

Prevalence of amniotic fluid disorders in fetal anomalies.

Authors:

Shruti P. Goswami 1, Gunjan A Badwaik 2

1 Assistant professor, Department of Anatomy, RKDF medical college hospital & RC, Bhopal, India 462026.

2 Associate professor, Department of Anesthesia, RKDF medical college hospital & RC, Bhopal, India 462026.

Corresponding Author:

Shruti P. Goswami

Assistant professor,

Department of Anatomy, RKDF medical college hospital & RC, Bhopal, India 462026.

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ABSTRACT:

Amniotic fluid is a clear, slightly yellow colored fluid surrounding fetus in amniotic sac. Amniotic fluid protects the fetus from injury and temperature changes. It allows fetus to move freely during development. It also acts as shock absorber. Antibodies present in amniotic fluid protects baby from infections. Amniotic fluid has been used as one of the reliable tool for screening of different congenital anomalies. There are two types of amniotic fluid disorders, polyhydramnios and oligohydramnios. Present study is about finding prevalence of amniotic fluid disorders in fetal anomalies.

Keywords: *amniotic fluid anomalies, polyhydramnios, oligohydramnios*

INTRODUCTION:

Amniotic fluid index is calculated from second trimester of pregnancy on ultrasound. Normal amniotic fluid index is 5cm to 24cm. AFI more than 24cm is considered as polyhydramnios and AFI less than 5 is considered as oligohydramnios. In early gestation amniotic fluid is produced by maternal plasma, later on fetal urination contributes to amniotic fluid. Amniotic fluid volume is kept normal by balance between fetal urination, fetal swallowing and intermembranous flow.

Polyhydramnios: Increased amniotic fluid volume is referred as Polyhydramnios and decreased amniotic fluid volume is referred as oligohydramnios. Polyhydramnios is associated with some congenital anomalies like neural tube deformities, facial anomalies, anterior abdominal wall defects, genetic disorders like Down syndrome or Edward syndrome with obstruction in gastrointestinal tract etc. Polyhydramnios is also seen in twin or multiple pregnancy, maternal diabetes, infections during pregnancy, maternal and fetal blood incompatibilities.

Oligohydramnios: Decreased amniotic fluid volume is referred as oligohydramnios. Oligohydramnios is associated with congenital anomalies of genitourinary system, dehydration, preeclampsia, placental abruption etc.

MATERIAL AND METHODS:

The project "Prevalence of amniotic fluid disorders in fetal anomalies" was carried out in our medical college and hospital, over the period of 2 years. The study included 1000 pregnant women who were selected from the antenatal care (ANC) patients in second trimester i.e., between 12 and 24 weeks of gestation attending ANC clinic for ultrasonographic screening at our medical college and hospital. The study subjects included rural, urban and migrated population from most part of the Central India. The subjects selected were from the age group of 18 to 40 years. All the subjects had sound knowledge about their menstrual dates. The subjects were given prior appointment in the morning hours and screened under the guidance of only one experienced sonologist throughout the study. The following procedure was adopted to collect the data for the study. The study patients were informed regarding the nature and purpose of the study and written consent was taken from the patients in the presence of an impartial witness.

1. Particulars of the subjects selected for the study with special reference to their menstrual and obstetric history, drug history was recorded in the proforma given below.
2. Ultrasound screening examination was performed on the subjects with full urinary bladder.

3. The equipment used was e saote My Lab 50 X vision which was routinely used in the obstetric practice.
4. The subjects were positioned on the ultrasound screening table in supine position with their abdomen exposed. Then a mineral oil gelly, 'Sonogel' was applied all over the surface so as to ensure an airless contact between the tissue and the transducer probe.
5. Transducer probe was placed in the longitudinal direction and moved all over the surface of the abdomen. The fetal position was then assessed.
6. Following particulars were noted :-
 - i. Number of gestations.
 - ii. Presentation of the fetus at the time of examination.
 - iii. Approximate gestational age of the fetus in weeks was obtained with the help of fetal parameters like fetal Biparietal Diameter (BPD), fetal Head Circumference (HC), fetal Abdominal Circumference (AC); fetal Femur Length (FL) as per the recommendations of the American Institute of Ultrasound in Medicine.
 - iv. The umbilical cord was identified and traced till its insertion in the placenta. First longitudinal scanning and then transverse scanning was done. Thus the position and extent of placenta was determined and its relativity from cervix was noted.
 - v. For assessment of amniotic fluid, amniotic fluid Index (AFI) was determined during ultrasound examination as per procedure given below:
 - Patients were given supine position.
 - A linear transducer was used.
 - Maternal uterus was divided into four quadrants by a sagittal midline vertical plane and an

arbitrary transverse line approximately halfway between the symphysis pubis and upper edge of the uterine fundus.

- The transducer was kept parallel to the maternal sagittal plane and perpendicular to the maternal coronal plane throughout examination.
- The deepest unobstructed and clear pocket of amniotic fluid was visualized and the image was obtained. The ultrasound calipers were manipulated to measure the pocket in a strictly vertical direction.
- The process was repeated in each of the four quadrants and the pocket measurements were summed = AFI
- If the AFI was $<8\text{cm}$, the evaluations in all four quadrants were performed three times and average values were taken.
- Polyhydramnios was diagnosed if $\text{AFI} > 24\text{cm}$ or a single pocket of fluid at least 8 cm in depth.
- Oligohydramnios was diagnosed if $\text{AFI} \leq 5\text{cm}$.

Fetus was screened for the structural anomalies of the head, face, neck, thorax, abdomen, limbs, spine and genitourinary system.

RESULTS:

The study was conducted on 1000 pregnant women who were attending antenatal clinics for routine examination and ultrasonographic screening in between 12 to 24 weeks of gestation at our Medical College and Hospital. All the subjects had sound knowledge about their menstrual dates and previous menstrual cycles. The parameters considered in our study were maternal age, gravida, gestational age, drug history, fetal anomalies, types of fetal anomalies, polyhydramnios or oligohydramnios associated with fetal anomalies.

Table 1: Shows percent wise distribution of polyhydramnios and oligohydramnios in pregnancies

Amniotic fluid	No. of subjects N=1000	%
Polyhydramnios	25	2.5
Oligohydramnios	36	3.6

Polyhydramnios was observed in 25 pregnant women. Incidence of polyhydramnios was calculated as 2.5%. Oligohydramnios was observed in 36 pregnant women giving an incidence of 3.6%.

Graph 1 Shows percent wise distribution of polyhydramnios and oligohydramnios in pregnancies.

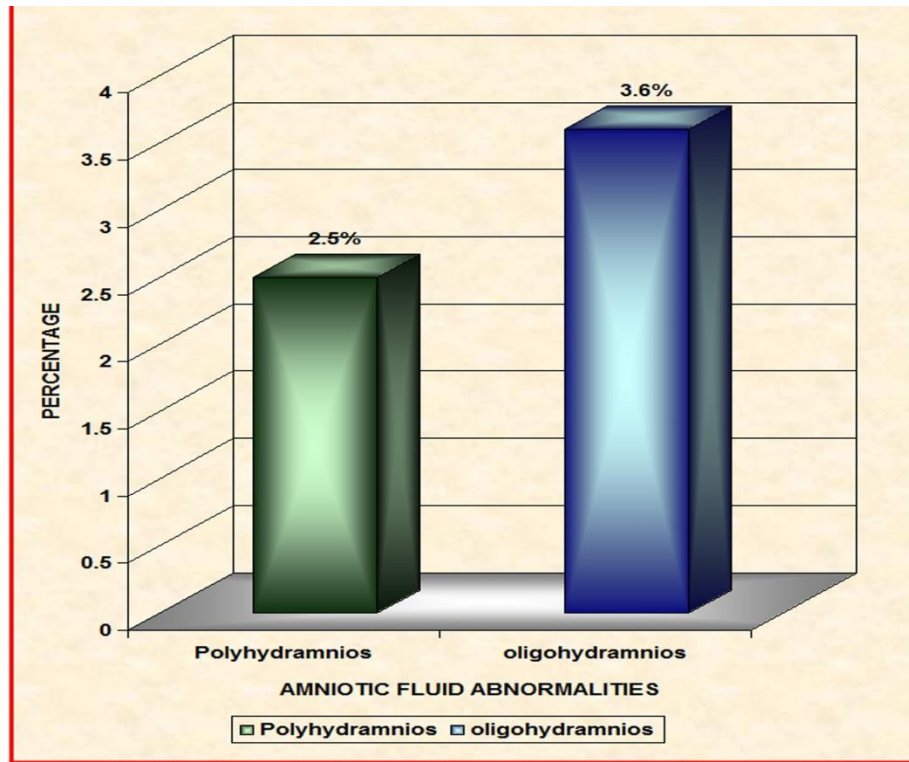


Table 2: Shows percent wise association of Polyhydramnios or Oligohydramnios with fetal anomalies.

Amniotic fluid abnormalities	Fetal anomalies	%
Polyhydramnios (n=25)	10	40
Oligohydramnios (n=36)	3	8.3

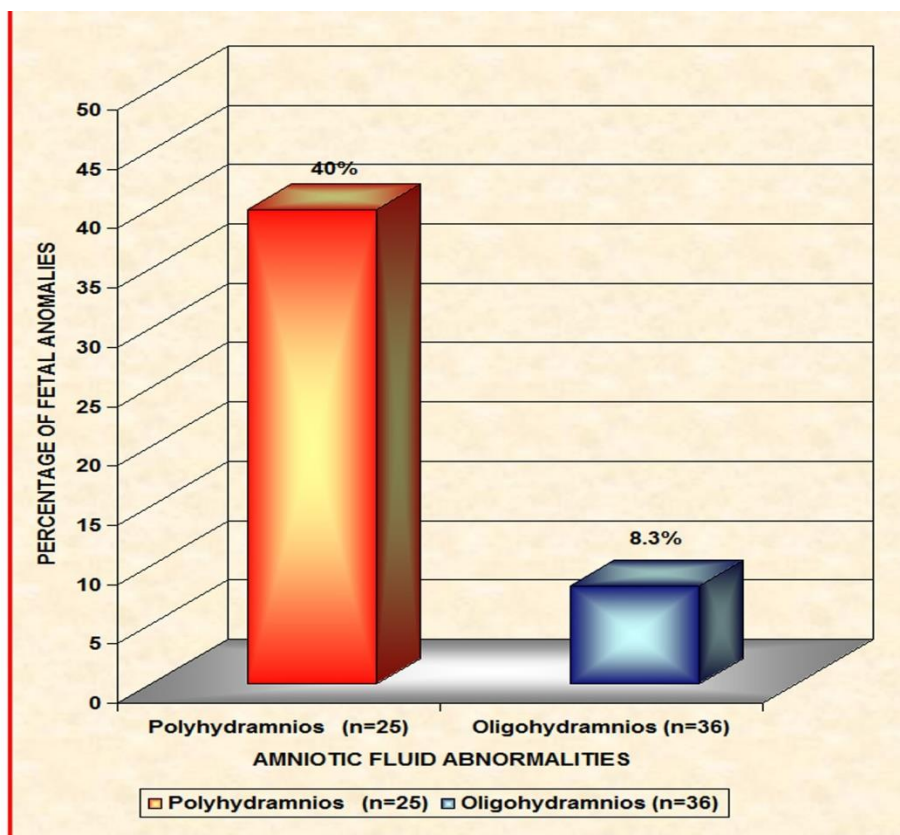
Table 3: Shows percent wise distribution of Polyhydramnios in different fetal anomalies.

Polyhydramnios	Incidence n=25	%
Neural tube defects	3	12
Facial cleft	1	4
Cystic hygroma	1	4
Anterior abdominal wall defect	1	4
Gastro-intestinal obstruction	1	4
Hydrops fetalis	2	8
Pentalogy of Cantrell syndrome	1	4

Table 4: Shows percent wise distribution of oligohydramnios in different fetal anomalies.

Oligohydramnios	No. of cases n=36	%
Urinary system defects	3	8.33

Graph 2: Shows percent wise association of Polyhydramnios and Oligohydramnios with fetal anomalies.



DISCUSSION:

Ultrasonography is an advanced tool for rapid obstetric imaging with high sensitivity without any adverse effects. Ultrasound scan is currently considered to be a safe, non-invasive, accurate and cost-effective investigation in the fetus. It has progressively become an indispensable obstetric tool and plays an important role

in the care of every pregnant woman. The main use of ultrasonography is in diagnosis and confirmation of early pregnancy, vaginal bleeding in early pregnancy, determination of gestational age and assessment of fetal size, diagnosis of fetal malformation, placental localization, multiple pregnancies and polyhydramnios or oligohydramnios.

Amniotic fluid anomalies – polyhydramnios

Investigators	Percentage of Polyhydramnios in fetal anomalies
S Z Barkin (1987)	75
N Lazebnik et al (1999)	14.5
Pauer HU (2003)	48
Singh S (2006)	71.79
Fawad A (2008)	20
Akinola RA (2008)	48.44
Present study	40

Amniotic fluid anomalies - Oligohydramnios

Investigators	Percentage of Oligohydramnios in fetal anomalies
Pauer HU (2003) ⁴⁵	11.8
Leeman L(2005) ³³	5
Akinola RA (2008) ²	12.5
Present study	8.3

S Z Barkin et al (1987) reviewed sonograms of 195 singleton pregnancies with polyhydramnios. In this study they found out sever polyhydramnios with 75% of prevalence of fetal anomalies predominantly involving CNS abnormalities, gastrointestinal tract, heart and genitourinary tract. **N Lazenbik et al (1999)** evaluate maternal and fetal risk factors associate with congenital malformations in patients with polyhydramnios. The study group consisted of 275 singleton pregnancies with amniotic fluid index >25 cm. an eual number of control cases were included in study. Congenital anomalies were detected in 14.5% with polyhydramnios. **Pauer HU et al (2003)** evaluated 840 pregnancies with oligohydramnios and polyhydramnios on the basis of ultrasonographic findings between 12 and 42 weeks of gestation. In polyhydramnios, 48% of fetuses had sever malformations and in oligohydramnios 11.8% of fetal malformations were noticed. Polyhydramnios was predominantly associated with anomalies of gastrointestinal tract. Oligohydramnios was predominantly associated with malformations of urinary tract. **Leeman L (2005), Kale A (2005), Fawad A (2008)** and **Akinola RA et al (2008)** carried out various studies for estimation of incidence, causes and effects of polyhydramnios and oligohydramnios. **Leeman L (2005)** stated that oligohydramnios was occurred in 1% to 5% of spregnancies complicated by fetal kidney and urogenital abnormalities predominantly. **Kale A (2005)** retrospectively evaluated pregnancies with polyhydramnios and calculated the prevalence of polyhydramnios as 1.01%. The etiology of polyhydramnios was idiopathic predominantly and also associated with anomalies of central nervous system, gastro-intestinal system, diabetes mellitus, hydrops fetalis and twin-to-twin transfusion. Similar study was carried out by **Singh S (2006)** they found that polyhydramnios was associated with 71.79% of fetal anomalies mostly neural tube defects. Oligohydramnios was associated with 66.66% cases of anomalies predominantly of renal system. **Fawad A (2008)¹⁷** found polyhydramnios in 2% of cases and 20% of patients with polyhydramnios was associated with fetal abnormalities. **Akinola RA et al (2008)²** found in their study that polyhydramnios was associated with 48.44% of congenital anomalies while 12.5% had oligohydramnios.

In the present study, polyhydramnios is observed in 2.5% of cases. 40% of cases with polyhydramnios are associated with fetal anomalies. These anomalies are Neural tube defects (n=3), Facial clefts (n=1) Cystic hygroma (n=1), Anterior abdominal wall defects (n=1), Gastro-intestinal obstruction (n=1), Hydrops fetalis (n=2) and Pentalogy of Cantrell syndrome (n=1). These findings are comparable with **Pauer HU (2003)⁴⁵, Kale A (2005)²⁶, Singh S (2006)⁵², Fawad A (2008)¹⁷** and **Akinola RA (2008)²**. In our study oligohydramnios are observed in 3.6% of cases, only 8.3% of fetal anomalies are associated with oligohydramnios and these are fetal urinary system anomalies. These findings are comparable with **Pauer HU (2003)⁴⁵, Leeman L (2005)³³, Singh S (2006)⁵²** and **Akinola RA (2008)²**.

CONCLUSION:

1. Incidence of polyhydramnios is 2.5% of pregnancies. 40% of cases of polyhydramnios are associated with fetal anomalies. Fetal anomalies associated with polyhydramnios are Neural tube defects (n=3), Facial cleft (n=1), Cystic hygroma (n=1), Anterior abdominal wall defects (n=1), Gastro-intestinal obstruction (n=1), Hydrops fetalis (n=2) and Pentalogy of Cantrell Syndrome (n=1).
2. Incidence of Oligohydramnios is 3.6% of pregnancies. 8.3% of oligohydramnios are associated with fetal anomalies. Fetal anomalies associated with oligohydramnios are fetal urinary system anomalies (n=3).

REFERENCES:

- Pauer HU, Viereck V, Krauss V, Osmera R, Krauss T. Incidence of fetal malformations in pregnancies complicated by oligo- and polyhydramnios -Arch Gynecol Obstet 2003;268(1):52–56.
- Singh S, Shergil G.S, Singh A, Chander R. Role of ultrasound in detection of Antenatal fetal

- malformations. *Indian Journal Radiol Imag.* 2006, 16(4):831-834.
- Fawad A, Danish S, Danish N. Frequency, causes and outcome of polyhydramnios. *Gomal Journal of Medical Sciences* 2008; 6(2)106-109.
 - Akinola RA; Akinola OI, Jinadu FO, Disu E, Balogun BO, Akintomade TE et al. Audit of congenital Fetal anomalies as seen on Ultrasound scan in a teaching Hospital in Ikeja, Lagos, Nigeria. *Nigerian Journal of Health & Biomedical Sciences* 2008;7(2):61-65.
 - Underwood MA, Gilbert WM, Sherman MP. Amniotic Fluid: Not Just Foetal Urine Anymore. *J Perinatol* (2005) 25(5):341–8. doi: 10.1038/sj.jp.7211290
 - John D. Yeast, MD. Polyhydramnios: Etiology, Diagnosis, and Treatment. *Neoreviews* (2006) 7 (6): e300–e304.
 - Sardia Tarique. Polyhydramnios: study of causes and foetal outcome. *The professional medical journal.* ISSN 1024-8919: Vol: 17; Issue: 4; Start page: 660;2010.
 - MOISE, KENNETH J. JR. MD. Polyhydramnios: *Clinical Obstetrics and Gynecology*: June 1997 - Volume 40 - Issue 2 - p 266-279.
 - SZ Barkin, DH Pretorius, MK Beckett, DK Manchester. Severe polyhydramnios: incidence of anomalies; *American Journal of Roentgenology.* 1987;148: 155-159. 10.2214/ajr.148.1.155.
 - John Nichols, MD; Rosemary Schrepfer, MD. Polyhydramnios in Anencephaly. *JAMA.* 1966;197(7):549-551.
 - N Lazebnik. The severity of polyhydramnios, estimated fetal weight and preterm delivery are independent risk factors for the presence of congenital malformations. *Gynecol obstet invest.* 1999.
 - N Lazebnik. Characteristics of fetuses with polyhydramnios and abnormal chromosome study; *Genetics in Medicine* volume 2, page111 (2000)
 - Erik G. Puffenberger, Kevin A. Strauss, Keri E. Ramsey, David W. Craig, Dietrich A. Stephan, Donna L. Robinson, Christine L. Hendrickson, Steven Gottlieb, David A. Ramsay, Victoria M. Siu. Polyhydramnios, megaloccephaly and symptomatic epilepsy caused by a homozygous 7-kilobase deletion in LYK5; *Brain*, Volume 130, Issue 7, July 2007, Pages 1929–1941.
 - Neelam Engineer ,Keelin O'Donoghue,Ruwan C. Wimalasundera,Nicholas M. Fisk. The Effect of

- Polyhydramnios on Cervical Length in Twins: A Controlled Intervention Study in Complicated Monochorionic Pregnancies. PLoS ONE 3(12): e3834. doi:10.1371/journal.pone.0003834.
- Andrea Panting-Kemp MD Tuan Nguyen MD Elaine Chang MD Ed Quillen PhD Lony Castro MD. Idiopathic polyhydramnios and perinatal outcome. American Journal of Obstetrics and Gynecology. Volume 181, Issue 5, November 1999, Pages 1079-1082.
 - Desirée M. J. Dorleijn, Titia E. Cohen-Overbeek, Floris Groenendaal, Hein W. Bruinse & Philip Stoutenbeek. Idiopathic polyhydramnios and postnatal findings. The Journal of Maternal-Fetal & Neonatal Medicine. Volume 22, 2009 - Issue 4 Pages 315-320.
 - R L Skovgaard 1, A L Silvonek. Oligohydramnios. Literature review and case study. J Nurse Midwifery. 1993 Jul-Aug;38(4):208-15.
 - Chung-Ming Chen, Leng-Fang Wang, Hsiu-Chu Chou, Yaw-Dong Lange. Mechanism of Oligohydramnios-induced Pulmonary Hypoplasia. Journal of Experimental & Clinical Medicine. Volume 2, Issue 3, June 2010, Pages 104-110.
 - C Christianson, D Huff & E Mcpherson . Limb deformations in oligohydramnios sequence: effects of gestational age and duration of oligohydramnios. Genetics in Medicine volume 1, page 53 (1999).
 - D Levine, R B Goldstein, P W Callen, N Damato. The effect of oligohydramnios on detection of fetal anomalies with sonography. American Journal of Roentgenology. 1997;168: 1609-1611.
 - G Mari, B Kirshon, A Abuhamad. Fetal renal artery flow velocity waveforms in normal pregnancies and pregnancies complicated by polyhydramnios and oligohydramnios. Obstet Gynecol. 1993 Apr; 81(4):560-4.
 - Christofer R Harman. Amniotic fluid abnormalities. Semin Perinatol. 2008 Aug;32(4):288-94.
 - Mark a Underwood et al. amniotic fluid: not just fetal urine anymore. J Perinatol. 2005 May;25(5):341-8.

Figure: 1,2. Oligohydraminos

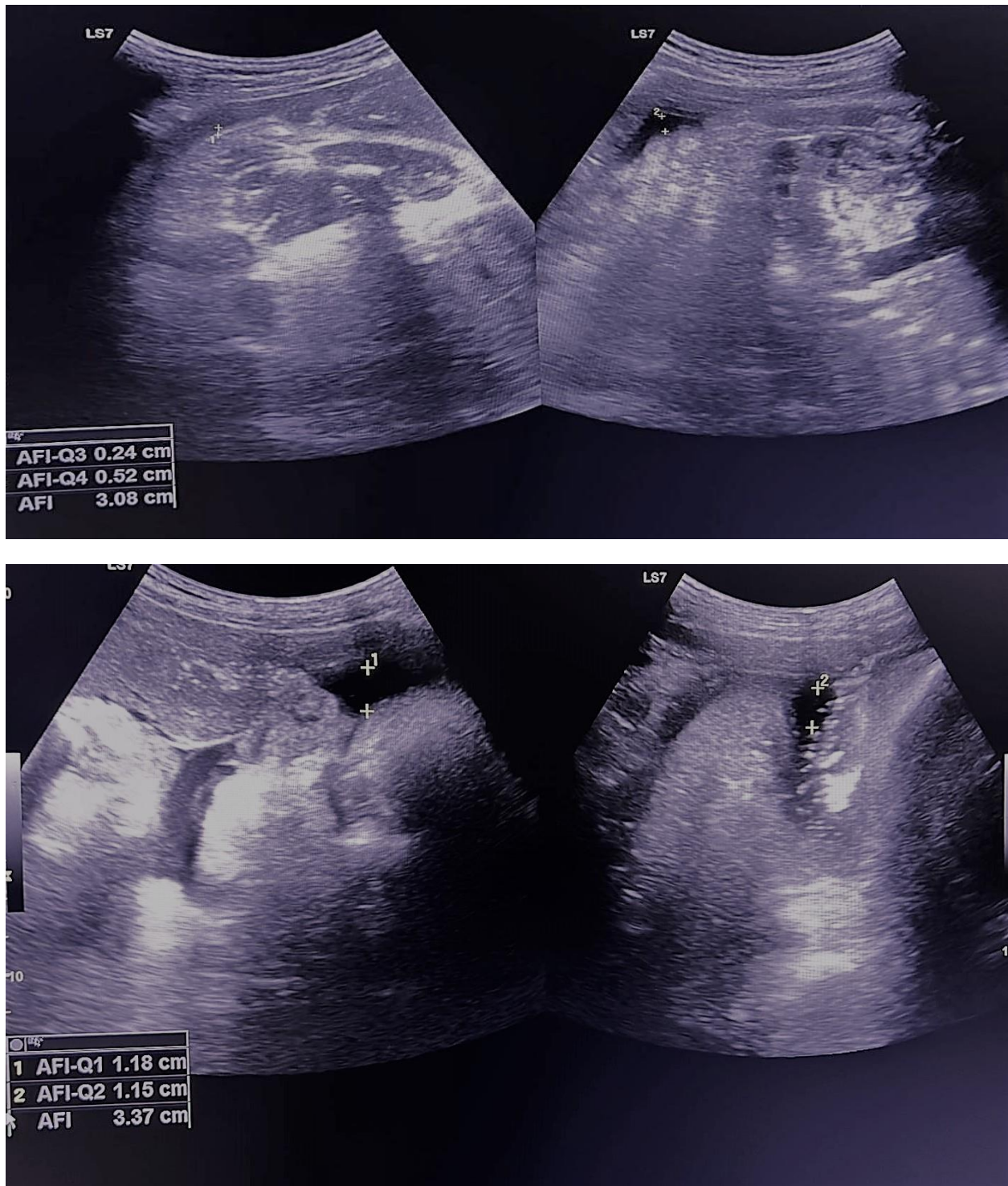


Figure: 1,2. Polyhydramnios

