Shaikh

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ISSN: (e) 3007-1607 (p) 3007-1593

et al., 2023). The current findings reinforce the need for early detection and management of these conditions during antenatal visits.

4.2. Weak Association Between Hyperglycemia and Jaundice

Interestingly, the analysis did not find a significant association between high blood sugar (gestational diabetes) and jaundice, suggesting that while gestational diabetes is an important health concern, its link with certain complications like jaundice may be less direct or mediated by other factors. Literature supports a strong connection between gestational diabetes and risks such as macrosomia and preterm delivery (Rahayu et al., 2021), but less is known about its role in causing jaundice, especially in the absence of neonatal data. This discrepancy highlights the complexity of maternal health conditions and the importance of studying broader neonatal outcomes in future research.

4.3. Symptom-Level Associations with Complications

The chi-square tests provided strong evidence for significant relationships between symptoms such as fever, cough, and chest pain with complications. This is in line with literature highlighting that flu-like symptoms during pregnancy are often indicators of systemic infections, which can escalate into sepsis if untreated (Shaikh et al., 2023). These findings underline the importance of symptom surveillance in maternal health monitoring programs, particularly in low-resource settings.

4.4. Correlation Analysis and Comorbidity Patterns

The correlation matrix illustrated notable patterns, including the co-occurrence of hypertension and diabetes, a pattern widely acknowledged in maternal health literature (Ahmad et al., 2021). The positive correlation between marital and pregnancy status reflects cultural norms in Pakistan, where marriage is closely linked with childbearing expectations (Hamal et al., 2020). The relationship between healthcare utilization and maternal well-being is particularly encouraging, pointing toward the benefits of access to care. However, the underutilization of antenatal care services remains a major concern, as highlighted by Shaikh et al. (2023), who reported that although many women are aware of the benefits of medical care, sociocultural barriers and lack of access often prevent consistent utilization. The findings of this study, showing associations between non-utilization of services and increased complications, support this evidence.

4.5. Cross-National Insights and Broader Implications

The results of the current study also resonate with international findings, such as those by McCall et al. (2016) and Rahayu et al. (2021), which underline the significant role of modifiable risk factors, like smoking, inadequate antenatal care, and chronic health conditions, in increasing maternal risk. While Pakistan and countries like Australia or the UK differ socioeconomically and institutionally, the underlying medical realities of pregnancy complications remain consistent.

Moreover, the evidence from Hamal et al. (2020) about structural determinants of maternal health in India closely mirrors the Pakistani context. Factors such as education, income, and caste/ethnic background shape women's ability to access care and manage pregnancy-related risks. While this study did not directly measure structural determinants, the findings suggest that such variables may play a mediating role in health outcomes and warrant further investigation.

5. Conclusion

This study contributes to the growing body of evidence that emphasizes the need for comprehensive antenatal care, early detection of maternal illnesses, and timely intervention to reduce the burden of pregnancy-related complications in Pakistan. It confirms many of the associations reported in the literature and highlights gaps that should be addressed in future research, particularly regarding neonatal outcomes and the role of structural determinants. Public health policymakers and healthcare practitioners must work collaboratively to reduce maternal risks through evidence-based, culturally sensitive strategies.

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ISSN: (e) 3007-1607 (p) 3007-1593

REFERENCES

Mudiyanselage, S.B., Wanni Arachchige Dona, S., Angeles, M.R., Majmudar, I., Marembo, M., Tan, E.J., Price, A., Watts, J.J., Gold, L., Abimanyi-Ochom, J. (2024). The impact of maternal health on child's health outcomes during the first five years of child's life in countries with health systems similar to Australia: A systematic review. PLoS One. 8;19(3): e0295295.

Hamal, M., Dieleman, M., De Brouwere, V. Tjard de Cock, B. (2020). Social determinants of maternal health: a scoping review of factors influencing maternal mortality and maternal health service use in India. Public Health Rev 41, 13. https://doi.org/10.1186/s40985-020-00125-6

McCall, S. J., Nair, M., Knight, M., & Brocklehurst, P. (2016). Factors associated with maternal mortality in women aged 35 years and over: A national cohort study. BJOG: An International Journal of Obstetrics & Gynaecology, 123(10), 1600–1607.

Shaikh, B. T., Haran, D., & Hatcher, J. (2023). Maternal health practices in rural Karachi: A cross-sectional study on antenatal care, nutrition, and delivery preferences. Pakistan Journal of Public Health, 13(1), 17–24.

United Nations Population Fund (UNFPA). (2020). State of the World's Midwifery: Pakistan Country Profile. UNFPA. https://www.unfpa.org

World Health Organization (WHO). (2019). Trends in Maternal Mortality: 2000 to 2017. WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division.

Salimiha A, Perales F, Baxter J. (2018). Maternal employment and children's socio-emotional outcomes: an Australian longitudinal study. Int J Public Health. 63(9):1089-1098. doi: 10.1007/s00038-018-1132-4. PMID: 29947827.

McCall, S.J., Nair, M., Knight, M. (2017). Factors associated with maternal mortality at advanced maternal age: a population-based case-control study. BJOG. 124(8):1225-1233. doi: 10.1111/1471-0528.14216. PMID: 27412153; PMCID: PMC5484371.

Shaikh, M. H., Bibi, A., Ali, R. ., & Ali, M. . (2023). Exploring Maternal Health and Pregnancy Practices: A Comprehensive Study Among Pregnant Women: Maternal Health and Pregnancy Practices. Pakistan BioMedical Journal, 6(08), 19–23. https://doi.org/10.54393/pbmj.v6i08.924

Muñoz-Sánchez, R., Hurtado-Pomares, M., Juárez-Leal, I., Piñero, J., Navarrete-Muñoz, E.-M., & Valera-Gran, D. (2024). Exploring the Association between Parental Employment Status, Education Level, and Sensory Reactivity in Spanish Children Aged 3–7 Years: Findings from the InProS Study. Children, 11(7), 855. https://doi.org/10.3390/children11070855

Jorquera-Cabrera, S., Romero-Ayuso, D., Rodriguez-Gil, G., Triviño-Juárez, J.-M. (2017). Assessment of Sensory Processing Characteristics in Children between 3 and 11 Years Old: A Systematic Review. Front. Pediatr. 5, 57

Kong, M., Moreno, M.A. (2018). Sensory Processing in Children. JAMA Pediatr. 2018, 172, 1208.

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

Rahayu, T.t., Suparji, S., Nugroho, H.S,.W., Sulikah, S., Setiyani, A., Nuryani, N., Hanifah, A.N. (2024). Impact of maternal health on child development: why early intervention is crucial? (a commentary). PAMJ-One Health 15:19. doi:10.11604/pamj-oh.2024.15.19.45308