

PREVALENCE AND ETIOLOGICAL FACTORS OF MISCARRIAGE AMONG WOMEN OF REPRODUCTIVE AGE IN KOHAT

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ABSTRACT

Background: Miscarriage is a common complication of pregnancy, but district-level evidence from Kohat, Khyber Pakhtunkhwa (KPK), Pakistan, is limited. This study describes selected infectious, haematological, metabolic and obstetric characteristics among women presenting with confirmed pregnancy loss.

Methods: A hospital-based descriptive study included 50 women aged 15–49 years with confirmed intrauterine pregnancy loss up to 23 weeks. Data included obstetric ultrasound, haemoglobin, random blood sugar, blood pressure, ABO/Rh status, Brucella serology, Toxoplasma IgG/IgM, hepatitis B surface antigen and anti-HCV. Descriptive statistics, Wilson 95% confidence intervals, chi-square/Fisher exact tests, Mann–Whitney U, Kruskal–Wallis and Spearman correlation were used.

Results: Missed abortion was the most frequent ultrasound classification (40.0%), and 80.0% of losses occurred in the first trimester. Toxoplasma IgG or IgM positivity was 36.0%, Brucella titres $\geq 1:160$ were 34.0%, Rh-negative status 20.0%, anaemia 16.0%, elevated random blood sugar 16.0%, recurrent miscarriage 16.0%, anti-HCV positivity 14.0%, and hypertension 12.0%. No tested categorical association with miscarriage subtype was statistically significant ($p > .05$).

Conclusion: Infectious seropositivity and several maternal health factors were common among women presenting with pregnancy loss in Kohat. Because this was a small, facility-based cohort without a non-miscarriage comparison group, the findings describe the recruited cohort and do not establish population prevalence or causation.

Keywords: Miscarriage, Pregnancy loss, Brucella, Toxoplasma, hepatitis C, Anemia, Kohat.

1. Introduction

Miscarriage is among the most frequent adverse outcomes of pregnancy. Clinically recognised pregnancy loss affects approximately 10%–20% of pregnancies, with the majority occurring early in gestation (Quenby et al., 2021). Causes are heterogeneous and include chromosomal abnormalities, maternal age, uterine

abnormalities, endocrine and metabolic disorders, infection and other maternal factors (Goddijn & Leschot et al, 2000; Regan & Rai et al., 2000).

Maternal age is an established determinant of fetal loss, with risk increasing substantially at older reproductive ages (Nybo Andersen et al., 2000). In low- and middle-income settings,

infectious diseases and nutritional disorders may add potentially modifiable risks. Brucellosis is relevant in livestock-exposed communities because human infection can involve pregnancy and the placenta (Corbel et al., 2006). Toxoplasma gondii is another important infection because primary maternal infection may result in congenital infection and adverse fetal outcomes (Montoya & Liesenfeld et al., 2004).

Pakistan also carries a substantial burden of hepatitis C infection (Blach et al., 2017), while anaemia remains an important maternal health problem globally and in South Asia (Milman et al, 2011). The supplied thesis identified limited district-level evidence describing these factors among women with pregnancy loss in Kohat. This study therefore presents a concise analysis of the reported clinical and laboratory profile.

2. Methods

2.1 Design and participants

This hospital based cross-sectional descriptive study enrolled 50 women aged 15–49 years with confirmed intrauterine pregnancy loss up to 23 completed weeks. Participants were recruited from hospitals, maternity clinics and associated diagnostic laboratories in Kohat. Women with ectopic pregnancy, induced abortion, gestational trophoblastic disease, inability/unwillingness to consent, or age outside the specified range were excluded.

2.2 Measurements

Data included demographic and obstetric history, symptoms, blood pressure, complete blood count, random blood sugar, ABO/Rh

group, Brucella Standard Tube Agglutination Test, Toxoplasma IgG/IgM by ELISA, HBsAg, anti-HCV and obstetric ultrasound. The study classified a Brucella titre $\geq 1:160$ as significant.

2.3 Statistical analysis

IBM SPSS Statistics version 25 was used. Continuous variables were summarised with means, standard deviations and medians; categorical variables with frequencies, percentages and Wilson 95% confidence intervals. Chi-square or Fisher exact tests assessed categorical associations; Mann-Whitney U and Kruskal-Wallis tests assessed non-parametric group differences; and Spearman rho assessed correlations. Statistical significance was set at $p < .05$.

2.4 Ethics

Ethical approval was obtained from the ethical committee of Kohat University of Science and Technology and written informed consent was also obtained from participants.

3. Results

3.1 Participant profile

All 50 participants had confirmed pregnancy loss. Age was recorded for 36 participants and had a mean of 30.11 years (SD = 5.31; range 20–38). Mean gestational age was 9.76 weeks (SD = 3.20). Among 40 participants with blood-pressure data, mean systolic and diastolic pressures were 116.25 and 75.00 mmHg, respectively. Mean haemoglobin among 27 participants with results was 11.54 g/dL (SD = 1.54). Mean random blood sugar among 26 participants was 102.73 mg/dL (SD = 11.62).

Table 1. Selected characteristics of the cohort.

Characteristic	n	Mean (SD) / %
Age, years	36	30.11 (5.31)
Gestational age, weeks	50	9.76 (3.20)
Systolic BP, mmHg	40	116.25 (9.32)
Diastolic BP, mmHg	40	75.00 (7.84)
Haemoglobin, g/dL	27	11.54 (1.54)
Random blood sugar, mg/dL	26	102.73 (11.62)

3.2 Miscarriage pattern

Missed abortion was the most common ultrasound classification (20/50, 40.0%; 95% CI [27.6%, 53.8%]), followed by incomplete abortion (11/50, 22.0%), blighted

ovum/anembryonic pregnancy (8/50, 16.0%), early pregnancy failure (6/50, 12.0%), early intrauterine pregnancy with an incidental finding (4/50, 8.0%) and post-abortion retained products (1/50, 2.0%). First-trimester losses

accounted for 40/50 (80.0%; 95% CI [67.0%, 88.8%]).

Table 2. Miscarriage classification and timing.

Miscarriage classification	n	%
Missed abortion	20	40.0
Incomplete abortion	11	22.0
Blighted ovum/anembryonic	8	16.0
Early pregnancy failure	6	12.0
Early IUP + incidental finding	4	8.0
Retained products	1	2.0
First trimester	40	80.0
Second trimester	10	20.0

3.3 Symptoms and investigated factors

Vaginal bleeding or spotting was reported by 45 participants (90.0%), while lower abdominal/cramping pain occurred in 26 (52.0%). Backache occurred in 13 (26.0%), dizziness/weakness/shortness of breath in 12 (24.0%), and nausea/vomiting in 5 (10.0%). Toxoplasma IgG or IgM positivity occurred in 18 participants (36.0%; 95% CI [24.1%,

49.9%]); IgM positivity was 14.0%. Brucella titres $\geq 1:160$ occurred in 17 (34.0%; 95% CI [22.4%, 47.8%]). Rh-negative status was documented in 10 (20.0%), anaemia in 8 (16.0%), random blood sugar >110 mg/dL in 8 (16.0%), recurrent miscarriage in 8 (16.0%), anti-HCV positivity in 7 (14.0%), and hypertension in 6 (12.0%).

Table 3. Selected infectious and maternal health findings.

Factor	n	% of total cohort
Toxoplasma IgG or IgM positive	18	36.0
Brucella $\geq 1:160$	17	34.0
Rh negative	10	20.0
Anaemia	8	16.0
RBS >110 mg/dL	8	16.0
Recurrent miscarriage	8	16.0
HCV antibody positive	7	14.0
Hypertension	6	12.0

3.4 Statistical associations

No tested categorical association between individual factors and miscarriage subtype reached statistical significance. Brucella status was not associated with miscarriage subtype ($\chi^2 = 3.313$, $df = 4$, $p = .507$), nor was Toxoplasma status ($\chi^2 = 1.543$, $df = 4$, $p = .819$). Hypertension, anaemia, age group, ABO blood group, Rh status and HCV status were also non-significant ($p > .05$). Fisher exact tests found no significant associations between Brucella and trimester (OR = 0.729, $p = 1.000$), Toxoplasma and trimester (OR = 1.357, $p = .713$), or recurrent miscarriage and Brucella status (OR = 0.656, $p = 1.000$). Kruskal-Wallis tests found no significant differences in age or gestational age across

miscarriage types. Spearman analysis identified a strong positive correlation between systolic and diastolic blood pressure ($\rho = .982$, $p < .001$), a moderate positive correlation between age and blood sugar ($\rho = .344$), and a moderate negative correlation between haemoglobin and gravida ($\rho = -.369$).

4. Discussion

The principal finding was that most pregnancy losses occurred during the first trimester, consistent with the established epidemiology of miscarriage (Quenby et al., 2021). Missed abortion represented the largest subtype in this cohort. The study also found relatively frequent Toxoplasma and Brucella seropositivity. The Toxoplasma result should be interpreted cautiously. IgG positivity generally indicates

previous exposure, whereas IgM may occur with recent infection but does not alone establish primary infection during the current pregnancy. Thus, the observed 36.0% seropositivity indicates exposure in this cohort rather than proof that Toxoplasma caused the losses (Montoya & Liesenfeld et al., 2004).

Brucella titres $\geq 1:160$ were found in 34.0% of participants. Given the importance of livestock exposure in many communities, this finding is clinically relevant and biologically plausible because brucellosis can involve pregnancy and placental tissues (Corbel et al, 2006). However, without a control group of pregnant women without pregnancy loss, the attributable contribution of Brucella cannot be determined. Anaemia was present in 16.0% of the total cohort and represented 29.6% of those with recorded haemoglobin values. The observed inverse correlation between haemoglobin and gravida may indicate an association between increasing reproductive burden and lower haemoglobin, but the small number of complete observations prevents causal interpretation (Milman et al, 2011). HCV antibody positivity was 14.0%, although only a small subset was tested; this finding should therefore be interpreted as descriptive rather than as an estimate of prevalence in pregnant women in Kohat (Blach et al., 2017).

The lack of statistically significant associations is likely influenced by the small sample size and missing observations. Importantly, statistical non-significance does not demonstrate absence of an effect. The study is best regarded as hypothesis-generating and useful for planning larger investigations.

A key methodological point is that all participants had already experienced pregnancy loss. Therefore, the study cannot calculate the population prevalence of miscarriage because the denominator of all pregnancies or women at risk is unavailable. The frequencies reported here describe the recruited miscarriage cohort, not the prevalence of miscarriage in the general population.

5. Conclusion

Among women presenting with confirmed pregnancy loss in Kohat, missed abortion was the most common subtype and 80.0% of losses occurred in the first trimester. Toxoplasma

seropositivity and Brucella titres $\geq 1:160$ were the most frequent investigated infectious findings, while Rh-negative status, anaemia, elevated random blood sugar, recurrent miscarriage, HCV antibody positivity and hypertension were also observed. No tested factor showed a statistically significant association with miscarriage subtype. Larger controlled prospective studies are required to determine whether these factors independently contribute to pregnancy loss.

6. Recommendations

- Larger prospective or case-control studies should include a comparison group of women with viable pregnancies.
- Future studies should reduce missing data and collect complete information on obstetric, nutritional, metabolic, infectious and exposure variables.
- Toxoplasma and Brucella serology should be interpreted with clinical findings and confirmatory testing where appropriate rather than assumed to demonstrate causation.
- Routine antenatal care should emphasise evidence-based assessment and management of anaemia, blood pressure, glucose abnormalities, hepatitis C and Rh status.
- Community prevention should address safe food handling and livestock-related exposure to reduce zoonotic infection risks.

References

- Blach, S., Zeuzem, S., Manns, M., Altraif, I., Duberg, A. S., Muljono, D. H., & Razavi, H. (2017). Global prevalence and genotype distribution of hepatitis C virus infection in 2015: A modelling study. *The Lancet Gastroenterology & Hepatology*, 2(3), 161–176. [https://doi.org/10.1016/S2468-1253\(16\)30181-9](https://doi.org/10.1016/S2468-1253(16)30181-9)
- Corbel, M. J. (2006). Brucellosis in humans and animals. World Health Organization.
- Goddijn, M., & Leschot, N. J. (2000). Genetic aspects of miscarriage. *Baillière's Best Practice & Research Clinical Obstetrics & Gynaecology*, 14(5), 855–865. <https://doi.org/10.1053/beog.2000.0124>

- Milman, N. (2011). Anemia still a major health problem in many parts of the world! *Annals of Hematology*, 90(4), 369–377. <https://doi.org/10.1007/s00277-010-1144-5>
- Montoya, J. G., & Liesenfeld, O. (2004). Toxoplasmosis. *The Lancet*, 363(9425), 1965–1976. [https://doi.org/10.1016/S0140-6736\(04\)16412-X](https://doi.org/10.1016/S0140-6736(04)16412-X)
- Nybo Andersen, A. M., Wohlfahrt, J., Christens, P., Olsen, J., & Melbye, M. (2000). Maternal age and fetal loss: Population based register linkage study. *BMJ*, 320(7251), 1708–1712. <https://doi.org/10.1136/bmj.320.7251.1708>
- Quenby, S., Gallos, I. D., Dhillon-Smith, R. K., Posadas, M., Brosens, J. J., & Coomarasamy, A. (2021). Miscarriage matters: The epidemiological, physical, psychological, and economic costs of early pregnancy loss. *The Lancet*, 397(10285), 1658–1667. [https://doi.org/10.1016/S0140-6736\(21\)00682-6](https://doi.org/10.1016/S0140-6736(21)00682-6)
- Regan, L., & Rai, R. (2000). Epidemiology and the medical causes of miscarriage. *Baillière's Best Practice & Research Clinical Obstetrics & Gynaecology*, 14(5), 839–854. <https://doi.org/10.1053/beog.2000.0123>