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Prevalence of Fetal Renal Pyelectasis in Primary Health Care Setting: An Ultrasound Approach

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Objectives: To study the prevalence of fetal renal pyelectesis among Bahraini high risk pregnant patients in primary care and the clinical outcome of infants affected.

Design: A prospective study.

Setting: In Naim Health center.

Method: This study was conducted from January 2000 to December 2001, a total of five hundred and fifty six high-risk pregnant Bahraini patients were scanned. Patients were identified through high-risk pregnancy referred for ultrasound examination from health centers, twenty-one were followed up at 32 weeks and after birth, ten were scanned at two years.

Results: A total of 556 Bahraini pregnant patients scanned at different stages during pregnancy, 29 (5.2%) were found to have mild to severe grades of fetal renal pylectasis. During the follow up at two years, three of them had persistent hydronephrosis.

Conclusion: In this study it was found that the prevalence of fetal renal pyelectasis was 5.2%, which is a common abnormality of fetal kidneys among high-risk pregnant women, and ultrasound is a good screening tool. Routine scan for all pregnant patients is recommended at mid trimester.

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Ultrasound is an essential screening and diagnostic method during pregnancy, by which a wide range of fetal anomalies are diagnosed.

Ultrasonography can detect the fetal bladder and kidney at 15 weeks of gestation and distinguish a central echo (renal sinus) at 18-20 weeks of gestation[1].

The fetal kidneys start to produce urine from 14 weeks of gestation, and although this has no function in terms of filtering the fetal blood, it is the major source of amniotic fluid from 14 to 16 weeks onwards. Maintenance of adequate volumes is essential for normal fetal lung development[1].

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Renal Ultrasonographic evaluation can provide important information, such as the sex of the fetus, unilateral or bilateral pyelectasis, renal pelvic diameter, bladder distension, volume of amniotic fluid, and associated pathologic conditions[2].

Twenty to thirty percent (20-30%) of significant fetal anomaly detected by ultrasound are genitourinary in origin, and 50% manifest as hydronephrosis. If not for prenatal ultrasonographic detection, many of these urologic anomalies would manifest later in life as pyelonephritis, hypertension, or even renal failure.

Upper tract dilatation of the renal pelvis with or without affecting the ureter is one of the more common abnormalities detected on prenatal ultrasound scanning. The majority of cases are due to pelvi-ureteric and vesico-ureteric junction anomalies and vesico-ureteric reflux[2].

Mild degree of transient hydronephrosis is present in many fetuses during pregnancy, possibly due to the high levels of maternal hormones that cause the smooth muscle of the urinary tract to relax. In Most cases of unilateral pelvi-ureteric junction (PUJ) obstruction, the prognosis is good, and most cases can be managed conservatively.

Posterior urethral valves represent a rare but severe congenital malformation in male fetuses, they can disrupt the development of the urinary tract and may be life-threatening to the affected boy due to renal impairment and oligohydraminos[3].

The overall value of antenatal diagnosis is that it prepares parents and medical staff for the likelihood of serious neonatal problems, and shows abnormalities of the urinary tract that may not be detected postnatally.

The size of the renal pelvis is dependant on gestational age but calyceal dilatation is more significant and usually indicates significant hydronephrosis. Studies have uniformly shown that the timing of hydronephrosis is important. The earlier a lesion develops, the more likely it is to have an effect on the fetal kidney, lungs, and overall outcome of the fetus[4].

Most cases of pyelectasis resolve spontaneously in the first year of life and invasive investigations are not required. Adequate monitoring of these children can avoid urinary tract infections and their sequelae.
No ultrasonic study in Bahrain was done to evaluate the prevalence of pyelectsis affecting the fetus during normal or high-risk pregnancy.

The objective of this research is to study the prevalence of fetal renal pyelectesis among Bahraini high-risk pregnant patients in primary care and the clinical outcome of infants affected.

METHOD

All pregnant patients referred through antenatal clinic for ultrasound from January 2000 to December 2001 were included in this study, these patients were high risk because of history of baby with congenital abnormality, family history of genetic abnormality, pregnancy with medical illness or drug exposure, gestational assessment,

fetal wellbeing and others. Five hundred and fifty six patients were scanned, identified cases with pyelectasis were scheduled for repeating scan at 32 weeks and after birth, follow up appointments were arranged with pediatric nephrology.

Criteria for diagnosing fetal renal pylectasis:

This was carried out according to the American Society for Fetal Urology (SFU) Grading System which is as follows:

Grade 0: Normal kidney with no hydronephrosis (no pelvic dilatation).
Grade 1: Slightly dilated renal pelvis without caliectasis (no calcyealdilatation).
Grade 2: Moderately dilated pelvis with mild caliectasis
Grade 3: Large renal pelvis, dilated calyces, and normal renal parenchyma
Grade 4: Very large renal pelvis, large dilated calyces, with thinning of the renal parenchyma

Anteroposterior diameter (APD) of 7-9.9 mm, 10-14.9 mm and greater than or equal to 15 mm were classified as mild dilatation, moderate hydronephrosis and severe hydronephrosis respectively[5].

Inclusion Criteria:

Only pregnant Bahraini patients were included, non-Bahrainis were excluded because of possible loss of follow up.
All fetuses with uni or bilateral fetal anteroposterior diameter (APD) of greater than or equal to 4 mm before 33 and/or greater than or equal to 7 mm after 33 weeks gestational ages were included.

Follow up criteria:

Women with prenatal fetal pelvic dilatation of greater than or equal to 4 mm before 33 weeks should have repeated ultrasound scans at 33 weeks, and of greater than or equal to 7 mm from 33 weeks onwards of gestation should have detailed postnatal evaluation. The dilatations of an APD greater than or equal to 4 mm before 33 weeks, which have disappeared at the post 33 week scan need no further investigation in the postnatal period.

Statistical analysis: SPSS software version 12 was used to analyze data.

Results:

Twenty-nine cases out of 556 were found to have mild to severe fetal renal pyelectasis with renal pelvis diameter between 7 to 20mm between grades one to four.

The prevalence of fetal renal pylectasis in this high-risk group was 5.2 %. Seventeen cases (59%) of the affected fetuses were male, and twelve (41%) were females.
Twenty-five (86.2%) of the affected fetuses had bilateral renal pyelectasis.

The mean age of all pregnant patients was 26 and the mean age of patients with fetal renal pyelectasis was 29.68.

Twenty-one of the affected fetuses had a repeat scan at 32 weeks of gestation and 8 pregnant women had no repeated scan because of late diagnosis between 31- 36 weeks. Of those scanned at 32 weeks eight fetuses (37.9%) had renal pyelectasis (Renal pelvis APD between 8-9 mm) and five (24.1%) had APD of 10-11mm.

Twenty-one of the identified fetuses had their follow up after delivery, eight neonates had missed follow up of those who need to be scanned according to the diagnostic criteria greater than or equal to 7mm after 33 weeks. 13 (44.8%) were abnormal (hydronephrptic). Ten neonates had their follow up at 2 years and three remained hydronephrotic.

DISCUSSION

The prevalence of fetal renal pyelectasis in this study in the period of January 2000 to December 2001 was 5.2%.

Hydronephrosis is the most common pathologic finding in the urinary tract during prenatal ultrasonographic screening, accounting for 50% of all abnormal findings. Most of these urinary abnormalities are detected by prenatal ultrasound between the 14^{th} and the 22^{nd} week of gestation. Their outcome is determined during the first few weeks of pregnancy and depends on the degree of renal impairment and the presence of associated extra renal malformations.

In a retrospective review of cases of mild pyelectasis, the incidence of pyelectasis was (2%). Persistent postnatal renal anomalies were seen in 30%. The renal threshold which predicted normal postnatal outcome was an anteroposterior diameter of less than 7.0 mm after 32 weeks, yielding sensitivity and specificity of 87% and 85%, respectively. Therefore, only those with an anteroposterior diameter of greater than 6 mm after 32 weeks deserve follow-up[6,7].

A cross sectional study found a positive correlation between gestational age and renal pelvic AP diameter[8]. In this study we found the same relationship.

In a prospective study it was found that normal or no significant findings in 61% of infants. Significant nephrouropathies were diagnosed in 39% of infants. The sensitivity, specificity, positive and negative predictive value were 96%, 76%, 72%, and 97%, respectively[9].

In a retrospective study it was found that 73.1% were male fetuses, 57.4% had bilateral pyelectasis and 18.6% of the cases were normalized, in 34.6% of the cases the dilatation reduced but did not disappear, in 30.7% it remained unchanged, while it worsened in 16.4%[10].

In our study we found 59% were male fetuses, 86.2% had bilateral pyelectasis, 9.5 % were worsened, 28.5% reduced but didn't disappear, 14.3% remained unchanged and 47.6 % normalized.

In another study, results showed normal renal function in all fetuses with renal pelvic diameters were at least 8mm anteroposterior, 11mm transverse, 14mm longitudinal, and deteriorating renal functions (corrective Neonatal surgery) was recommended

when the anteroposterior, transverse, and longitudinal renal pelvic diameters during the prenatal period are at least 20, 25, and 26mm, respectively[11].
In our study only two cases with anteroposterior diameter of 20 mm had deteriorating renal functioning.

Mild pyelectasis occurs in up to 25% of Down syndrome fetuses. A prospective study, found that isolated fetal pyelectasis is associated with increased risk for both Down syndrome and all chromosomal abnormalities[12].

In a retrospective study, it was found that 25% of the affected fetuses had pylectasis. The incidence of Down syndrome was 3.3% when fetal pylectasis was present[13].

In another study, Pylectasis was observed in 17.4% of Down syndrome fetuses versus only 2% of normal controls[14]. In our study we didn't find any case of chromosomal abnormalities among the identified cases of renal pyelectasis.

In another study, antenatal ultrasonography was found to be an accurate detector of renal disease, as uropathy was subsequently confirmed in (89%) infants[15]. In our study we found that pyelectasis was confirmed in 77.4% of cases.

Every antenatally dilated urinary tract requires postnatal investigation. Postnatal ultrasound on the 3rd to 4th day of life is recommended for confirming or excluding urinary abnormalities, as mild to moderate hydronephrosis may not be present in the first day of life due to dehydration[16].

The incidence of prenatal pyelectasis varies among other studies because of dilation criteria and timing of ultrasonography; however, the incidence of a significant uropathy in association with hydronephrosis is 0.2%. Other international studies found an incidence of 0.25% in Sweden and 0.92% in Great Britain. Another study in Spain found the incidence of fetal renal pyelectasis was 2%[17].

A prospective study in Belgium to determine the incidence of mild degree fetal pyelectasis and its value in prediction of significant uropathies found to be 4.5 %[18]. In our study we found that the incidence of fetal renal pyelectsis was 5.2% among high-risk pregnant patients.

In case of persistence of fetal renal pyelectasis, ultrasound has to be complemented by other radiologic methods. Voiding cystourethrography and or nuclear renography allow identifying the origin of the observed abnormalities. Apart from a few situations needing immediate correction, surgical treatment is rarely indicated. In our study five infants had voiding cystourethrogram, two had nuclear renogram and one needed surgical intervention.

Most pyelectasia resolve spontaneously in the first year of life and invasive investigations are not required. The principal of postnatal management is prevention of urinary tract infections by antibiotic prophylaxis and a close follow-up until adulthood[19]. In our study 47.6% resolved spontaneously in the first two years, seven infants (33%) were kept on prophylactic antibiotic.

Limitations:

Patients included in the study were high-risk pregnancy for many obstetric reasons, which might explain the higher incidence of fetal renal pylectasis in Bahrain compared to other studies.
The loss of follow-ups in this study may affect the prevalence estimation.

CONCLUSION

In this study the prevalence of fetal renal pyelectasis was 5.2%, which is a common abnormality of fetal kidneys among high-risk pregnant women, and ultrasound is a good screening tool. Routine scan for all pregnant patients is recommended at mid trimester.

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