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A study of the effect of abnormal amniotic fluid volume on maternal and fetal outcome

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Abstract
Background: Liquor amnii plays important role both in the development of the fetus and antenatal assessment of the fetal wellbeing. Its cushioning effect protects the fetus from external trauma whereas a decrease in liqor may leads to flexion contracture in the fetus. A decrease in the liqor volume, with intact membranes, in the third trimester indicates decreased utero-placental flow and maybe the indication for early termination of pregnancy.
Methods: This prospective study was conducted in the department of Obstetrics and Gynecology at Dr. Rajendra Prasad Government Medical College Kangra at Tanda, Himachal Pradesh from January 2018 to December 2018, where 100 expectant mothers with abnormal liqor volume were studied with an aim to evaluate AFI for the assessment of perinatal outcome after all required formalities.
Results: Out of 100 parturients studied 90 and 10 women had oligohydramnios and polyhydramnios respectively. 16(17.8%) women with oligohydramnios and 4(40%) women with polyhydramnios had preterm delivery. There were 20(22.2%) of women with PIH in the oligohydramnios group whereas none of the expectant mothers with polyhydramnios had PIH. Gestational diabetes mellitus was seen in polyhydramnios group women only and was present in 3(30%) women. In oligohydramnios group, NST was found to be non-reactive in 23(25.6 %) women and 58(64.4%) women required induction of labor. Meconium-stained liqor was found in 28(31.1%) women and CS was done in 59(65.6%) expectant mothers. 24(26.7%) neonates required NICU admissions as 12(12.3%) with respiratory distress, 5(5.5%) neonatal jaundice and 1 (1.1%) congenital pneumonia. There were 57(63.3%) neonates with LBW and 17(18%) neonates with VLBW. In polyhydramnios group, induction of labor was done in 3(30%) women. CS was done in 5(50%) women as 2(40%) for cord prolapse, 2(40%) for fetal distress and 1(20%) for NPOL. 2(20%) neonates were admitted to NICU with respiratory distress and one neonate had a congenital malformation in the form of tracheal stenosis. Two (20%) neonates had LBW and one (10%) had macrosomia.
Conclusion: Oligohydramnios was associated with an increased incidence of induction of labor, non-reactive NST, meconium-stained liqor and CS. Neonates born to women with oligohydramnios had increased incidence of a low Apgar score, respiratory distress, LBW and NICU admission. Parturients with polyhydramnios showed more association gestational diabetes mellitus and neonatal congenital anomalies. Almost all the patients had spontaneous labor but required cesarean section for cord prolapse and macrosomia.

Keywords: Oligohydramnios, polyhydramnios, parturient, morbidity

Introduction
Modern obstetrics is the clinical practice concerned with the health and wellbeing of both mother and fetus. Identification and quantification of fetal risk, further balancing the fetal risk against the neonatal complications of premature birth, determining the optimal time of intervention and quantification of maternal morbidity associated with intervention are the basis of management in obstetrics.
Amniotic fluid provides a protected milieu for growing fetus, cushioning the fetus against mechanical and biological injury, supplying nutrients and facilitating growth and movement. The quantity of amniotic fluid at any time in gestation is the product of water exchange between the mother, fetus, and placenta. Disorders of this regulatory process can lead to either polyhydramnios or oligohydramnios. These disorders may also result from abnormal fetal or maternal conditions and may be responsible for alterations of fetal well-being as well. With the advent of real-time ultrasonography, assessment of amniotic fluid has been possible, resulting in earlier recognition of abnormal conditions and possible intervention.

The normal range for amniotic fluid index (AFI) that is most commonly used is 5 to 24 cm. AFI less than or equal to 5 cm termed as oligohydramnios and above 24 termed as polyhydramnios [1]. In the first half of pregnancy, amniotic fluid is identical to the fetal and maternal plasma but with a lower protein concentration. Water and solutes freely traverse fetal skin and may diffuse through the amnion and chorion as well [2]. By the second trimester, the fetal skin becomes keratinized, making it impermeable to further diffusion. At this time, a fetus contributes to amniotic fluid volume and composition almost exclusively through urination. Urine has been observed in the fetal bladder as early as 11 weeks by trans-abdominal and 9 weeks by transvaginal ultrasonography [3]. Because fetal urine is hypotonic (80–140 mOsm/liter), it results in progressively hypotonic fluid (250–260 mOsm/liter near term) that contains increasing concentrations of urea, uric acid, and creatinine as the fetal kidneys mature. By term, a fetus produces on average from 500 to 700 ml/day with a slight decline in hourly fetal urine production after 40 weeks gestation [4].

Amniotic fluid resorption takes place by three mechanisms. The primary source of resorption is through fetal swallowing, which has been observed as early as 16 weeks [5]. Studies using radiolabeled red blood cells and radioactive colloid estimate that, on average, a fetus swallows from 200 to 450 ml/day at term, removing 50% of the amniotic fluid produced through fetal urination. This fluid is reabsorbed through the fetal gastrointestinal system and is either recycled through the kidneys or is transferred to the maternal compartment through the placenta. A second, more debatable means of amniotic fluid reabsorption is by the respiratory tract. The fetal respiratory activity has been observed as early as 11 weeks' gestation [6]. At term, inspiratory flow in the fetus is approximately 200 ml/kg/day [7]. Amniotic fluid may also potentially be reabsorbed by continuous bulk flow (i.e., via hydrostatic and oncotic forces). Exchange of fluid may take place at the chorionic plate, where exposure of the relatively hypotonic amniotic fluid to the fetal surface of the placenta may lead to net reabsorption of water by the fetus (up to 80 ml/day). Transport across the amnion may occur through intercellular channels between amniotic epithelial cells and may be modulated by amniotic fluid prolactin levels [8]. The regulatory role of the amniotic epithelium in the transport of fluid is suggested by ultrastructural changes in the amnion of pregnancies complicated by disorders of amniotic fluid volume [9].

A final, perhaps underestimated, pathway for volume regulation may occur within the placenta itself. The large surface area of the fetal capillary/ intervillous interface could magnify small osmolarity gradients between a mother and fetus, resulting in large volumes of net water transfer [10]. The exchange of water at this level would influence the fetal intravascular volume and potentially affect renal blood flow and urine production.

Amniotic fluid is predictable from the first half of pregnancy. At 12 weeks gestation, the average volume is 60 ml. By 16 weeks, when genetic amniocentesis is often performed, the mean volume is 175 ml [4]. After 20 weeks of period of gestation (POG), there is a greater variance of amniotic fluid volume. Based on numerous studies, it has been determined that amniotic fluid volume increases steadily throughout pregnancy to a maximum of 400–1200 ml at 34–38 weeks [11]. Despite large fluxes of fluid between the various compartments near term (500–700 ml/day through urine; 200–450 ml/day through deglutition), the net increase of amniotic fluid is only 5–10 ml/day in the third trimester. After 38 weeks, fluid volume declines by approximately 125 ml/week, to an average volume of 800 ml at 40 weeks [12]. After 43 weeks, this volume is reduced to 250 ml [13]. In some instances, this reduction may possibly reflect a shift of cardiac output away from the kidneys as a result of a relative uteroplacental insufficiency.

Polyhydramnios is the term used to describe an excess accumulation of amniotic fluid. This clinical condition is associated with a high risk of poor pregnancy outcomes [14, 15]. The reported prevalence of polyhydramnios ranges from 0.2 to 1.6% of all pregnancies [16]. Polyhydramnios is defined as the amniotic fluid volume of 2000ml or more at term. It is also defined as a state where single deepest pocket (SDP) of amniotic fluid measures more than or equal to 8 cm, or AFI of equal to or more than 24 cm, or above the 95th percentile for gestational age on ultrasound [17]. Maternal disorders, such as diabetes, in utero infections, drug usage, placental abnormalities, and fetal conditions like congenital and chromosomal abnormalities, Rh iso-immunization, and multiple gestations, are generally associated with half of the cases with polyhydramnios.

Oligohydramnios is defined as an AFI of less than or equal to 5 cm [1]. Certain fetal anomalies lead to the reduction of amniotic fluid volume and also lead to poor visibility and restricted evaluation of these anatomical structures. An adequate volume of amniotic fluid is critical to allow normal fetal movement and growth and to cushion the fetus and umbilical cord. Oligohydramnios is associated with an increased risk of small for gestational age (SGA) and also the incidence of cesarean section (CS), meconium-stained liqor, low Apgar score, and neonatal intensive care unit (NICU) admission. Oligohydramnios usually dictates induction of labor when pregnancy reaches term [18] and its incidence varies from 1-5% at term [19]. Oligohydramnios can be found in an otherwise uncomplicated pregnancy or as an additional finding in a complicated pregnancy (hypertensive disorders, decreased fetal movement). The diagnosis of oligohydramnios alters pregnancy management and maybe an indication of labor induction for delivery. Depending on the gestational age, induction may increase the risk of CS along with risks associated with late preterm/early-term deliveries. Therefore, it is important to delineate the risks of oligohydramnios and the benefits of prompt delivery.

Aims and Objectives

Primary Objective

- To find the association between AFI and perinatal outcome.

Secondary objectives

- To asses maternal morbidity associated with abnormal AFI.
- To find out causes associated with abnormal AFI

Material and Methods

This prospective observational study was carried out in the department of Obstetrics and Gynecology at Dr. Rajendra Prasad Government Medical College Kangra at Tanda (HP) from January 2018 to December 2018, after taking the approval of the protocol review committee and institutional ethics committee. All pregnant women having singleton pregnancy with cephalic presentation at POG 34-40 weeks, presenting with abnormal AFI, were included in the present study. While parturients complicated with PROM, malpresentations, antepartum hemorrhage, previous CS, myomectomy, hysterotomy and the ante-natal mothers requiring elective CS for medical and obstetric conditions not related to amniotic fluid variations were excluded from the study. Informed written consent was obtained from all the patients before including them in the study.

On admission, detailed menstrual and obstetrical history of the patient was taken and clinical examination was performed. Dating of pregnancy was done by the last menstrual period if the patient is sure of dates. If a pregnant woman was not sure of dates then it was calculated from first-trimester ultrasound or early second-trimester ultrasound. An ultrasound at 34-36 weeks for various fetal parameters including AFI was done as a routine and repeat ultrasound for AFI was done if indicated. In patients with abnormal AFI, AFI assessed within one week prior to spontaneous/induced labor between 34 weeks to 40 weeks of pregnancy was taken into consideration. AFI was calculated by using the four-quadrant technique as described by Phelan *et al*. [27] Women were divided into 2 groups as per her AFI:

1. Group 1: AFI <5cm (oligohydramnios)
2. Group 2: AFI >24 cm (polyhydramnios)

Pregnant women with oligohydramnios and polyhydramnios are further evaluated for fetal wellbeing by NST and fetal doppler studies if indicated. The NST result was considered reactive if 2 accelerations of >15 beats/min from baseline and lasting >15 seconds were present during a 20-minute period. NST was considered abnormal if baseline variability was less than 5 beats/min or absent accelerations or presence of late decelerations with spontaneous uterine contractions. If NST was normal, close fetal surveillance was done by 48 hourly NST and weekly doppler studies if indicated until the 37 weeks of gestation. Patients with abnormal NST and/or doppler studies at the time of diagnosis or any time during fetal surveillance were considered for termination of pregnancy. Termination of pregnancy in oligohydramnios and polyhydramnios was done according to standard institutional labor room protocol. The labor was monitored partographically.

The maternal morbidity was assessed in terms of:

1. CS
2. Preterm labor
3. Abruption
4. Induction of labor
5. Instrumental delivery
6. Macrosomia

The perinatal outcome was assessed in terms of:

1. Perinatal mortality
2. Gestational age at birth
3. Birth weight
4. APGAR scores at 1 and 5 min
5. Admission in NICU
6. Condition at discharge/referral

Statistical analysis

Data was presented as frequency and percentages.

Observations and Results

This study was carried on all the parturients having singleton pregnancy with cephalic presentation, presenting with abnormal AFI at POG 34-40 weeks, in the department of Obstetrics and Gynecology at Dr. Rajendra Prasad Government Medical College Kangra at Tanda (HP) from January 2018 to December 2018, after taking consent for willingness to participate in the study and required the approvals of the protocol review committee and institutional ethics committee.

Table 1: Patient profile

	Parity		Age		
	Primigravida n (%)	**Multigravida n (%)**	**20 – 24 Years n (%)**	**25 – 29 Years n (%)**	**>30 Years n (%)**
Oligohydramnios	61 (67.8)	29 (32.2)	29 (32.1)	46 (51.1)	15 (16.7)
Polyhydramnios	4 (40)	6 (60)	3 (30)	4 (40)	3 (30)

In oligohydramnios group, 67.8% (n=61) patients were primigravidas while 32.2% (n=29) were multigravidas. The majority of patients (n=46, 51.1%) were in the age group 25-29 years followed by 32.1% (n=29) in the age group 20-24 and 16.7% (n=15) in 30 years and above age group. whereas in polyhydramnios group 40% (n=4) patients were primigravidas while 60% (n=6) were multigravidas. 40% (n=4) patients were in 25-29 years age group followed by 30% (n=3) patients each in 20-24 years and above 30 years age group (Table – 1).

In the oligohydramnios group, 20 out of 90 (22.2%) were reported to have pregnancy induced hypertension (PIH) and 25.6 % (n = 23) had non-reactive NST. Liqor was found to be meconium-stained in 31.1% (n=28) cases whereas none of the cases in the polyhydramnios group were reported to have PIH and 3 out of 10 (30%) patients had gestational diabetes mellitus (GDM). None of the parturients had non-reactive NST and meconium stained liqor (Table – 2).

Table 2: Associated Complication

	Associated Medical Complications		NST		Color of Liqor	
	PIH n (%)	**GDM n (%)**	**Non-reactive n (%)**	**Reactive n (%)**	**Muconium stained n (%)**	**Clear n (%)**
Oligohydramnios	20 (22.2)	Nil	23 (25.6)	6 7(74.4)	28 (31.1)	62 (68.9)
Polyhydramnios	Nil	3 (30)	Nil	10 (100)	Nil	10 (100)

In the present study, 64.4% (n=58) and 3/10 (30%) parturients required the induction of labor in this oligohydramnios and polyhydramnios groups respectively. In the oligohydramnios group, 17.8% (n=16) delivered before 37 weeks and 59 (65.6%) underwent emergency caesarean section while in the polyhydramnios group, 40% (n=4) delivered before 37 weeks and 5 (50%) required emergency caesarean section (Table – 3).

Table 3: Labor Events

	Induction of labor		Timing of delivery		Mode of delivery	
	Required n (%)	**Not-required n (%)**	**Pre-term n (%)**	**Term n (%)**	**Vaginal n (%)**	**CS n (%)**
Oligohydramnios	58 (64.4)	32 (35.5)	16 (17.8)	74(82.2)	31 (34.4)	59 (65.6)
Polyhydramnios	3 (30)	7 (70)	4 (40)	6 (60)	5(50)	5(50)

51(86.4%) CS were done for fetal distress followed by NPOL and failed induction in 6(10.2%) and 2(3.4%) respectively in the laboring mothers with oligohydramnios whereas in the polyhydramnios group, out of 5 CS, 40% (n=2) were done for fetal distress, 40% cord-prolapse (n=2) and 20% (n=1) for non-progress of labor (Table – 4).

Table 4: Indications for Caesarean Section

Indications of CS	Oligohydramnios n (%)	Polyhydramnios n (%]
Fetal distress	51(86.4)	2 (40)
Failed induction	2 (3.4)	Nil
Non progress of labor (NPOL)	6 (10.2)	1(20)
Cord Prolapse	Nil	2 (40)

Apgar scores below 7 at 1 minute were found in 31.1% (n=28) in the oligohydramnios group while in the polyhydramnios group only 20% (n=2) had Apgar score below 7 at 1 minute. Apgar scores below 7 at 5 minutes was found in 8.9% (n=8) neonates in the oligohydramnios group and 20% (n=2) in polyhydramnios group. Apgar score above 7 was found in 91.1% (n=82) in the oligohydramnios group and 80% (n=8) in the polyhydramnios group (Table – 5).

Table 5: Apgar score

Apgar score		Oligohydramnios [n (%)]	Polyhydramnios [n (%)]
Apgar score at 1 minute	<7	28 (31.1)	2 (20)
	>7	65 (72.2)	8 (80)
Apgar score at 5 minute	<7	8 (8.9)	2 (20)
	>7	82 (91.1)	8 (80)

Table 6: Neonatal complications

Neonatal Complications	Oligohydramnios [n (%)]	Polyhydramnios [n (%)]
Congenital pneumonia	1 (1.1%)	Nil
Neonatal jaundice	5 (5.5%)	Nil
Respiratory distress	12 (12.3%)	2 (20%)
CMF	Nil	1 (10%)
Normal	72 (80%)	7 (70%)

A higher proportion of mothers with oligohydramnios had neonatal complications as compared to that of mothers with polyhydramnios. Neonates born to mothers having oligohydramnios were found to have respiratory distress (n=12), neonatal jaundice (n=5), and congenital pneumonia (n=1). Out of 90 cases of oligohydramnios 72 (80%) were having neonates without any complications. Out of 10 cases of polyhydramnios group only 2 (20%) neonates were shown to have respiratory distress while one neonate had congenital malformation in the form of tracheal stenosis which was found after birth of baby (Table – 6).

In the oligohydramnios 63.3% (n=57) had LBW and 18% (n=17) had VLBW. In the polyhydramnios group, only 20% (n=2) had LBW and one (10%) had macrosomia (Table – 7).

Table 7: Birth weight

Birth weight (Kg)	Oligohydramnios [n (%)]	Polyhydramnios [n (%)]
Normal	16 (17.8)	8(80.)
LBW (1.5-2.49)	70 (77.8)	2(20.)
VLBW (<1.5)	4 (4.4)	Nil
Macrosomia (>4)	Nil	1(10)

NICU admissions were reported in 26.7% (n=24) neonates in the oligohydramnios group and 30% (n=3) neonates in polyhydramnios group (Table – 8).

Table 8: NICU admission

NICU Admission	Oligohydramnios [n (%)]	Polyhydramnios [n (%)]
Yes	24 (26.7)	3 (30)
No	66 (73.3)	7 (70)

In our study, in most of the parturients 58 (64.4%) the cause of oligohydramnios was unknown while 20 (22.2%) and 12(13.3%) cases were associated with PIH and IUGR. was associated in cases (Table – 9).

Table 9: Causes of oligohydramnios

Causes	N	%
PIH	20	22.2
IUGR	12	13.3
Unknown	58	64.4

In polyhydramnios group out of 10 cases three (30%) had gestational diabetes mellitus and one (10%) had CMF causing polyhydramnios. The majority of cases were idiopathic.

Table 10: Causes of polyhydramnios

Causes	n	Percentage
Gestational diabetes mellitus	3	30
CMF baby	1	10
Unknown	6	60

In our study, no women with abnormal liqor volume had abruption and instrumental delivery.

Discussion

This study was done with an aim to evaluate the AFI for the assessment of perinatal outcome. It was carried out among 100 women with pregnancy complicated with oligohydramnios or polyhydramnios. An ultrasound at 34-36 weeks for various fetal parameters including AFI was done as a routine and repeated if indicated.

In the present study, the mean age of the mothers in the oligohydramnios group was 26.2 years and in the polyhydramnios group, it was 26.8 years. While it was 24 and 23 years in the oligohydramnios group and polyhydramnios group respectively in a similar study conducted by Magann *et al*. [40] Similarly in study conducted by Kaur T *et al*. mean maternal age for oligohydramnios was 25.8 years and in the polyhydramnios group, the mean maternal age was 27 years [51] (Table – 11).

Table 11: Mean age of study population

	Present study (years)	Magann *et al*. [40] (years)	Kaur T *et al*. [51] (years)
Oligohydramnios	26.2	24	25.8
Polyhydramnios	26.8	23	27

In the present study, of all women with oligohydramnios 67.8% were primigravidae. Similarly, in study conducted by Asgharnia M *et al*. and Jagatia K *et al*., 64% and 52% were primigravidae respectively [46, 47]. Polyhydramnios was found to be in a higher percentage among multigravidas (60%) in the present study. Similarly, in study done by Tashfeen K *et al*. and Guin G *et al*. incidence of polyhydramnios was 81.1% and 86.7% respectively in multigravidae [42, 44] (Table – 12).

Table 12: Parity of parturients

Parity	Oligohydramnios			Polyhydramnios		
	Present study	**Asgharnia M *et al*. [47]**	**Jagatia K *et al*. [46]**	**Present study**	**Tashfeen K *et al*. [44]**	**Guin G *et al*. [42]**
Primigravida	67.8%	64%	52%	40%	19.9%	13.3%
Multigravida	29%	36%	48%	60%	81.1%	86.7

Maternal morbidity was noted in the form of pregnancy induced hypertension and gestational diabetes mellitus.

In our study, in the oligohydramnios group, 20 (22.2%) out of 70 were reported to be hypertensive. None of the patients in the polyhydramnios group had PIH. In a study conducted by Bansal D *et al*., 21% had PIH associated with oligohydramnios [50]. In another study conducted by Many A *et al*., polyhydramnios was associated with PIH in 1.4% cases [15]. While in the study conducted by Magann *et al*. PIH was associated with 6% cases in the polyhydramnios group and 3% cases in the oligohydramnios group [40]. In a study conducted by Kaur T *et al*., oligohydramnios was associated with PIH in 17.5% cases (Table – 13). This observation is in accordance with available standard literature that *PIH is associated with poor placental perfusion and hence causing oligohydramnios. So, oligohydramnios group had a much higher association of PIH as compare to polyhydramnios* [1].

Table 13: PIH in women with abnormal AFI

	Present study	**Kaur T *et al*.[51*]**	**Magann *et al*.[40]**	**Bansal D *et al*.[50*]**	**Many A *et al*.[15#]**
Oligohydramnios	22.2%	17.5%	3%	21%	NA
Polyhydramnios	nil	NA	6%	NA	1.4%

*not evaluated polyhydramnios

not evaluated oligohydramnios

In our study, 30% (3 out of 10) women in the polyhydramnios group had gestational diabetes mellitus but none in the oligohydramnios group had gestational diabetes mellitus. Similarly, Kaur T *et al*. reported gestational diabetes incidence of 14.3% in polyhydramnios group and none in the oligohydramnios group [51]. A similar observation was made by Guin G *et al*. with an incidence of gestational diabetes as 20% in polyhydramnios group while no women had gestational diabetes in the oligohydramnios group [42]. While in the study conducted by Magann *et al*. gestational diabetes mellitus was found to be associated in 7% cases in polyhydramnios group whereas no women had gestational diabetes mellitus in the oligohydramnios group [40] (Table – 14)

Table 14: Gestational diabetes mellitus in women with abnormal AFI

	Present study	**Kaur T *et al*. [51]**	**Guin G *et al*. [42]**	**Magann *et al*. [40]**
Oligohydramnios	nil	Nil	nil	nil
Polyhydramnios	30	14.3%	20	7

This observation is in accordance with standard literature as diabetes mellitus in pregnancy has been found to be associated with polyhydramnios in 18% of women [55].

In our study induction of labor was done in 64.4% cases in the oligohydramnios group and 30% cases in polyhydramnios group indicating that oligohydramnios is associated with an increased incidence of labor induction. Similarly, in study conducted by Magann *et al*., labor induction rate was 18% in the oligohydramnios group and 6% in polyhydramnios group also indicating more incidence of labor induction in the oligohydramnios group [40]. Kumar A *et al*., Bawa R *et al*. and Casey *et al*. reported a labor induction rate of 54%, 72.1%, and 42% respectively in oligohydramnios cases in their study [28, 36, 52]. Guin *et al*. in their study found an incidence of labor induction to be 56.5% in the oligohydramnios group and 13.3% in polyhydramnios group [42] (Table – 15).

Table 15: Induction of labor in women with abnormal AFI

	Present study	**Guin G *et al*. [42]**	**Magann *et al*. [40]**	**Kumar A *et al*. [28]***	**Bawa R *et al*. [52]***	**Casey *et al*. [36]***
Oligohydramnios	64.4%	56.5%	18%	54%	72.1%	42%
Polyhydramnios	30%	13.3%	6%	NA	NA	NA

***not evaluated polyhydramnios.

Our study confirms the standard established protocol that *women with oligohydramnios have a higher incidence of induction of labor*. This observation is in agreement with standard literature that women with oligohydramnios has twice the higher incidence of induction of labor [1]

In our study out of a total of 100 patients, 64 had an emergency CS and 36 had a normal vaginal delivery. In the CS group, 59 (92.2%) were done in the oligohydramnios group and 5(7.8%) were done in the polyhydramnios group. In the oligohydramnios group, 86.4% (n=51) CS were done for fetal distress followed by non-progress of labor and failed induction in 10.5%(n=6) and 3.4%(n=2) respectively. In the polyhydramnios group, out of five CS 40%(n=2) were done for fetal distress, 40% for cord prolapse (n=2) and 20%(n=1) for NPOL. Chate P *et al*., Kumar A *et al*., and Bansal *et al*. found the incidence of CS to be 65%, 44%, and 47% respectively in oligohydramnios complicated pregnancies in their studies [28, 45, 50]. But in a study conducted by Kaur T *et al*. CS was done in 38.1% cases in the oligohydramnios group and 28.6% in the polyhydramnios group [51]. Magann *et al*. found a higher incidence of CS in the polyhydramnios group (36%) than in the oligohydramnios group (21%) (Table – 16).

Table 16: Cesarean Section in women with abnormal AFI ()

	Present study	Chate P *et al*. [45]*	Kumar A *et al*. [28]*	Bansal D *et al*. [50]*	Magann *et al*. [40]	Kaur T *et al*. [51]
Oligohydramnios	65.6%	65%	44%	47%	21%	38.1%
Polyhydramnios	50%	NA	NA	NA	36%	28.6%

*not evaluated polyhydramnios

Oligohydramnios is significantly associated with cord compression during labor hence these women had a higher incidence of acute fetal distress and consequently higher chance of emergency CS. This observation is well established in standard literature that women with oligohydramnios have a two-fold greater risk of CS for fetal distress [1]. In women with polyhydramnios it is in accordance with well-established standard literature that *cord prolapse is associated with higher frequency in women with polyhydramnios leading to CS* [1].

Non-reactive NST was found in 25.6 % of cases in the oligohydramnios group. None patient in the polyhydramnios group had non-reactive NST. Chate P *et al*. and Kumar A *et al*. also observed a 38% occurrence of non-reactive NST in their studies [28, 45]. Magann *et al*. found 29% of cases with NST traces influencing delivery in polyhydramnios group while 18% cases with similar traces in the oligohydramnios group [40]. Jagatia K *et al*. found similar observations as in our study of 32% cases with non-reactive NST in oligohydramnios group [46] (Table – 17) According to available standard literature, *oligohydramnios is associated with non-reactive NST and subsequently pathological NST influencing the decision of termination* [1].

Table 17: Non-reactive NST in women with abnormal AFI ()

	Present study	**Magann *et al*. [40]**	**Kumar *et al*. [28]***	**Chate P *et al*. [45]***	**Jagatia K *et al*. [46]***
Oligohydramnios	25.6%	18%	38%	38%	32%
Polyhydramnios	nil	29%	NA	NA	NA

*evaluated only oligohydramnios

In our study, no significant difference was found between the occurrence of AFI abnormalities and low Apgar score at 1 min but the occurrence low Apgar score at 5 min was statistically significant. Apgar score below 7 at 5 minutes was found in 8.9% neonates in the oligohydramnios group and 20% in polyhydramnios group in our study. A similar observation was made by Sriya *et al*. in their study of 9.72% cases with a low Apgar score in the oligohydramnios group [51]. Kaur T *et al* also observed a greater number of cases in the polyhydramnios group with the low Apgar score at 5 min. as compare to the oligohydramnios group [51]. In a study conducted by Magann *et al*. there were 8% cases with Apgar less than 7 in polyhydramnios group and 4% cases in the oligohydramnios group [40] (Table – 18)

Table 18: Apgar score of neonates of women with abnormal AFI

	Present study	**Kaur T *et al.* [51]**	**Magann *et al.* [40]**	**Sriya *et al.* [51]***
Oligohydramnios	8.9%	20.7%	4%	9.72%
Polyhydramnios	20%	50%	8%	NA

*not evaluated polyhydramnios

It is well established in available standard literature that *oligohydramnios is associated with cord compression during labor leading to acute fetal distress and subsequent fivefold higher risk of low Apgar score* [1].

In our study meconium stained liqor was found in 31.1% cases in the oligohydramnios group while 68.9% had clear liqor, whereas in polyhydramnios group none had meconium stained liqor. In a study conducted by Locatelli *et al*. meconium stained liqor was found in 36% cases with oligohydramnios [37]. Kumar A *et al*. observed the incidence of meconium stained liqor to be 48% [28]. In contrary to our study Bhagat *et al*. found meconium stained liqor only in 16% cases in the oligohydramnios group [49] (Table – 19).

Table 19: Comparison of presence of meconium stained liqor

	Present study	**Locatelli *et al.* [37]***	**Kumar A *et al.* [28]***	**Bhagat *et al.* [49]***
Oligohydramnios	31.1%	36%	48%	16%
Polyhydramnios	nil	NA	NA	NA

*not evaluated polyhydramnios.

As mentioned in standard literature, *meconium stained liqor is found in higher frequency in women with oligohydramnios as oligohydramnios leads to cord compression and further to fetal distress and passage of meconium* [1].

In our study polyhydramnios was associated with high incidence of preterm deliveries as compared to oligohydramnios (20% vs 8.9%). In a study conducted by Many A *et al*., prematurity was observed in 18.9% cases of polyhydramnios [15]. Whereas prematurity was found in 43.7 % cases in oligohydramnios and 42.8% cases in polyhydramnios group in a study conducted by Kaur T *et al*. [51] In another study conducted by Magann *et al*. 15 % had preterm delivery in polyhydramnios group and 29% in the oligohydramnios group had preterm delivery [40] (Table – 20).

Table 20: Preterm delivery in women with abnormal AFI

	Present study	Kaur T *et al*. [51]	Magann *et al*. [40]
Oligohydramnios	8.9%	43.7%	29%
Polyhydramnios	20%	42.8%	15%

Above observation is in accordance with available standard literature that *polyhydramnios leads to excessive uterine distension which can result in preterm labor*. *Also women with oligohydramnios had higher chances of induction of labor leading to iatrogenic preterm delivery* [1].

In our study, in the oligohydramnios group, 63.3% had LBW and 18% had VLBW. In the polyhydramnios group, only 20%(n=2) had low birth weight and 10% (1) had macrosomia. Kumar A *et al*. and Bhagat *et al*. observed an incidence of LBW of 64% and 56 % respectively in their study [28, 49]. Kaur T reported incidence of 62% and 16.6% in oligohydramnios and polyhydramnios group respectively [51]. Similarly in a study conducted by Bawa R *et al*. incidence of LBW was found to be in 55.9% of the study group [52]. (Table – 21)

Table 21: Birth weight

	Present study	**Kaur T *et al.* [51]**	**Bhagat *et al.* [49]***	**Kumar A *et al.* [28]***	**Bawa R *et al.* [52]***
Oligohydramnios	81.3%	62%	64%	56%	55.9%
Polyhydramnios	20%	16.6%	Nil	nil	nil

*not evaluated polyhydramnios

Women with oligohydramnios have associated IUGR hence significantly higher number of neonates in oligohydramnios group were LBW. Also, these women require termination of pregnancy at earlier gestation hence preterm delivery is also a contributing factor for LBW. *In women with polyhydramnios birth weight more than 4000 gm has been found to be associated in nearly 25%* [1].

A higher proportion of mothers with oligohydramnios had neonatal complications as compared to that of mothers with polyhydramnios. Neonates born to mothers having oligohydramnios were found to have respiratory distress (n=12), neonatal jaundice (n=5), and congenital pneumonia (n=1). Out of 10 cases of polyhydramnios group, 2(20%) neonates had respiratory distress while one (10%) had a CMF in the form of tracheal stenosis which was found after the birth of the baby. Kaur T *et al*. reported a 7.9% incidence of CMF in their study in the polyhydramnios group. Out of 90 neonates, NICU admissions were reported in 26.7% (n=24) neonates in the oligohydramnios group and out of 10, 30% (n=3) neonates in the polyhydramnios group. Jagatia K *et al*., Bansal *et al*. and Bhagat *et al*. reported 22%, 36% and 36% NICU admissions respectively in their study [46, 49, 50]. Magann *et al*. reported an incidence of 18% in the oligohydramnios group and 10% in polyhydramnios group [40]. Kaur T *et al*. in their study reported 58.8% and 50% NICU admissions in oligohydramnios and polyhydramnios groups respectively [51] (Table – 22).

Table 22: NICU admission

	Present study	Magann *et al*. [40]	Kaur T *et al*. [51]	Jagatia K *et al*. [46]*	Bansal *et al*. [50]*	Bhagat *et al*. [49]*
Oligohydramnios	26.7%	18%	58.8%	22%	36%	36%
Polyhydramnios	30%	10%	50%	NA	NA	NA

*not evaluated polyhydramnios

Oligohydramnios is associated with adverse perinatal outcome in the IUGR, fetal distress and meconium aspiration leading to higher NICU admission. This observation is in concordance with standard literature available [1].

Polyhydramnios is known to be associated with a higher rate of CMF. As per standard literature, neonates born to mothers with polyhydramnios have 2-10% incidence of CMF to be found after birth [55]. In our study a neonate with tracheal stenosis was missed on standard ultrasound for CMF. Hence *there is always a possibility of unforeseen CMF in women with polyhydramnios* [1].

Conclusion

This study demonstrates that an increased or decreased liqor volume is associated with high perinatal morbidity. Oligohydramnios is associated with increased risk fetal distress, meconium aspiration, LBW, respiratory distress, and NICU admission whereas polyhydramnios is specifically associated with increased risk of preterm delivery, cord prolapse, CMF and large for gestation age baby. Women with abnormal amniotic fluid volume have more association with medical disorders like hypertension and diabetes mellitus depending upon the type of abnormality and also increased rate of CS. Pregnancy with abnormal liqor volume may needs specialized and individualized management necessitating early induction and delivery. Every case of abnormal liqor volume needs careful antenatal evaluation, parental counseling regarding perinatal morbidity and unforeseen congenital malformations, and individualized decision regarding timing and mode of delivery for a better perinatal outcome.

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References

1. Leveno KJ, Spong CY, Dashe JS, Casey B, Hoffman BL, Cunningham FG *et al*. Williams obstetrics (25th edition). New York: McGraw-Hill Education, 2018, 225-33.
2. Lind T, Kendall A, Hytten FE. The role of the fetus in the formation of amniotic fluid. J Obstet Gynaecol Br Commonwealth. 1972; 79(4):289-98.
3. Abramovich DR. Fetal factors influencing the volume and composition of liqor amnii. J Obstet Gynaecol Br Commonwealth. 1970; 77(10):865-77.
4. van Otterlo LC, Wladimiroff JW, Wallenburg HC. Relationship between fetal urine production and amniotic fluid volume in normal pregnancy and pregnancy complicated by diabetes. Br J Obstet Gynecol. 1977; 84(3):205-9.
5. Pritchard JA. Fetal swallowing and amniotic fluid volume. Obstet Gynecol. 1966; 28(5):606-10.
6. Boddy K, Dawes GS. Fetal breathing. Br Med Bull. 1975; 31(1):3-7.
7. Duenhoelter JH, Pritchard JA. Fetal respiration: quantitative measurements of amnionic fluid inspired near term by human and rhesus fetuses. Am J Obstet Gynecol. 1976; 125(3):306-9.
8. Leontic EA, Schruefer JJ, Andreassen B, Pinto H, Tyson JE. Further evidence for the role of prolactin on human fetoplacental osmoregulation. Am J Obstet Gynecol. 1979; 133(4):435-8.
9. Hebertson RM, Hammond ME, Bryson MJ. Amniotic epithelial ultrastructure in normal, polyhydramnic, and oligohydramnic pregnancies. Obstet Gynecol. 1986; 68(1):74-9.
10. Seeds AE. Current concepts of amniotic fluid dynamics. Am J Obstet Gynecol. 1980; 138(5):575-86.
11. Gillibrand PN. The rate of water transfer from the amniotic sac with advancing pregnancy. J Obstet Gynaecol Br Commonwealth. 1969; 76(6):530-3.
12. Brace RA, Wolf EJ. Normal amniotic fluid volume changes throughout pregnancy. Am J Obstet Gynecol. 1989; 161(2):382-8.
13. Elliott PM, Inman WH. Volume of liquor amnii in normal and abnormal pregnancy. Lancet (London, England). 1961; 2(7207):835-40.
14. Golan A, Wolman I, Sagi J, Yovel I, David MP. Persistence of polyhydramnios during pregnancy-its significance and correlation with maternal and fetal complications. Gynecol Obstet Invest. 1994; 37(1):18-20.
15. Many A, Hill LM, Lazebnik N, Martin JG. The association between polyhydramnios and preterm delivery. Obstet Gynecol. 1995; 86(3):389-91.
16. Hill LM, Breckle R, Thomas ML, Fries JK. Polyhydramnios: ultrasonically detected prevalence and neonatal outcome. Obstet Gynecol. 1987; 69(1):21-5.
17. Lapaire O, Holzgreve W, Zanetti-Daellenbach R, Refecca ME, Hösli I, Tercanli S. Polyhydramnios: an update. Donald School J Ultrasound Obstet Gynecol. 2007; 1(7):3-9.
18. McCurdy CM, Jr., Seeds JW. Oligohydramnios: problems and treatment. Seminars in Perinatol. 1993; 17(3):183-96.
19. Leeman L, Almond D. Isolated oligohydramnios at term: is induction indicated? J Family Prac. 2005; 54(1):25-32.
20. Brace RA. Physiology of amniotic fluid volume regulation Clin Obstet Gynecol. 1997; 40:280-9.
21. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid vol. I. The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome. Am J Obstet Gynecol. 1984; 150(3):245-9.
22. Crowley P, Herlihy CO, Boylan O. The value of ultrasound measurement of amniotic fluid volume in the management of prolonged pregnancies. Br J Obstet Gynecol. 1984; 91:444-8.
23. Bastide A, Manning F, Harman G, Lange I, Marrison I. Ultrasound evaluation of amniotic fluid: outcome of pregnancy with severe oligohydramnios. Am J Obstet Gynecol. 1986; 15(4):895-900.
24. Phelan JP, Smith CV, Broussard P *et al*. Amniotic fluid volume assessment with the four-quadrant technique at 36–42 weeks' gestation. J Reprod Med. 1987; 32:540-2.

25. Moore TR, Cayle JE. The amniotic fluid index in normal human pregnancy. Am J Obstet Gynecol. 1990; 162(5):1168-73.
26. Kumar A, Rao PS, Kumar S, Mitra B. Perinatal outcome in pregnancy complicated with oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2018; 7:3936-40.
27. Grubb DK, Paul RH. Amniotic fluid index and prolonged antepartum fetal heart rate decelerations. Obstet Gynecol. 1992; 79:558-60.
28. Youssef AA, Abdulla SA, Sayed EH, Salem HT, Abdelalim AM, Devoe LD. Superiority of amniotic fluid index over amniotic fluid pocket measurement for predicting bad fetal outcome. South Med J. 1993; 86(4):426-9.
29. Shenker L, Reed KL, Anderson CF *et al*. Significance of oligohydramnios complicating pregnancy. Am J Obstet Gynecol. 1991; 164:1597-9.
30. Baron C, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. Am J Obstet Gynecol. 1995; 173:167-74.
31. Ariel Many, Hill LM, Lazebnik, Martin. The Association between polyhydramnios and preterm delivery; Obstet Gynecol. 1995; 86:389-91.
32. Garmel SH, Chelmow D, Sha SJ, Roan JT, D'Alton ME. Oligohydramnios and the appropriately grown fetus. Am J Perinatol. 1997; 14:359-63.
33. Conway DL, Adkins WB, Schroeder B *et al*. Isolated oligohydramnios in the term pregnancy: is it a clinical entity. J Matern Fetal Med. 1998; 7:197-200.
34. Hsieh TT, Hung TH, Chen KC, Hsieh CC, Lo LM, Chiu TH. Perinatal outcome of oligohydramnios without associated premature rupture of membranes and fetal anomalies. Gynecol Obstet Invest. 1998; 45(4):232-6.
35. Chauhan SP, Sanderson M, Hendrix NW *et al*. Perinatal outcome and amniotic fluid index in the antepartum and intrapartum periods. Am J Obstet Gynecol. 1999; 18:1473-8.
36. Casey BM, McIntire DD, Bloom SL, Lucas MJ, Santos R, Twickler DM *et al*. Pregnancy outcomes after antepartum diagnosis of oligohydramnios at or beyond 34 weeks' gestation. Am J Obstet Gynecol. 2000; 182:909-12.
37. Locatelli A, Vergani P, Toso L, Verderio M, Pezzullo JC, Ghidini A. Perinatal outcome associated with oligohydramnios in uncomplicated term pregnancies. Arch Gynaecol Obstet. 2004; 269(2):130-3.
38. Dashe JS, McIntire DD, Ramus RM, Santos-Ramos R, Twickler DM. Hydramnios: anomaly prevalence and sonographic detection. Obstet & Gynecol. 2002; 100(1):134-9.
39. Pauer HU, Viereck V, Krauss V, Osmers R, Krauss T. Incidence of fetal malformations in pregnancies complicated by oligo- and polyhydramnios. Arch gynaecol obstet. 2003; 268(1):52-6.
40. Nabhan AF, Abdelmoula YA. Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. Cochrane Database Syst Rev. 2003, Cd006593.
41. Magann EF, Doherty DA, Lutgendorf MA, Magann MI, Chauhan SP, Morrison JC. Peripartum outcomes of high-risk pregnancies complicated by oligo- and polyhydramnios: a prospective longitudinal study. J Obstet Gynaecol Res. 2010; 36(2):268-77.
42. Petrozella LN, Dashe JS, McIntire DD, Leveno KJ. Clinical Significance of Borderline Amniotic Fluid Index and Oligohydramnios in Preterm Pregnancy. Am J Obstet Gynecol. 2011; 117(2):338-42.
43. Guin G, Punekar S, Lele A *et al*. A Prospective Clinical Study of Feto-Maternal Outcome in Pregnancies with Abnormal Liquor Volume. J Obstet Gynecol India. 2011; 61:652-5.
44. Melamed N, Pardo J, Milstein R, Chen R, Hod M, Yogev Y. Perinatal outcome in pregnancies complicated by isolated oligohydramnios diagnosed before 37 weeks of gestation. Am J Obstet Gynecol. 2011; 205(3):241-6.
45. Tashfeen K, Hamdi IM. Polyhydramnios as a predictor of adverse pregnancy outcomes. Sultan Qaboos Univ Med J 2013; 13(1):57-62.
46. Chate P, Khatri M, Hariharan C. Pregnancy outcome after diagnosis of oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2013; 2(1):23-6.
47. Jagatia K, Singh N, Patel S. Maternal and fetal outcome in oligohydramnios: A study of 100 cases. Int J Med Sci Public Health. 2013; 2(3):724-7.
48. Asgharnia M, Faraji R. Perinatal outcomes of pregnancies with borderline versus normal amniotic fluid index. Iran J Reprod Med. 2013; 11:705-710.
49. Jamal A, Kazemi M, Marsoosi V, Eslamian L. Adverse perinatal outcomes in borderline amniotic fluid index. Int J Reprod Biomed. 2016; 14(11):705-8.
50. Bhagat M, Chawla I. Correlation of Amniotic Fluid Index with perinatal outcome. J India. 2014; 64(1):32-5.
51. Bansal D, Deodhar P. A Clinical Study of Maternal and Perinatal Outcome in Oligohydramnios. J Res Med Den Sci. 2015; 3(4):312-6.
52. Kaur T, Sood R. Feto-Maternal Outcome in Pregnancies with Abnormal AFI. IOSR J Dental & Med Sci. 2016; 15(4):71-5.
53. Bawa Neerja R. The predictive value of amniotic fluid index for adverse perinatal outcome and suggested plan of action. Int J Reprod Contracept Obstet Gynecol. 2017; 6:2952-4.
54. Neethika Raghuwanshi, Sumit Aggarwal S. A Cross Sectional Study of Fetal Outcome in Cases of Polyhydramnios at Tertiary Care Center. Int J Curr Adv Res. 2017; 06(05):3960-3.
55. Leveno KJ, Spong CY, Dashe JS, Casey B, Hoffman BL, Cunningham FG *et al*. Williams obstetrics (25th edition). New York: McGraw-Hill Education, 2018, 1097-117.