


The Association between Oligohydramnios and the Risk of Malpresentation: A Meta-Analysis

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Abstract

Background: There is no consensus on the role of oligohydramnios on the increased risk of fetal malpresentation. Therefore, we decided, for the first time, to collect all published studies on this topic to synthesize all available data through a systematic review and meta-analysis to evaluate the effect of oligohydramnios on the increased risk of fetal malpresentation.

Methods: A search was done in the following international electronic bibliographic databases: PubMed, Web of Science, and Scopus to April 2021. Heterogeneity among studies was determined by the Q-test and I² statistic. Publication bias was assessed by Begg and Egger tests. The results were reported using odds ratio (OR) estimates with 95% confidence intervals (CI) using a random-effects model. Data were analyzed using Stata software Version 14 (StataCorp).

Results: The meta-analysis identified 431 articles, comprising 227,351 participants, exploring the link between oligohydramnios and malpresentation. A significant association was found (OR, 1.79 [95% CI, 1.42-2.15]), indicating that oligohydramnios increases the risk of malpresentation. The analysis also revealed substantial heterogeneity among the included studies (I² = 80.2%; $P < 0.001$).

Conclusion: This meta-analysis provides robust evidence that oligohydramnios is a significant risk factor for fetal malpresentation. These findings underscore the critical importance of monitoring amniotic fluid levels during pregnancy. The results suggest that healthcare providers should prioritize the assessment of amniotic fluid volume in pregnant patients, especially those presenting with risk factors for oligohydramnios.

Keywords: Oligohydramnios, Malpresentation, Pregnancy, Meta-analysis

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Introduction

Amniotic fluid plays an important role in maintaining the health of the fetus. Amniotic fluid provides nutrients and growth factors for fetal growth and also protects the fetus through antimicrobial effectors (1). One essential part of

obstetric management by obstetricians is assessing amniotic fluid volume. Oligohydramnios is defined as a small amount of amniotic fluid volume for gestational age (amniotic fluid index (AFI), ≤ 5). Oligohydramnios is associated

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↑What is “already known” in this topic:

Previous research has indicated that oligohydramnios, characterized by a low volume of amniotic fluid, is associated with various pregnancy complications, including fetal malpresentation. However, there has been no consensus on the extent to which oligohydramnios increases the risk of fetal malpresentation. Some studies have reported no significant association, while others have indicated a notable link. Therefore, the specific impact of oligohydramnios has remained unclear.

→What this article adds:

The findings indicate that oligohydramnios increases the risk of malpresentation by 79%. The study emphasizes the clinical implications of monitoring amniotic fluid levels during pregnancy to mitigate risks associated with malpresentation.

with increased pregnancy complications, birth defects, and increased perinatal morbidity and mortality (2).

Fetal malpresentation is associated with an increased probability of fetal and maternal complications (3). Prolonged labor, postpartum hemorrhage, chorioamnionitis, and operative deliveries are some worse outcomes of fetal malpresentation (4, 5). This problem is not uncommon and occurs approximately in 10% of all pregnancies (6). According to the evidence, macrosomia, previously affected pregnancy, polyhydramnios, maternal age >35 years, uterine leiomyoma, assisted reproduction technology, anomalies in fetus, preterm premature rupture of membranes (PPROM), nulliparity, low birth weight, female sex, and fetal congenital anomalies are considered known risk factors for fetal malpresentation (7-11).

Despite the existing body of literature, there remains no consensus regarding the impact of oligohydramnios on the risk of fetal malpresentation. While some studies, such as those by Toijonen et al (12), have found no significant association, others (13, 14) have reported a notable link between oligohydramnios and an increased risk of malpresentation. Given these conflicting results, we aimed to conduct a comprehensive systematic review and meta-analysis to synthesize all available data and evaluate the effect of oligohydramnios on the risk of fetal malpresentation. This study represents the first attempt to aggregate and analyze published studies on this topic, providing valuable insights into the relationship between oligohydramnios and fetal positioning.

Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were applied for performing the present meta-analysis (15).

Inclusion Criteria

The inclusion criteria for this meta-analysis focused on epidemiological studies examining the association between oligohydramnios and the risk of malpresentation, with no restrictions on age, race, publication date, or language of the articles. The primary exposure of interest was oligohydramnios, defined as a reduced volume of amniotic fluid for gestational age, while the outcome of interest was malpresentation, which encompasses various nonvertex presentations such as breech and transverse lie. This inclusive approach aimed to capture a comprehensive range of studies to provide a robust synthesis of the available evidence regarding how oligohydramnios may influence fetal positioning during pregnancy.

Search Methods

The search method for this meta-analysis involved a comprehensive review of major international electronic databases—specifically PubMed, Web of Science, and Scopus—to evaluate the association between oligohydramnios and the risk of malpresentation. The search was conducted up until April 2021 and utilized a carefully constructed set of keywords—including "oligohydramnios" combined with related terms such as "malpresentation," "nonvertex presentation," "abnormal presentation," and "breech

presentation." Moreover, the references of the included studies were manually examined to identify any further relevant articles that may not have been captured in the initial database searches.

Data Collection and Validity Assessment

The articles were independently determined by 2 researchers (M.N. and M.N.). Any disagreements between the researchers were resolved through discussion between the 2 authors. Variables extracted from the studies by the 2 authors separately included the first author, study setting, year, number of investigated patients, age, diagnosis method for oligohydramnios, malpresentation, and OR with 95% confidence intervals (CI).

The Newcastle Ottawa Statement Manual (NOS) scale was used to evaluate the quality of the studies (16). A set of items was included in this scale (a maximum of 9 stars) and included selection, comparability, exposure, and outcome. The studies with 7-star items or more were considered high-quality and others were considered low-quality.

Heterogeneity and Publication Bias

In our study, we performed a meta-analysis using OR to evaluate the association between oligohydramnios and malpresentation. To ensure the validity of our findings, we applied the necessary transformations. Heterogeneity among the studies was assessed using the Q-test and I^2 statistic, with an I^2 of >50% indicating substantial heterogeneity (17). We also assessed publication bias using Begg and Egger tests (18). Specifically, we utilized a random-effects model to account for variability among studies and calculated pooled ORs with 95% CIs. (19). The confounding variables of the association between oligohydramnios and the risk of malpresentation were body mass index, in vitro fertilization, and patient-reported outcome measures (PROM). Data were analyzed using the Stata software Version 14 (StataCorp), with the significance level set at 0.05.

Results

A total of 431 articles were retrieved through searches in the aforementioned electronic databases and hand searching up until April 2021. Of these, 221 articles were excluded due to duplicate publications. During the screening of titles and abstracts, 191 articles did not meet the inclusion criteria and were thus excluded. A further assessment of the full texts resulted in the exclusion of 11 additional studies. Consequently, a total of 8 studies were included in this meta-analysis (Figure 1). Of these studies, 2 were cross-sectional (20, 21), 1 was case-control (12), and 5 were cohort (13, 14, 22-24). The studies included in this meta-analysis were published between 1994 and 2020, and all were conducted in English. The total number of participants across these studies amounted to 227,351.

Effects of Exposure

Figure 2 demonstrates the association between oligohydramnios and the risk of malpresentation. The results indicate a significant relationship, with an OR of 1.79 (95% CI, 1.42-2.15), suggesting that oligohydramnios is associated with a 79% increased risk of malpresentation. However, the

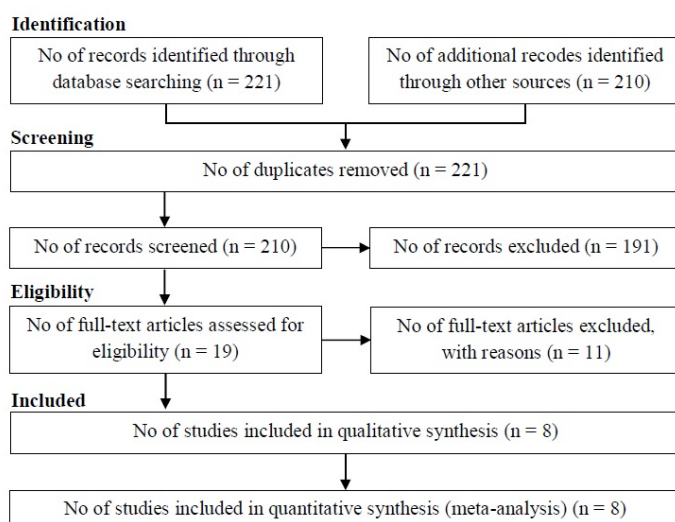


Figure 1. Flow of information in the systematic review and meta-analysis

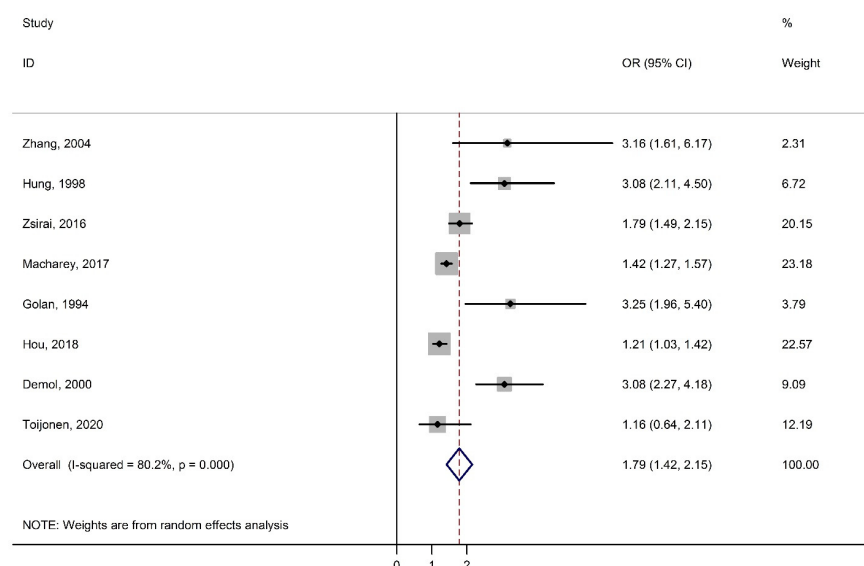


Figure 2. Forest plot of the association between oligohydramnios and the risk of malpresentation

findings were heterogeneous, as evidenced by the I^2 statistic ($I^2 = 80.2\%$; $P = 0.001$) (Figure 2).

Publication Bias

To evaluate potential publication bias in the studies included in our meta-analysis on the association between oligohydramnios and the risk of malpresentation, we utilized Begg and Egger tests. There was no publication bias among studies by Begg and Egger tests ($P = 0.458$ and $P = 0.071$, respectively), respectively.

Quality of the Studies

Out of the 8 studies analyzed, all were deemed to be of high quality, with scores of $7 \geq$ on the NOS scale (Table 1).

Subgroup Analysis

The subgroup analysis was conducted based on studies that provided adjusted results. The pooled ORs revealed that the risk of malpresentation in crude studies was 1.32 (95% CI, 1.13-1.51), while in adjusted studies, it was 1.49 (95% CI, 1.36-1.63) (Table 2).

Discussion

To our knowledge, this is the first meta-analysis evaluating the relationship between oligohydramnios and the risk of malpresentation, which makes the current study unique. According to the findings, there is a 79% higher incidence of malpresentation when oligohydramnios is present. There was also heterogeneity among the studies that were part of this meta-analysis.

Table 1. Summaries of included studies in present meta-analysis

1 st aut, year	Design	Sample size	Diagnose method	Estimate	Adjustment	Maternal age (Years)	Quality
Zhang, 2004	Cohort	6657	Ultrasonography	Odds ratio	Crude	28.3	High
Hung, 1998	Cohort	27506	Ultrasonography	Odds ratio	Adjusted	37.6	High
Golan, 1994	Cohort	18914	Ultrasonography	Odds ratio	Crude	No reported	Low
Hou, 2013	Cross-sectional	88142	Ultrasonography	Odds ratio	Crude	28	High
Zsirai., 2016	Cohort	2081	Medical history	Odds ratio	Adjusted	22.7	High
Demol, 2016	Cross-sectional	76618	Ultrasonography	Odds ratio	Crude	28.2	High
Macharey, 2000	Cohort	5377	Medical record	Odds ratio	Adjusted	30.2	High
Toijonen, 2020	Case-control	2056	Ultrasonography	Odds ratio	Adjusted	No reported	High

Table 2. Results of subgroup analysis of the oligohydramnios and malpresentation

Subgroup	Studies		
	No. of studies	OR (95% CI)	I ²
Adjusted form			
Crude	4	1.32 (1.13, 1.51)	74.1 %
Adjust	4	1.49 (1.36, 1.63)	84.1 %

Findings of the present meta-analysis reported that oligohydramnios is a known significant risk factor for malpresentation. Therefore, it is linked to reduced fetal movements partly due to restricted intrauterine space and nuchal cords (25). Additionally, placental abnormalities linked to oligohydramnios in the late second or third trimester may decrease fetal resources, affect fetal movements over time, and prevent cephalic presentation (23).

Among the etiological factors associated with oligohydramnios, PROM and congenital malformations of the fetus are the main parts and certainly affect the management strategies and the prevalence of adverse pregnancy consequences (13).

Oligohydramnios is associated with active antenatal and intrapartum management (26). Oligohydramnios is associated with several adverse perinatal outcomes—including an increased risk of labor induction, fetal heart rate decelerations during labor, meconium-stained amniotic fluid, cesarean delivery, stillbirth, neonatal intensive care unit admissions, low Apgar scores, and neonatal mortality (27).

The Begg and Egger tests for publication bias yielded no statistically significant results, indicating that the search strategy was effective in identifying eligible studies. Significant heterogeneity was observed among the findings of the included studies, as evidenced by a low P value from the Q-test and a high I² statistic. However, it is essential to interpret these statistical tests for heterogeneity with caution; the Q-test has limited power when sample sizes are small, while it can detect minor heterogeneity that may not be clinically relevant in larger meta-analyses (28).

The findings of this meta-analysis indicate that oligohydramnios significantly increase the risk of fetal malpresentation, which has important clinical implications. Healthcare providers should prioritize routine assessment of amniotic fluid levels during prenatal visits to enable early identification and management of oligohydramnios. This proactive approach can help mitigate the associated risks of malpresentation, such as prolonged labor and higher cesarean delivery rates. Furthermore, understanding this association can guide clinical decision-making regarding delivery methods and enhance patient counseling about potential risks. By integrating these findings into practice,

healthcare professionals can improve outcomes for pregnancies affected by oligohydramnios.

Two limitations in this meta-analysis must be considered. First, it relies on observational studies, which are inherently subject to unchangeable biases. Second, because of the constraints in the included studies, we were unable to conduct subgroup analyses based on potential confounders. In addition, the generalizability of our findings may be limited. However, the strengths of this study enhance the validity of its conclusions, including a systematic search across major international databases and the high quality of most included studies as assessed by the NOS.

Conclusion

This meta-analysis provides robust evidence that oligohydramnios is a significant risk factor for fetal malpresentation. These findings underscore the critical importance of monitoring amniotic fluid levels during pregnancy. The results suggest that healthcare providers should prioritize the assessment of amniotic fluid volume in pregnant patients, especially those presenting with risk factors for oligohydramnios.

Authors' Contributions

The authors contributed to the study equally.

Ethical Considerations

None.

Acknowledgment

None.

Conflict of Interests

The authors declare that they have no competing interests.

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