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Abstract

Objective: Polyhydramnios carries a high rate of complications during pregnancies and adverse perinatal outcomes. Obstetrical ultrasound screening is the prime tool to rule out any possible adverse outcome that might lead towards worst scenarios outcome such as growth retardation, C-section and preterm delivery. The objective of this study was to determine sonographic association of polyhydramnios with adverse perinatal outcomes in diabetic mothers from 34 to 40 weeks of pregnancy.

Methodology: A cross sectional analytical study was carried out at the Department of Radiology in Services Hospital Lahore, Pakistan. Duration of study was from March 2017 to November 2017. Patients in 3rd trimester of pregnancy with Polyhydramnios and diabetes were chosen subsequent to fulfilling consideration (inclusion) and rejection (exclusion) criteria. A complete history and investigation were finished. All necessary examination done. Polyhydramnios confirmed by estimating amniotic fluid index. Statistical Software for Social Sciences (SPSS version 24) was used for analysis of all data. Standard and Mean Deviation (SD) remained calculated for continuous variables. The sample size was 101 in this study. While throughout the study period data of 89 patients was collected.

Findings: Patients were between the age group of 18 to 35 years. Severity of polyhydramnios was classified as mild moderate and severe. Out of 89 babies delivered during study 66 had no complications while 4 were macrosomic, 1 infant suffered from shoulder dystocia, 1 was lager for gestational age, 3 had respiratory distress syndrome and 3 were smaller for gestational age. Hb1AC levels were higher in diabetic patients with the mean value of 6.18%. In this study, we found that polyhydramnios is associated with poor diabetic control. This research shows that polyhydramnios is associated with an increased risk of adverse perinatal outcomes, and there is a significant positive relation with maternal age, diabetes, fetal anomalies, and fetal macrosomia. Pregnant women with GDM showed higher risk of macrosomic newborns. This study demonstrates that the likelihood of an adverse perinatal outcome increases in association with polyhydramnios.

Recommendations: Polyhydramnios is considered as indicative of developmental disorder if there is a suspicion of a developmental disorder, regular follow-up examinations and further diagnostic tests are recommended. This study recommend that women with severe polyhydramnios deliver at a tertiary center due to the significant possibility that fetal anomalies may be present. The study also recommend that amnioreduction be considered only for the indication of severe maternal discomfort, dyspnea or both in the setting of severe polyhydramnios.

Keywords: *Amniotic fluid index, polyhydramnios, perinatal outcomes, diabetes.*

1.0 INTRODUCTION

Diabetes mellitus is a condition caused by insulin deficiency or its peripheral resistance to hyperglycemia impacts¹. Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. Also, it is associated with an increased risk for neonatal adverse outcome as well as maternal complications including preeclampsia and cesarean section². Polyhydramnios is defined as an AFI above 24 or 25cm. Polyhydramnios is subdivided to mild, moderate and severe³. The uterus is a pear-shaped dynamic organ that is responsible for a variety of functions such as gestation (pregnancy), menstruation, and labor and delivery. The uterus functions by accepting the fertilized ovum which passes through the fallopian tube. The ovum then implants into the endometrium where it receives nourishment from blood vessels developed exclusively for that purpose. As the embryo grows and matures, the uterus expands to accommodate the pregnancy. During normal labor, the uterus contracts as the cervix dilates, and this results in delivery of the infant⁴. The placenta intermediates the transfer of nutrients between mother and fetus⁵.

Placental nutrient metabolism was found to play a key role in limiting the transfer of some nutrients⁶. Adverse pregnancy situations, such as those involving maternal diabetes or obesity, can increase or decrease levels of nutrient transporters in the placenta potentially resulting in overgrowth or restricted growth of the fetus⁷. The maternal causes of polyhydramnios include mainly gestational and pregestational diabetes mellitus⁸. Females with abnormal amounts of amniotic fluid, whether too much (Polyhydramnios) or too little (oligohydramnios) are at danger⁹. Diabetes has become a global pandemic because of aging population, sedentary life style, urbanization, and increasing incidence of obesity¹⁰. Diabetes mellitus increases the risk of important adverse outcomes of pregnancy¹¹. Gestational diabetes mellitus is characterized in most cases by postprandial hyperglycemia, resulting from impaired insulin release and an exaggeration of the insulin resistance seen in normal pregnancies. However, excellent blood glucose control, with diet and, when necessary, insulin will result in an improved perinatal outcome¹².

Polyhydramnios is generally detected either by physical examination, if the uterus appears larger or measures larger than expected by the pregnancy dating¹³. Amniotic fluid is responsible for a protective and supportive surrounding for fetal growth throughout pregnancy¹⁴. Numerous semi-quantitative methods are described to measure amniotic fluid volumes¹⁵. For the single deepest pocket (SDP) the amniotic fluid capacity is measured vertically in the deepest amniotic fluid pocket. Values above 8 cm point indicate polyhydramnios and values under 2 cm point indicate oligohydramnios¹⁶. In 4-quadrant method the deepest amniotic pocket in every single four quadrants are measured vertically and the values added together¹⁷. The subsequent processes are used to reduce amniotic fluid volumes; pharmacological treatment and amnioreduction (therapeutic amniocentesis)¹⁸.

2.0 MATERIALS AND METHODS

2.1 Study Design

Cross sectional analytical study.

2.2 Settings

The study was conducted at, Services hospital after institutional ethical committee approval. The study was started after the approval of synopsis.

2.3 Study Duration

08-03-2019 to 03-09-2019

2.4 Sample Size

Sample size calculated with statistical power analysis formula:

$$n = \frac{z^2 \frac{a}{1-\frac{a}{2}} p(1-p)}{d^2}$$

As the prevalence of this research topic sonographic association of polyhydramnios with adverse perinatal outcomes in diabetic mothers from 34 to 40 weeks of pregnancy was 7.1%¹⁹. So the calculated sample size was 101 patients. However, during the study duration, the data of 89 patients was collected. So pregnant ladies with polyhydramnios and diabetes mellitus were examined.

2.5 Sampling Technique

Convenient sampling

2.6: Sample Selection

2.6.1 Inclusion Criteria

All singleton pregnant ladies with diabetes from 34 to 40 weeks of gestation.

2.6.2 Exclusion Criteria

Unwilling.

2.7 Equipment(s)

GE logic S8 with 3.5 MHz convex probe.

2.8 Scanning Techniques

Patient was in supine position. The amniotic fluid index was measured by single pocket method and four quadrant method by dividing the abdomen into four imaginary quadrants. Normal AFI values range from 5 to 24. The range exceeding the normal values was considered as polyhydramnios. The pocket must be free of any fetal part and umbilical cord.

2.9 Statistical Analysis

Data was evaluated and analyzed with Statistical Software for Social Sciences (SPSS version 24), Microsoft Excel 2013. Descriptive analyses were performed to investigate the distribution of data. Mean and standard deviation (SD) was calculated for continuous variables. Frequency and percentages were calculated for categorical variables. Collected data was stored in Microsoft Excel.

3.0 RESULTS

These maternal complications were associated with polyhydramnios in patients according to table 1.

Table 1: Maternal complications* AFI cross tabulation

AFI	Maternal Complications				Total
	Normal	Pregnancy induced by hypertension	Premature rupture of membrane	Preterm labour	
25.00	6	2	0	1	9
26.00	15	0	0	0	15
27.00	11	0	0	1	12
28.0	9	1	0	2	12
29.00	14	2	0	1	17
30.00	11	0	1	2	14
31.00	6	0	0	0	6
32.00	3	0	0	0	3
34.00	1	0	0	0	1
Total	76	5	1	7	89

According to table 2 these were the major complications we have seen in fetuses that were born during the study period.

Table 2: Fetal complications * AFI Cross tabulation

Fetal complications	AFI										Total
	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	34.00		
Cleft lip	1	0	0	0	0	0	1	0	0	2	
Cleft palate	0	0	0	0	0	1	0	0	0	1	
Hypoglycaemia	0	1	0	0	0	1	0	0	0	2	
LGA	0	0	0	0	1	0	0	0	0	1	
Macrosomia	3	0	0	0	1	0	0	0	0	4	
Normal	5	13	11	12	10	8	4	2	1	66	
Perinatal asphyxia	0	0	0	0	1	1	0	0	0	2	
Polycythemia	0	0	0	0	0	2	0	0	0	2	
Prematurity	0	0	0	0	1	1	0	0	0	2	
Respiratory distress syndrome	0	1	0	0	2	0	0	0	0	3	
SGA	0	0	1	0	1	0	1	0	0	3	
Shoulder dystocia	0	0	0	0	0	0	0	1	0	1	
Total	9	15	12	12	17	14	6	3	1	89	

Table 3: AFI * Outcomes Cross tabulation

			Outcomes		
			C. Section	Normal delivery	Total
AFI	25	Count	7	2	9
		% within AFI	77.8%	22.2%	100.0%
	26	Count	9	6	15
		% within AFI	60.0%	40.0%	100.0%
	27	Count	6	7	13
		% within AFI	46.2%	53.8%	100.0%
	28	Count	5	6	11
		% within AFI	45.5%	54.5%	100.0%
	29	Count	13	4	17
		% within AFI	76.5%	23.5%	100.0%
	30	Count	7	7	14
		% within AFI	50.0%	50.0%	100.0%
	31	Count	4	2	6
		% within AFI	66.7%	33.3%	100.0%
	32	Count	2	1	3
		% within AFI	66.7%	33.3%	100.0%
	34	Count	1	0	1
		% within AFI	100.0%	.0%	100.0%
Total		Count	54	35	89
		% within AFI	60.7%	39.3%	100.0%

4.0 DISCUSSION

This study was conducted at services hospital Lahore. A total of 89 patients were diagnosed with polyhydramnios by ultrasound scan between the age group of 18 to 35 years. The mean of age came out to be 26.71. Women with polyhydramnios had higher HbA1c levels throughout the pregnancy. Severity of polyhydramnios was classified as mild moderate and severe in 10.1%, 19.1%, and 1.1%. In this study 74 (83.1%) patients had no previous abortion 12 (13.5%) patients had history of one abortion, while 3 (3.4%) patients had history of 2 abortions. During the study period one patient had premature rupture of membrane. Seven patients delivered early due to preterm labour. Out of 89 babies delivered during study, 66 had no complications while 4 were macrosomic, 1 infant suffered from shoulder dystocia, one was larger for gestational age, 3 had respiratory distress syndrome and 3 were smaller for gestational age. Two infants suffered from perinatal asphyxia, 3 had congenital anomalies, 2 suffered from hypoglycemia, and 2 had polycythemia. In this study 54 (60.7%) patients had cesarean section and 35 (39.3%) had normal delivery. Out of 89 patients 10.1% patients delivered at 37 weeks, 16.9% patients delivered at 41 weeks while 4.5% patients delivered the baby at 34 weeks of pregnancy.

Despite the lower gestational age higher incidences of macrosomia and LGA were found. The mean birth weight was 3.4 kg. Hb1AC levels were higher in diabetic patients with the mean value of 6.18%. In this study, it was found that polyhydramnios is associated with poor diabetic control. Another study was conducted by Kaukab Tashfeen in 2010 he studied on Polyhydramnios as a Predictor of Adverse Pregnancy Outcomes. 25,979 singleton pregnancies were included in study and 477 were diagnosed with polyhydramnios by ultrasound scan. Polyhydramnios was classified as mild, moderate, and severe in 80.1%, 17.6%, and 2.4% of cases. Polyhydramnios occurred in 76.8% of cases diabetes mellitus in 15.3% of cases and congenital anomalies found in 8.2% of cases. Increased amniotic fluid volume in diabetic pregnancies could be a result of maternal hyperglycemia which, in turn, produces fetal hyperglycemia and osmotic diuresis. It has consistently been reported that approximately 15% of pregnancies complicated by polyhydramnios occur in diabetic women.

A total of 73 polyhydramnios patients, (15.3%) were diabetic, including 59 who were being treated for gestational diabetes or were on a medically supervised diet twelve had gestational insulin-treated diabetes. Only two patients had pre-existing diabetes mellitus. The mode of delivery was also influenced by polyhydramnios, with a higher proportion of Caesarean deliveries as compared with those mothers who had a normal volume of amniotic fluid. This study shows that polyhydramnios had an impact on perinatal outcomes and fetal congenital anomalies. It was concluded that the results and outcomes of his study were matched with our study²⁰. Another study was done by Gulfareen Haider *et al*, in 2009 studied on perinatal outcome in diabetic mothers at Isra university hospital. In the study population, frequency of occurrence of diabetes mellitus was 4.6%.

Among 110 patients, 81(73.6%) had gestational diabetes mellitus while 29(26.3%) had established diabetes mellitus. Forty-one (37.2%) patients belonged to 20-30 years of age group and 58(52.7%) to 31-35 years' age group. Out of 110 diabetic patients, 73.6% had gestational diabetes compared to 26.3% established diabetes with pregnancy, while a study at Sheikh Zayed Hospital Lahore, Pakistan has reported 75% gestational diabetes cases compared to 25% established diabetic 11 pregnancies. Pregnant woman with pre-existing or gestational diabetes has a higher risk of giving birth to a child with malformations. Stillbirth rates were high in pre-diabetic pregnancies and in those occurring after the diagnosis of diabetes, compared with non-diabetic population. In this study, 30% patients had elective cesarean section and 33.6% underwent emergency cesarean section due to mechanical obstruction. This was due to the fact that a large number of diabetic mothers had multiple previous pregnancy losses and a high prevalence of macrosomia.

It is shown from this study that diabetes during pregnancy is more common in a woman of high parity than the lower one. This study shows that diabetes mellitus is one of the major problems, which requires multidisciplinary management approach for optimal results. The attending physicians and obstetricians should offer the joint care to the patient to get best results²¹. Ayaz A *et al*, (2007) studied on Maternal and Neonatal Outcomes in Gestational Diabetes Mellitus. 1429 women were included in this study fifty patients (3.5%) were diagnosed as a case of GDM. In this study, 88% of the diabetic pregnant women were above 25 years of age and only 12% women were <25 years of age. Increasing maternal age was associated with higher frequency of GDM. Several obstetric problems occur in diabetic pregnancy their frequency being directly related to the quality of the diabetic control achieved. Despite good glycemic control, the maternal complications were 56% in the present study.

Polyhydramnios is a common complication, with a reported incidence of 3- 32% in diabetic pregnancies. Premature labour occurs up to 20% of diabetic pregnancies. The reason might be

that preterm labor, occasionally associated with polyhydramnios and the presence of illiteracy and poverty adversely affect this problem. The majority of women with GDM proceed to term and have a spontaneous vaginal delivery. Abdominal delivery of infants of mothers with gestational diabetes has been considered a therapy. This study showed a 58% caesarean section rate quite similar to other studies. Thirty-six percent of neonates weighed >4kg. Minor metabolic disturbances in pregnancy, labor and delivery put mother and baby at high risk of developing certain complications and result in long term morbidity; these minor metabolic disturbances hence need to be screened and treated at the appropriate time, reducing the social and financial burdens of managing the results of untreated diabetes. These patients should be cared for in those centers which have facilities of obstetrician, physician and neonatologist with special experience in the field²².

5.0 CONCLUSION

This research shows that polyhydramnios is associated with an increased risk of adverse perinatal outcomes, and there is a significant positive relation with maternal age, diabetes, fetal anomalies, and fetal macrosomia. Pregnant women with GDM showed higher risk of macrosomic newborns. This study demonstrates that the likelihood of an adverse perinatal outcome increases in association with polyhydramnios.

Case no 1

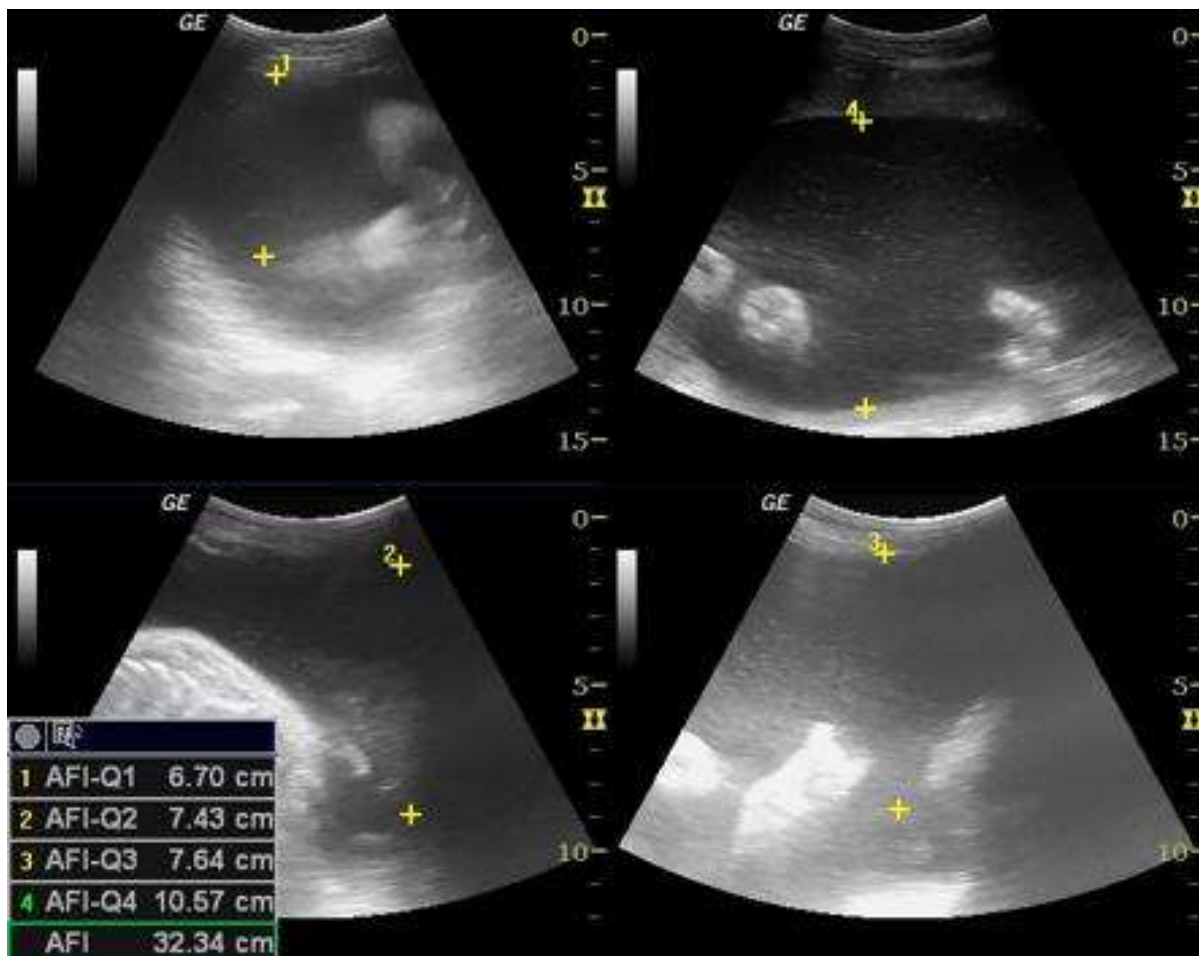


Image 1: Measurements of amniotic fluid in polyhydramnios patient taken with four quadrant method.

6.0 RECOMMENDATIONS

Polyhydramnios is considered as indicative of developmental disorder. If there is a suspicion of a developmental disorder, regular follow-up examinations and further diagnostic tests are recommended. We recommend that women with severe polyhydramnios deliver at a tertiary center due to the significant possibility that fetal anomalies may be present. Amnioreduction be considered only for the indication of severe maternal discomfort, dyspnea or both in the setting of severe polyhydramnios.

Ethical Approval

Ethical approval was gained from the ethical committee of the University of Lahore before the study. Written informed consent was taken from all the patients. All information and collected data was kept confidential. Individual patient identification and detail was kept confidential and no information regarding patient was published.

Conflict of interest

The authors declare that they have no conflicts of interest.

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