DOI: https://doi.org/10.53350/pjmhs2023176404

ORIGINAL ARTICLE

Frequency of Ultrasonographically Detectable Fetal Anomalies in Pregnancies Complicated by Polyhydramnios

SIDRA QADIR[1], MARIA YOUNAS[2], SADIQ JAN[3], AMINA AFTAB[4], MUHAMMAD AIMAN WALEED KHAN[5], MUHAMMAD ADIL HADEED KHAN[6]

[1]MBBS FCPS (Radiology), Consultant Radiologist , Maroof international hospital, Islamabad .
[2]MBBS FCPS (Radiology), Senior Registrar , Radiology Department, Riphah International Hospital.
[3]Associate Professor gynecology, Riphah International hospital.
[4]Assistant professor. Gynecology, Riphah International hospital.
[5,6]House Officer (Pakistan Atomic Energy Commission General Hospital Islamabad)
Corresponding author: Sidra Qadir, Email: drsidraqadir.sindhu1@gmail.com, Cell: +92 320 2200312

ABSTRACT

Introduction: The diagnosis of polyhydramnios is made prenatally by ultrasound examination using a noninvasive qualitative or quantitative approach. Ultrasound is well suited to assess liquor status and assess amniotic fluid volume. It is non- invasive, easily performed test and had no adverse effects on fetus and mother. 3.5 MHz convex ultrasound transducer (probe) is used to perform sonography, with use of Color Doppler whenever necessary.

Objectives: To find out the frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by polyhydramnios.

Study design: Cross sectional study

Settings: Radiology Department of PAF Hospital Islamabad.

Study duration: 6th October 2020 to 5th April 2021

Materials & Methods: A total of 150 women 20 to 40 years old having polyhydramnios during their second or third trimester of pregnancy were included. Patients with multiple gestation and intrauterine fetal death were excluded. They were scanned in detail with ultrasound machine having a convex 3.5 MHz probe for the severity of Amniotic Fluid Index (AFI) and for congenital fetal anomalies. Patients' demographics and clinical characteristics were recorded.

Results: Age range in this study was from 20 to 40 years with mean age of 28.87±4.16 years. Majority of the patients 92 (61.33%) were between 20 to 30 years of age. Mean gravidity was 3.01 ± 0.99. Mean duration since marriage was 5.50 ± 1.22 years. In this study, frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by polyhydramnios was found to be 38 (25.33%).

Conclusion: This study concluded that frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by Polyhydramnios is quite high.

Keywords: polyhydramnios, fetal anomalies, ultrasonography

INTRODUCTION

Normal foetal growth and development depend on the amniotic fluid. An excessive amount of amniotic fluid is referred to as polyhydramnios. Preterm birth, placental abruption, postpartum haemorrhage, and foetal malformations are just a few of the negative pregnancy outcomes it is linked to.[1] When the uterus is larger than expected for the gestational age, polyhydramnios should be clinically suspected. In the general obstetric population, the incidence of polyhydramnios ranges from 2 to 3 percent. Numerous issues related to pregnancy are correlated with abnormalities in amniotic fluid volume, both low (oligohydramnios) and excessive (polyhydramnios).[2,3]

Amniotic fluid volume can significantly increase in response to any disease that causes even a small daily increase in foetal urine production or a decline in foetal swallowing. Although the management of this process is not fully understood, the volume of amniotic fluid reflects the equilibrium between fluid production and transportation out of the amniotic sac.[4] Foetal urine and the secretion of lung fluid are the main sources of amniotic fluid generation in late gestation. Foetal swallowing and absorption through the intramembranous pathway, which involves passing through the amnion and into foetal vessels on the surface of the placenta, are the two main ways that amniotic fluid is expelled.[5]

Foetal abnormalities, which are frequently linked to an underlying genetic disorder or syndrome, are the most frequent cause of severe polyhydramnios; in contrast, milder occurrences are more frequently attributed to maternal diabetes, multiple gestations, and idiopathic causes.[6] Up to 25% of prenatal cases thought to be idiopathic have an anomaly after birth. Foetal anaemia, Bartter syndrome, infection, and neurological conditions are responsible for some cases that are thought to be idiopathic in utero and should be taken into consideration in the differential diagnosis if structural defects and maternal diabetes are ruled out. However, Bartter syndrome and neuromuscular disorders are quite uncommon, and infection (TORCH, parvovirus) is only rarely linked to isolated polyhydramnios.[7]

Foetal abnormalities in the majority of organ systems have been linked to polyhydramnios. The anatomical abnormalities that prevent foetal fluid absorption and/or swallowing are the most often occurring ones connected to polyhydramnios. Reduced swallowing may be brought on by basic gastrointestinal obstructions (such as esophageal or intestinal atresia), nervous system diseases (such as anencephaly), or secondary gastrointestinal obstructions, such as large dysplastic kidneys. The creation of extra amniotic fluid occasionally involves several pathways.8 Prenatal ultrasound examination is used to make a noninvasive qualitative or quantitative diagnosis of polyhydramnios. The evaluation of amniotic fluid volume and alcohol status can both be done with ultrasound. It is a simple, non-invasive test that has no negative effects on either the mother or the foetus. Sonography is carried out with a 3.5 MHz convex ultrasound transducer (probe), occasionally supplemented with Colour Doppler.[9,10]

In a study by Jakub Kornacki et al., the prevalence of foetal abnormalities in pregnant patients with polyhydramnios was found to be 21.3% overall.[11] Foetal abnormalities were found in 28 out of 100 polyhydramnios cases (or 28% of the 100 cases) in another investigation by Neetu Meena et al.[12]

The purpose of this study was to determine the prevalence of foetal malformations that can be identified using sonography in pregnancies affected by polyhydramnios. Polyhydramnios is usually linked to congenital foetal abnormalities and pain for the mother. Some of these anomalies would make life impossible, while others might cause significant morbidity in a person's early years. In order to consider early pregnancy termination rather than carrying a pregnancy to term, it is critical to diagnose foetal defects that are not compatible with life. To increase the likelihood of a successful outcome in other cases, treatment can be planned during pregnancy or the first few days after delivery. Therefore, our goal was to determine how frequently foetal abnormalities in

pregnant women with polyhydramnios could be identified using ultrasound.

MATERIALS AND METHODS

After approval from the hospital's ethical review board (ERB), this cross-sectional study was conducted at Radiology Department of PAF Hospital Islamabad and will include in-patients as well as out-patients presenting with polyhydramnios during second or third trimester of pregnancy from 6th October 2020 to 5th April 2021. Informed consent was taken from patients.

Sample size is calculated using World Health Organization's (WHO) sample size calculator. Sample size will be 150 using 33% as prevalence of fetal anomalies in pregnancies complicated by polyhydramnios6. Confidence interval of 95% with 7.5% margin of error was used. Non-probability, consecutive sampling. Pregnant women 20 to 40 years old having polyhydramnios during their second or third trimester of pregnancy were included in this study. Patients in their first trimester of pregnancy, with multiple gestations and pregnant patients with intrauterine fetal death were excluded from the study.

All pregnant women in their second or third trimesters with polyhydramnios were enquired about their personal data such as name, age, gravidity, gestational age at diagnosis of polyhydramnios, duration since marriage and consanguinity. They were scanned in detail with ultrasound machine having a convex 3.5 MHz probe for the severity of Amniotic Fluid Index (AFI) and for congenital fetal anomalies. Patients' demographics and clinical characteristics were recorded on the approved pro forma.

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 21.0. Results were presented as mean, median and standard deviation (SD) for numerical variables such as age, gravidity and duration since marriage. Frequencies and percentages were calculated for categorical variables such as consanguinity and presence and types of fetal anomalies. The primary outcome measure (i.e. presence of fetal anomalies) were stratified by age, gravidity, consanguinity and severity of polyhydramnios. Chi square test was used to compare categorical variables such as consanguinity, severity of polyhydramnios and fetal anomalies. Student's t test was used to compare continuous variables such as age, gravidity, and duration since marriage. p-value was calculated and p-value

≤0.05 was considered as statistically significant. The results were presented in the form of tables and graphs.

STUDY RESULTS

Age range in this study was from 20 to 40 years with mean age of 28.87±4.16 years. Majority of the patients 92 (61.33%) were between 20 to 30 years of age. Mean gravidity was 3.01 ± 0.99. Mean duration since marriage was 5.50 ± 1.22 years. Distribution of patients according to consanguinity and severity of Polyhydramnios is shown in Table VI & VII respectively as shown in table 1.

In this study, frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by polyhydramnios was found to be 38 (25.33%) as shown in Table 2.

Table 1: Age distribution of patients

Variables	Characterstics	No. of Patients	%age
Age	Mean ± SD	28.87 ± 4.16	-
	20-30	92	61.33
	31-40	58	38.67
Gravidity	Mean ±SD	3.01 ± 0.99	-
	≤3	93	62.0
Duration (years)	Mean ±SD	5.50 ± 1.22	-
	>3	57	38.0
	≤5	72	48.0
	>5	7	52.0
consanguinity	Yes	63	42.0
	No	87	58.0

Stratification of the fetal anomalies with respect to age and gravida is shown in table 4. Table 4 has also shown the stratification of the fetal anomalies with respect to duration since marriage. Stratification of the fetal anomalies with respect to consanguinity and severity of Polyhydramnios is shown in Table 4.

Table 2: Distribution of patients according to severity (n=150)

Severity	No. of Patients	% age
Mild	63	42.0
Moderate	44	29.33
Severe	43	28.67

Table 3: Frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by polyhydramnios (n=150)

fetal anomalies	No. of Patients	% age
Yes	38	25.33
No	112	74.67
Total	150	100.0

Table 4: Stratification of congenital anomalies with respect to age

Variables	Characterstics	Congenital Anomalies		p-value
		Yes	No	
Age	20-30	29	63	0.028
	31-40	09	49	
Gravidity	≤3	26	67	0.345
	>3	12	45	
Duration Years	≤5	16	56	0.400
	>5	22	56	
consanguinity	Yes	15	48	0.715
	No	23	64	
Severity	Mild	12	51	0.195
	Moderate	14	30	
	Severe	12	31	

DISCUSSION

An abnormal rise in amniotic fluid volume is a defining feature of polyhydramnios. Amniotic fluid volume can be measured without surgery using an ultrasonographic approach. By seeing a rise in amniotic fluid, polyhydramnios can be identified subjectively. This can be verified by measuring a single antero-posterior fluid pocket larger than 8 cm or an amniotic fluid index (AFI) measurement larger than 25.[13]. Foetal anomalies, maternal diabetes, and twin pregnancies are the most frequent causes of polyhydramnios. In 60% of cases, the cause is idiopathic.[14] It is associated with a high prevalence of prenatal and perinatal problems, such as foetal abnormalities, diabetes mellitus, pre eclampsia, threatening abortion, and low Apgar scores. Cardiac, digestive, central nervous system, and musculoskeletal anomalies occur more frequently in foetuses. In one study, 48% of the foetuses with polyhydramnios developed serious abnormalities. An important aspect of prenatal monitoring is the ultrasound assessment of amniotic fluid volume. Accordingly, focused ultrasonography can dramatically increase abnormality diagnosis in the presence of even slight amniotic fluid anomalies.[15]

I have conducted this study to find out the frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by Polyhydramnios. In my study, frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by polyhydramnios was found to be 38 (25.33%). In a study by Jakub Kornacki et al., the general frequency of fetal anomalies in pregnant patients complicated by polyhydramnios was 21.3%.[11] In another study by Neetu Meena et al., fetal anomalies were present in 28 out of 100 cases (i.e. 28%) of polyhydramnios studied.[12]

As the amniotic fluid volume grew, the prevalence of foetal abnormalities rose among the 672 pregnancies with polyhydramnios, from 1% in cases of mild polyhydramnios to 11% in situations of severe polyhydramnios, according to research by Dashe et al.86. Foetal abnormalities in the CNS, foetal heart, gastrointestinal system, and thorax, respectively, were present in 28, 22, 14, and 11% of these patients. The type of abnormality was unrelated to the amount of amniotic fluid present. A correlation

between the degree of polyhydramnios and the probability of premature delivery, which complicates these situations, has been found in pregnancies with foetal abnormalities.[16]

Despite the fact that in his study polyhydramnios was assessed using the amniotic fluid index, Lazebnik also noted that the relative risk of congenital abnormalities rose with the degree of polyhydramnios.[17] Additionally, Barkin noted a correlation between growing foetal anomaly frequency and growing polyhydramnios severity. To rate the severity of polyhydramnios, they instead employed their subjective impression.[18]

20% of instances, according to research by Ben Chetrit et al, involved congenital abnormalities. The most frequent anomalies (39%) were gastrointestinal, including omphalocele, diaphragmatic hernia, esophageal atresia, and duodenal atresia.Only 26% of the anomalies were CNS anomalies, with anencephaly being the most frequent. abnormalities of the cardiovascular and urinary systems made up 35% of the abnormalities.[19] Carlson et al. discovered that 44% of their patients had a recognised foetal abnormality, of which 27% had foetal aneuploidy, of which 3 had trisomy 18, 3 were determined to be hydrocephalous, 2 had tracheoesophageal fistulas, and 2 had ventricular septal defects.[20] Gita Guin et al. discovered that the prevalence of congenital malformations in their study was 31.1%, with the most prevalent defects being hydrocephalus (5/14), cerebral palsy (3/14), spina bifida (2/14) and duodenal atrophy (2/14).[21]

There aren't many series that have examined an unselected obstetric population for polyhydramnios that can be seen on an ultrasound.[22,23] The congenital abnormality in ten of the 12 instances reported by Quinlan et al.23 caused the deaths of all but two of the infants. In 10,214 patients investigated by Hill et al.[24, 102] cases of polyhydramnios were found; 10 of these 102 newborns had malformations. 99 cases were identified in Landy et al.'s analysis of hydramnios-complicated pregnancies96. Thirteen of them, including three twins or triplets, had accompanying abnormalities. High incidence of abnormalities (79.1%) were observed in foetuses of mothers with severe polyhydramnios (35 cm) in a research by Pri-Paz et al.26 The most common congenital defects in polyhydramnios, particularly in cases of severe polyhydramnios, were gastrointestinal system malformations, according to a research by Kornacki et al.[27]

CONCLUSION

This study concluded that frequency of ultrasonographically detectable fetal anomalies in pregnancies complicated by Polyhydramnios is quite high. So, we recommend that sonographic detection of polyhydramnios and assessment of its severity should be used as a warning sign for an underlying congenital fetal malformation, requiring a meticulous and focused ultrasonographic fetal assessment thereby significantly improving fetal anomaly detection rate on prenatal imaging.

Conflict of interest: Nil
Funding source: Nil

REFERENCES

1. Huri M, Di Tommaso M, Seravalli V. Amniotic Fluid Disorders: From Prenatal Management to Neonatal Outcomes. Children. 2023 Mar 16;10(3):561.
2. Whittington JR, Ghahremani T, Friski A, Hamilton A, Magann EF. Window to the Womb: Amniotic Fluid and Postnatal Outcomes. International Journal of Women's Health. 2023 Dec 31:117-24.
3. Hamza A, Herr D, Solomayer EF, Meyberg-Solomayer G. Polyhydramnios: causes, diagnosis and therapy. Geburtshilfe und Frauenheilkunde. 2013 Dec;73(12):1241-6.
4. Dubil EA, Magann EF. Amniotic fluid as a vital sign for fetal wellbeing. Australasian journal of ultrasound in medicine. 2013 May;16(2):62-70.
5. Sandlin AT, Chauhan SP, Magann EF. Clinical relevance of sonographically estimated amniotic fluid volume: polyhydramnios. Journal of Ultrasound in Medicine. 2013 May;32(5):851-63.
6. Pagan M, Magann EF, Rabie N, Steelman SC, Hu Z, Ounpraseuth S. Idiopathic polyhydramnios and pregnancy outcome: systematic review and meta-analysis. Ultrasound in Obstetrics & Gynecology. 2023 Mar;61(3):302-9.
7. Massey JM, Gable KL. Neuromuscular disorders and pregnancy. Continuum: Lifelong Learning in Neurology. 2022 Feb 1;28(1):55-71.
8. Kazemi S. Perinatal Outcomes of Idiopathic Polyhydramnios with Normal Ultrasound: A Systematic Review and Meta-Analysis. Int J Pediatr 2019; 7(5): 9349-62.
9. Igbinidu E, Akhigbe AO, Akinola RA. Sonographic evaluation of the amniotic fluid index in normal singleton pregnancies in a Nigerian population. IOSR J Dent Med Sci. 2013;6(29):e33.
10. Moore TR. The role of amniotic fluid assessment in evaluating fetal well-being. Clinics in perinatology. 2011 Mar 1;38(1):33-46.
11. Kornacki J, Adamczyk M, Wirstlein P, Osiński M, Wender-Ożegowska E. Polyhydramnios—frequency of congenital anomalies in relation to the value of the amniotic fluid index. Ginekol Pol. 2017;88(8):442-5.
12. Meena N, Ara A, Khokad M, Meena R, Meena A. Prevalence and Neonatal Outcome by Ultrasonically Detected Polyhydramnios. J Med Sci Clin Res. 2013;04(12):14728--32.
13. Middleton WD, Kurtz AB, Hertzberg BS. Ultrasound – the requisites. 2 nd ed. Missiouri: Mosby; 2004: 3-376.
14. Volante E, Gramellini D, Moretti S, Kaihura C, Bevilacqua G. Alteration of the amniotic fluid and neonatal outcome. Acta Biomed Ateneo Parmense 2004; 75 (Suppl 1): 71-75.
15. Chetrit AB, Celnikier DH, Ron M, Yagel S. Hydramnios in the third trimester of pregnancy: A change in the distribution of accompanying fetal anomaliesas a result of early ultrasonographic prenatal diagnosis. Am J Obstet Gynecol 2009; 162(5):1344- 5.
16. Many A, Lazebnik N, Hill LM: The underlying cause of polyhydramnios determines prematurity. Prenat Diagn 2006;16:55–57.
17. Lazebnik N, Many A. The severity of polyhydramnios, estimated fetal weight and preterm delivery are independent risk factors for the presence of congenital malformations. Gynecol Obstet Invest. 2008; 48: 28-32.
18. Barkin SZ, Pretorius DH, Beckett MK, Manobester D K, Nelson T R, Manco – Johnson M L. Severe polyhydramnios: incidence of anomalies. AJR Am J Roentgenol. 2019; 148: 155-9.
19. Chetrit AB, Celnikier DH, Ron M, Yagel S. Hydramnios in the third trimester of pregnancy: A change in the distribution of accompanying fetal anomaliesas a result of early ultrasonographic prenatal diagnosis. Am J Obstet Gynecol 2001; 162(5):1344- 5.
20. Carlson DE, Platt LD, Medearis AL, Hornestein J. quantifiable polyhydramnios Diagnosis and management. Obstet Gynecol 2009;75: 989 - 993.
21. Guin G, Punekar S, Lele A, Khare S. A Prospective Clinical Study of Feto-Maternal Outcome in Pregnancies with Abnormal Liquor Volume JObstet Gynaecol India. 2011 Dec; 61(6):652–655.
22. Zamah NM, Gillieson MS, Walters JH, et al: Sonographic detection of polyhydramnios: A 5- year experience. Am J Obstet Gynecol 2002; 143:523–527.
23. Quinlan RW, Cruz AC, Martin M: Hydramnios ultrasound diagnosis and its impact on perinatal management and pregnancy outcome. Am J Obstet Gynecol 2013;145:306– 311.
24. Hill LM, Breckle R, Thomas ML, Fries JK: Polyhydramnios: Ultrasonically detected prevalence and neonatal outcome. Obstet Gynecol 2007;69:21–25.
25. Landy HJ, Isoda NB, Larsen JW: Genetic implications of idiopathic hydramnios. Am J Obstet Gynecol 2002;157:114–117.
26. Pri-Paz S, Khalek N, Fuchs KM, Simpson LL. Maximal amniotic fluid index as a prognostic factor in pregnancies complicated by polyhydramnios. Ultrasound Obstet Gynecol 2012;39(6):648–653.
27. Kornacki J, Adamczyk M, Wirstlein P, Osiński M, Wender-Ożegowska E. Polyhydramnios — frequency of congenital anomalies in relation to the value of the amniotic fluid index. Ginekol Pol 2017;88(8):442-445