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ORIGINAL RESEARCH

Title: Is Mild Idiopathic Polyhydramnios Associated with an Increased Risk for an Intrauterine Fetal Demise? A Retrospective Cohort Study

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Objective: Antenatal fetal surveillance has been recommended for moderate/severe idiopathic polyhydramnios but not for mild idiopathic polyhydramnios. The purpose of this study is to determine if pregnancies with mild idiopathic polyhydramnios have an increased risk for an intrauterine fetal demise (IUFD).

Methods: Medical records and amniotic fluid volume ultrasound data from 2016 to 2021 at a university medical center were examined. Pregnancies with fetal anomalies, fetal infection, isoimmunization, multiple gestation, maternal diabetes and oligohydramnios were excluded. Normal amniotic fluid volume was defined as an amniotic fluid index (AFI) <24 cm which was compared to mild idiopathic polyhydramnios, AFI of ≥24.0 cm–29.9 cm, and moderate/severe polyhydramnios which is an AFI ≥30 cm.

Results: Of 12,725 patients meeting inclusion study criteria, there were 249 with idiopathic polyhydramnios (n = 249) which was associated with an increased odds of IUFD (aOR) of 3.27 (CI 1.50–7.15), NICU admission (aOR 1.28, CI 0.96–1.70), 5-minute APGAR score less than 7 (aOR 2.16, CI 1.52–3.07), and large for gestational age infant (LGA) (aOR 4.04, CI 2.83–5.78) compared to normal amniotic fluid volume (AFV). In the mild polyhydramnios group (n = 204, out of the 249 women with polyhydramnios) compared to the 12,476 pregnancies with normal AFV group, IUFD (aOR 3.38, CI 1.46–7.82), NICU admission (aOR 1.19, CI 0.87–1.64), 5-minute APGAR score less than 7 (aOR 1.68, CI 1.10–2.55) and LGA (aOR 3.87, CI 2.59–5.78). In moderate/severe polyhydramnios group (n = 45) compared to the normal AFV group, there was no increased odds of IUFD (aOR 2.78, CI 0.38–20.29) or NICU admission (aOR 1.74, CI 0.93–3.26) but an increased odds for a 5-minute APGAR score less than 7 (aOR 4.94, CI 2.57–9.53) and LGA fetus (aOR 4.80, CI 2.26–10.22).

Conclusion: There is an increased odds of IUFD in pregnancies complicated by mild idiopathic polyhydramnios. Patients should be counseled on an increased odds of adverse pregnancy outcomes associated with idiopathic polyhydramnios, and in those pregnancies with mild idiopathic polyhydramnios, antenatal fetal surveillance should be considered.

Keywords: amniotic fluid volume, mild idiopathic polyhydramnios, intrauterine fetal demise, IUFD, perinatal outcomes

Introduction

Polyhydramnios is defined as an excess amount of amniotic fluid surrounding the fetus. Idiopathic polyhydramnios is defined as polyhydramnios that is not related to fetal anomalies or infections, diabetes, multiple gestations, isoimmunization or placental tumors.[1] Amniotic fluid volume (AFV) can be measured by invasive dye dilution administration during pregnancy or by waiting to measure the actual fluid during cesarean delivery. Neither are practical options for daily AFV assessment. Due to the limitations of these options, ultrasound is more often chosen to estimate AFV during pregnancy. Three techniques are used to estimate the AFV: the amniotic fluid index (AFI), single deepest pocket (SDP), and subjective assessment (AFV visualization without measurements).[2–4]

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In the consult series of the Society of Maternal Fetal Medicine, it is stated that antenatal surveillance is suggested for moderate/severe idiopathic polyhydramnios (an AFI of ≥ 30) but is not required for mild idiopathic polyhydramnios (an AFI of ≥ 24–29.9), and that delivery should be allowed to occur spontaneously at term.[5] Due to the association of idiopathic polyhydramnios and an overall 2–5 fold increase in perinatal mortality, other investigators recommend antenatal testing anytime polyhydramnios (mild, moderate, or severe) is diagnosed after 32 weeks. As long as antenatal testing remains reassuring, they recommend delivery at 39 weeks' gestation.[1,6]

In this study, we evaluated the outcomes of singleton pregnancies diagnosed with mild or moderate to severe idiopathic polyhydramnios compared to pregnancies with normal AFV.

Methods

This retrospective cohort study used data extraction from the Epic electronic medical record and Viewpoint ultrasound software at the University of Arkansas for Medical Sciences (UAMS). No individual patient chart reviews were done by investigators. Inclusion criteria were delivery of a singleton pregnancy at the UAMS hospital from 2016–2020. The Institutional Review Board (IRB) for the University of Arkansas for Medical Sciences reviewed and approved this study #262647 on 3/29/2021. The IRB determined that this project is not human subject research as defined in 45 CFR 46.102, as no individually identified information was used, and informed consent was waived. This research study on humans has been performed in accordance with the principles stated in the Declaration of Helsinki.

Patients with polyhydramnios were identified by data extraction from the Viewpoint ultrasound software and amniotic fluid index (AFI) as well as the gestational age at the time of ultrasound were recorded. Patients with oligohydramnios, fetal anomalies, fetal infections, isoimmunization, placental tumors, multiple gestation and maternal pre-gestational or gestational diabetes were excluded. The AFI thresholds defined for this study were normal AFV is an AFI of < 24 cm, mild polyhydramnios an AFI of 24 −29.9, and moderate/severe polyhydramnios as an AFI ≥ 30.[7] Normal AFV was compared to mild polyhydramnios and moderate/severe idiopathic polyhydramnios. If a patient had moderate/severe polyhydramnios at any point, they were grouped into the moderate/severe group even if at most recent ultrasound it was considered mild. Pregnancies with idiopathic polyhydramnios were also analyzed as mild or moderate/severe at initial AFI and most recent AFI.

The primary outcomes were intrauterine fetal demise (IUFD) and neonatal intensive care unit (NICU) admission.

Statistical Analysis

Descriptive summary was used to describe the patient population stratified by AFV groups. Initially, data were analyzed and presented based on two groups (ie, normal amniotic fluid volume and idiopathic polyhydramnios). Continuous measures were presented as mean ± standard deviation (SD) or median with interquartile range (IQR) for skewed data while categorical data were presented as frequency and percentage. To assess the bivariate relationship between each measure with AFV groups, two-sample *t*-test or Wilcoxon rank-sum test, as appropriate, was used for continuous measures while chi-square test or Fisher's exact was applied to categorical variables. Next, both unadjusted and adjusted logistic regression models were used to examine increased likelihood of IUFD and NICU admission among those infants born to mothers with idiopathic polyhydramnios compared to normal amniotic fluid volume. In addition to IUFD and NICU admission, we examined the relationship between classification groupings of AFV with several secondary endpoints including 1-min APGAR < 7, 5-min APGAR < 7, fetal growth restriction (IUGR), and large for gestational age (LGA). The multivariable logistic model included maternal age, race/ethnicity, body mass index (BMI at the first antenatal visit most of which were in the first trimester), parity, and chronic hypertension (CHTN). In subsequent analyses, the classification of AFV was partitioned into three levels: normal AFV, mild idiopathic polyhydramnios, and moderate to severe idiopathic polyhydramnios. Similarly, both unadjusted and adjusted logistic regression models were used to evaluate the relationships between AFV groups and outcomes. Finally, we examined the sensitivity of our results based on the timing of the AFI assessment period as defined by initial AFI, highest AFI, and most recent AFI. All analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, NC) based on two-sided tests with significance level 0.05.

Results

We identified 12,725 patients that met criteria for inclusion. Of those, 249 patients had idiopathic polyhydramnios. Compared to the women with a normal AFI, the women with moderate to severe polyhydramnios were more likely to be non-Hispanic white,

deliver via cesarean and have a higher BMI. The women with mild polyhydramnios compared to the women with a normal AFI were more likely to be non-Hispanic black, deliver via cesarean, and have a higher BMI (Table 1). This group was subdivided into mild and moderate to severe idiopathic polyhydramnios using an AFI of 24.0–29.9 cm and >30 cm, respectively. There were 204 patients with mild polyhydramnios and 45 patients with moderate to severe polyhydramnios. The polyhydramnios group was also analyzed by diagnosis at initial AFV assessment, most recent AFV assessment or highest AFV assessment (Table 2).

Idiopathic Polyhydramnios

There were 249 patients with idiopathic polyhydramnios (either mild or moderate to severe) overall. At the time of the highest AFI the mean AFI measurement was 27.9±5.0 cm and the mean gestational age at time of assessment was 31.67 ±4.49 weeks. Additional analysis was performed for polyhydramnios diagnosed by initial AFI (n=241) and by most recent AFI (n=224). The mean AFI at initial assessment was 27.1±4.17 cm and the mean gestational age at time of assessment was 30.67±4.77 weeks. The mean AFI at most recent assessment was 27.23±4.88 cm and the mean gestational age at time of assessment was 32.49±4.31 weeks.

Intrauterine Fetal Demise

There were 116 (0.91%) IUFD cases among 12,725 patients that met criteria for inclusion. The group of women with a normal AFI had 109 (0.87%) cases of IUFD compared to 6 (2.94%) cases among women with mild polyhydramnios and 1 (2.22%) case among women with moderate to severe idiopathic polyhydramnios. There were higher odds of IUFD in the idiopathic polyhydramnios group with an adjusted odds ratio (aOR) of 3.27 (CI 1.50–7.15) (Table 3). The adjusted predicted probability of having an IUFD for women in the idiopathic polyhydramnios group was 2.6% (95% CI: 1.1% to 5.9%) compared to 0.8% (95% CI: 0.5% to 1.2%) for women with normal AFI. The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Table 1 Descriptive Summary

Maternal Measures	Normal AFI	Polyhydramnios (Mild)	Polyhydramnios (Mod/Severe)	p-value
Race, N (%)				0.0008
White	5125 (41.1)	86 (42.2)	25 (55.6)	
Black	4606 (36.9)	94 (46.1)	15 (33.3)	
Other	2745 (22.0)	24 (11.8)	5 (11.1)	
Ethnicity, N (%)				0.007
Non-Hispanic	9479 (76.0)	173 (84.8)	39 (86.7)	
Hispanic	2381 (19.1)	20 (9.8)	5 (11.1)	
Other	616 (5.0)	11 (5.4)	1 (2.2)	
Cesarean, N (%)	4314 (34.6)	101 (49.5)	26 (57.8)	<0.0001
Age, mean ± SD	27.0 ± 5.9	28.3 ± 5.9	27.7 ± 6.1	0.005
BMI, mean ± SD	33.1 ± 7.7	36.2 ± 9.8	37.1 ± 9.9	<0.0001
Parity, median [IQR]	1 [2]	1 [2]	1 [2]	0.770*
Chronic hypertension, N (%)	772 (6.2)	29 (14.2)	2 (4.4)	<0.0001**
Unspecified HTN, N (%)	446 (3.6)	13 (6.4)	1 (2.2)	0.102**

(*Continued*)

Table 1 (Continued).

Maternal Measures	Normal AFI	Polyhydramnios (Mild)	Polyhydramnios (Mod/Severe)	p-value
Gestational hypertension, N (%)	1430 (11.5)	25 (12.3)	2 (4.4)	0.329**
Arrest dilation/descent, N (%)	304 (2.4)	9 (4.4)	1 (2.2)	0.192**
Preeclampsia, N (%)	893 (7.2)	16 (7.8)	1 (2.2)	0.455**
Malpresentation, N (%)	273 (2.2)	3 (1.5)	2 (4.4)	0.354**
PPROM, N (%)	430 (3.5)	4 (2.0)	2 (4.4)	0.432**
Infant Measures				
Gestational age, mean ± SD	38.0 ± 2.9	37.9 ± 2.4	36.9 ± 2.8	0.031
Birthweight, mean ± SD	3051.0 ± 711.5	3230.6 ± 781.9	3049.6 ± 926.3	0.002
1-min APGAR, median [IQR]	8.0 [1]	8.0 [2]	7.0 [5]	<0.0001*
5-min APGAR, median [IQR]	9.0 [0]	9.0 [1]	8.0 [3.0]	<0.0001*
Preterm, N (%)	2135 (17.1)	37 (18.1)	15 (33.3)	0.015
Neonatal death, N (%)	41 (0.33)	1 (0.5)	0 (0)	0.565**
Fetal demise (IUFD), N (%)	109 (0.9)	6 (2.9)	1 (2.2)	0.015**
NICU, N (%)	2701 (21.7)	55 (27.0)	15 (33.3)	0.033
LGA, N (%)	544 (4.4)	35 (17.2)	10 (22.2)	<0.0001
Fetal growth restriction, N %)	2319 (18.6)	31 (15.2)	9 (20.0)	0.451
Cord prolapse, N (%)	18 (0.14)	0 (0)	1 (2.2)	0.100**
Shoulder dystocia, N (%)	63 (0.50)	3 (1.5)	0 (0)	0.145**

Notes: *Denote p-value based on Kruskal–Wallis test; **Denote p-value based on Fisher's exact test.
Abbreviations: SD, standard deviation; IQR, interquartile range; LGA, large for gestational age.

Table 2 Sample Size

Define Groups	2-Level	3-Level
Based on AFI initial, recent, or highest	Normal (N = 12,476) Polyhydramnios (N = 249)	Normal (N = 12,476) Mild (N = 204) Severe (N = 45)
Based on AFI initial	Normal (N = 12,484) Polyhydramnios (N = 241)	Normal (N = 12,484) Mild (N = 206) Severe (N = 35)
Based on AFI recent	Normal (N = 12,501) Polyhydramnios (N = 224)	Normal (N = 12,501) Mild (N = 185) Severe (N = 39)
Based on AFI highest	Normal (N = 12,476) Polyhydramnios (N = 249)	Normal (N = 12,476) Mild (N = 204) Severe (N = 45)

Note: Defining groups using AFI highest is the same as the union between AFI initial, recent, or highest.

Table 3 Unadjusted/Adjusted Odds Ratios with 95% Confidence Intervals Examining the Association Between Polyhydramnios and Infant Outcomes

	Method 1[a]		Method 2[b]		
Infant Outcomes	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**		**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**
Fetal demise	3.28 (1.51, 7.12)	3.27 (1.50, 7.15)	Mild Mod/Severe	3. 44 (1.49, 7.92) 2.58 (0.35, 18.88)	3.38 (1.46, 7.82) 2.78 (0.38, 20.29)
NICU	1.41 (1.07, 1.87)	1.28 (0.96, 1.70)	Mild Mod/Severe	1.34 (0.98, 1.82) 1.81 (0.97, 3.37)	1.19 (0.87, 1.64) 1.74 (0.93, 3.26)
1-min APGAR < 7	1.97 (1.50, 2.59)	1.81 (1.37, 2.38)	Mild Mod/Severe	1.62 (1.18, 2.22) 4.21 (2.34, 7.56)	1.48 (1.07, 2.03) 3.99 (2.20, 7.24)
5-min APGAR < 7	2.33 (1.64, 3.29)	2.16 (1.52, 3.07)	Mild Mod/Severe	1.83 (1.21, 2.77) 5.09 (2.66, 9.72)	1.68 (1.10, 2.55) 4.94 (2.57, 9.53)
Preterm	1.28 (0.94, 1.74)	1.19 (0.87, 1.63)	Mild Mod/Severe	1.07 (0.75, 1.54) 2.42 (1.30, 4.51)	0.97 (0.67, 1.40) 2.53 (1.35, 4.73)
LGA	4.84 (3.46, 6.76)	4.04 (2.83, 5.78)	Mild Mod/Severe	4.54 (3.13, 6.60) 6.27 (3.09, 12.72)	3.87 (2.59, 5.78) 4.80 (2.26, 10.22)
IUGR	0.84 (0.60, 1.18)	0.87 (0.61, 1.23)	Mild Mod/Severe	0.79 (0.53, 1.15) 1.10 (0.53, 2.28)	0.78 (0.53, 1.16) 1.35 (0.64, 2.83)

Notes: [a]Under Method 1, the primary comparison was Polyhydramnios vs Normal AFI (reference group); [b]under Method 2, the level of AFI was partitioned into 3 groups (Normal AFI < 24 cm (reference group); Mild Polyhydramnios AFI 24–29.9 cm; Severe Polyhydramnios AFI ≥ 30 cm). The first odds ratio estimate represents the comparison of Mild vs Normal and the second odds ratio represents the comparison of Severe vs Normal. [c]All adjusted models included the following maternal characteristics: age, race, BMI, parity, and CHTN.

Table 4 Unadjusted/Adjusted Odds Ratios with 95% Confidence Intervals Examining the Association Between Polyhydramnios and Infant Outcomes (Using Recent AFI Values to Define Groups)

	Method 1[a]		Method 2[b]		
Infant Outcomes	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**		**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**
Fetal demise	3.10 (1.35, 7.13)	3.11 (1.35, 7.19)	Mild	3. 13 (1.26, 7.76)	3.14 (1.26, 7.82)
			Mod/Severe	2.97 (0.40, 21.78)	2.99 (0.41, 22.11)
NICU	1.35 (1.00, 1.82)	1.25 (0.92, 1.69)	Mild	1.30 (0.94, 1.81)	1.20 (0.86, 1.67)
			Mod/Severe	1.61 (0.81, 3.17)	1.49 (0.75, 2.97)
1-min APGAR < 7	1.83 (1.37, 2.45)	1.71 (1.27, 2.29)	Mild	1.49 (1.07, 2.09)	1.40 (1.00, 1.96)
			Mod/Severe	4.17 (2.22, 7.82)	3.77 (2.00, 7.13)
5-min APGAR < 7	2.31 (1.60, 3.34)	2.18 (1.51, 3.16)	Mild	1.69 (1.07, 2.64)	1.59 (1.01, 2.51)
			Mod/Severe	6.24 (3.20, 12.18)	5.78 (2.94, 11.35)
Preterm	1.29 (0.93, 1.78)	1.22 (0.88, 1.70)	Mild	1.05 (0.72, 1.54)	0.98 (0.67, 1.44)
			Mod/Severe	2.71 (1.41, 5.22)	2.76 (1.42, 5.34)
LGA	4.58 (3.21, 6.54)	3.86 (2.65, 5.64)	Mild	4.37 (2.95, 6.49)	3.68 (2.41, 5.60)
			Mod/Severe	5.61 (2.57, 12.26)	4.74 (2.09, 10.78)
IUGR	0.76 (0.52, 1.10)	0.79 (0.54, 1.16)	Mild	0.65 (0.42, 1.01)	0.67 (0.43, 1.04)
			Mod/Severe	1.31 (0.62, 2.77)	1.51 (0.71, 3.22)

Notes: [a]Under Method 1, the primary comparison was Polyhydramnios vs Normal AFI (reference group); [b]under Method 2, the level of AFI was partitioned into 3 groups (Normal AFI < 24 cm (reference group); Mild Polyhydramnios AFI 24–29.9 cm; Severe Polyhydramnios AFI ≥ 30 cm). The first odds ratio estimate represents the comparison of Mild vs Normal and the second odds ratio represents the comparison of Severe vs Normal. [c]All adjusted models included the following maternal characteristics: age, race, BMI, parity, and CHTN.

Table 5 Unadjusted/Adjusted Odds Ratios with 95% Confidence Intervals Examining the Association Between Polyhydramnios and Infant Outcomes (Using Initial AFI Values to Define Groups)

	Method 1[a]		Method 2[b]		
Infant Outcomes	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**		**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)[c]**
Fetal demise	3.40 (1.57, 7.37)	3.37 (1.55, 7.36)		NA	NA
NICU	1.42 (1.07, 1.89)	1.29 (0.97, 1.73)	Mild	1.32 (0.96, 1.80)	1.18 (0.86, 1.62)
			Mod/Severe	2.14 (1.08, 4.26)	2.12 (1.06, 4.25)
1-min APGAR < 7	1.99 (1.51, 2.62)	1.84 (1.39, 2.43)	Mild	1.81 (1.33, 2.45)	1.66 (1.22, 2.27)
			Mod/Severe	3.30 (1.69, 6.45)	3.12 (1.58, 6.17)
5-min APGAR < 7	2.27 (1.59, 3.24)	2.11 (1.47, 3.03)	Mild	1.89 (1.25, 2.84)	1.74 (1.15, 2.63)
			Mod/Severe	5.00 (2.39, 10.44)	4.90 (2.33, 10.34)
Preterm	1.27 (0.93, 1.74)	1.18 (0.86, 1.63)	Mild	1.20 (0.85, 1.70)	1.10 (0.77, 1.56)
			Mod/Severe	1.68 (0.79, 3.59)	1.78 (0.83, 3.83)
LGA	5.04 (3.60, 7.05)	4.29 (2.99, 6.14)	Mild	4.81 (3.33, 6.93)	4.10 (2.77, 6.08)
			Mod/Severe	6.50 (2.94, 14.38)	5.39 (2.31, 12.57)
IUGR	0.87 (0.62, 1.23)	0.90 (0.63, 1.28)	Mild	0.84 (0.58, 1.22)	0.84 (0.57, 1.24)
			Mod/Severe	1.310 (0.48, 2.51)	1.31 (0.56, 3.03)

Notes: [a]Under Method 1, the primary comparison was Polyhydramnios vs Normal AFI (reference group); [b]Under Method 2, the level of AFI was partitioned into 3 groups (Normal AFI < 24 cm (reference group); Mild Polyhydramnios AFI 24–29.9 cm; Severe Polyhydramnios AFI ≥ 30 cm). The first odds ratio estimate represents the comparison of Mild vs Normal and the second odds ratio represents the comparison of Severe vs Normal. [c]All adjusted models included the following maternal characteristics: age, race, BMI, parity, and CHTN.

NICU Admission

While patients with idiopathic polyhydramnios had a higher adjusted predicted probability of NICU admission (47.2% vs 36.8%), it was not statistically significant with an aOR of 1.28 (CI 0.96–1.70) (Table 3). The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Large for Gestational Age (Birthweight Greater Than the 90th %)

Patients with idiopathic polyhydramnios also had a higher odds of LGA infants with an adjusted odds ratio (aOR) of 4.04 (CI 2.83–5.78) (Table 3). The adjusted predicted probability of delivering a LGA infant for women in the idiopathic polyhydramnios group was 12.3% (95% CI: 8.4% to 18.0%) compared to 3.0% (95% CI: 2.5% to 3.6%) for women with normal AFI. In the most recent AFI group, the odds remained increased with an aOR of 3.86 (CI 2.65–5.94) (Table 4). The odds were higher in the initial AFI group with an aOR of 4.29 (CI 2.99–6.14) (Table 5).

5-Min APGAR < 7

Patients with idiopathic polyhydramnios had a higher odds of having an infant with 5-minute APGAR score <7 with an adjusted odds ratio (aOR) of 2.16 (CI 1.52–3.07) (Table 3). The adjusted predicted probability of 5-min APGAR < 7 in the idiopathic polyhydramnios group was 17.8% (95% CI: 12.4% to 25.5%) compared to 8.2% (95% CI: 7.2% to 9.4%) for women with normal AFI. The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Neonatal Death

There was no difference in odds of neonatal death between the overall idiopathic polyhydramnios group and the normal AFV group (Table 1). There was only 1 neonatal death in the idiopathic polyhydramnios group, therefore no formal statistical model was used to examine the relationship with polyhydramnios with this rare outcome.

The outcomes were similar between normal and idiopathic polyhydramnios for preterm delivery and for intrauterine growth restriction.

Mild Idiopathic Polyhydramnios

There were 204 patients with only mild idiopathic polyhydramnios (AFI was 24.0–29.9 cm). The mean AFI at time of highest AFI assessment was 26.0±1.7 cm and the mean gestational age at time of assessment was 31.4±4.5 weeks. Additional analysis was performed on patients diagnosed with mild polyhydramnios at initial AFI assessment (n=206) and at the time of the most recent AFI assessment (n=185). The mean AFI at initial assessment was 25.8±1.5 cm and the mean gestational age at time of assessment was 30.6±4.68 weeks. The mean AFI at most recent assessment was 25.9 ±1.7 cm and the mean gestational age at time of assessment was 32.1±4.44 weeks.

Patients with mild idiopathic polyhydramnios were older, more likely to be black, have chronic hypertension and higher BMI when compared to patients with normal AFV (Table 1). Patients with mild idiopathic polyhydramnios on average delivered at an earlier gestational age (37.7±2.5 vs 38.0±2.9), had infants with a higher mean birthweight (3230.6 ±781.9 vs 3051.0±711.5), higher rate of preterm births (18.1% vs 17.1%) and were more likely to have a cesarean delivery (49.5% vs 34.6%). There were no differences in parity, gestational hypertension, preeclampsia, malpresentation, fetal growth restriction or premature prelabor rupture of membranes (PPROM).

Intrauterine Fetal Demise

The odds of IUFD were increased in the mild idiopathic polyhydramnios group compared to normal AFV with an aOR of 3.38 (CI 1.46–7.82) (Table 3). The adjusted predicted probability of having an IUFD for women in the mild idiopathic polyhydramnios group was 2.7% (95% CI: 1.1% to 6.4%) compared to 0.8% (95% CI: 0.5% to 1.2%) for women with normal AFI. The results were consistent based on most recent AFI (see Table 4).

NICU Admission

While infants born to mothers with mild idiopathic polyhydramnios had a higher adjusted predicted probability of NICU admission (44.0% vs 36.8%), it was not statistically significant with an aOR of 1.19 (CI 0.87–1.64) (Table 3). The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Large for Gestational Age (Birthweight Greater Than the 90th%)

Patients with mild idiopathic polyhydramnios also had a higher odds of having LGA infants with an adjusted odds ratio (aOR) of 3.87 (CI 2.59–5.78) (Table 3). The adjusted predicted probability of delivering a LGA infant for women in the mild idiopathic polyhydramnios group was 11.8% (95% CI: 7.7% to 18.0%) compared to 3.0% (95% CI: 2.5% to 3.6%) for women with normal AFI. In the most recent AFI group, the odds remained increased with an aOR of 3.68 (CI 2.41–5.60) (Table 4). The odds were higher in the initial AFI group with an aOR of 4.10 (CI 2.77–6.08) (Table 5).

5-Min APGAR < 7

Patients with mild idiopathic polyhydramnios had a higher odds of having an infant with 5-minute APGAR score <7 with an adjusted odds ratio (aOR) of 1.68 (CI 1.10–2.55) (Table 3). The adjusted predicted probability of 5-min APGAR < 7 in the mild idiopathic polyhydramnios group was 13.8% (95% CI: 12.4% to 25.5%) compared to 8.2% (95% CI: 7.2% to 9.4%) for women with normal AFI. The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Moderate to Severe Idiopathic Polyhydramnios

There were 45 patients with only moderate/severe idiopathic polyhydramnios (AFI was ≥30 cm at any ultrasound assessment). The mean AFI at time of highest AFI assessment was 38.7±17.6 cm and the mean gestational age at time of assessment was 32.8±4.3 weeks. Additional analysis was performed for patients diagnosed with moderate/severe polyhydramnios at initial AFI (n=35) and at most recent AFI (n=39). The mean AFI at initial assessment was 38.2 ±19.6 cm and the mean gestational age at time of assessment was 31.9±4.4 weeks. The mean AFI at most recent assessment was 38.7±18.7 cm and the mean gestational age at time of assessment was 33.5±4.0 weeks.

Patients with moderate/severe idiopathic polyhydramnios were older, more likely to be white, and have a higher BMI (Table 1). Patients with moderate/severe idiopathic polyhydramnios delivered at an earlier gestational age (36.9±2.8 vs 38.0±2.9), had higher rate of preterm birth (33.3% vs 17.1%) and were more likely to have cesarean delivery (57.8% vs

34.6%). Birthweight was similar in the moderate/severe polyhydramnios group (3049.6±926.3 vs 3051.0±711.5). There were no differences in parity, gestational hypertension, preeclampsia, malpresentation, fetal growth restriction or premature prelabor rupture of membranes (PPROM).

Intrauterine Fetal Demise

While the moderate/severe idiopathic polyhydramnios group had a higher adjusted predicted probability of IUFD compared to the normal AFI group (2.2% vs, 0.8%), it was not statistically significant with an aOR of 2.78 (CI 0.38–20.29) (Table 3). The results were consistent using the most recent AFI group with an aOR of 2.99 (CI 0.451–22.11) (Table 4).

NICU Admission

While infants born to mothers with moderate/severe idiopathic polyhydramnios had a higher adjusted predicted probability of NICU admission (44.0% vs 36.8%), it was not statistically significant with an aOR of 1.74 (CI 0.93–3.26) (Table 3). The result was similar using the most recent AFI group with an aOR of 1.49 (CI 0.75–2.97) (Table 4). However, based on the initial AFI grouping, the odds of NICU admission for infants born to mothers with moderate/severe idiopathic polyhydramnios were statistically significant with an aOR of 2.12 (CI 1.06–4.25) (Table 5). The adjusted predicted probability was 64.1% for the moderate/severe idiopathic polyhydramnios group compared to 36.8% for the normal AFV group.

Large for Gestational Age (Birthweight Greater Than the 90th %)

Patients with moderate/severe idiopathic polyhydramnios also had a higher odds of having LGA infants with an adjusted odds ratio aOR of 4.80 (CI 2.26, 10.22) (Table 3). The adjusted predicted probability of delivering a LGA infant for women in the moderate/severe idiopathic polyhydramnios group was 14.6% (95% CI: 6.8% to 31.7%) compared to 3.0% (95% CI: 2.5% to 3.6%) for women with normal AFI. In the most recent AFI group, the odds remained increased with an aOR of 4.74 (CI 2.09–10.78) (Table 4). The odds were higher in the initial AFI group with an aOR 5.39 (CI 2.31–12.57) (Table 5).

5-Min APGAR < 7

Patients with moderate/severe idiopathic polyhydramnios had a higher odds of having an infant with a 5-minute APGAR score <7 with an adjusted odds ratio (aOR) of 4.94 (CI 2.57–9.53) (Table 3). The adjusted predicted probability of 5-min APGAR < 7 in the moderate/severe idiopathic polyhydramnios group was 41.0% (95% CI: 21.1% to 79.7%) compared to 8.2% (95% CI: 7.2% to 9.4%) for women with normal AFI. The results were consistent using both recent AFI and initial AFI values to define the groups (see Tables 4 and 5).

Discussion

Findings

The most important finding in this study is the increased odds of an IUFD in idiopathic polyhydramnios, even in patients with only mild polyhydramnios. These odds remained elevated regardless of whether mild idiopathic polyhydramnios was diagnosed at the initial or most recent ultrasound assessment. Interestingly, we observed higher odds of IUFD in mild idiopathic polyhydramnios than moderate/severe. Although the cause of a higher rate of IUFD in mild compared to moderate/severe polyhydramnios cannot be identified in this study, we hypothesize that patients with moderate/severe polyhydramnios undergo antenatal fetal surveillance at our institution and fetal deterioration may be recognized, whereas per the Society for Maternal Fetal Medicine consult series guideline, patients with mild idiopathic polyhydramnios do not. This study identified other adverse pregnancy outcomes as well. Both mild and moderate/severe Idiopathic polyhydramnios was associated with a higher odds of having an infant with a 5-minute APGAR score less than 7, which may suggest that polyhydramnios adversely affects intrapartum fetal well-being. Both polyhydramnios groups were also associated with large for gestational age infants.

There have been other studies evaluating idiopathic polyhydramnios; however, most had a smaller sample size and/or did not differentiate mild versus moderate or severe idiopathic polyhydramnios compared to normal AFV. There are 2

studies that included a larger sample size. In a study by Luo, 276 patients with mild idiopathic polyhydramnios were included. Luo defined polyhydramnios as an AFI of greater than 25cm, which would have excluded some patients with polyhydramnios by the most commonly used definition of an AFI of 24 cm or greater.[8] These investigators found a significantly increased odds of IUFD (0.4%, n=4 vs 0.03%, n=37) with an aOR of 24.4. Weigand published a study with a large sample size of 348 patients with idiopathic polyhydramnios of which 274 patients had mild idiopathic polyhydramnios and they did not observe an increased odds of an IUFD.[9] They defined polyhydramnios as an AFI greater than 24 cm. They found no increased odds of (0.19%, n=19 vs 0.29%, n=1), however IUFD was a rare outcome in the study which may have affected their analysis.

The outcomes of 5-minute Apgar scores < 7 at 5 minutes, and LGA were significantly increased in the comparison of normal vs idiopathic polyhydramnios, mild polyhydramnios, and moderate to severe polyhydramnios groups. NICU admissions, preterm delivery, and intrauterine growth restriction were similar among all groups (normal, mild polyhydramnios, moderate/severe polyhydramnios) except the initial AFI in the moderate/severe polyhydramnios groups. Overall whether the group assignment was defined by the initial or most recent AFI had minimal effect on pregnancy outcomes.

Strength

This large retrospective study evaluates perinatal outcomes in pregnancies with idiopathic polyhydramnios, allowing us to evaluate rare outcomes such as IUFD. We evaluated and compared all ultrasound estimated polyhydramnios, mild idiopathic polyhydramnios, and moderate to severe polyhydramnios compared to pregnancies with normal AFI using the initial AFI and the final AFI measurements of polyhydramnios (Table 5).

Limitations

The retrospective study design has the potential to have missing or inaccurate data. The AFVs were extracted from the Viewpoint ultrasound software and diagnosis of polyhydramnios was made based on AFI which reduced the odds of misclassification of polyhydramnios. The data were adjusted for confounders by logistic regression; however, there is a residual risk of confounding bias. This study, despite its limitations can make an important contribution to the existing literature.

Conclusion

This study has identified adverse perinatal outcomes in pregnancies complicated by idiopathic polyhydramnios. We found increased odds of IUFD in moderate/severe idiopathic polyhydramnios, but most importantly, these increased odds were found with mild idiopathic polyhydramnios as well. Antenatal fetal testing should be considered in pregnancies complicated by mild idiopathic polyhydramnios.

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Disclosure

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