



Incidence of polyhydramnios, associated factors and perinatal outcome in tertiary center, Erbil city

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Abstract

The objective of this study is to identify the Incidence of Polyhydramnios and its factors among women in Erbil, Iraq. This is a cross-sectional study that investigated women who had complicated pregnancies due to polyhydramnios at Erbil Maternity Teaching Hospital from January 2023 to January 2024. Control women were selected from the same source. Data included maternal demographics (age, residence), obstetric history, comorbidities (pre-gestational diabetes, gestational diabetes, febrile illnesses), and prenatal fetal anomalies. Neonatal outcomes comprised Apgar scores at 1/5 minutes, birth weight, congenital anomalies, NICU admission, stillbirth, and early neonatal death (≤ 7 days). Polyhydramnios severity was classified as mild (AFI 24.0–29.9 cm), moderate (30.0–34.9 cm), or severe (≥ 35.0 cm). Data were analyzed using statistical software at $p < 0.05$. Among 19,062 deliveries, 123 cases of polyhydramnios were identified (Incidence 0.64%). Polyhydramnios was independently associated with reduced 1-minute Apgar (aOR=0.041), increased birth weight (aOR=2.794), and higher NICU admission risk (aOR=5.533) ($P < 0.05$). Severity distribution was 62.6% mild, 28.5% moderate, and 8.9% severe. Type II diabetes (aOR=3.44, 95% CI:1.28–9.26; $p=0.014$) and fetal anomalies (aOR=19.80, 95% CI:2.54–154.22; $p=0.004$) were independent predictors of severity. The Incidence of Polyhydramnios in Erbil is at the lower spectrum of reported rates. However, it correlates with adverse neonatal outcomes and demonstrated relatively high severity. Type II diabetes shows a strong association with polyhydramnios occurrence and severity; as a modifiable factor, meticulous glycemic control in diabetic mothers may substantially mitigate this risk.

Keywords: Polyhydramnios, Perinatal outcomes, Diabetes

Introduction

Polyhydramnios is a well-known condition that related to maternal comorbidities, increased Incidence of fetal anomalies including congenital structural abnormalities, gastrointestinal obstructive pathologies, Rh incompatibility, and multiple pregnancies relative to the general obstetric population [1]. There is a rich literature on adverse perinatal outcomes: polyhydramnios contributes greatly to the likelihood of perinatal mortality, preterm birth and neonatal respiratory distress syndrome [2]. Polyhydramnios has shown a variation in occurrence with some studies reporting it among 0.3 and 9.7 of the deliveries [3, 4]. Adverse maternal and neonatal outcomes are positively related to the severity of polyhydramnios [5]. Mild cases of polyhydramnios should not be monitored in pregnancy, but expulsive birth plans should be recommended [6]. Other researchers recommend in cases of polyhydramnios diagnosed after 32 weeks, antenatal fetal testing (e.g., non-stress test, biophysical profile) due to 2 to 5-fold increased risk

of perinatal mortality. In case of reassuring testing, 39-week delivery is suggested [7, 8].

Polyhydramnios literature is heterogeneous and does not have consensus on risk factors and perinatal outcomes. An example is cesarean birth, which is commonly mentioned in the context of polyhydramnios in many studies [9, 10], yet, its impact was not found in the study by Lallar et al. (2015) [11]. Moreover, although certain reports suggest a highly increased risk of neonatal death [11], and intrauterine fetal death [12], other well-constructed studies have not been able to find a statistically significant relationship between polyhydramnios and these lethal outcomes [13, 14]. Such discrepancy is also observed in the rate of Neonatal Intensive Care Unit (NICU) admission, which is reported to have been significantly increased in most of the studies [15, 16], but was not reported to have significantly differed in the cohort studied by Berezowsky et al. (2019) [13]. Such continuity of contradictions and the following uncertainty in the evidence base demonstrate the

need to conduct further in-depth research to determine the peculiar nature of such associations.

The epidemiology of polyhydramnios, its reported rates and the importance of the factors and delivery outcomes are characterized by a significant degree of variability among the published papers. This difference stems largely from variations in diagnostic criteria, the severity of the condition studied, and the underlying etiology found in the patient population [9, 11, 13, 16]. This study was conducted to determine the Incidence of Polyhydramnios in a tertiary public hospital and to evaluate the associated maternal and fetal factors and perinatal outcomes.

Patients and Methods

This was a cross-sectional study conducted to determine the Incidence of Polyhydramnios and a case-control design that evaluated associated risk factors and perinatal outcome for polyhydramnios, in Maternity Teaching Hospital, Erbil city, Kurdistan region Iraq, from January 2023 to January 2024. Women with singleton pregnancies and polyhydramnios who delivered at a gestational age of more than 28 weeks were included in this study. Exclusion criteria included multiple pregnancies, gestational age at delivery <28 weeks, and intrauterine fetal death. Controls were selected by 1:1 matching based on maternal age from women without polyhydramnios delivering during the same period.

The study design was approved by the research protocol ethics committee of the Kurdistan Higher Council of Medical Specialties (approval number 208, dated 22/1/ 2023). Each participant voluntarily gave consent to participate in the study. Steps were taken to ensure that the information given by the participants would be kept strictly confidential for research purposes.

The electronic medical records were used in a systematic process to obtain data. Maternal demographic characteristics (age, residency), obstetric history (parity, Rh status), antenatal care attendance, comorbidities (pre-gestational diabetes, gestational diabetes, febrile illness), and prenatal fetal abnormalities were recorded. In terms of parity, women were classified into primiparous (Para 1),

multiparous (Para 2-4) and grand multiparous (Para \geq 5). Adequate antenatal care, based on the latest revision of the World Health Organization guidelines, was considered to consist of at least 8 visits, and fewer than this number was deemed inadequate [17]. Pre-gestational diabetes included type 1 and type 2 diabetes and gestational diabetes diagnosed with a 75gm Glucose Tolerance Test (GTT). Neonatal outcomes included Apgar scores at 1 and 5 minutes, birth weight, congenital anomalies diagnosed post-delivery, NICU admission, stillbirth, and early neonatal death (\leq 7 days). The 5-minute Apgar score of 7 to 10 was considered reassuring, 4 to 6 moderately abnormal, and 3 or less severely abnormal, based on the American College of Obstetricians and Gynecologists (ACOG); an Apgar score of 0 to 3 at 1 and 5 minutes is concerning and increases the likelihood of NICU admission [18]. Birth weight was stratified into low (1500–2499 grams), normal (2500–3999 grams) or high (>4000 grams) categories, based on WHO guidelines[19]. Stillbirth was defined as the absence of vital signs at delivery in fetuses \geq 28 weeks of gestation [20]. The death of a live-born infant before the seventh day of life is defined as early neonatal death [21]. Polyhydramnios severity was classified as mild (AFI 24.0–29.9 cm), moderate (AFI 30.0–34.9 cm), or severe (AFI \geq 35.0 cm) [22].

Data were analyzed using SPSS version 25. Continuous variables (e.g., age, gestational age, Apgar scores) were reported in terms of mean \pm standard deviation and compared using independent samples t-tests. Categorical variables (e.g., residency, diabetes, delivery outcomes) were displayed in the form of frequencies (percentages) and analyzed by Pearson chi-square test. The p 0.05 was taken as the definition of statistical significance.

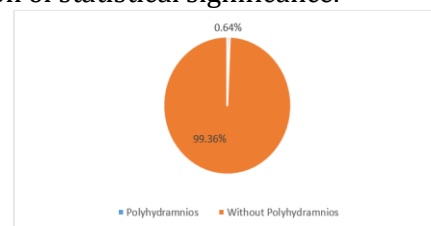


Figure 1. Incidence of Polyhydramnios

Results

In the current investigation, among 19,062 deliveries carried out in a tertiary maternity hospital, 123 cases

of polyhydramnios were observed, which means that the Incidence of this condition is 0.64% (Figure 1). In every instance of polyhydramnios, a woman of similar age with a normal amount of amniotic fluid was identified as control group. There were no differences in maternal age ($p=1.000$), but no

significant differences in gestational age ($p=0.774$). There were equal distributions in demographic and obstetric factors ($p>0.05$). It is important to note that the only significant difference in the baseline was the fetal abnormalities in the polyhydramnios group ($p=0.044$) (Table 1).

Table 1. Comparison of maternal and baseline characteristics between polyhydramnios and control groups

Variable		Control (n=123)	Case (n=123)	Total (n=246)	p-value
Age (years)		31.62 ± 4.13	31.62 ± 4.13	31.62 ± 4.12	1.000
Gestational Age (weeks)		37.64 ± 1.50	37.59 ± 1.60	37.61 ± 1.55	0.774
Residency	Rural	43 (35.0%)	43 (35.0%)	86 (35.0%)	1.000
	Urban	80 (65.0%)	80 (65.0%)	160 (65.0%)	
Parity	Primigravida	13 (10.6%)	12 (9.8%)	25 (10.2%)	0.833
	Multigravida	110 (89.4%)	111 (90.2%)	221 (89.8%)	
Rh status	Negative	6 (4.9%)	6 (4.9%)	12 (4.9%)	1.000
	Positive	117 (95.1%)	117 (95.1%)	234 (95.1%)	
Antenatal care	Adequate	55 (44.7%)	54 (43.9%)	109 (44.3%)	0.898
	Inadequate	68 (55.3%)	69 (56.1%)	137 (55.7%)	
Febrile illness	Yes	15 (12.2%)	17 (13.8%)	32 (13.0%)	0.705
	No	108 (87.8%)	106 (86.2%)	214 (87.0%)	
Type II diabetes	Yes	18 (14.6%)	19 (15.4%)	37 (15.0%)	0.858
	No	105 (85.4%)	104 (84.6%)	209 (85.0%)	
GDM	Yes	24 (19.5%)	25 (20.3%)	49 (19.9%)	0.873
	No	99 (80.5%)	98 (79.7%)	197 (80.1%)	
GDM treatment	Yes	20 (83.3%)	18 (72.0%)	38 (77.6%)	0.342
	No	4 (16.7%)	7 (28.0%)	11 (22.4%)	
Fetal abnormality	Yes	0 (0.0%)	4 (3.3%)	4 (1.6%)	0.044
	No	123 (100.0%)	119 (96.7%)	242 (98.4%)	

Among polyhydramnios cases, severity was distributed as mild (62.6%), moderate (28.5%), and severe (8.9%), with a mean AFI of 29.96 ± 3.03 cm. Polyhydramnios cases exhibited compromised neonatal outcomes compared to controls. Apgar scores were significantly lower at both 1 minute ($p<0.001$) and 5 minutes ($p<0.001$). Neonates in the polyhydramnios group had higher birth weights

($p=0.009$) and were markedly more likely to require NICU admission ($p<0.001$). Congenital anomalies ($p=0.044$) and early neonatal deaths ($p=0.044$) occurred exclusively in the polyhydramnios group. While delivery mode and stillbirth rates showed no significant differences, the proportion of infants classified as "normal" approached significance ($p=0.081$) (Table 2).

Table 2. Comparison of delivery outcomes, and neonatal status between groups

Variable		Control (n=123)	Case (n=123)	Total (n=246)	p-value
AFI (cm)		N/A	29.96 ± 3.03	29.96 ± 3.03	N/A
Grade of polyhydramnios	Mild	N/A	77 (62.6%)	77 (31.3%)	N/A
	Moderate	N/A	35 (28.5%)	35 (14.2%)	
	Severe	N/A	11 (8.9%)	11 (4.5%)	
Apgar 1-min		8.42 ± 0.53	7.11 ± 1.28	7.77 ± 1.18	<0.001
Apgar 5-min		9.43 ± 0.51	8.77 ± 0.86	9.10 ± 0.78	<0.001
Birth weight (kg)		3.45 ± 0.50	3.62 ± 0.49	3.54 ± 0.50	0.009

Mode of delivery	VD	80 (65.0%)	79 (64.2%)	159 (64.6%)	0.894
	CS	43 (35.0%)	44 (35.8%)	87 (35.4%)	
Normal baby	Yes	123 (100.0%)	120 (97.6%)	243 (98.8%)	0.081
	No	0 (0.0%)	3 (2.4%)	3 (1.2%)	
Stillbirth	Yes	0 (0.0%)	1 (0.8%)	1 (0.4%)	0.316
	No	123 (100.0%)	122 (99.2%)	245 (99.6%)	
Congenital anomaly	Yes	0 (0.0%)	4 (3.3%)	4 (1.6%)	0.044
	No	123 (100.0%)	119 (96.7%)	242 (98.4%)	
Admission to NICU	Yes	48 (39.0%)	98 (79.7%)	146 (59.3%)	<0.001
	No	75 (61.0%)	25 (20.3%)	100 (40.7%)	
Early neonatal death	Yes	0 (0.0%)	4 (3.3%)	4 (1.6%)	0.044
	No	123 (100.0%)	119 (96.7%)	242 (98.4%)	

Based on univariate logistic regression, polyhydramnios was significantly associated with lower Apgar scores at 1 minute (OR = 0.066, p < 0.001), lower Apgar scores at 5 minutes (OR = 0.082, p < 0.001), higher birth weight (OR = 1.999, p = 0.010), and a six-fold increase in NICU admission (OR = 6.125, p < 0.001). Variables like early neonatal death and congenital anomalies were excluded due to complete separation (absence in controls), which would produce biased estimates.

After mutual adjustment for confounding effects, three factors retained significant associations with polyhydramnios. Lower Apgar scores at 1 minute remained strongly associated (aOR = 0.041, p < 0.001), while the association for Apgar scores at 5 minutes was no longer significant (aOR = 2.698, p = 0.241). Higher birth weight (aOR = 2.794, p = 0.008) and NICU admission persisted as a robust factor (aOR = 5.533, p < 0.001) (Table 3).

Table 3. Logistic regression analysis of perinatal outcomes in polyhydramnios

Variable	Univariate			Multivariate		
	OR	95% CI	p-value	OR	95% CI	p-value
Apgar 1-min	0.066	[0.029, 0.149]	<0.001	0.041	[0.010, 0.172]	<0.001
Apgar 5-min	0.082	[0.036, 0.186]	<0.001	2.698	[0.513, 14.185]	0.241
Birth weight	1.999	[1.180, 3.388]	0.010	2.794	[1.307, 5.970]	0.008
Admission to NICU	6.125	[3.466, 10.823]	<0.001	5.533	[2.487, 12.308]	<0.001

Table 4 shows significant associations between polyhydramnios severity and maternal/neonatal

factors. Rural residency and febrile illness were associated with moderate polyhydramnios (p<0.05).

Table 4. Association of polyhydramnios severity with baseline characteristics and perinatal outcomes

		Grade of polyhydramnios			p-value
		mild (n=77)	Moderate (n=35)	severe (n=11)	
Age	<35 years	56 (72.7%)	22 (62.9%)	10 (90.9%)	0.185
	≥ 35 years	21 (27.3%)	13 (37.1%)	1 (9.1%)	
Residency	Rural	21 (27.3%)	18 (51.4%)	4 (36.4%)	0.045
	Urban	56 (72.7%)	17 (48.6%)	7 (63.6%)	
Gestational Age (weeks)		37.55 ± 1.19	37.46 ± 2.08	38.27 ± 2.33	0.321
Parity	primigravida	8 (10.4%)	3 (8.6%)	1 (9.1%)	0.953
	multigravida	69 (89.6%)	32 (91.4%)	10 (90.9%)	
Rh status	negative	4 (5.2%)	1 (2.9%)	1 (9.1%)	0.689
	positive	73 (94.8%)	34 (97.1%)	10 (90.9%)	
Antenatal care	Adequate	37 (48.1%)	10 (28.6%)	7 (63.6%)	0.060
	Inadequate	40 (51.9%)	25 (71.4%)	4 (36.4%)	

Febrile illness	Yes	8 (10.4%)	9 (25.7%)	0 (0.0%)	0.035
	No	69 (89.6%)	26 (74.3%)	11 (100.0%)	
Type II diabetes	Yes	7 (9.1%)	10 (28.6%)	2 (18.2%)	0.029
	No	70 (90.9%)	25 (71.4%)	9 (81.8%)	
GDM	Yes	19 (24.7%)	5 (14.3%)	1 (9.1%)	0.280
	No	58 (75.3%)	30 (85.7%)	10 (90.9%)	
GDM treatment	Yes	15 (78.9%) ¹	2 (40.0%) ¹	1 (100.0%) ¹	0.184
	No	4 (21.1%) ¹	3 (60.0%) ¹	0 (0.0%) ¹	
Fetal abnormality	Yes	0 (0.0%)	2 (5.7%)	2 (18.2%)	0.004
	No	77 (100.0%)	33 (94.3%)	9 (81.8%)	
Apgar 1-min		7.44 ± 0.97	6.80 ± 1.41	5.82 ± 1.78	<0.001
Apgar 5-min		8.97 ± 0.43	8.57 ± 1.17	8.00 ± 1.34	<0.001
Birth weight (kg)		3.61 ± 0.42	3.70 ± 0.58	3.45 ± 0.65	0.297
Mode of delivery	VD	52 (67.5%)	21 (60.0%)	6 (54.5%)	0.581
	CS	25 (32.5%)	14 (40.0%)	5 (45.5%)	
Normal baby	yes	77 (100.0%)	33 (94.3%)	10 (90.9%)	0.062
	no	0 (0.0%)	2 (5.7%)	1 (9.1%)	
Stillbirth	yes	0 (0.0%)	1 (2.9%)	0 (0.0%)	0.282
	no	77 (100.0%)	34 (97.1%)	11 (100.0%)	
Congenital anomaly	yes	0 (0.0%)	2 (5.7%)	2 (18.2%)	0.004
	no	77 (100.0%)	33 (94.3%)	9 (81.8%)	
Admission to NICU	yes	67 (87.0%)	29 (82.9%)	2 (18.2%)	<0.001
	no	10 (13.0%)	6 (17.1%)	9 (81.8%)	
Early neonatal death	yes	0 (0.0%)	2 (5.7%)	2 (18.2%)	0.004
	no	77 (100.0%)	33 (94.3%)	9 (81.8%)	

Type II diabetes (p=0.029), fetal abnormalities (p=0.004), Apgar score (p<0.001) and early neonatal mortality (p=0.004) were associated with severe cases. Severe polyhydramnios had lower NICU admissions (p<0.001). No significant associations were found for age, parity, gestational age, GDM, birth weight, or delivery mode (p>0.05).

In ordinal regression analysis, univariate

associations with higher polyhydramnios severity included rural residency (OR=2.17; p=0.042), type II diabetes (OR=2.78; p=0.033), and fetal abnormalities (OR=15.85; p=0.007). After multivariate adjustment, only type II diabetes (aOR=3.44; p=0.014) and fetal abnormalities (aOR=19.80; p=0.004) maintained independent associations with increased severity (Table 5).

Table 5. Evaluation of predictors for polyhydramnios severity

Variable	Univariate			Multivariate		
	OR	95% CI	p-value	OR	95% CI	p-value
Residency (Rural)	2.17	[1.03, 4.55]	0.042	1.85	[0.85, 4.03]	0.119
Febrile illness	1.56	[0.57, 4.23]	0.384	1.67	[0.57, 4.89]	0.345
Type II diabetes	2.78	[1.09, 7.14]	0.033	3.44	[1.28, 9.26]	0.014
Fetal abnormality	15.85	[2.14, 117.39]	0.007	19.80	[2.54, 154.22]	0.004

Discussion

The Incidence of Polyhydramnios in our study was 0.64%, which falls within the wide range reported in the literature. For instance, studies have reported rates from 0.3% in China [4], to 1.8% in Oman [23],

and up to 9.7% in Israel [3]. Given this substantial global variation, the Incidence observed in our region does not appear elevated.

In the present study, the polyhydramnios group had worse neonatal outcomes than controls (lower Apgar scores, higher birth weight, more NICU admissions),

with neonatal mortality and anomalies only in this group. A meta-analysis showed polyhydramnios increases risk for neonatal mortality, NICU admission, 5-min Apgar <7, macrosomia, and cesarean delivery [12]. Another study in China found that intrauterine fetal demise, 5-minute Apgar score, cesarean delivery, and macrosomia were associated with polyhydramnios [4]. These findings are consistent with the results of the present study. The only discrepancy in results pertained to the mode of delivery. This discrepancy may be because the Incidence of non-vertex fetal presentation in the control group of the present study might be high, as the cesarean delivery rate in both groups was approximately 35% significantly higher than typically reported Incidence of cesarean delivery in the general population (21%) [24].

In the present study, polyhydramnios was classified as mild in 62.6% of cases, moderate in 28.5%, and severe in 8.9%. A study in Oman, identifying 477 cases of polyhydramnios, reported mild type in 80%, moderate in 17.6%, and severe in 2.4% [23]. Another study in Israel, examining 750 cases, reported polyhydramnios severity as mild in 75.0%, moderate in 18.0%, and severe in 7.0% [3]. Another study reported a Incidence of mild polyhydramnios at 90% [4]. This indicates that the severity of polyhydramnios in the present study was relatively higher than in the aforementioned studies.

In the present study, only type II diabetes and fetal anomalies independently predicted polyhydramnios severity. Conversely, Bas Lando et al. found macrosomia and cesarean delivery as severity factors [3], which is attributable to the fact that they excluded diabetic people and fetal abnormalities. All variables were used in the current study, which sought to establish the best predictors. Majid et al. also showed that diabetic mothers have a higher severity of polyhydramnios which is associated with inadequate glycemic control [25]. They describe that maternal hyperglycemia triggers fetal hyperglycemia resulting in osmotic diuresis and high fetal urine production that is the main amniotic fluid source.

The study was conducted solely at a single teaching hospital, which may not be representative of the entire regional population. The sample size in the present study was relatively limited, hindering subgroup comparisons due to insufficient outcome

data in subgroups. The findings of this study must be regarded with circumspection.

Conclusion

The Incidence of Polyhydramnios in Erbil city is on the lower end of the range in comparison with other studies. This indicates that the Incidence of Polyhydramnios in the region is not of concern. However, polyhydramnios has been associated with adverse neonatal outcomes. These include low Apgar scores, neonatal mortality rates, and NICU admission rates. In addition, the severity of polyhydramnios in the present study is relatively high and emphasizes the need for its management and prevention. There is a strong association between type II diabetes and the incidence and severity of polyhydramnios. Polyhydramnios is modifiable risk factor and substantially prevented by controlling diabetes in pregnant women.

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