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PREVALENCE AND FACTORS ASSOCIATED WITH ANAEMIA IN FULL-TERM PREGNANT WOMEN AT A TERTIARY CARE HOSPITAL

Original Research

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ABSTRACT

Background: Iron deficiency remains the leading cause of anemia during pregnancy, a condition that poses serious public health challenges worldwide. The burden is particularly high in low- and middle-income regions, with the greatest prevalence reported in Africa and Southeast Asia. Anemia during pregnancy contributes to adverse maternal and neonatal outcomes, including low birth weight and preterm delivery, yet the underlying factors remain underexplored in many regional contexts.

Objective: To examine the frequency and associated factors of anemia among women with full-term pregnancies.

Methods: A descriptive cross-sectional study was conducted over six months (January–June 2022) at the Department of Obstetrics and Gynaecology, SMBBMU, Larkana. A total of 212 pregnant women with singleton, full-term pregnancies (gestational age 37–42 weeks) were recruited using a non-probability consecutive sampling technique. Data were collected on maternal age, gestational age, height, weight, BMI, parity, gravidity, hemoglobin levels, serum ferritin levels, previous history of preterm birth, booking status, mode of admission, educational status, residential area, and socioeconomic background. Statistical analysis was performed using SPSS version 26.0, and associations were assessed using Chi-square tests at a 5% level of significance.

Results: Out of 212 participants, 145 (68.4%) were anemic. The mean maternal age was 27.4 ± 2.45 years, mean BMI was 24.31 ± 1.61 kg/m², and mean hemoglobin level was 9.74 ± 1.46 g/dL. The mean gestational age was 36.2 ± 1.42 weeks. Significant associations were observed between anemia and booking status (p=0.02), education level (p=0.031), socioeconomic status (p=0.01), history of previous preterm birth (p=0.04), and low birth weight delivery (p=0.03).

Conclusion: A high prevalence of maternal anemia was identified, with significant associations observed with socioeconomic, educational, and obstetric factors. Focused antenatal interventions and nutritional education are crucial to reduce anemia-related risks in full-term pregnancies.

Keywords: Anemia, Ferritins, Maternal Health, Parity, Pregnancy Complications, Pregnancy Trimester Third, Socioeconomic Factors.

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INTRODUCTION

Anemia during pregnancy is a significant global public health issue, particularly in low- and middle-income countries where nutritional deficiencies are prevalent. Among these, Pakistan bears a substantial burden, with maternal anemia being both widespread and under-addressed (1). The primary cause is iron deficiency, driven by the increased physiological demands of pregnancy. As the maternal body adapts to support fetal growth, blood volume expands considerably, raising the requirement for micronutrients such as iron (2). Hemoglobin, the iron-containing protein in red blood cells, plays a vital role in oxygen transport; insufficient iron stores lead to iron deficiency anemia, a condition that impairs oxygen delivery to both maternal and fetal tissues (3). South Asia, home to roughly 25% of the world's population, continues to grapple with a high prevalence of anemia, with pregnant women among the most vulnerable groups (4,5). The highest rates are observed in Africa and Southeast Asia, where nutritional inadequacies, infections, and inadequate prenatal care intersect to exacerbate the condition (6). The World Health Organization (WHO) estimates that while anemia affects about 14% of pregnant women in high-income countries, the figure can soar to 51% in developing regions. Such disparities highlight stark inequities in maternal health outcomes and access to care (7).

Although pregnancy complications are well-recognized contributors to adverse birth outcomes such as low birth weight (LBW), the specific role of maternal anemia in influencing the risk of preterm delivery and intrauterine growth restriction remains an area of ongoing debate (8). Some studies suggest a correlation between maternal anemia and these outcomes, while others report inconsistent findings, reflecting the complexity of contributing factors and differences in study design (9). Nonetheless, LBW—whether due to prematurity or restricted fetal growth—is unequivocally associated with increased neonatal morbidity and mortality, underlining the need to address preventable maternal risk factors like anemia (10). Despite growing global recognition of maternal anemia as a health priority, local data on its prevalence and determinants among full-term pregnancies remain insufficient, particularly in specialized healthcare settings. To fill this gap, the present study aims to determine the prevalence and associated factors of anemia among women with full-term pregnancies receiving care at a specialist hospital, with the broader goal of informing targeted interventions and enhancing maternal-fetal outcomes.

METHODS

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU), Larkana, over a six-month period from January 2022 to June 2022. The study aimed to assess the prevalence and contributing factors of maternal anemia in women presenting for delivery. A total of 212 participants were recruited using a non-probability consecutive sampling technique, which allowed for the inclusion of all eligible women presenting during the study period. Ethical approval was obtained from the Institutional Ethical Review Committee of SMBBMU, Larkana, and permission was secured from the College of Physicians and Surgeons Pakistan prior to initiation of the study. All participants provided informed written consent before enrollment. Pregnant women aged between 20 and 45 years with a confirmed singleton pregnancy and gestational age ranging from 37 to 42 weeks—verified via ultrasonography—were eligible for inclusion. The study population included both booked and unbooked cases, irrespective of parity or gravidity, provided that participants consented voluntarily. Women were excluded if they had pre-existing medical conditions known to influence hemoglobin levels, such as chronic kidney disease or hematological disorders. Additional exclusion criteria included multiple pregnancies confirmed on ultrasound, high-risk pregnancies due to complications such as preeclampsia or gestational diabetes, and any history of substance abuse during pregnancy, as these could confound the relationship between anemia and pregnancy outcomes (6,11).

Following consent, a comprehensive clinical assessment was carried out for each participant. This included detailed history taking and a complete general physical examination. Data were collected by the principal investigator and included maternal age, gestational age, height (m), weight (kg), body mass index (BMI), parity, gravidity, hemoglobin (Hb) levels, serum ferritin levels, previous history of preterm birth, residential status (urban or rural), educational background, socio-economic status, and mode of hospital admission. All gestational data were verified through ultrasonography, and biochemical parameters were assessed through standard laboratory protocols. Data entry and statistical analysis were performed using SPSS version 26.0. The normality of continuous variables was evaluated using the Shapiro-Wilk test, with a threshold of $P > 0.05$ indicating normal distribution. For normally distributed variables,

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mean and standard deviation (SD) were reported, while for skewed data, medians with interquartile ranges were presented. Categorical variables were expressed as frequencies and percentages. The association between maternal anemia and low birth weight was analyzed using the Chi-square test, with a p-value < 0.05 considered statistically significant.

RESULTS

The study included 212 pregnant women, with a mean maternal age of 27.4 ± 2.45 years. The mean body mass index (BMI) was 24.31 ± 1.61 kg/m², and the average gestational age at delivery was 36.2 ± 1.42 weeks. Participants had a mean hemoglobin level of 9.74 ± 1.46 g/dL, while the mean height and weight were 1.57 ± 0.34 meters and 62.34 ± 3.87 kilograms, respectively. The average gravidity and parity were 3.4 ± 0.11 and 3.2 ± 0.21. Among the total participants, 144 women (67.92%) presented through the emergency department, whereas 68 (32.08%) reported through the outpatient department. A majority of the women, 164 (77.36%), were unbooked cases, and only 48 (22.64%) had received any form of antenatal care. In terms of residential status, 146 (68.87%) belonged to rural areas, while 66 (31.13%) resided in urban settings. Educational attainment varied notably, with 109 women (51.42%) reporting no formal education, 44 (20.75%) having completed primary education, 32 (15.09%) with secondary education, 19 (8.96%) having studied up to the intermediate level, and only 8 participants (3.77%) holding graduate or higher qualifications.

Socioeconomic classification revealed that more than half of the participants, 108 (50.94%), belonged to poor-income families (monthly income < PKR 50,000), followed by 90 (42.45%) in the middle-income bracket, and 14 (6.60%) from high-income households. A total of 34 women (16.04%) had a history of previous preterm birth. Low birth weight (LBW) neonates were delivered by 91 participants (42.92%). Maternal anemia was prevalent in 145 women (68.4%), while 67 (31.60%) were non-anemic. The chi-square test of association revealed statistically significant relationships between maternal anemia and several socio-demographic and clinical factors. Booking status showed a strong association ($p = 0.02$), with anemia more prevalent among unbooked women. Similarly, level of education was significantly linked to anemia ($p = 0.031$), with a higher proportion of anemic women among those lacking formal education. Socioeconomic status also showed a significant association ($p = 0.01$), with higher anemia rates in lower-income groups. History of previous preterm birth was another associated factor ($p = 0.04$), as was the delivery of low birth weight neonates ($p = 0.03$). No statistically significant associations were found between anemia and mode of admission ($p = 0.23$) or residential status ($p = 0.12$).

The analysis of serum ferritin levels—a key biomarker for assessing iron stores—was crucial in distinguishing iron deficiency anemia from other etiologies. The mean serum ferritin level among the study participants was found to be 13.6 ± 4.2 ng/mL, which is notably lower than the standard reference range for pregnant women, typically considered to be above 15 ng/mL. These values are indicative of depleted iron stores in the majority of cases. Given that 68.4% of the women in the study were anemic, and with serum ferritin levels falling below the threshold for iron sufficiency, it is highly suggestive that iron deficiency was the predominant cause of anemia in this cohort. Further analysis was conducted to stratify serum ferritin levels based on maternal anemia status, offering more nuanced insight into the etiology of anemia among the participants. Among the 145 anemic women, the mean serum ferritin level was markedly low at 11.2 ± 3.7 ng/mL, reinforcing the diagnosis of iron deficiency anemia as the primary underlying cause. In contrast, the 67 non-anemic women exhibited a higher mean serum ferritin level of 18.9 ± 3.4 ng/mL, which falls within the normal range for pregnant women. This stratification confirms that the majority of anemia cases were indeed related to iron depletion rather than alternative hematologic or chronic causes. These findings underscore the importance of incorporating ferritin screening into routine antenatal assessments, especially in regions where nutritional anemia remains highly prevalent.

Table 1: Descriptive Statistics of the Study Participants

Variable	Mean	SD
Maternal Age	27.4	2.45
Height:(m)	1.57	0.34
BMI (kg/m2)	24.31	1.61
Gravidity	3.4	0.11
Gestational Age (weeks)	36.2	1.42
Weight (kg)	62.34	3.87
Parity	3.2	0.21

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Variable	Mean	SD
Hb Level (g/dl)	9.74	1.46

Table 2: Frequency Distribution of the Study participants based on Socio-demographic Factors

Variable	Freq	%
MODE OF ADMISSION		
Emergency	144	67.92
OPD	68	32.08
BOOKING STATUS		
Booked	48	22.64
Un-booked	164	77.36
RESIDENTIAL STATUS		
Urban	66	31.13
Rural	146	68.87
EDUCATIONAL STATUS		
No formal Education	109	51.42
Primary	44	20.75
Secondary	32	15.09
Intermediate	19	8.96
Graduate and above	8	3.77
SOCIO-ECONOMIC STATUS		
Poor (Family Income < 50,000)	108	50.94
Middle (Family Income 500,01 to 150,000)	90	42.45
Upper (Family Income > 150,000)	14	6.60
PREVIOUS H/O PRETERM BIRTH		
Yes	34	16.04
No	178	83.96
ANAEMIA		
Yes	145	68.4
No	67	31.60
LOW BIRTH WEIGHT		
Yes	91	42.92
No	121	57.08

Table 3: Chi Square Test of Association between Maternal Anemia and Sociodemographic Factors

Sociodemographic Factors			Maternal Anemia		P Value
			Yes (145)	No (67)	
MODE OF ADMISSION	Freq.	%	Freq.	Freq.	
Emergency	144	67.92	98	46	0.23
OPD	68	32.08	47	21	
BOOKING STATUS					
Booked	48	22.64	16	32	0.02
Un-booked	164	77.36	129	35	

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Sociodemographic Factors			Maternal Anemia		P Value
			Yes (145)	No (67)	
RESIDENTIAL STATUS					
Urban	66	31.13	28	38	0.12
Rural	146	68.87	117	29	
EDUCATIONAL STATUS					
No formal Education	109	51.42	83	26	0.031
Primary	44	20.75	33	11	
Secondary	32	15.09	15	17	
Intermediate	19	8.96	9	10	
Graduate and above	8	3.77	5	3	
SOCIO-ECONOMIC STATUS					
Poor (Family Income < 50,000)	108	50.94	82	26	0.01
Middle (Family Income 500,01 to 150,000)	90	42.45	58	32	
Upper (Family Income > 150,000)	14	6.60	5	9	
PREVIOUS H/O PRETERM BIRTH					
Yes	34	16.04	24	10	0.04
No	178	83.96	121	57	
LOW BIRTH WEIGHT					
Yes	91	42.92	53	38	0.03
No	121	57.08	92	29	

Table 4: Overall and Anemia-Stratified Serum Ferritin Levels Among Study Participants

Anemia Status	Mean Serum Ferritin (ng/mL)	SD
Overall	13.6	4.2
Anemic	11.2	3.7
Non-Anemic	18.9	3.4

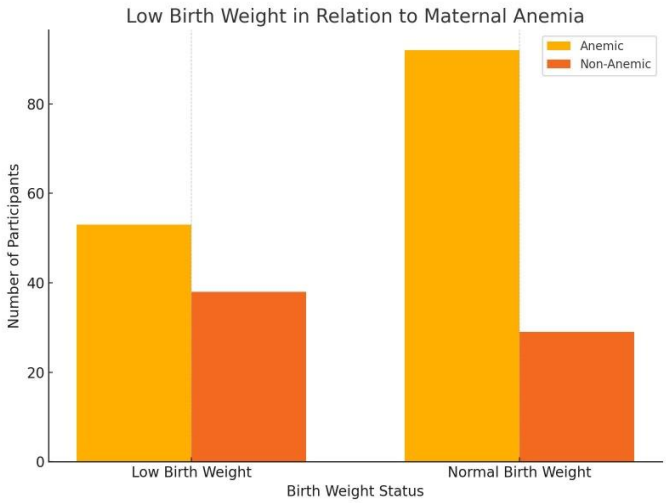


Figure 2 Low Birth Weight in Relation to Maternal Anemia

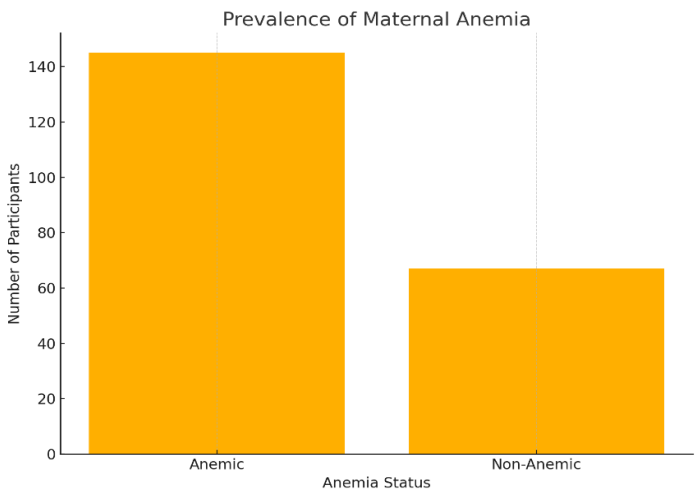


Figure 1 Prevalence of Maternal Anemia

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DISCUSSION

The present study revealed a notably high prevalence of maternal anemia, with 68.4% of the participants found to be anemic. This aligns with global estimates from the World Health Organization, which report that at least half of all pregnant women are affected by anemia and approximately 30% of the world's population suffers from this condition (12). The prevalence in this cohort, although slightly lower than in some regional studies reporting rates up to 98%, still reflects a significant public health concern (12,14). Comparatively, some investigations conducted in similar socioeconomic and geographic settings have reported anemia prevalence ranging from 18% to as high as 80%, suggesting that environmental, nutritional, and healthcare access factors play a critical role in this variation (15). The current findings are consistent with broader regional trends and reaffirm the urgent need for improved maternal nutrition and health interventions. The predominance of anemia among unbooked, rural-dwelling, and poorly educated women further highlights the multifaceted nature of maternal health disparities. In this study, only 22.64% of participants had received any form of antenatal booking, while 68.87% resided in rural areas with limited access to quality healthcare. A considerable proportion of women, 51.42%, reported no formal education, and half of the participants belonged to low-income households. These factors, collectively, were found to have significant associations with maternal anemia. Socioeconomic constraints, lack of awareness, and limited healthcare accessibility likely contributed to delayed or inadequate antenatal care, thereby exacerbating anemia prevalence. These observations reflect similar patterns reported in previous studies across South Asia, where anemia is especially widespread due to persistent structural barriers and nutritional deficiencies (16,17).

Furthermore, the study demonstrated a significant association between maternal anemia and adverse pregnancy outcomes, particularly low birth weight (LBW), which was observed in 42.92% of cases. This is higher than the proportion reported in some nearby settings, where LBW rates in term pregnancies were reported at 29.2% (18). The relationship between anemia and LBW may be attributed to impaired oxygen and nutrient delivery to the fetus, a known consequence of iron deficiency anemia. The stratification of serum ferritin levels reinforced the central role of iron deficiency, with anemic women exhibiting mean ferritin levels well below the diagnostic threshold for iron sufficiency. In contrast, non-anemic women had ferritin levels within the normal range, strongly indicating that iron depletion was the principal etiology behind the anemia observed in this population (19). A major strength of this study lies in its targeted focus on full-term pregnancies and the incorporation of objective laboratory markers, such as serum ferritin, which helped establish iron deficiency as a key underlying factor. Additionally, the inclusion of socio-demographic variables allowed for a comprehensive assessment of associated risk factors. However, the cross-sectional nature of the study limits causal inferences, and the single-center design may reduce generalizability to other populations.

Future studies would benefit from longitudinal designs to assess the progression of anemia throughout pregnancy, incorporating detailed dietary assessments, compliance with iron supplementation, and more diverse populations. Additionally, evaluating healthcare utilization patterns could provide actionable data to improve maternal health service delivery. Despite these limitations, the findings underscore the urgent need for enhanced antenatal care coverage, especially in rural and socioeconomically disadvantaged populations. Promoting early booking, routine screening for anemia, and nutritional education remains critical for reducing maternal anemia and its associated complications. In the broader context, maternal anemia continues to be a pressing concern in low-resource settings like Pakistan, which remains one of the top ten contributors to global maternal mortality. The persistent challenges in reducing maternal deaths are intricately linked to poor health infrastructure, inadequate data systems, and deeply rooted socioeconomic inequalities (20). Addressing maternal anemia must therefore be prioritized through integrated public health strategies that combine nutritional interventions, community awareness, and systemic healthcare improvements.

CONCLUSION

The study concluded that maternal anemia remains a critical concern, closely linked to socioeconomic disadvantage, low educational attainment, lack of antenatal care, prior preterm births, and low birth weight outcomes. These findings emphasize the urgent need for early, targeted interventions aimed at improving maternal nutrition and health literacy. Empowering women of reproductive age through nutritional education—particularly regarding iron-rich diets and factors influencing iron absorption—can play a pivotal role in prevention. Strengthening antenatal care services and community-level awareness programs can significantly reduce the burden of anemia and improve both maternal and neonatal health outcomes.

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Author Contribution

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Shaista Hifaz Abro	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Parial Shahani	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Lubna Naz	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

REFERENCES

1. Cole AA, Wagner SM, Gupta M. Sickle Cell Crises in Pregnancy: Fetal and Neonatal Implications. Neoreviews. 2023;24(7):e452-e7.
2. Shah AA, Donovan K, Seeley C, Dickson EA, Palmer AJR, Doree C, et al. Risk of Infection Associated With Administration of Intravenous Iron: A Systematic Review and Meta-analysis. JAMA Netw Open. 2021;4(11):e2133935.
3. Sundararajan S, Rabe H. Prevention of iron deficiency anemia in infants and toddlers. Pediatr Res. 2021;89(1):63-73.
4. Baer RJ, Bandoli G, Jelliffe-Pawlowski LL, Rhee KE, Chambers CD. Pregnancies complicated by bulimia nervosa are at increased risk of chorioamnionitis, anemia, and preterm birth. Am J Obstet Gynecol. 2024;231(2):e57-e66.
5. Ramos JG, Leavitt AD, Rosenstein MG. Phlebitis After Intravenous Iron Sucrose Administration in Postpartum Women. Obstet Gynecol. 2020;136(1):167-9.
6. Zhang J, Li Q, Song Y, Fang L, Huang L, Sun Y. Nutritional factors for anemia in pregnancy: A systematic review with meta-analysis. Front Public Health. 2022;10:1041136.
7. Lewi L. Monochorionic diamniotic twins: What do I tell the prospective parents? Prenat Diagn. 2020;40(7):766-75.
8. Yang Y, Hou Y, Wang H, Gao X, Wang X, Li J, et al. Maternal Thyroid Dysfunction and Gestational Anemia Risk: Meta-Analysis and New Data. Front Endocrinol (Lausanne). 2020;11:201.
9. Montoro-Huguet MA, Santolaria-Piedrafita S, Cañamares-Orbis P, García-Erce JA. Iron Deficiency in Celiac Disease: Prevalence, Health Impact, and Clinical Management. Nutrients. 2021;13(10).
10. Ugwu NI, Uneke CJ. Iron deficiency anemia in pregnancy in Nigeria-A systematic review. Niger J Clin Pract. 2020;23(7):889-96.
11. Licht C, Al-Dakkak I, Anokhina K, Isbel N, Frémeaux-Bacchi V, Gilbert RD, et al. Characterization of patients with aHUS and associated triggers or clinical conditions: A Global aHUS Registry analysis. Nephrology (Carlton). 2024;29(8):519-27.
12. Zhao B, Sun M, Wu T, Li J, Shi H, Wei Y. The association between maternal anemia and neonatal anemia: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2024;24(1):677.
13. JAHAN E, JABEEN A, IMTIAZ R, KHALID S, JAVAID S, KHAN M. Prevalence of Anemia in Pregnant Women Visiting Abbasi Shaheed Hospital: a cross Sectional Study. 2021.
14. Shah T, Warsi J, Laghari Z. Effect of Maternal Anemia on the Anthropometric Indices of Newborn. Journal of Liaquat University of Medical & Health Sciences. 2020;19(03):191-

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15. Shahani MP, Humayun A, Shaikh Z, Siddiqui I, Khoso MH, Naz S, Siyal FJ, Unar K, Unar AA, Saleem R, Advani RS. Obesity associated hypertension in university staff at SMBBMU Larkana, Pakistan. Journal of Pharmaceutical Research International. 2021 Apr 3;33(20A):39-43.
16. Shahani MP, Gemnani VK, Abro K, Shaikh AR, Jokhio SA, Jamro FS. Maternal Age and Low Birth Weight in Sindh Province: A Cross Sectional Survey. InMedical Forum Monthly 2022 (Vol. 33, No. 3).
17. Baldi A, Pasricha SR. Anaemia: Worldwide Prevalence and Progress in Reduction. InNutritional Anemia 2022 Dec 16 (pp. 3-17). Cham: Springer International Publishing.
18. Pradhan N, Tamrakar SR, Karmacharya SB. Effect of anaemia in pregnancy and its perinatal outcome: a prospective cohort study. J Lumbini Med Coll. 2021;9(2):6.
19. Jamshed S, Khan F, Begum A, Ali BB, Akram Z, Ariff M. Frequency of low birth weight and its relationship with maternal nutritional and dietary factors: a cross-sectional study. *Cureus*. 2020 Jun 21;12(6)
20. 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.

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