Original Article

Prenatal sonographic evaluation and postnatal outcome of renal anomalies

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OBJECTIVE: To determine the prognosis of antenatally detected renal anomalies by sonographic evaluation.

MATERIALS AND METHODS: This was a follow-up study of all antenatally detected renal anomalies from January 2008 to Dec 2009 referred to fetal medicine clinic. Prenatal evaluation was done and cases were divided into four groups depending upon their prenatal sonographic findings. Post natal follow-up was done up to one year in cases of live babies. Autopsy was carried out in still born fetus after consent.

RESULTS: The renal anomaly was detected in 55 cases, which were fully followed. The prognosis was said to be poor for group I cases with gross extra renal anomaly along with the renal anomaly, and for group II in which there was organic renal pathology with loss of renal function suggested by non-visualization of bladder and almost absent liquor. Prognosis was guarded and depended upon the gestational age of presentation in group III, which had obstructive uropathy; prognosis was good in group IV cases, which were mild, unilateral or which presented late.

CONCLUSION: Prenatal sonographic evaluation gives reasonably accurate picture of the prognosis and can be very helpful in counseling the parents regarding prognosis and help in deciding the timing and route of delivery.

Key words: Postnatal outcome, prenatal diagnosis, prognosis, renal anomaly

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Introduction

Ultrasonography has become a standard part of prenatal care. Around one percent of the scan will reveal fetal anomaly. Whenever such an anomaly is diagnosed it is the duty of the caregiver to provide accurate information about the findings as quickly as possible.

Urinary tract abnormalities account for 15-20% of all congenital anomalies.[1,2] Although prenatal diagnosis of urinary tract anomalies is relatively easy (detection rate of 89%) based on sonographic images corresponding to dilated urinary tract, using the sonographic finding to provide prognostic counseling to the couple is a difficult task. Counseling regarding prognosis becomes a dilemma for obstetricians and pediatric nephrologists and urologists more so as many anomalies may be manifested late in the second trimester. Data on antenatal diagnosis and post-natal follow-up is important for assessing prognosis and hence counseling of parents.

There are many published studies evaluating the use of fetal urinary metabolites in prospectively predicting postnatal renal function; however, a recently published systematic review evaluating the diagnostic ability of fetal urinary analytes to predict outcome concluded that there was insufficient evidence to commend such investigation.[3] There is conflicting data on ultrasound finding in predicting outcome. Previous papers have reported that early gestational age at diagnosis by USG, renal parencymal cystic appearance and echogenicity, and severe oligohydramnios are associated with good predictive accuracy.[4,5] However no consensus exists

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on most specific ultrasound parameter or combination of features that prospectively predict postnatal renal function. This may be because of heterogeneity of previous studies or may be due to retrospective study design of previous studies.

The objective of the study was to do prenatal sonographic evaluation regarding renal function impairment after diagnosis and to provide prognostic counseling accordingly. Postnatal correlation was done in all cases in order to see the accuracy of prognostic counseling. The outcome of the study was to provide better counseling for women and families dealing with prenatally diagnosed renal anomalies.

Material and Methods

It was a prospective study. All patients with prenatally detected renal malformation by ultrasound referred to the fetal medicine OPD for first 2 years of the 3-year study period (Jan 2008 - Dec 2010) were included. After diagnosis women underwent targeted scanning for appropriate counseling regarding prognosis, ultrasound was done especially with respect to rule out other congenital malformations, to see the renal involvement whether unilateral or bilateral, the amount of liquor, bladder visualization and cortical differentiation. A follow-up scan was done to observe the evolution of the anomaly. Fetal echocardiography was also done. Relevant maternal investigations were done.

In women with gestation less than 20 weeks having gross renal anomaly in fetus, termination was offered. In gestation more than 20 weeks, pediatric surgery referral was taken. Counseling by geneticist was done, depending upon the prenatal evaluation findings. All the cases were divided into 4 groups. The fetuses with suspected major extra renal malformations along with renal malformation were grouped as Group I. In cases with bilateral renal malformation, we looked for sonographic findings suggesting functioning kidneys by seeing the amount of liquor and visualization of bladder, if the cases had oligohydramnios and non-visualization of bladder showing poorly functioning kidney, they were grouped as group II. Group III constituted those fetuses with bilateral renal malformation, oligohydramnios but bladder seen with or without presence of corticomedullary differentiation. In group IV were fetuses with unilateral or mild bilateral renal affection, shown by corticomedullary differentiation present, with slightly decreased or normal liquor, bladder was visualized. Termination was offered in group I and group II women between 21 and 24 weeks having lethal syndromic etiology as the prognosis was poor. Rest cases were followed at regular intervals (USG every 2-3 weekly) to detect the course of the disease.

Postnatal follow-up was done to see the accuracy of the prenatal evaluation. The cases in which there was stillbirth or termination of pregnancy, fetal autopsy was done according to the routinely followed protocol. All post-mortem examinations were carried out with written consent. This included a photograph, X-ray of fetus (AP and lateral), external and internal examination including histopathological examination of the kidneys and other viscera. The chromosomal analysis was done whenever fetal sample was available and the parents gave consent. All live born babies underwent ultrasound within 3-5 days of birth and renal function tests were done. The babies were followed up after 1 month, 6 months and one year, 2 years after delivery; minimum period of follow-up was one year.

Results

Out of 24,160 deliveries, there were 422 cases (1.8%) with gross congenital anomaly registered in the study period; there were 63 cases with renal anomaly (14.9%). There were 8 cases, which were lost to follow-up and total 55 cases were fully followed up. Diagnosis was done at less than 20 weeks (mean 19 weeks) in 9 cases (16.4%), Termination of pregnancy was offered in them as the anomaly was severe. Fetal autopsy was done after termination of pregnancy in 8 cases, and diagnosis was confirmed in all of them [Table 1].

There were 46 cases in which diagnosis was done after 20 weeks (83.6%), after targeted scan women were divided into groups according to the findings on prenatal evaluation. The women in group I (11 cases) had suspected gross extra renal malformations; the mean gestational age was 31weeks. They were counseled

regarding poor prognosis in view of the findings. Termination was offered in 4 cases, which had suspected lethal syndromic etiology and who presented before 24 weeks [Figures 1 and 2]. There were 3 live births, all of them died within hours to 2 days after delivery. Autopsy was done in 9 cases. Lower segment cesarean section (LSCS) was done in 3 cases for maternal indication only (one case each of placenta previa, previous 2 LSCS and transverse lie) [Table 2].

The women who belonged to group II were also counseled that the prognosis was poor as the renal function seemed to be impaired as bladder was not seen and liquor was reduced. There were 13 cases in this group, mainly cases with bilateral cystic kidneys; mean gestational age was 27 weeks. There were 5 live births, but all of them died within days of delivery, one survived till 3 months and then succumbed to renal failure [Table 3]. LSCS was done in one case for fetal distress (case no 27). The baby later died after 2 days due to respiratory distress and renal failure. Autopsy was done

Table 1: Fetus with renal malformation detected at less than 20 weeks

Case no.	Ultrasound findings	Gestation	Autopsy	Diagnosis
1	Liquor almost nil, kidneys and bladder not visualized	18	Bilateral renal agenesis	Bilateral renal agenesis
2	Bilateral multicystic, size 2 mm to 4 mm, oligohydramnios	19	Bilateral multicystic kidney, anal atresia	Multicystic kidney disease
3	Oligohydramnios, kidney and bladder not seen, limb abnormality	18	Bilateral kidney absent right lower limb mesomelia, polydactyly	Bilateral renal agenesis with limb defect
4	Amniotic fluid absent unilateral multicystic kidney, other kidney not visualized	18	Unilateral multicystic and dysplastic kidney	Bilateral multicystic and dysplastic kidneys
5	Cystic hygroma, amniotic fluid normal, short limbs	18	Female, subcutaneous edema, low set ears, cystic hygroma 5x6 cm, horse shoe kidney	Turner syndrome
6	Oligohydramnios, bilateral kidneys and bladder not visualized	Intrauterine death at 20 weeks	bilateral kidneys absent	Bilateral renal agenesis
7	Oligohydramnios, bilateral multicystic kidney disease	19	Autopsy not done	Cystic kidney disease
8	Oligohydramnios, bilateral enlarged bright echogenic kidneys, encephalocele, polydactyly	19	Bilateral Enlarged echogenic kidney, encephalocele, polydactyly	Meckel- Gruber syndrome
9	Nuchal fold thickness -9.5mm, mild bilateral pylectasis	20	Amniocentesis for karyotyping done-trisomy 21, Autopsy showed- low set ears, clinodactyly, simian crease, anal atresia	Down Syndrome

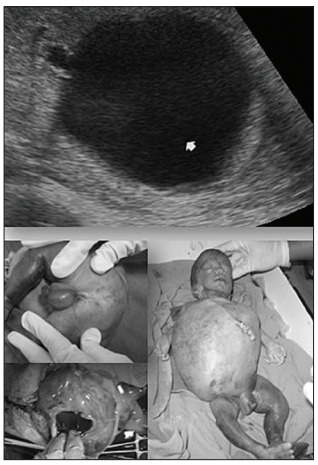

Figure 1: Ultrasound showing large cyst in abdomen. Autopsy picture showing with large abdomen with thinned out abdominal wall. Internal examination showed it to be bladder. Baby had urethral atresia (Case 13)

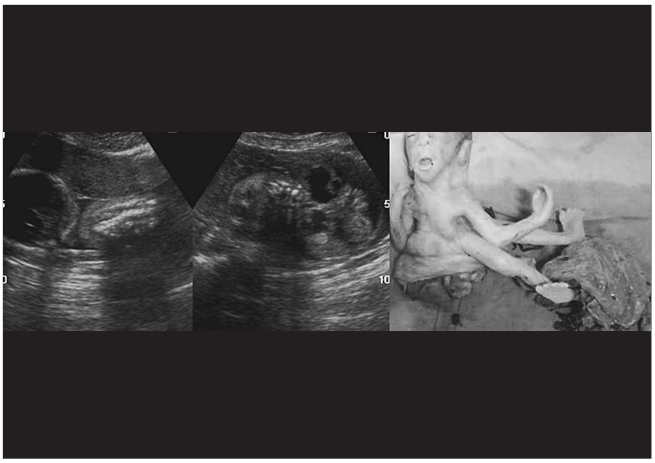

Figure 2: Ultrasound picture of limb body wall defect with enlarged cystic kidney. Autopsy picture confirming the same (Case 19)

Table 2: Fetus of more than 20 weeks gestation with gross extra renal anomaly

Case no	Gestational age	Ultrasound finding	Outcome on follow up	Autopsy finding	Diagnosis
10	22	Arachnoid cyst, short curved spine, stomach bubble, bladder not seen severe oligohydramnios	Termination advised	Asymmetrical setting of ears, absent nipple, depressed mandible, Abnormality of spine and pelvis, tracheoesophageal fistula, post axial polydactyly, shortened or absent tibia fibula	VATER
11	29	Mild hydrocephalous, Spina bifida with meningomyocele, oligohydramnios	Termination advised	bilateral absent kidney, spina bifida, meningomyocele in thoraco-lumber region, nipple absent, CTEV	BRA with spina bifida
12	31	Microcephaly with irregular shape of the head (cloverleaf skull) ascitis, hyperechoic, bowel, oligohydramnios	IUD	Down syndrome phenotype, brachycephaly, TEV, kidneys appeared grossly normal. HPE - Loss of corticomedullary differentiation	Karyotype – trisomy 21, Down Syndrome
13	26	Massively enlarged bladder with hydroureter and bilateral hydronephrosis, diaphragmatic hernia, lung hypoplasia, severe oligohydramnios	Termination advised	Autopsy showed massively dilated bladder with hydroureter and urethral atresia, lung hypoplasia, anal atresia, undescended testis	Prune Belly syndrome. Urethral atresia
14	36	Bilateral hydronephrosis, enlarged bladder, hydroureter, multiple anechoic rounded mass suggestive of dilated bowel	Baby died after 6 hours of delivery	Bilateral Hydronephrosis, hydroureter, dilated proximal portion of urethra, PUV. Anal atresia, distended bowel loops with anal atresia	PUV with anal atresia
15	36	Intrauterine growth retardation, polyhydramnios, cyst in posterior fossa, dilated cisterna magna, small cerebellum, diaphragmatic hernia, bilateral hydronephrosis	LSCS Died after an hour of delivery	Autopsy not done	Dandy walker malformation with CDH
16	35	Amniotic fluid normal, unilateral multicystic kidney with absent stomach bubble. Placenta previa	LSCS done Baby died after 2 days	Autopsy not done	Cystic kidney with Tracheo- esophageal fistula
17	37	Spina bifida, MCK, amniotic fluid grossly reduced	Breech delivery male	bilateral MCK, spina bifida, epispaedias	Bilateral multicystic kidney spina bifida,
18	30	Omphalocele, Echogenic enlarged gut loops Bilateral enlarged echogenic kidneys, liquor grossly reduced	Spontaneous labor, male	Grossly distended thinned out abdominal wall, potters facies, tallipes, anal atresia Refused internal examination	Prune belly syndrome
19	27	A large anterior wall defect, with liver, intestines, heart, bladder herniating into it, bilateral multicystic kidney, amniotic fluid almost nil, cord not visualized properly	Termination advised, male	Large omphalocele, extrophy of bladder, imperforate anus, spinal deformity on the lumber region, short cord, kidneys	Limb body wall complex
20	36	Transverse lie, enlarged cystic mass occupying whole of fetal abdomen, oligohydramnios, 2 vessel cord	LSCS, for transverse lie	Grossly distended abdomen with very thinned out abdominal wall, anal atresia,. bladder sacculated and grossly distended no urethral stenosis, hydronephrosis, ureteral dilatation, gut loops distended	Prune belly syndrome

VATER: Vertebral anomaly, anal atresia, tracheoesophageal fistula, renal anomaly, BRA: Bilateral renal agenesis, IUD: Intrauterine death, TEV: Tallipes equino varus, HPE: Histopathological examination, PUV: Posterior urethral valve, LSCS: Lower segment cesarean section, CDH: Congenital diaphragmatic hernia, MCK: Multicystic kidney

in 6 cases. Histopathology confirmed multicystic kidney in 5 and autosomal recessive polycystic kidney disease (ARPKD) in one fetus. In one patient with positive family history (case 21), the ultrasound finding of bright echogenic kidney was diagnosed on histopathology as multicystic kidney, showing the possibility of familial multicystic kidney disease [Figure 3].

In women of group III (9 cases), there was mainly lower urinary tract obstruction [Table 4], in this group prognosis chiefly depended upon the gestational age of diagnosis, renal cortical appearance, and degree of oligohydramnios. The mean gestational age was 31 weeks, 5 cases survived after delivery, 2 had vesicouretral reflux, 3 underwent surgery, and one baby had deteriorating renal function. The diagnosis was after 32 weeks and renal cortical appearance was preserved in all cases that survived. LSCS was done in one case for fetal indication. Autopsy was done in all 4 cases which were stillborn [Figure 4]. There was posterior urethral valve in 3 cases and urethral atresia in one case.

Table 3: Fetus of more than 20 weeks gestation with oligohydramnios and bladder not visualized

Case no	Gestation	Ultrasound finding	Outcome on follow up	Autopsy/ postnatal finding	Diagnosis
21	22	Bilateral enlarged hyperechoic kidney, reniform shape maintained severe oligohydramnios	Advised termination	Potters facies, cord two vessel, tallipes, kidneys 3.75 x 2.75cm, small 2-3 mm cysts	multicystic kidney disease
22	30	Bilateral enlarged polycystic kidney 4x3 cm, reniform shape maintained, severe oligohydramnios, bladder not visualized. Lung hypoplasia	Preterm labor at 34 weeks	Live Baby had low apgar, respiratory distress, died after 24 hours, autopsy not done	Bilateral cystic kidney disease
23	24	Bilateral echogenic enlarged kidneys, severe oligohydramnios	Advised termination	Autopsy showed enlarged spongy kidneys with multiple small cysts, HPE -confirmed the diagnosis	Polycystic kidney disease
24	37	Right kidney multicystic, oligohydramnios, other kidney not visualized	Spontaneous labor	Live girl baby, enlarged multicystic kidney right kidney, left kidney small dysplastic, KFT derranged, had renal failure after 2 months, died at 3 months	Cystic kidney disease
25	32	Bilateral multicystic kidney, oligohydramnios	Spontaneous labor, IUD	IUD, CTEV, female baby, MCKD	MCKD
26	22	Severe oligohydramnios, bilateral multicystic kidneys, Bladder not seen	Advised termination	autopsy not done	Cystic kidney
27	21	Bilateral multicystic kidney, absent liquor	Wanted to continue pregnancy LSCS done at term for fetal distress	female baby died after 3 hours , autopsy not done	Cystic kidneys
28	30	Bilateral multicystic kidney, absent liquor	Spontaneous labor	Live female baby, died after 1 day Autopsy not done	Cystic kidneys
29	26	Oligohydranios, bilateral kidneys present, bladder not seen	IUD	Male baby, Autopsy - kidneys small in size.HPE - bilateral dysplastic kidneys	Dysplastic kidneys
30	31	Bilateral multicystic kidney, severe oligohydramnos	Spontaneous labor,	Female, Refused autopsy	Cystic kidney
31	26	Oligohydamnios, Bilateral kidneys not visualized, bladder absent	IUD	Male baby, Contractures present, potter's facies, bilateral kidneys absent	Bilateral renal agenesis
32	35	Left multicystic kidney, right dysplastic kidney, oligohydramnios	Spontaneous labor at term	Still born female baby, autopsy not done	Cystic kidneys
33	24	Bilateral echogenic kidney, bladder not seen, oligohydramnios	Wanted to continue pregnancy, Intrauterine death at 28 weeks	Potter's facies, tallipes. Internal examination not done	Cystic kidneys

KFT: Kidney function test, IUD: Intrauterine death, CTEV: Congenital tallipes equino varus, MCKD: Multicystic kidney disease, IUD: Intrauterine death, HPE: Histopathological examination

Group IV consisted of total 13 cases, they had unilateral (7 cases) or bilateral affection (6 cases) with mild oligohydramnios or normal liquor, and bladder was seen in all cases [Table 5]. They were counseled that the prognosis was good and follow-up was required, the mean gestational age of presentation was 34 weeks. All of them were delivered live; LSCS was done for fetal indication in 2 of them. Kidney function test in all but one were normal although the ultrasound after delivery showed mild hydronephrosis persisting in 5 of them; 2 babies underwent surgery.

Autopsy was done in 27 cases out of total 29 stillbirths. There was extra renal anomaly present in 15 cases (27.3%). Chromosomal analysis was done in 10 cases and this was abnormal in 3 cases; in all 3 cases there were extra renal malformation as well. Out of the total 55 cases, 17 survived (32.1%), surgery was done postnatally in 5 cases.

Discussion

Renal malformations are detected in 0.2–2% of all newborns.[6] The fetal kidneys and adrenal glands can be visualized by transabdominal ultrasound between

Table 4: Fetus of more than 20 weeks gestation with bilateral renal involvement, oligohydramnios and bladder visualized

Case no	Gestation	Ultrasound finding	Outcome on follow up	Autopsy finding	Diagnosis
34	22	Bilateral hydronephrosis, dilated ureters, dilated urethra, severe oligohydramnios	IUD at 28 weeks	Potter's facies, TEV, bilateral hydronephrosis, dilated ureter, dilated proximal urethra, PUV	PUV
35	24	Bilateral hydronephrosis with distended bladder, oligohydramnios	IUD at 26 weeks	bilateral hydronephrosis with dilated ureters, dilated bladder and proximal urethra	PUV
36	34	Bilateral hydronephrosis, corticomedullary differentiation present, distended bladder, amniotic fluid grossly reduce	Vaginal delivery at 37 weeks	Baby apparently normal after delivery	Vesico- ureteral reflux (VUR)
37	36	Bilateral hydronephrosis, distended bladder, oligohydramnios	spontaneous labor at 36 weeks	mild hydronephrosis on USG, KFT normal	VUR
38	28	Bilateral hydronephrosis with dilated bladder and proximal urethra, severe oligohydramnios,	IUD	Bilateral hydronephrosis with dilated ureters, dilated bladder and proximal urethra	PUV
39	34	Right kidney dilated calyces, loss of corticomedullary differentiation, left kidney also enlarged 6.8x3cm, bladder seen, oligohydramnios	Preterm labor, stillbirth	Right kidney hydronephrotic, left kidney 6x3.4 multicystic, dilated ureters, thickened bladder, dilated proximal urethra , distal urethra atretic, HPE- confirmed the diagnosis	Urethral atresia
40	36	Liquor reduced, bilateral kidneys normal, bladder overtly distended	LSCS done for fetal distress	Baby male, baby had phimosis, normal USG after birth	phimosis
41	38	Bilateral hydronephrosis, small bladder seen, liquor reduced	Spontaneous labor	Male baby, live bilateral UPJ obstruction, surgery done	Bilateral Uretero pelvic junction obstruction
42	34	Bilateral hydronephrosis, grossly reduced liquor, enlarged bladder	Labor induced at 36 weeks	Posterior urethral valve, surgery done	Posterior urethral valve

IUD: Intrauterine death, PUV: posterior urethral valve, VUR: vesicourethral reflux, HPE: histopathological examination, USG: ultrasonography, UPJ: ureteropelvic junction

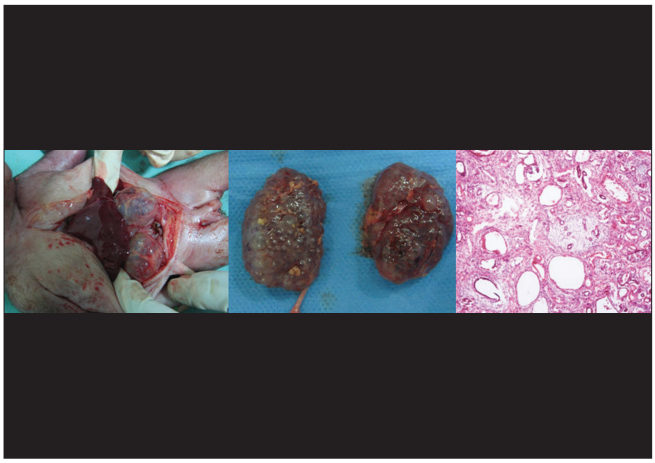

Figure 3: Case 21, with positive family history and bilateral echogenic kidneys on USG, autopsy showing cysts of varying sizes on autopsy, histopathology confirmed it to be multicystic kidney

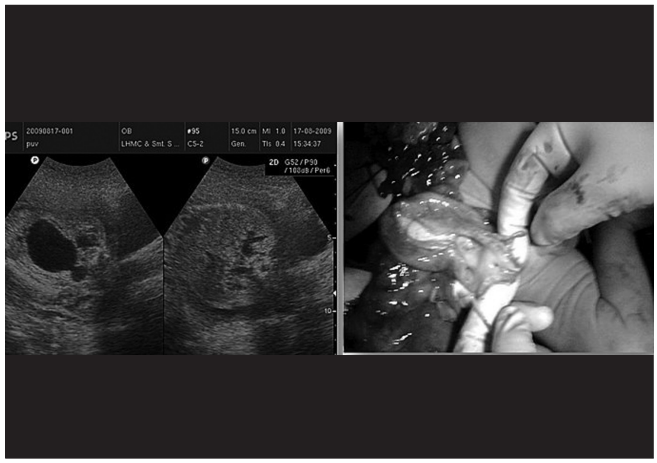

Figure 4: Ultrasound picture of bilateral hydronephrosis with enlarged bladder and typical keyhole sign. autopsy confirming the finding (Case 24)

the 12–15th week of gestation. Medulla and cortex can be differentiated well by the 20–25th week of gestation.[7] Ultrasound is a very effective diagnostic modality for identifying fetal urinary tract anomalies. But once the abnormality is diagnosed it is equally important to delineate the prognosis of malformation.

Our criteria for determining the prognosis of the malformation was based on evaluation of sonographic findings suggesting functioning kidneys to find out the severity of the disease. The cases in group I with associated extra renal malformation had poor prognosis for survival. LSCS in this group was only performed for maternal indications (3 cases). Detection of any renal malformation should warrant a detailed examination of the fetus for other

Table 5: Fetus with unilateral or bilateral renal involvement, normal or slightly reduced liquor with normal bladder

Case no	Gestation in weeks	Ultrasound finding	Outcome on follow up	Diagnosis
43	34	Left kidney multicystic right kidney normal, liquor adequate IUGR	USG after delivery- Unilateral multicystic kidney, Baby normal after 1year	Unilateral multicystic kidney
44	37	Hydronephrosis without hydroureter in left kidney Liquor normal, right kidney normal	USG- Right kidney normal, left kidney hydronephrotic, surgery done, baby fine after 1 year	Unilateral UPJ obstruction
45	30	Multicystic enlarged > 95th centile left kidney, cyst 10-20 mm in size, right kidney normal, bladder seen adequate liquor, no cysts in liver	Kidney function test (KFT) normal at delivery USG – same findings, right kidney was also multicystic at follow up after 1year, renal function test – normal. Fathers' USG done – cyst in left kidney	ADPKD
46	34	Unilateral mild hydronephrosis. Other kidney normal, liquor adequate	USG at delivery - normal	Normal
47	36	Twin pregnancy with unilateral multicystic kidney in one fetus	Renal function test normal at delivery, USG- same finding, baby normal at 6 months	Unilateral MCKD
48	32	Bilateral renal pelvis mild dilatation	Follow up ultrasound after 4 weeks showed gradually decreasing hydronephrosis, normal after delivery , normal at 1 yr. follow up	Normal
49	39	left kidney echogenic and enlarged, right kidney normal	LSCS done for breech, girl baby, left kidney smaller on USG postnatally, right normal, KFT- normal	Unilateral cystic/ dysplastic kidney
50	37	Bilateral echogenic kidney. no cysts in liver Parents' USG done – normal kidneys	LSCS for fetal distress, live female baby, normal after birth Kidney echogenic at follow up at 6 months and 1 year, KFT –abnormal after 1 yr	Cystic kidney disease
51	33	Bilateral renal pelvis dilatation 10 mm and 12 mm, liquor mildly reduced	Vaginal delivery, male KFT Normal after 1month, hydronephrosis present on USG, decreasing hydronephrosis on follow up	Vesico- ureteral reflux (VUR)
52	38	Bilateral hydronephrosis 15mm, no calyceal dilatation seen mild polyhydramnios	Vaginal delivery, male, phimosis, Follow up after 1 month-mild hydronephrosis present, surgery done normal KFT, laryngomalacia	Phimosis
53	31	Borderline pelvicalyceal dilatation 8 mm and 10 mm	Vaginal delivery, male, Normal after one month	Normal
54	32	Liquor adequate, left kidney pylectasis (13mm), right kidney normal	Vaginal delivery, male baby, USG – mild hydronephrosis, MSU- Vesico-ureteral reflux	Vesico- ureteral reflux
55	24	Liquor normal, left kidney multicystic, Right kidney normal	Vaginal delivery at term. Baby – male, left kidney multicystic, right normal, normal renal function	Unilateral Cystic kidney

USG: Ultrasonography, IUGR: Intrauterine growth restriction, UPJ: Ureteropelvic junction, MCKD: Muticystic kidney disease, LSCS: Lower segment cesarean section

structural anomalies. Associated anomaly in our study was 27.3%, other studies have reported the incidence of up to 50 %.[8] Chromosomal studies on amniotic fluid should be offered in cases with renal malformation; the incidence of chromosomal abnormality in our study was 5.5%, and the incidence in other studies has reported to be 8-12%.[9,10] The incidence of chromosomal abnormality was low in our study population as many parents did not opt for the test.

The cases in which there were structural abnormality in kidneys coupled with loss of function, apparent in terms of non-visualization of bladder and absent or severely decreased liquor, the prognosis was believed to be poor and on follow-up none of the babies survived. Severe oligohydramnios and non-visualization of urinary bladder is associated with poor renal function. Fetal autopsy after termination of pregnancy is important to arrive at a definitive diagnosis. It may be difficult to detect bilateral renal agenesis on USG due to severe oligohydramnios and fetal autopsy is necessary to confirm renal agenesis and also any other associated malformation. This will help in counseling for next pregnancy. In cases where there was lower urinary tract obstruction but the kidneys were functioning, prognosis depended upon the gestational age at presentation. Almost all who survived presented after 34 weeks; it helped in timing of delivery, with induction done at 37 weeks to salvage the kidneys if possible. Ultrasound diagnosis when made early helps in the timing of delivery and also the route of delivery and early treatment.[9]

We did not attempt prenatal bladder drainage but the recent review on effectiveness of antenatal intervention for treatment of congenital lower urinary tract obstruction done by Morris *et al.*, concluded that although bladder

drainage improves survival but it may confer a high residual risk of poor postnatal renal function.[11] In group IV, the cases were mild, renal function was preserved, as shown by appearance of normal liquor and normal bladder. The antenatal screening in these cases helps in follow-up and helps in early detection of anomaly. Though many believe that the detection of mild dilatation have no therapeutic clinical significance and causes undue anxiety in many cases, in such situation they may be counseled and reassured that they may expect a healthy child with possibly minor problems without consequences for life and renal function.[9]

Some authors suggest that the risk of surgery is minimal when the dilatation is less than 10 mm in late pregnancy.[12,13] Thomas *et al.*, suggested that prenatal dilatation is not a sensitive indicator of pathology but increasing dilatation is associated with morbidity and mortality.[14]

Our prognostication was reasonably accurate in terms of preparing the couple and the physicians dealing with the case to the outcome of the anomaly. The criteria was simple and not too complicated so it was easy for the obstetrician dealing with the case to interpret them and counsel accordingly. The categorization helped them to take decision regarding route of delivery especially in severe cases, in timing of delivery particularly in cases which were gradually worsening and in post natal follow-up of mild cases.

Although we followed the babies postnatally for one year, prolonged follow-up of these cases would have been more useful and would have given even better estimate of renal function.

Conclusion

Renal malformations are commonly detected on antenatal ultrasound. Prognosis varies upon the type of malformation and associated malformations. The antenatal sonographic evaluation and counseling helps in delineating the prognosis and thus helping the couple to make reproductive decision. Pregnancy can be terminated in cases of lethal abnormality, if diagnosed early. The authors report no conflict of interest.

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