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BURDEN OF ABNORMAL LIQUOR CONDITIONS IN ANTENATAL ULTRASOUND STUDIES.

Radiology

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ABSTRACT

Amniotic fluid assessment by ultrasound plays important role in antenatal cases and disorders of amniotic fluid are commonly detected by assessment of amniotic fluid volume by ultrasound. Oligohydramnios indicates reduction of amniotic fluid whereas polyhydramnios indicates excess of amniotic fluid. Various causes are associated with these two conditions and the aim of present study based in HNB Base Teaching hospital of Srinagar Garhwal region is to identify such causes classifying conditions into these two groups.

Methods and methodology: This descriptive retrospective study, conducted from March 2016 to December 2016, was retrospectively assessed. Descriptive analysis was done. Proportions were given wherever necessary. Test of significance was used with significance at p value <0.05.

Results: The present study included 759 antenatal ultrasound female patients. The age group studied ranged from 18 to 44 years age group. About 55 cases with abnormal liquor conditions were detected. The department of referral was Obstetrics and Gynecology. 13 cases of polyhydramnios found suggested prevalence of about 1.71% in local hilly population,and 43 cases of oligohydramnios found in our subset of abnormal liquor conditions suggest prevalence of about 5.6 % in antenatal ultrasound cases.

Conclusion: Ultrasound study of antenatal cases (pregnant women) was used in our study to assess burden of disorders of amniotic fluid in our surrounding hilly population, with two major groups including oligohydramnios and polyhydramnios.

KEYWORDS

Amniotic Fluid, Oligohydramnios, Polyhydramnios, Ultrasound

Introduction:

The evaluation of amniotic fluid in gravid condition is now considered an integral and vital part of sonographic assessment of the gravid or pregnant patient. The role of amniotic fluid assessment by single deepest pocket or by semi-quantitative assessment using amniotic fluid index cannot be overstated as it can help in assessment of biophysical profile, fetal maturity, guide in abnormal values to further assess the fetal status for any anomaly or fetal hypoxemia, decision for conservation or immediate intervention of pregnancy depending upon status of fetus, placenta, mother, liquor, condition if any associated. Additional use of Color Doppler for IUGR has become an important commonly advised investigation in cases of oligohydramnios.

Materials and methodology:-

The aim of this hospital record-based retrospective study is to assess the burden of abnormal liquor (amniotic fluid) conditions, which can also be called as disorders of amniotic fluid in pregnant women undergoing antenatal ultrasound examinations in Department of Radiology of HNB Base Teaching Government hospital situated in Garhwal hills of town of Srinagar, District Pauri, Uttarakhand state. The studies were conducted in March 2016 to December 2016 on a Toshiba Nemio Color Doppler ultrasound machine using 3.5 MHz convex probe and includes about total 759 cases referred for antenatal ultrasound study by Obstetrics and Gynecology department of hospital. Out of these 759 cases, 55 positive cases of disorders of amniotic fluid were found in which the liquor in the gravid uterus was either reduced (oligohydramnios) or increased (polyhydramnios). We also assessed the causes of reduced or increased liquor amnii so as to predict the outcome of pregnancy, guide referring clinician as to the status of fetus, placenta, liquor and to take decision to conserve or intervene in the present scenario of a gravid case as the findings may be. Descriptive analysis was done. Proportions were given wherever necessary. Test of significance was used with significance at p value <0.05.

Results:-

The present record based study was conducted in March 2016 to December 2016 and includes about total 759 cases referred for antenatal ultrasound study by Obstetrics and Gynecology department of hospital. Out of these 759 cases, n=55 positive cases of disorders of amniotic fluid were found in which the liquor gravid uterus was either reduced (oligohydramnios) or increased (polyhydramnios).

Sr No	Condition	**Total= 759** Breakup of cases
1	Normal single live gestations	602
2	Abnormal pregnancy outcome (abortions, ectopic pregnancy, IUD etc.)	92
3	Disorders of Amniotic fluid	**55**
4	Twin live gestations	09

13 cases of polyhydramnios found suggested prevalence of about 1.71% in local hilly population which is similar to various studies which indicate prevalence of polyhydramnios (hydramnios) to be between 0.2 to 3.3 %. Similarly 43 cases of oligohydramnios found in our subset of abnormal liquor conditions suggests prevalence of about 5.6 % in antenatal cases; rest of 602 cases in entire study had normal live single gestations, whereas 9 cases had live twin gestations. Remainder some odd 92 cases had abnormal pregnancy outcomes and conditions (which we need not consider and include in our studies) including abortions, intrauterine fetal demise, ectopic pregnancy, placental abruptions, placenta previas, etc.

The breakup of normal single live gestations in gravid patients is as follows:- a) Ist trimester (upto 12 weeks)- total 69 cases, b) 2nd trimester (12- 24 weeks)- total 241 cases c) 3rd trimester (25- 40 weeks)- 292 cases, The amniotic fluid indices of gravid patients on sonography in 2nd trimester varied between 12 to 20 cms, whereas in 3rd trimester it varied between 10 to 18 cms. We consider AFI, 10 cms especially in 2nd trimester and early 3rd trimester as oligohydramnios, whereas in late 3rd trimester, we considered AFI< 8 cms as oligohydramnios; values of AFI< 5 cms were labeled as severe oligohydramnios. Polyhydramnios was diagnosed when AFI > or = 18 cms in 2nd and 3rd trimester. The statistical analysis of data using SPSS data analysis software revealed very high statistical significance in data of diagnosis with respect to AFI values.(p<0.05)(Table 2). Most of the positive cases were from Pauri district (25 out of 55 cases)

In our study, whatever 43 cases of oligohydramnios; we found- major subset of 24 cases had no obvious fetal or maternal cause or condition:- presumably here oligohydramnios was due to near-term, undiagnosed pre-eclampsia (PIH), malnutrition, TORCH infections, maternal co-morbid conditions not clinically apparent, dehydration, Rhesus (Rh) incompatibility etc. About eleven cases of reduced liquor were found in association with Intra-uterine fetal growth retardation (IUGR); four cases had history of active PV leaking of liquor with reduced amniotic fluid on sonography. Two cases had serious fetal congenital anomalies (both had posterior urethral valves with obstructed fetal urinary bladder). One case had monochorionic diamniotic twin live gestation with a donor stuck twin adherent to anterior uterine fundic wall with AFI< 2 cms, the recipient twin had normal AFI of 8 cms (case of 28 weeks gestation). Only one case showed evidence of pre-eclampsia in form of edematous placenta with placental lakes/ maternal villous thrombi with associated oligohydramnios. Herein reduced placental perfusion remains the cause of reduced liquor. (Table 1)

The another subset of abnormal liquor condition was group of patients with increased liquor in gravid uterus- totaling about thirteen in number, out of which ten cases (major group) were having no obvious cause in mother or fetus, and rest three cases had some underlying obvious cause detected on ultrasound. Two of these had fetal congenital anomalies viz. fetal esophageal atresia and other had Anencephalic fetus (Figure 1) showing absent calvarium, poorly formed prosencephalon(forebrain) with exposed meninges. The last case of third trimester had maternal viral hepatitis with resultant polyhydramnios and significant internal echoes in liquor (amniotic fluid sludge). The main focus of antenatal ultrasound cases is to diagnose the fetal anomalies which inadvertently have abnormal liquor like oligo- or poly-hydramnios depending upon which organ, system of fetus is involved. Thus when we find either increased or decreased liquor in gravid uterus, we need to focus on fetal anomalies and conduct dedicated anomaly scan especially in 2nd trimester when decision for amniocentesis, karyotyping or even medical termination of pregnancy can be contemplated if the anomaly is incompatible with life, e.g anencephalic fetus needs to be terminated whereas a fetus with severe oligohydramnios due to renal agenesis (bilateral) is also incompatible with life. A case of oligohydramnios resulting from posterior urethral valves (Figure 3) needs to be waited till term and after delivery at later date fulguration of valve obstructing urine flow may be contemplated by a pediatric or urologic surgeon. Similarly in feto-fetal transfusion syndrome in a monochorionic diamniotic twin, when detected in 2nd trimester can be decided upon for therapeutic amniocentesis in recipient twin, and amniotic septostomy can be contemplated to save donor twin (Figure 2). In our case of Twin-to-twin transfusion syndrome- the donor twin had only 2 cm AFI, whereas recipient twin had 8 cms AFI and had weight of 1820 gms. The donor had EFW of 1340 gm wt.

IUGR is recognized in (BPD), femur length (FL), and abdominal circumference (AC) with non-progression of gradual weight gain on serial ultrasound scans, usually fetal weight is below 2200 gm. wt. In such cases of IUGR, serial scans are done to assess the status of fetus, presence of fetal hypoxemia, compromised uterine and fetal blood flow by Color Doppler velocimetry. We found eleven cases of IUGR in association with oligohydramnios, and all cases except one were detected in third trimester. The one rare case of early onset IUGR was detected in 24 wks gestation in a 23 year old female from Rudraprayag district. No fetal anomaly was seen in that case. On further analysis of data, we found majority of cases of abnormal liquor were seen in third trimester, with only four cases were seen in 2nd trimester.

Discussion:

We consider various details of amniotic fluid like its general considerations, amniotic fluid volume assessment and case related details and inference drawn there-from and guidance thus obtained by assessment of AFI.

General considerations of amniotic fluid:

Amniotic fluid is a clear, yellow fluid found within first 4 days following conception within amniotic sac, and surrounds the growing embryo and later fetus in the uterus[1,2,3,4,5,6]. It serves many important functions in the normal healthy embryo and fetal development, it cushions fetus against physical trauma, acts like a shock-absorber, allows for the growth of the fetus in gravid uterus free from any restriction, insulates fetus and keeps it warm, and maintaining stable temperature[1,2,5,6]. As the fetal body develops the fetus breathes and swallows the liquor. The fluid stimulates the respiratory, musculoskeletal system and digestive system development[1,2,5,6]. It prevents compression of umbilical cord as fetus grows. Majority of amniotic fluid consists of water from the mother's body and eventually in seconds and third trimesters, fetal urination plays important role in amniotic fluid production [1,2,5,6]. Presence of normal liquor in these trimesters implies that at least one kidney is functioning[1]. It also contains important nutrients, hormones, and antibodies [1,6]. The level of amniotic fluid is highest at 34-36 weeks gestation, measuring approximately 800 ml[1]. This level decreases as the term approaches to around 600 ml at 40 weeks gestation[1]. During delivery the amniotic sac tears and fluid leaks out of vagina and labor contractions start leading to delivery of fetus.

Under physiological conditions, dynamic equilibrium is maintained between fluid production and fluid absorption [1,2, 5,6]. These are influenced by fetal urination and fetal lung liquid production[1,2,6]. It is reabsorbed by fetal swallowing and absorption through lung membranes. Two additional pathways of amniotic fluid production are the intramembranous and transmembranous routes, in which intramembranous pathways includes transfers between amniotic fluid and fetal blood perfusing the fetal surface of the placenta, fetal skin and umbilical cord[1]. The transmembranous route[1] involves exchange across the membranes between liquor and maternal blood within the uterine wall. It is stated by Brace[1] that only under conditions of fetal asphyxia (hypoxia)/ fetal distress like in IUGR that fetal lungs absorb liquor[1]. A reduction of fetal renal arterial blood flow and/or increase in renal tubular re-absorption from antidiuretic hormone, results in reduction of Amniotic fluid volume (AFV) [1]. Both these conditions result from fetal hypoxia due to any cause. Maternal disease states and maternal hydration play an important role in amniotic fluid volume, as evident by study done by Kilpatrick and Stafford wherein AFV increased with ingestion of 2 litre water[1].

Now a word about 'Internal echoes' also termed as 'amniotic fluid sludge' by Espinoza[1] et al, which appear as early as 15 weeks of gestation, may be due to vernix and/or may be secondary to meconium. It is present in 1% of uncomplicated pregnancies and about 22.6 % in those with preterm labor and intact membranes[1]. It may be cause of histological chorio-amnionitis, microbial invasion of liquor, and impending preterm delivery as per study by Espinoza[1] et al, whereas in contrary Mungen[1] et al found out that the echoes in liquor were not associated with any adverse pregnancy outcome.

Oligohydramnios indicates presence of too little fluid, whereas polyhydramnios indicates presence of excess fluid in gravid uterus. Low levels of amniotic fluid are present in approximately 4% of all pregnancies and 12% of all post-dated pregnancies[5,6]. Amniotic fluid is assessed by antenatal ultrasound by semiquantitative analysis using four quadrant measurements (suggested by Phelan)[1,5,6] of liquor pockets free of fetal limbs or cord, termed as Amniotic Fluid Index (AFI). Alternative technique is measuring maximum vertical pocket of liquor in gravid uterus (MVP) [1,5,6]. If MVP is less than 2 cm, it is termed as severe oligohydramnios, whereas AFI less than 8 cms, but > 5 cms, is termed as mild oligohydramnios [1,2,5,6]. For practical purposes values of less than 10 cms AFI especially in early third trimester, suggests low-normal status of liquor and needs to be monitored closely in remainder of pregnancy by weekly Ultrasound assessment of status of liquor. Values of AFI greater than 18 cms are suggestive of mild polyhydramnios[5], MVP measuring > 8 cms in such cases. When MVP measures > 12 cms it suggests moderate to severe polyhydramnios[5]. AFI in such cases is usually above 24 cms.

Fetal biometrics study is done by taking BPD, FL, AC and HC with estimation of fetal weight by predestined algorithms fed in computers of ultrasound scanner[5]. Mean AFI in 3rd trimester (27-29 weeks) is 172.1 mm, whereas in 36-38 weeks it dips down to mean value of 144 mm, and sharp dip in AFI is seen in 39-40 weeks to mean of 125 mm[5]. Thus values of 100 mm can be considered in late trimester to be approaching low-normal range and adequate precautions be taken like hydration of mother, nutritional supplementation with bed rest may be suggested as per the case and condition may be [1,2,5].

Ultrasonic assessment of Amniotic fluid in gravid uterus:-

Ultrasound is well suited to assess liquor status and assess AFV [1,2,3,4,5,6]. It is non-invasive, easily performed test and had no adverse effects on embryo/ fetus and mother. 3.5 Mhz convex (curvilinear) ultrasound transducer (probe) is used to perform sonography, with use of Color

Doppler whenever necessary [1, 2]. Sector or even linear probe can be used[1]. Two different methods are tried successfully all over the world by sonologists;

1) **Single deepest pocket[1, 2] (Maximum vertical pocket- MVP) of** amniotic fluid free of umbilical cord and fetal limbs is done by keeping probe vertical to floor/ maternal abdomen with minimal possible pressure and intervening jelly. This was devised by Manning, Hill and Platt[1]. Values of MVP < 2 cms indicates definite oligohydramnios[1,2]. In multiple gestations, 3-8 cms deepest pocket measurements are normal[2]. Polyhydramnios is classified as mild (MVP – 8-11 cm); moderate (MVP- 12-15 cm) and severe as MVP with values greater than 16 cms[2]. Several studies conducted across the world showed no significant correlation with estimated fetal weight for all subdivisions of gestational age like 27-29, 30-32, 33-35, 36-38, and 39-40 weeks[3,4,5].

2) **4-quadrant method[1,2] (Amniotic fluid index-AFI)[semiquantitative assessment of amniotic fluid volume]-** This method was devised by Phelan[1,2,] in year 1987, later by Rutherford[1] et al as well as Moore and Cayle[1,2] who developed semiquantitative assessment of AFV. Probe is held vertically and assessment of AFV done by dividing uterus into four quadrants and measuring cord-free deepest single pocket in each quadrant and adding them, if values are below 8 cms, three averages are performed and final values of AFI are given. In our study, we took 10 cms as cut-off limit to designate as low normal, values below 8 cms but 5 cms as mild oligohydramnios and values of < 5 cms as moderate to severe oligohydramnios[1, 2, 5, 6]. AFI values above 18 cms were considered as polyhydramnios. AFI values greater than 24 cms are suggestive of moderate to severe polyhydramnios. It is suggested that even probe pressure also leads to alteration in AFI values by as much as 13 to 21 %[1].

Oligohydramnios: It is defined as condition in which AFV is decreased relative to gestational age, with AFV less than 300 to 500 ml after midtrimester [1,2,5,6]. On sonography, marked crowding of fetal parts is seen with poor fluid-fetal interface and obvious lack of liquor[1].

There are various causes of oligohydramnios [1,2,5,6]:-

1) Pre-eclampsia.
2) Placental abruption
3) Diabetes Mellitus (maternal)
4) SLE
5) Multiple pregnancy (due to feto-fetal transfusion syndrome)
6) Fetal renal anomalies, fetal posterior urethral valves, Urinary bladder obstruction, bilateral renal agenesis, bilateral multicystic dysplastic kidneys, prune belly syndrome.
7) Premature rupture of membranes- the most common cause of reduced liquor.
8) Post-maturity:- produces decrease in amniotic fluid volume as fetus ages with increase in incidence of fetal meconium aspiration, fetal postmaturity syndrome and fetal death.[1]
9) IUGR:- main cause include TORCH group of infections, fetal chromosomal anomalies, maternal abuse of substance, alcohol, tobacco, maternal co-morbidities like cardiovascular disorders, malnutrition, etc[1,2,5,6].

Oligohydramnios when detected in first 6 months of pregnancy, it is more serious and cause for concern, as there is increased incidence of fetal anomalies, stillbirth, preterm labor, abortions [1,5,6]. When oligohydramnios is seen in third trimester, there is risk of fetal growth retardation (IUGR), labor complications like PROM (premature rupture of membranes, a need for LSCS (Caesarean section) [1,2,5,6]. Decreased fluid in gravid uterus leads to compression of umbilical cord and further causes reduction in fetal perfusion and further decrease in AFV. So also; as amniotic fluid acts as an internal stent for developing surrounding lung, prolonged oligohydramnios leads to pulmonary hypoplasia and related complications[1]. In view of presence of oligohydramnios, the clinician closely monitors the remainder of pregnancy, and assess the status of fetus by non-stress test, Biophysical profiling of fetus [1,3,4,5,6] monitoring fetal movements, breathing movements, fetal muscle tone, and AFI as well as assessing fetal kick counts, with judicious use of Color Doppler [1,2,5,6] to assess utero-placental and feto-placental blood circulation with any fetal hypoxemia as evident by fetal MCA Doppler assessment of peak systolic velocity and RI value (fetal brain sparing effect) & uterine artery diastolic notch especially after 28 weeks gestation[1,6]. Use of Color Doppler in ultrasound assessment of AFV for visualizing cord resulted in diagnosis of oligohydramnios in 21% in cases showing normal AFVs[1].

In oligohydramnios- Perinatal mortality is also increased by 13-folds when MVP measures < 2cms, if MVP measures <1 cm perinatal mortality rate increases 47-fold. Treatment of oligohydramnios includes- amnioinfusion, increasing maternal hydration, asking patient to take bed rest [1,2,5]. Labor may be induced or C-section may be advised depending on Doppler assessment and NST assessment.

Causes of polyhydramnios:-

Polyhydramnios is defined as an excessive accumulation of amniotic fluid during pregnancy, with incidence of 0.2 to 3.3% and in such cases AFV exceeds 1500 – 2000 ml[1, 2]. It should be noted at the outset that underlying cause of polyhydramnios found only in 17% cases of severe polyhydramnios[2].

a) 60% cases of polyhydramnios have no cause and no abnormality in fetus or mother; occur gradually and are often asymptomatic, resolve spontaneously and termed as chronic polyhydramnios[1,2,6].
b) About 20% have maternal causes like[1,2,5,6]:-

1. Maternal diabetes with LGA fetus[macrosomia][1,2] (proposed mechanism is increase in amniotic fluid osmolality resulting from fetal hyperglycemia and polyuria and also decreased swallowing by large well fed fetus[1])

2. Rhesus blood group incompatibility
3. Pre-eclampsia
4. TORCH group of maternal infections
5. Cardiac failures.
6. Maternal infections like viral infections[1,2,5,6].
7. Bartter's syndrome[2]
8. Maternal hypercalcemia[2]

c) Other 20% cases have following fetal causes[1,2,5,6]

1) GI disorders like gastroschisis, congenital diaphragmatic hernia, omphalocele, duodenal and small bowel atresias, annular pancreas, congenital goiter- (all lead to hampered swallowing due to proximal bowel obstruction)
2) Nervous system disorders like Anencephaly, hydranencephaly, cebocephaly, myotonic dystrophy, meningocele, encephalocele, hydrocephalus, (herein proposed mechanism is impaired fetal swallowing due to obvious nervous disorder, polyuria due to lack of antidiuretic hormone (ADH), transfusion of fluid through meninges exposed due to defect[1].
3) Skeletal dwarfisms like Thanatophoric dwarfism, Achondroplasia, asphyxiating thoracic dystrophy.
4) Fetal cardiac dysrhythmias, large septal defects, myocardial diseases, coarctation of aorta.
5) Fetal lung anomalies
6) Hydrops fetalis and fetal anemia
7) Twin- Twin transfusion syndrome.
8) Multiple pregnancies (twins or triplets)

Rare and miscellaneous causes are:-[1,2,5,6]
9) Chromosomal anomalies like Trisomy 18, trisomy 21.
10) Congenital chylothorax
11)Drugs like lithium used in psychiatry produce polyhydramnios[1,6].

Various risks associated with cases of polyhydramnios include preterm labor, PROM, Abruptio placentae, PPH, fetal malpositions, cord prolapsed, pre-eclampsia, eclampsia, urinary tract infections, etc [1,2,5,6]. Various laboratory tests[2] conducted in such cases include- 1) Blood sugar estimation to rule out diabetes 2) TORCH serological assessment 3) triple serum tests in early trimesters when fetal chromosomal studies are suspected on ultrasound scan 3) maternal blood group, Rhesus factor and screening for Rh antibodies[1,2] is done. Treatment options[1, 2] to reduce AFV in polyhydramnios cases include therapeutic amniocentesis, indomethacin (sulindac) and prostaglandin synthetase inhibitors [1,2,6].

Conclusion:

The guidance thus suggested by a proper reporting of AFI, placental location, gestational age, EFW of fetus, lie, presentation, any anomalies, status of internal os, status of uterine wall and integrity, scar integrity in history of previous LSCS, FHR (fetal heart rate), Color Doppler done if any will give a prior preparedness of clinician before suggesting any intervention in form of induction of labor (like PROM near term with mature fetus in utero), medical termination of

pregnancy (like in non-viable incompatible anencephalic fetus or IUD with oligohydramnios) or LSCS (caesarean section) in case of IUGR with mature fetus, mature placenta, fetal lung maturity with decreasing liquor and suggestive Color Doppler indicating fetal hypoxemia (uterine artery diastolic notch with ductus venosus changes and fetal MCA changes). All these interventions are to prevent any fetal or maternal injury or injury in both and save both in any emergent situation associated with abnormal liquor. Likewise a case of posterior urethral valve with oligohydramnios can be waited till fetal maturity and contemplated for surgery in newborn with fulguration of valves postnatally at suitable time. So also a case of esophageal atresia or trachea-esophageal fistula with consequent polyhydramnios needs to dealt similarly. A case of IUGR with meconium stained liquor showing dense internal echoes, decreasing liquor on serial scans done preferably by weekly follow-up by antenatal ultrasound, NST, Doppler will be dealt with immediate intervention to avoid meconium aspiration syndrome, meconium ileus in fetus. Plain oligohydramnios without obvious fetal or maternal cause can be serially assessed by weekly scans and if AFI falls below 5 cms, an induction of labor or C-section is warranted for to prevent fetal hypoxemia by resulting umbilical cord compression with fetal vascular compromise. PROM in early trimester is treated conservatively with strict bed rest. PROM case nearing term is induced for labor to avoid chorio-amnionitis, fetal compromise and infections, related fetal mortality. So also idiopathic cases of polyhydramnios without any obvious cause should be monitored closely to prevent preterm labor, PROM, and induction of labor or C-section is suggested as the case may be when fetus achieves maturity.

Table 1: Distribution of Diagnosis with age group:

Table 1: Distribution of Diagnosis with age group					
Diagnosis	**AGEGROUP**				**Total**
	20-25 (%)	**25-30(%)**	**30-35(%)**	**35+ (%)**	
Oligohydramnios	9(33.33)	9(47.37)	4(50)	1(100)	23
Oligohydramnios with IUGR	7(25.92)	4(21.05)	0	0	11
Oligohydramnios with PV leaking of liquor	2(7.4)	1(5.26)	1(12.5)	0	4
Oligohydramnios with fetal posterior urethral valves	1(3.7)	0	0	0	1
Oligohydramnios with pre-Eclampsia related placental changes	1(3.7)	0	0	0	1
Polyhydramnios	6(22.22)	2(10.52)	2(25)	0	10
Polyhydramnios with Anencephalic fetus	0	1(5.26)	0	0	1
Polyhydramnios with fetal esophageal atresia and absent stomach bubble	0	0	1(12.5)	0	1
Polyhydramnios with maternal hepatitis and internal echoes in liquor	1(3.7)	0	0	0	1
Severe oligohydramnios with fetal posterior urethral valves	0	1(5.26)	0	0	1
Twin- twin transfusion syndrome with stuck twin showing oligohydramnios	0	1(5.26)	0	0	1
Total	**27(100)**	**19(100)**	**8(100)**	**1(100)**	**55**

Table 2: Distribution of Diagnosis with AFI-group

	AFI-GROUP	TOTAL	
Table 2: Distribution of Diagnosis with AFI-group	**Oligohydramnios (%)**	**Polyhydramnios (%)**	
Oligohydramnios	23(54.76)	0	23
Oligohydramnios with IUGR	11(26.2)	0	11
Oligohydramnios with PV leaking of liquor	4(9.52)	0	4
Oligohydramnios with posterior urethral valves	1(2.3)	0	1
Oligohydramnios with preclampsia related placental changes	1(2.3)	0	1
Polyhydramnios	0	10(76.92)	10
Polyhydramnios with Anencephalic fetus	0	1(7.69)	1
Polyhydramnios with fetal esophageal atresia	0	1(7.69)	1
Polyhydramnios with maternal viral hepatitis	0	1(7.69)	1
Severe oligohydramnios with fetal PU Valves	1(2.3)	0	1
Twin twin transfusion syndrome with stuck twin	12.3)	0	1
TOTAL	**42(100)**	**13(100)**	**55**

Table 3: Distribution of Conditions district-wise

Diagnosis	**District**					**Total**
	CHAMOLI (%)	**OTHER (%)**	**PAURI (%)**	**RPG (%)**	**TG (%)**	
Oligohydramnios	3(50)	0	10(40)	6(42.85)	4(44.44)	23
Oligohydramnios with IUGR	1(16.66)	0	7(28)	3(21.43)	0	11
Oligohydramnios with PV leaking of liquor	0	0	3(12)	1(7.14)	0	4
Oligohydramnios with fetal PU valves	0	0	0	0	1(11.11)	1
Oligohydramnios with pre-Eclampsia related placental changes	0	0	0	1(7.14)	0	1
Polyhydramnios	0	1(100)	4(16)	2(14.28)	3(33.33)	10
Polyhydramnios with Anencephalic fetus	0	0	0	1(7.14)	0	1
Polyhydramnios with fetal esophageal atresia	0	0	1(4)	0	0	1
Polyhydramnios with maternal viral hepatitis	1(16.66)	0	0	0	0	1
Severe oligohydramnios with fetal PU Valves	0	0	0	0	1(11.11)	1
Twin-Twin transfusion syndrome with stuck twin	1(16.66)	0	0	0	0	1
Total	**6(100)**	**1(100)**	**25(100)**	**14**	**9(100)**	**55**

Figure 1- Ultrasound image of anencephalic fetus with absent cranial vault and poorly developed forebrain and polyhydramnios.

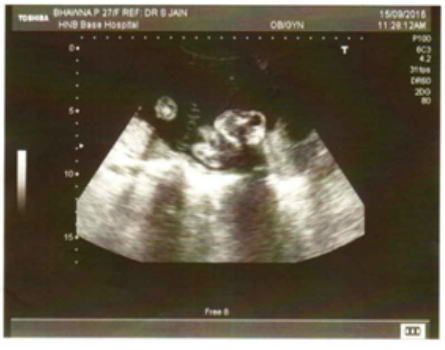


Figure 2 - Ultrasound image of a stuck twin with severe oligohydramnios (feto-fetal transfusion syndrome)

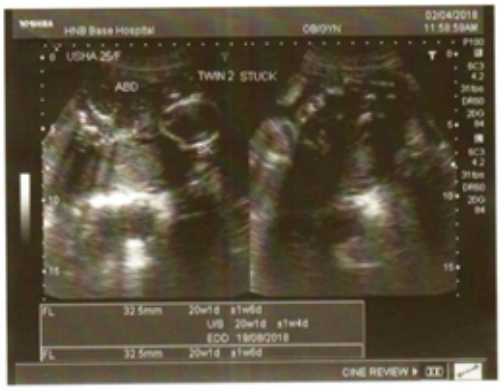
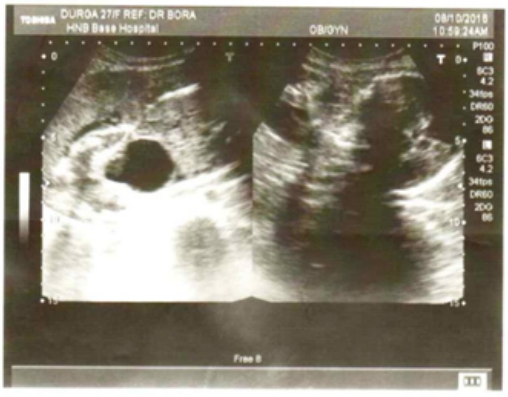


Figure 3- Ultrasonography of a posterior urethral valve in fetus showing key-hole sign of an obstructed urinary bladder of the fetus with oligohydramnios.



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