

Prevalence of Renal Pathologies in Fetuses Detected on Ultrasound in the Second Trimester of Pregnancy in Females with Oligohydramnios

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ABSTRACT

Background: Common fetal renal abnormalities due to oligohydramnios are deficiency in the renal tissue congenitally, obstruction in the flow of urine, and reduced perfusion of renal tissue can also cause pathologies. Oligohydramnios is responsible for causing various serious fetal complications. Due to this reason, ultrasound screening in the second trimester of pregnancy is a common practice to rule out these complications.

Objective: Assessment of fetal renal pathologies on ultrasound in the second trimester of pregnancy in patients with oligohydramnios

Methodology: The current study is a descriptive study that was conducted in Gilani Ultrasound Centre, Ferozpur Road, Lahore from August 12, 2021, to December 14, 2021. The duration of the study was four months. A total of 149 participants were considered as a sample in the study. All the participants were in their second trimester of pregnancy and all of them were detected with oligohydramnios. According to the exclusion criteria, the patients with already present renal pathology were excluded from the study. Transabdominal ultrasound was done in all the patients with a 2-5MHz concave probe. The parameters considered for the assessment of the outcomes were gestational age (GA), estimated fetal weight (EFW), amniotic fluid index (AFI), umbilical artery Systolic/Diastolic (S/D) ratio, and findings of the fetal renal system on ultrasound.

Results: A total of 149 patients in the second trimester of pregnancy, having oligohydramnios, underwent transabdominal ultrasound. 123 (82.55%) patients were not found with any fetal renal abnormalities. The remaining 26 (17.45%) had different renal pathologies such as hydronephrosis in 9 (6.04%) and infantile polycystic kidneys (PKD) in 17 (11.41%).

Conclusion: The present study suggests that most of the patients with oligohydramnios had normal fetuses. Only 17.4% were detected with fetuses with renal pathologies. The most common abnormality seen was PKD and then hydronephrosis.

Keywords: Second Trimester, Oligohydramnios, Infantile Polycystic Kidneys, Hydronephrosis

INTRODUCTION

Amniotic fluid is a slightly yellowish clear liquid that surrounds the fetus and functions as a cushion for fetal support during pregnancy. It provides the fetus with a sterile environment, protects it from harm to the external environment, regulates the temperature, and reduces the contractile force of the uterus [1]. It is a stagnant pool of fluid that circulates with a turnover time of one day. The proper range of the volume of amniotic fluid is maintained by a balance production of fluid by means of kidney and lungs, and its reabsorption by intramembranous flow and swallowing [2]. Reduction in the amniotic fluid volume (AFV) is termed oligohydramnios. The volume of amniotic fluid varies at different stages of gestation. It increases linearly from the 34th week to the 36th week. It levels off by the 36th week and the average quantity at that time is about 400 ml. The volume of fluid stays the same until term. Following the 40th week of pregnancy, the AFV starts declining gradually. It is the reason why post-term pregnancies show lesser AFV. This pattern of decrease in the AFV enables analysis through ultrasonography and measurement of fundal height [3]. 87 (0.7%) out of 12,940 women enrolled for assessment during pregnancy in Pakistan, Congo and Guatemala were seen to development of oligohydramnios in the third trimester. Although, there are some variations in the percentage of prevalence of oligohydramnios in Pakistan and other locations. Pakistan had the highest prevalence of 1.5% [4]. Oligohydramnios is also responsible for other neonatal complications such as severe asphyxia, lower APGAR score, meconium aspiration syndrome, and various other congenital abnormalities. Oligohydramnios is also associated with maternal morbidity as it interferes with surgical or vaginal delivery. Maternal morbidities associated with oligohydramnios are pregnancy-induced hypertension (PIH), infections, and post-date pregnancies [5].

Bilateral renal dysfunction of a fetus is responsible for renal oligohydramnios (ROH). Bilateral agenesis of kidneys, autosomal recessive polycystic kidney disease (ARPKD), and blockage of the urinary tract are responsible for underlying diseases. After the first

trimester, fetal urinary production increases the AFV. The previously mentioned abnormalities are responsible for the reduction in urinary production, hence, lesser AFV [6]. ROH has effects on both the kidneys and leads to renal failure. It also has pulmonary consequences such as hypoplasia. By the use of broad CAKUT spectrum ultrasonography, structural abnormalities such as cortical necrosis, and venous thrombosis in both kidneys, ARPKD, and ROH can be seen in a fetus [7]. Complexity in the AFV can be due to various factors correlated with functional roles, fetal systems, malnutrition, and some maternal issues [8]. For the measurement of AFV, obstetric ultrasound plays a crucial role [9]. For this purpose, amniotic fluid index (AFI) or maximum vertical pocket (MVP) are considered the standards of transabdominal ultrasonography. The deepest MVP on the scan can be measured from 12 o'clock to 6 o'clock position. It usually has a 2-8 cm range. An MVP of more than 8 cm is considered polyhydramnios. On the other hand, AFI is measured after 20 weeks of pregnancy. It is done in such a way that the uterus is divided into four compartments. Then MVP is measured in each compartment for the calculation of AFI. The Sum of MVP of all the vertical pockets of the quadrants is equal to AFI. An AFI of 5cm is considered oligohydramnios [10].



Figure 1: Hydronephrosis in a fetus with distention in urinary bladder



Figure 2: Echogenicity in kidney showing polycystic kidney disease in the fetus

A large chunk of the population has been suffering from oligohydramnios. Most of these cases lead to fetal complications and sometimes cause intrauterine growth restriction.

METHODOLOGY

The present study is a descriptive study. The study was conducted at the Gillani Ultrasound Centre, Ferozpur Road, Lahore. The duration of the study was four months. A total of 149 participants were included in the study. The participants were included after evaluation on the basis of inclusion and exclusion criteria. According to the inclusion criteria, patients in the second trimester of pregnancy detected with oligohydramnios were added to the study. On the other hand, those patients with already present underlying fetal complications were excluded from the study as per the exclusion criteria.

Written informed consent was taken from all the participants after briefing them about the procedure. They were informed that the procedure carries no harm to the mother as well as to the fetus. The participants were given the authority to withdraw at any time. The data was kept confidential.

During the performance of the scan, the patients were laid in a supine position. The equipment used for ultrasonography was Toshiba Xario Prime SSA-660A, edition 2012 with a concave probe of 2-5 MHz. A transabdominal approach was used for the scan. The variables noted on the scan were Gestational age (GA), AFI, estimated fetal weight (EFW), S/D ration of the umbilical artery, and other significant ultrasound findings. The patients were included if the GA was 14-24 weeks. AFI was calculated by the four pockets method. Fetuses with less than 8 AFI were considered in the study as the case was of oligohydramnios. After that, the renal system of the fetus was examined along with the presence of any other pathology.

After the collection of the data, it was tabulated. The data were analyzed in IBM SPSS version 21. The qualitative variables were reported in frequency and percentage. AFI, EFW, GA, and S/D ration were reported as mean and standard deviation.

RESULTS

A total of 149 patients in their second trimester of pregnancy with oligohydramnios were added to the present study. Table 1 shows ultrasound findings, especially hydronephrosis and polycystic kidneys, according to the GA.

Table 1: Ultrasound findings according to the gestational age GA

Gestational age in weeks	Hydronephrosis n (%)	Infantile polycystic kidneys n (%)	Normal findings n (%)	Total (n)
13-16	1 (20%)	1 (20%)	3 (60%)	5
17-20	2 (5.88%)	2 (5.88%)	30 (88.24%)	34
21-24	3 (4.92%)	5 (8.19%)	53 (86.89%)	61
25-28	3 (6.12%)	9 (18.37%)	37 (75.51%)	49
Total	9 (6.04%)	17 (11.41%)	123 (82.55%)	149

The GA was classified into four groups. The first group consisted of patients with GA of 13-16 weeks. The total number of patients in this group was 5. 1 of them was found to have hydronephrosis and 1 had polycystic kidneys. 3 patients did not have any significant abnormalities. The second group consisted of patients with 17-20 weeks of gestational age. The total number of patients in this group was 34. 2 had hydronephrosis and 2 had polycystic kidneys. The remaining 30 were found with no significant complications. The patients in the third group were between 21 to 24 weeks of gestation. The number of patients in this group was 61. 3 had hydronephrosis, 5 had polycystic kidneys and the remaining 53 were normal. The fourth category of patients had 25 to 28 weeks of gestation. 49 patients were present in this group. 9 of them had hydronephrosis, 9 had polycystic kidneys and the remaining 37 were normal. Hence, out of a total of 149 patients included in this study, 9(6.04%) patients were seen with hydronephrosis and 17(11.41%) were detected with infantile polycystic kidneys. The remaining 123(82.55%) had normal kidneys.

Table 2: shows ultrasound findings according to the EFW. The patients were divided into three categories on the basis of EFW.

Table 2: Ultrasound findings based on estimated fetal weight (EFW)

EFW in grams	Hydronephrosis n (%)	Infantile polycystic kidneys n (%)	Normal findings n (%)	Total (n)
100-500	4 (8%)	3 (6%)	43 (86%)	50
500-1000	4 (4.7%)	11 (12.94%)	70 (82.35%)	85
1000-1500	1 (7.14%)	3 (21.42%)	10 (71.42%)	14
Total	9 (6.04%)	17 (11.41%)	123 (82.55%)	149

The patients in the first category were those having 100-500 grams of EFW. Out of the total of 50 patients in the first category, 4 had hydronephrosis and 3 had polycystic kidneys while the remaining 43 were normal. In the second category, the patients with EFW of 500-1000 g were allocated comprising a total of 85 patients. 4 had hydronephrosis, 11 had polycystic kidneys and the remaining 70 were normal. The third category consisted of patients with EFW of 1000-1500 g. There were 14 patients in this category. 1 had hydronephrosis, 3 had polycystic kidneys and the remaining 10 were normal. Hence, out of the total patients included in the study (n=149). 9 had hydronephrosis, 17 had polycystic kidneys and the remaining 123 had normal kidneys.

DISCUSSION

A study for the determination of the fate of fetuses with oligohydramnios was conducted by Grijseels et al. in 2011. The focus of the study was the observation of renal abnormalities in such patients. According to their study, 36 fetuses were detected with cystic dysplasia on ultrasound. 15 patients had polycystic kidneys and 20 patients had hydronephrosis [11]. In the present study, cystic dysplasia was not observed, whereas, 9 fetuses had hydronephrosis and 17 had polycystic kidneys out of a total of 149 patients considered in the study. The results of the present study are similar to the study of Grijseels et al.

A similar study was conducted by Kumar et al in 2014. It was prospective research aiming at the determination of renal abnormalities in fetuses and the identification of factors responsible for postnatal prognosis. Their study included 587 patients with significant prenatal malformations. 136 of these fetuses were detected with renal abnormalities. According to the results of their study, the most common renal abnormality was hydronephrosis presenting in 61 of the cases, whereas, bilateral renal cysts were present in 50 cases [12]. Contrary to that, the percentage of presence of hydronephrosis in the present study was much lower than in their study. Likewise, the percentage of polycystic kidneys in the present study was also lower than in their study.

Spiro et al conducted a study in 2015 regarding the outcomes and prognosis of patients with oligohydramnios. A total of 104 participants were included in their study. 21 fetuses had been determined with hydronephrosis, 28 had polycystic kidneys while the remaining 55 were normal [13]. The percentage of abnormalities in their study was much greater compared to the present study.

EK et al conducted a study in 2007 on renal abnormalities related to oligohydramnios. The study was a retrospective study. They considered abnormalities such as hydronephrosis and postnatal abnormalities. The study included 9000 participants. 85 patients were diagnosed with hydronephrosis which was merely 1% [14]. It was much lower compared to the present study.

CONCLUSION

The present study concludes that most patients with oligohydramnios are not likely to present with renal pathology. Only 17.4% of the participants had abnormalities. The most common pathology seen in the present study was polycystic kidneys comprising 11.4% followed by hydronephrosis which was present in 6.04% of the patients.

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