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MATERNAL RISK FACTORS AND FETO-MATERNAL OUTCOMES IN PREGNANCIES COMPLICATED BY OLIGOHYDRAMNIOS: A PROSPECTIVE OBSERVATIONAL STUDY AT A RURAL TERTIARY CARE TEACHING HOSPITAL

Obstetrics & Gynaecology

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ABSTRACT

Oligohydramnios is a relatively common obstetric condition associated with increased maternal intervention and adverse perinatal outcomes. It often reflects placental insufficiency, fetal compromise, or maternal comorbidities and therefore requires careful antenatal surveillance and timely obstetric intervention. Although numerous studies have evaluated pregnancy outcomes in oligohydramnios, evidence regarding the contribution of individual maternal risk factors, particularly in rural tertiary care settings, remains limited.A prospective observational study was conducted involving 100 pregnant women diagnosed with oligohydramnios after fetal viability and managed at a rural tertiary care teaching hospital. Maternal demographic characteristics, obstetric profile, associated maternal risk factors, serial fetal surveillance findings, mode of delivery, birth weight, neonatal intensive care unit (NICU) admission, and neonatal outcomes were recorded using a structured proforma. Statistical analysis was performed using appropriate descriptive and inferential statistical methods.The mean maternal age was 28.88 years. Primigravidae constituted 43% of the study population, while 57% were multigravidae. Previous lower segment caesarean section, gestational diabetes mellitus, pregnancy-induced hypertension, Rh-negative pregnancy, postdated pregnancy, hypothyroidism, and maternal anemia were among the common associated maternal risk factors. Caesarean section was the predominant mode of delivery (57%), followed by full-term normal vaginal delivery (32%). The mean neonatal birth weight was 2.65 kg, and 30% of neonates required NICU admission. Maternal risk factors frequently coexisted, necessitating individualized obstetric management. Oligohydramnios was associated with increased operative delivery and significant neonatal morbidity requiring specialized neonatal care

KEYWORDS

Oligohydramnios, Amniotic Fluid Index, Maternal Risk Factors, Fetomaternal Outcome

INTRODUCTION

Amniotic fluid is a dynamic and essential component of the intrauterine environment that plays a pivotal role in normal fetal growth and development. It provides mechanical protection to the fetus, facilitates musculoskeletal development, allows unrestricted fetal movements, maintains thermal stability, and contributes to pulmonary and gastrointestinal maturation. The volume of amniotic fluid changes progressively throughout pregnancy and reflects the complex interaction between fetal urine production, fetal swallowing, intramembranous absorption, and transmembranous exchange. Any disturbance in this physiological equilibrium may result in abnormalities of amniotic fluid volume, among which oligohydramnios remains one of the most clinically significant conditions.

Oligohydramnios is commonly defined as an amniotic fluid index (AFI) of **≤5 cm** or a single deepest vertical pocket measuring **<2 cm** on ultrasonography. The reported incidence varies between **1% and 5%** of all pregnancies, depending on the gestational age, population studied, and diagnostic criteria employed. Although isolated oligohydramnios may occur in otherwise uncomplicated pregnancies, it is frequently associated with maternal disorders, placental insufficiency, fetal anomalies, prolonged pregnancy, rupture of membranes, and fetal growth restriction.

The pathophysiology of oligohydramnios is multifactorial. Reduced uteroplacental perfusion secondary to maternal disorders such as pregnancy-induced hypertension, chronic hypertension, diabetes mellitus, autoimmune diseases, and severe anemia may diminish fetal renal perfusion and consequently reduce fetal urine production, which constitutes the major source of amniotic fluid during the second half of pregnancy. Placental dysfunction, premature rupture of membranes, congenital fetal urinary tract anomalies, and certain medications such as angiotensin-converting enzyme inhibitors may also contribute to reduced amniotic fluid volume. In many pregnancies, however, oligohydramnios develops without an identifiable cause, posing challenges in clinical decision-making.

From an obstetric perspective, oligohydramnios is important because it has consistently been associated with increased maternal and perinatal morbidity. Reduced liquor volume predisposes to umbilical cord compression, recurrent variable fetal heart rate decelerations, meconium-stained amniotic fluid, operative vaginal delivery, caesarean delivery for suspected fetal distress, low birth weight, neonatal intensive care unit (NICU) admission, and perinatal mortality. Nevertheless, the severity of adverse outcomes depends not only on the amniotic fluid volume but also on the presence of associated maternal risk factors, gestational age at diagnosis, fetal surveillance findings, and timely obstetric intervention.

Advances in ultrasonography and fetal surveillance have enabled earlier diagnosis and closer monitoring of pregnancies complicated by oligohydramnios. Despite these advances, the optimal management of such pregnancies remains challenging. Decisions regarding expectant management, timing of delivery, induction of labour, and mode of delivery require careful integration of maternal condition, fetal well-being, cervical status, gestational age, and associated obstetric complications. Consequently, understanding the maternal clinical profile accompanying oligohydramnios assumes considerable importance in guiding individualized management.

Several studies have evaluated pregnancy outcomes in women with oligohydramnios; however, most have primarily focused on neonatal outcomes or the predictive value of a single AFI measurement. Comparatively fewer studies have comprehensively analysed the spectrum of maternal risk factors encountered in routine obstetric practice and their influence on fetomaternal outcomes, particularly in rural tertiary care settings where referral bias, delayed presentation, nutritional deficiencies, and limited healthcare access may substantially alter the clinical profile.

A rural tertiary care teaching hospital receives a heterogeneous population of high-risk pregnancies referred from peripheral healthcare facilities. The coexistence of disorders such as previous caesarean section, pregnancy-induced hypertension, gestational diabetes mellitus, Rh-negative pregnancy, hypothyroidism, maternal anemia, and postdated pregnancy frequently complicates the management of oligohydramnios. Evaluating these associated maternal conditions is therefore essential not only for improving pregnancy outcomes but also for optimizing antenatal surveillance, counselling, and institutional resource allocation.

The present prospective observational study was undertaken to evaluate the maternal risk factors associated with oligohydramnios and to analyze their influence on fetomaternal outcomes among

pregnancies managed at a rural tertiary care teaching hospital. By identifying the predominant maternal risk factors and their relationship with obstetric interventions and neonatal outcomes, the study aims to provide clinically relevant evidence that may assist obstetricians in risk stratification, timely decision-making, and improvement of perinatal care in similar healthcare settings.

AIM

To evaluate the maternal risk factors associated with oligohydramnios and to study their influence on fetomaternal outcomes in pregnancies managed at a rural tertiary care teaching hospital.

OBJECTIVES

1. To determine the demographic and obstetric profile of women diagnosed with oligohydramnios.
2. To identify the common maternal medical and obstetric risk factors associated with oligohydramnios.
3. To evaluate fetomaternal outcomes, including mode of delivery, birth weight, NICU admission, and neonatal outcome.
4. To analyse the relationship between maternal risk factors and adverse fetomaternal outcomes.

MATERIALS AND METHODS

Study Design

This was a hospital-based prospective observational study conducted to evaluate maternal risk factors associated with oligohydramnios and their influence on fetomaternal outcomes.

Study Setting

The study was conducted in the Department of Obstetrics and Gynaecology, B.K.L. Walawalkar Rural Medical College and Hospital, Sawarde, Chiplun, Maharashtra, a rural tertiary care teaching hospital catering to referred high-risk pregnancies from surrounding primary and secondary healthcare centres.

Study Period

The study was conducted over a period of 18 months, from October 2024 to April 2026

Study Population

The study included pregnant women diagnosed with oligohydramnios who were admitted for antenatal management or delivery during the study period.

Sample Size

A total of 100 pregnant women fulfilling the inclusion criteria were enrolled consecutively after obtaining informed written consent.

Sampling Technique

Consecutive sampling was employed, wherein every eligible woman diagnosed with oligohydramnios during the study period was included until the desired sample size was achieved.

Inclusion Criteria

Pregnant women satisfying all of the following criteria were included:

- Singleton pregnancy
- Gestational age ≥28 weeks
- Ultrasonographic diagnosis of oligohydramnios (AFI ≤5 cm)
- Women willing to participate and provide informed written consent

Exclusion Criteria

Women with any of the following conditions were excluded:

- Multiple pregnancy
- Polyhydramnios
- Major fetal congenital anomalies incompatible with life
- Pregnancies with incomplete clinical records
- Women declining consent for participation

Study Procedure

After admission, each participant underwent detailed clinical evaluation using a structured case record form.
The following information was recorded:

Maternal Variables

- Maternal age
- Gravidity and parity
- Gestational age at diagnosis
- Previous obstetric history
- Previous lower segment caesarean section
- Maternal medical disorders
- Pregnancy-induced hypertension
- Gestational diabetes mellitus
- Chronic hypertension
- Hypothyroidism
- Rh-negative pregnancy
- Severe anaemia
- Postdated pregnancy
- Premature rupture of membranes
- Other associated obstetric complications

Fetal Assessment

Each woman underwent comprehensive fetal surveillance, including:

- Ultrasonographic estimation of Amniotic Fluid Index (AFI)
- Serial AFI measurements where indicated
- Non-Stress Test (NST)
- Modified Biophysical Profile (mBPP)
- Doppler velocimetry whenever clinically indicated
- Fetal presentation
- Estimated fetal weight

Clinical management was individualized according to gestational age, fetal surveillance findings, cervical favourability, maternal condition, and institutional protocol.

Maternal Outcomes

The following maternal outcomes were evaluated:

- Mode of delivery
- Induction of labour
- Requirement of caesarean section
- Indications for operative delivery
- Maternal complications during labour and delivery

Neonatal Outcomes

The neonatal outcomes assessed included:

- Birth weight
- APGAR score at 1 and 5 minutes
- Meconium-stained liquor
- Need for neonatal resuscitation
- NICU admission
- Duration of NICU stay
- Neonatal complications
- Live birth/stillbirth
- Early neonatal outcome

Data Collection

Data were entered into a predesigned Microsoft Excel spreadsheet after verification for completeness and consistency. Variables were coded before statistical analysis to minimize data-entry errors.

Statistical Analysis

- Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software version (IBM Corp., Armonk, NY, USA).
- Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR) depending on data distribution. Categorical variables were summarized as frequencies and percentages.
- The association between maternal risk factors and fetomaternal outcomes was analysed using the Chi-square test or Fisher's exact test for categorical variables. Continuous variables were compared using the Student's t-test or Mann–Whitney U test, as appropriate after assessment of normality.
- A p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee of B.K.L. Walawalkar Rural Medical College and Hospital before commencement of the study.

Written informed consent was obtained from all participants prior to enrolment. Confidentiality of patient information was maintained throughout the study by anonymizing all collected data.

RESULTS

A total of 100 pregnant women diagnosed with oligohydramnios were included in the study and analyzed.

4.1 Maternal Demographic Characteristics

The mean maternal age of the study population was 28.88 years. The majority of women belonged to the reproductive age group of 21–30 years, followed by women aged 31–35 years. Very few patients were younger than 20 years or older than 35 years.

Table 1. Maternal Demographic Profile

Variable	Observation
Total study population	100
Mean maternal age	28.88 years
Predominant age group	21–30 years

The study population predominantly comprised women in the optimum reproductive age group, reflecting the typical obstetric population attending the institution.

4.2 Obstetric Characteristics

Among the 100 women studied, **43 (43%)** were primigravidae, while **57 (57%)** were multigravida.

Table 2. Distribution According to Gravidity

Gravidity	Number	Percentage
Primigravida	43	43%
Multigravida	57	57%
Total	100	100%

Multigravida constituted the larger proportion of women diagnosed with oligohydramnios.

4.3 Maternal Risk Factors Associated with Oligohydramnios

A wide spectrum of maternal medical and obstetric risk factors was observed among women with oligohydramnios. The most frequently encountered conditions included:

- Previous lower segment caesarean section
- Gestational diabetes mellitus (GDM)
- Pregnancy-induced hypertension (PIH)
- Maternal anaemia
- Postdated pregnancy
- Hypothyroidism
- Rh-negative pregnancy

Several women had more than one coexisting maternal risk factor, emphasizing the multifactorial nature of pregnancies complicated by oligohydramnios.

Table 3. Maternal Risk Factors Identified

Maternal Risk Factor
Previous LSCS
Gestational diabetes mellitus
Pregnancy-induced hypertension
Maternal anaemia
Hypothyroidism
Rh-negative pregnancy
Postdated pregnancy
Other associated obstetric complications

Previous caesarean section, hypertensive disorders of pregnancy, and gestational diabetes were among the common high-risk conditions encountered. The coexistence of multiple maternal risk factors frequently influenced antenatal surveillance, timing of delivery, and choice of mode of delivery.

4.4 Summary of Baseline Findings

The baseline characteristics indicate that oligohydramnios in this cohort was not merely an isolated ultrasonographic finding but was commonly associated with significant maternal medical and obstetric disorders. The predominance of multigravidae and the high prevalence of associated high-risk conditions underscore the need for individualized antenatal surveillance and timely obstetric intervention.

4.5 Fetal Surveillance

Serial antenatal fetal surveillance was performed in all women according to institutional protocol. Assessment included serial amniotic fluid index (AFI), Non-Stress Test (NST), Modified Biophysical Profile (mBPP), and Doppler velocimetry whenever clinically indicated.

Abnormal fetal surveillance findings were more frequently observed in women requiring early delivery. Persistent oligohydramnios associated with non-reassuring fetal surveillance often prompted obstetric intervention to minimize the risk of fetal compromise.

Table 4. Fetal Surveillance Profile

Parameter	Observation
Serial AFI	Performed as indicated
NST	Performed in all eligible women
Modified BPP	Performed where indicated
Doppler Study	Performed in selected high-risk pregnancies

Overall, fetal surveillance played an important role in determining the timing and mode of delivery in pregnancies complicated by oligohydramnios.

4.6 Mode of Delivery

Among the 100 women studied, 57 (57%) underwent lower segment caesarean section, while 32 (32%) delivered by full-term normal vaginal delivery. The remaining women had assisted vaginal or preterm vaginal deliveries according to obstetric indications.

Table 5. Mode of Delivery

Mode of Delivery	Number	Percentage
,.Caesarean Section	57	57%
Full-Term Normal Vaginal	32	32%
Other Vaginal Deliveries*	11	11%
Total	100	100%

*Includes preterm vaginal delivery and/or assisted vaginal delivery according to the study dataset.

The high caesarean section rate reflected the coexistence of oligohydramnios with maternal high-risk conditions, previous caesarean section, abnormal fetal surveillance, and obstetric indications requiring operative intervention.

4.7 Birth Weight

The mean neonatal birth weight was 2.65 kg.

Most neonates had birth weights between 2.5 and 3.0 kg, while a smaller proportion had low birth weight (<2.5 kg). Reduced birth weight was commonly observed among pregnancies complicated by placental insufficiency and associated maternal disorders.

Table 6. Neonatal Birth Weight

Variable	Observation
Mean Birth Weight	2.65 kg

The observed birth weight indicates a tendency towards lower fetal growth among pregnancies complicated by oligohydramnios.

4.8 NICU Admission

Among all live-born neonates, 30 (30%) required admission to the Neonatal Intensive Care Unit (NICU) for further observation and management.

Table 7. NICU Admission

Outcome	Number	Percentage
NICU Admission	30	30%
No NICU Admission	70	70%
Total	100	100%

The relatively high NICU admission rate emphasizes the increased neonatal morbidity associated with pregnancies complicated by oligohydramnios, particularly when accompanied by maternal medical or obstetric risk factors.

4.9 Overall Fetomaternal Outcome

The majority of mothers experienced favourable maternal outcomes following timely obstetric management. However, oligohydramnios was associated with an increased requirement for operative delivery and specialized neonatal care.

Important observations from the present study include:

- Most women belonged to the 21–30-year age group.
- Multigravida constituted **57%** of the study population.
- Previous LSCS, PIH, GDM, maternal anemia, hypothyroidism, Rh-negative pregnancy, and postdated pregnancy were common associated risk factors.
- Caesarean section was the predominant mode of delivery (**57%**).

- Mean neonatal birth weight was 2.65 kg.
- 30% of neonates required NICU admission.

These findings suggest that adverse neonatal outcomes are influenced not only by reduced amniotic fluid volume but also by the coexistence of maternal medical and obstetric complications.

DISCUSSION

Oligohydramnios remains one of the most challenging obstetric conditions because it is both an independent marker of fetal compromise and a manifestation of underlying maternal or placental pathology. The present prospective observational study evaluated the maternal risk factors associated with oligohydramnios and their influence on fetomaternal outcomes in a rural tertiary care teaching hospital. The findings highlight that oligohydramnios is rarely an isolated clinical entity and is frequently accompanied by maternal medical and obstetric complications that significantly influence pregnancy management.

Maternal Demographic Profile

The mean maternal age in the present study was 28.88 years, with the majority of women belonging to the 21–30-year age group. This observation is comparable to reports by Casey et al., Chauhan et al., and several Indian studies, where oligohydramnios was predominantly observed in women within the peak reproductive age group. This distribution probably reflects the age profile of the obstetric population rather than indicating maternal age as an independent risk factor.

Multigravida constituted **57%** of the study population, whereas **43%** were primigravidae. The higher proportion of multigravida women may be explained by the greater prevalence of associated obstetric complications such as previous lower segment caesarean section, hypertensive disorders, and gestational diabetes mellitus in subsequent pregnancies. Similar observations have been reported in studies from tertiary referral centres managing high-risk pregnancies.

Maternal Risk Factors

One of the important findings of the present study was the frequent coexistence of maternal medical and obstetric disorders with oligohydramnios. Previous lower segment caesarean section, pregnancy-induced hypertension (PIH), gestational diabetes mellitus (GDM), maternal anaemia, hypothyroidism, Rh-negative pregnancy, and postdated pregnancy were commonly encountered.

Hypertensive disorders are known to reduce uteroplacental perfusion, resulting in chronic fetal hypoxia and decreased fetal urine production, ultimately leading to reduced amniotic fluid volume. Likewise, placental dysfunction associated with postdated pregnancy contributes to declining amniotic fluid during the later weeks of gestation. These mechanisms are well established and explain the frequent association observed in the present study.

The coexistence of multiple maternal risk factors in several patients indicates that oligohydramnios should be viewed as a manifestation of high-risk pregnancy rather than as an isolated ultrasonographic finding. Comprehensive maternal evaluation is therefore essential before decisions regarding timing and mode of delivery are made.

Mode of Delivery

In the present study, 57% of women underwent caesarean section, whereas 32% had full-term normal vaginal delivery. The caesarean section rate observed is comparable to that reported by numerous Indian and international studies, where operative delivery rates ranged from approximately 40% to 70% among women with oligohydramnios.

The increased operative delivery rate is unlikely to be attributable to reduced amniotic fluid volume alone. Instead, factors such as abnormal fetal heart rate patterns, previous caesarean section, failed induction, hypertensive disorders, and associated obstetric complications collectively influence the decision for operative delivery. This observation reinforces the concept that management should be individualized rather than based solely on AFI values.

Neonatal Outcome

The mean neonatal birth weight in the present study was **2.65 kg**, suggesting a tendency toward reduced fetal growth. Furthermore, **30%** of neonates required admission to the Neonatal Intensive Care Unit (NICU), indicating a substantial burden of neonatal morbidity.

Low birth weight and increased NICU admission have consistently been reported in pregnancies complicated by oligohydramnios. Reduced placental perfusion and chronic fetal compromise may contribute to impaired fetal growth and increase the likelihood of neonatal respiratory distress, meconium aspiration, transient tachypnoea, hypoglycaemia, and the need for specialized neonatal care.

It is noteworthy that the majority of neonates had favourable survival following appropriate obstetric and neonatal management, emphasizing the importance of timely diagnosis, close fetal surveillance, and institutional delivery.

Clinical Implications

The findings of the present study have practical implications for obstetric practice, particularly in rural tertiary care hospitals. Oligohydramnios should prompt a systematic search for associated maternal disorders rather than being considered solely as an abnormal ultrasound finding. Early identification and treatment of maternal conditions such as hypertension, diabetes, anaemia, and thyroid disorders may improve uteroplacental function and optimize pregnancy outcomes.

Serial assessment of amniotic fluid volume, fetal movement counting, non-stress testing, biophysical profile, and Doppler studies should be integrated into the management protocol whenever indicated. Decisions regarding induction of labour or caesarean section should be based on the overall clinical scenario, incorporating gestational age, cervical status, fetal well-being, and maternal condition.

Strengths of the Study

The present study has several strengths:

- Prospective observational design minimizing recall bias.
- Uniform clinical management in a tertiary care teaching hospital.
- Evaluation of both maternal risk factors and neonatal outcomes.
- Representation of a rural referral population, where high-risk pregnancies are commonly encountered.
- Comprehensive assessment of fetomaternal outcomes in routine clinical practice.

LIMITATIONS OF THE STUDY

Certain limitations should be acknowledged:

- The study was conducted at a single tertiary care centre, limiting generalizability.
- The sample size of 100 participants may not have been sufficient to detect less common associations.
- There was no control group of pregnancies with normal amniotic fluid volume, which limits direct comparative analysis.
- Long-term neonatal follow-up was not performed.
- Some maternal risk factors coexisted, making it difficult to determine the independent contribution of each factor to adverse outcomes.

Comparison with Existing Literature

Overall, the findings of the present study are consistent with published literature demonstrating that oligohydramnios is associated with increased operative delivery, lower birth weight, and higher NICU admission rates. However, this study also emphasizes the substantial contribution of associated maternal medical and obstetric disorders in determining pregnancy outcome. These observations support the growing consensus that clinical management should focus on the entire maternal–fetal clinical picture rather than on AFI values alone.

CONCLUSION

The present prospective observational study demonstrates that oligohydramnios is frequently associated with important maternal medical and obstetric risk factors that significantly influence both maternal management and neonatal outcome. Rather than occurring as an isolated ultrasonographic finding, oligohydramnios commonly coexisted with conditions such as previous lower segment caesarean section, pregnancy-induced hypertension, gestational diabetes mellitus, maternal anaemia, hypothyroidism, Rh-negative pregnancy, and postdated pregnancy.

The study observed a relatively high caesarean section rate (**57%**) and a substantial requirement for neonatal intensive care (**30% NICU admissions**), highlighting the increased obstetric intervention and

neonatal morbidity associated with these pregnancies. The mean neonatal birth weight of **2.65 kg** further reflects the adverse influence of compromised intrauterine conditions on fetal growth.

The findings emphasize that successful management of oligohydramnios depends not merely on the sonographic measurement of amniotic fluid but on comprehensive assessment of the maternal clinical profile, fetal surveillance findings, gestational age, and associated obstetric complications.

Early diagnosis, appropriate referral, vigilant antenatal monitoring, and timely obstetric intervention remain the cornerstones for improving fetomaternal outcomes, particularly in rural tertiary care settings where high-risk pregnancies constitute a significant proportion of obstetric admissions.

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