Maternal and Foetal Outcomes in Full-Term Pregnancies with Abnormal Amniotic Fluid Index

ABSTRACT

Background:

The AFI is directly associated with adverse outcomes for both the mother and the foetus; oligohydramnios (AFI ≤8 cm) and polyhydramnios (AFI ≥25 cm) are considered 'abnormal'. The aim of this study was to compare the maternal and foetal complications in full-term pregnancies with abnormal AFI, as well as to assess the effectiveness of ultrasound and Doppler in identifying possible threats that may affect delivery plans.

Methods:

The current observational study was conducted in a hospital context at Paropakar Maternity and Women's Hospital located in Kathmandu, Nepal between October 2019 and February 2020. Sixty term pregnancies with abnormal AFI were recruited in the study, 44 with oligohydramnios and 16 with polyhydramnios. Data on maternal and foetal results, including the type of birth, problems, and neonatal APGAR ratings, were collected and evaluated. Continuous variables were described as mean ± SD, while categorical data were expressed in percentage.

Results:

Oligohydramnios was mainly associated with post-term pregnancy (36.36%) and preterm premature rupture of membranes (13.63%). However, polyhydramnios was related to diabetes mellitus 25% and pregnancy induced hypertension 12.5%. Some complications noticed among the mothers were preeclampsia, anaemia, and postpartum haemorrhage most of which occurred in polyhydramnios cases. With regard to foetal consequences, oligohydramnios was associated with decreased birth weights and higher NICU admission rates. On the other hand, polyhydramnios was linked with higher incidence of low APGAR scores and congenital anomalies. Caesarean section was performed in 70.46% of cases of oligohydramnios, while vaginal delivery was observed in 56.25% of cases of polyhydramnios.

Conclusion

Abnormal AFI in term pregnancy is known to have significant risks for both the mother and the foetus. The use of ultrasound and Doppler to monitor AFI helps in the identification of high-risk situations which allow early intervention in improving the maternal and foetal results.

INTRODUCTION

Amniotic fluid is the protective liquid in amniotic sac of pregnant uterus. It develops as fluid - filled extracelomic cavity before embryo is recognized.[1] In first trimester, human amniotic fluid is isotonic with maternal or foetal plasma and contains minimal protein.[2] Amniotic fluid provides protection to the foetus from traumatic forces, cord compression and microbial pathogens. AF has an integral role in the development of foetal musculoskeletal, pulmonary and gastrointestinal systems.[3]Normal amniotic fluid volume at 10 weeks of gestation is 30 ml, at 16 weeks is 200 ml. AFV increases to a maximum of 400-1200ml at 34-38 weeks. After 38 weeks, fluid volume declines by approximately 125ml/week, an average volume of 800ml at 40 weeks.[4]

The most common method of calculating an AFI is by using semi-quantitative method by ultrasound that measures the sum of the deepest pockets of amniotic fluid in the 4 quadrants of maternal abdomen.[5]The normal amount of AFI when measuring the large single vertical pocket (SVP) ranges from 2 to 8cm. If AFI $\geq$ 8 cm it is called polyhydramnios and when it is $\leq$2cm called oligohydramnios.[4]Polyhydramnios occurs in 0.4%-1.2% of pregnancies and it is associated with a high perinatal mortality rate due to fetal malformations and immaturity; it is also associated with diabetes and possibly with pre-eclampsia.[6]The various maternal complication associated with polyhydramnios in mother were pre-eclampsia, antepartum hemorrhage, gestational diabetes ,abruptio placenta, anemia, Intrauterine infection, acute renal failure.[6] The fetal complications associated with polyhydramnios is preterm delivery.

Oligohydramnios is associated with congenital heart anomalies, chromosomal aneuploidy, foetal demise, ruptured membranes, abnormal FHR, fetal distress, facial distortion and clubfoot, pulmonary hypoplasia IUGR and fetal asphyxia which often require LSCS and may result in perinatal morbidity and mortality.[7,8,9]Doppler waveforms of umbilical artery is an indirect measure of insufficient uteroplacental function.[10] Umbilical artery doppler (UAD) has an important role in modern obstetric assessment in high risk pregnancies.[11]

In regular practice at our centre, amniotic fluid index (AFI) is measured with ultrasonography at 8 weeks, 20 weeks, and full-term gestation. Cases with altered AFI are further assessed using Doppler USG for more accurate evaluation and management. However, as of now, abnormal AFI findings at term are not commonly reported in routinely. The aim of this study is to evaluate the outcomes of full-term pregnancies with abnormal AFI and to determine how this finding can help to decide the timing of delivery. The study seeks to assess the potential of ultrasound and Doppler ultrasound in identifying mothers and foetuses at greater risk of adverse perinatal outcomes associated with abnormal amniotic fluid levels. By detecting these risks, obstetricians can make timely, evidence-based decisions to improve foetal and maternal outcome.

METHODS

Study Design and Setting

This exploratory research, conducted in a hospital context, took place in Paropakar Maternity and Women's Hospital (PMWH) in Kathmandu and was conducted from October 2019 to February 2020.

Study Population and Sampling

The study recruited term pregnancies that met specific criteria for inclusion in the study, using convenience sampling. The participants were selected from the antenatal clinic outpatient, the emergency, and inpatient sections. Among the 1500 admissions per month, 110 cases of abnormal amniotic fluid volume were identified, of which 30 were polyhydramnios and 80 were oligohydramnios. Using a prevalence rate of 4%, the required sample size was determined to be 60, adhering to a ratio of 5:1 for cases with oligohydramnios to polyhydramnios.

Inclusion and Exclusion Criteria

Inclusion Criteria: The study will include singleton term pregnancies with AFI less than or equal to 8cm (oligohydramnios) or greater than or equal to 25cm (polyhydramnios) by ultrasound assessment.

Exclusion Criteria: Cases of IUD and normal AFI, which falls between 8 and 25 centimetres will not be included in the study.

Data Collection

After obtaining the approval from the Institutional Review committee (IRV), participants who fulfilled the inclusion criteria and were at least 37 weeks' gestation underwent AFI and foetal wellbeing assessment by ultrasound and Doppler ultrasound when needed. Demographic characteristics, past medical history, general physical examination, and necessary relevant investigations were noted on a structured form. The data collected included patients' demographic data, obstetric history, medical, surgical, and family history of chronic diseases. Maternal and foetal status were closely monitored to determine the subsequent care including follow up, induction of labour or caesarean section. The APGAR scores were done at 1 and 5 minutes after birth, complications of the mother and foetus were also recorded.

Amniotic Fluid Index Measurement

AFI measurements were performed by experienced radiologists using a Samsung H60 ultrasound machine coupled with a 5-7 MHz transducer. The uterus was divided into four quadrants and the maximum depth of the fluid collection in each quadrant was measured and the values added together. AFI of 5 cm or less was considered as oligohydramnios, AFI between 5 and 8 cm was considered as borderline oligohydramnios and AFI of 25 cm or more was considered as polyhydramnios.

Data Analysis

Data analysis was done using SPSS version 16. The continuous variables were described by mean ± standard deviation (SD) and categorical variables were presented by frequency and

percentage. Finally, the level of significance was set at $p<0.05$ and the data analysed by Pearson correlation coefficients.

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of NAMS, Bir Hospital. All participants agreed in writing to participate in the research and were informed of anonymity and the right to refuse or withdraw from the study. Procedures followed were those of any standard hospital to ensure that the patients were safe during the study and the participants did not spend any more money than usual during the study.

RESULTS

Out of the total 60 cases of abnormal amniotic fluid index, 16 cases of polyhydramnios and 44 cases of oligohydramnios were present. The maximum number of polyhydramnios cases 8 (50%) belonged to the age group between 20-24 years with mean age of 22 years. While in oligohydramnios group, 50% of patient were in the age group of 20-24 years with mean age of 22 years The age ranged from 19 to 40 years. Among the polyhydramnios cases, about 69% were primigravida. Similarly, among oligohydramnios, 59.1% were primigravida as in figure 2.

Table 1: Maternal Factors associated with Oligohydramnios

Factors	AFI (cm)		Total no.
	<5 cm	5–8 cm	
PIH	0	3	3 (6.81%)
PROM	1	5	6 (13.63%)

Chronic abruption	0	0	0
Postdated pregnancy (40–42 weeks)	1	15	16 (36.36%)
Post term pregnancy (>42 weeks)	0	0	0

The common maternal condition associated with oligohydramnios were post-dated pregnancy in 36.36%, PROM in 13.63% followed by PIH 6.81%. Anaemia was found to be associated as a co-morbid factor.

Table 2: Fetal Factors associated with Oligohydramnios

Factors	AFI (cm)		Total no.
	<5 cm	5–8 cm	
GIT Abnormalities	0	1	1(2.27%)
CNS Abnormalities	1	0	1(2.27%)
CVS Abnormality	1	0	1(2.27%)

Congenital infections	0	0	0

Among the 44 oligohydramnios cases, 3 cases were found to be associated with fetal abnormalities as in Table 2.

Table 3: Maternal Factors associated with Polyhydramnios

Factors	AFI (cm)			Total no.
	25–30 cm	30–35 cm	>35 cm	
Diabetes mellitus	4	0	0	4 (25%)
PIH	2	0	0	2 (12.5)
RH Isoimmunization	0	0	0	0
Rh incompatibility	0	0	0	0
Cardiac abnormality	0	0	0	0

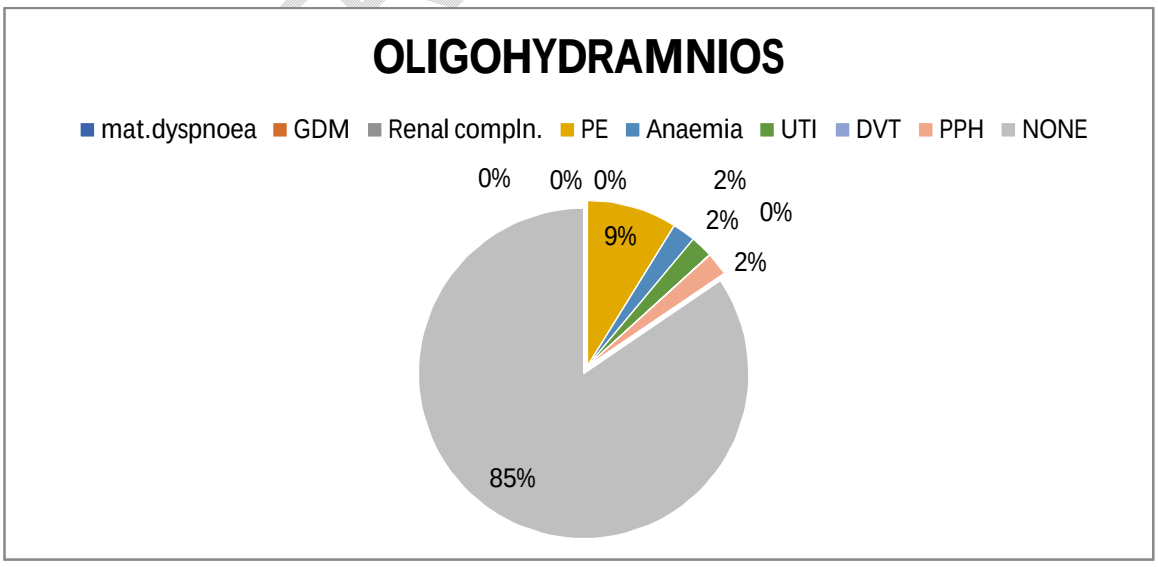
Among 16 cases of polyhydramnios, 6 cases were found to be associated with Maternal factors mentioned in the table 3, 4 cases (25%) were of DM and 2 cases (12.5%) were of PIH.

Table 4: Fetal Factors associated with Polyhydramnios

Factors	AFI (cm)			Total no.
	25–30 cm	30–35 cm	>35 cm	
CNS Defects	0	1	0	1 (6.25%)
GIT Abnormalities	0	0	0	0

Skeletal malformation	0	0	0	0
Fetal TUMOR	0	0	0	0
CVS Abnormality	0	0	0	0
Intrauterine infections	0	0	0	0

Fetal factors causing polyhydramnios was found to be just 1 case (6.25%) with CNS defect among 16 cases of polyhydramnios.



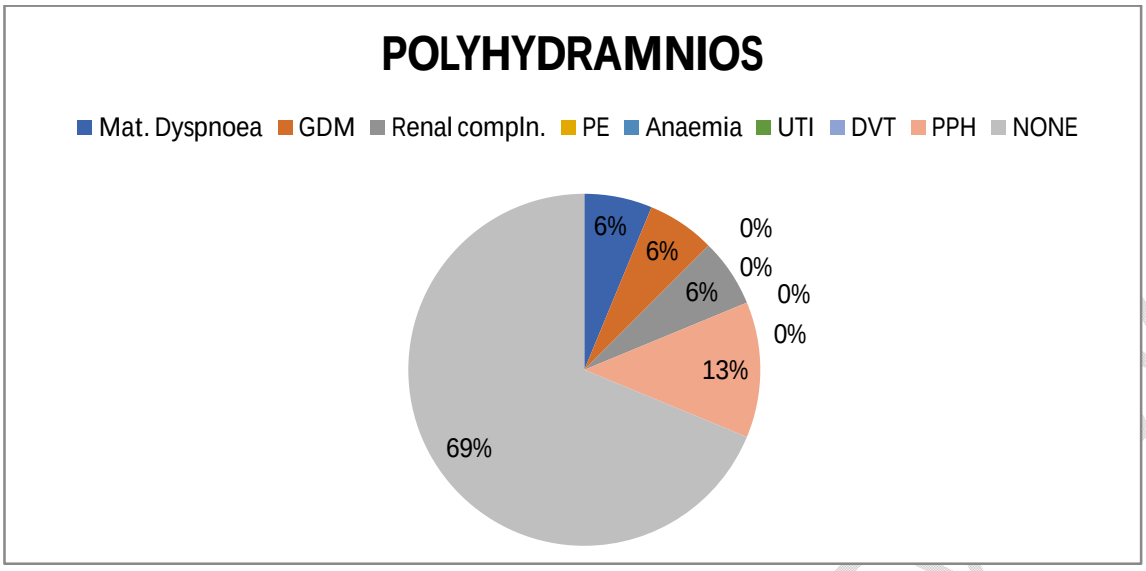
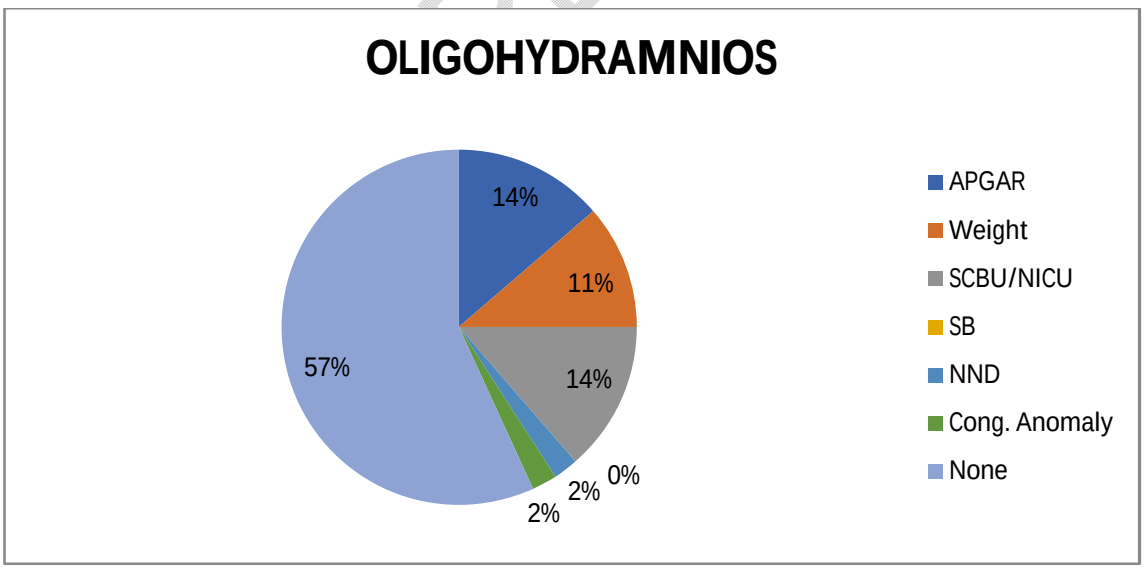


Figure No 1. Maternal outcome In Oligohydramnios and Polyhydramnios

Among 44 women diagnosed with oligohydramnios, 4 women (9.09%) had PIH, 1 woman (2.27%) had post-partum hemorrhage, anemia and UTI. Whereas in case of polyhydramnios, 2 cases (12.5%) have PPH followed by each 1(6.25%) case of GDM and renal complication and maternal fever with dyspnea.



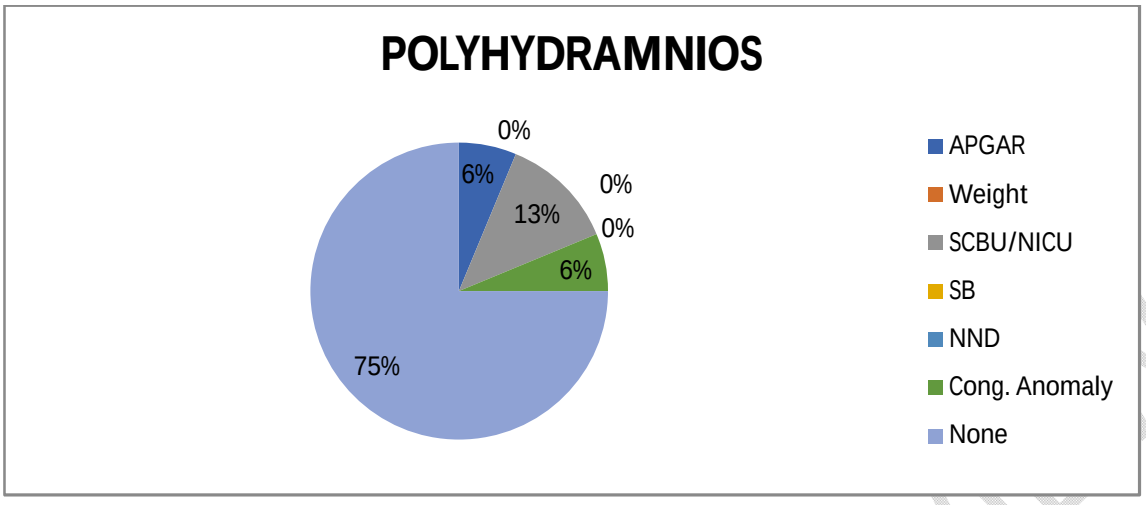


Figure no 2: Fetal Outcome in Oligohydramnios and Polyhydramnios

Among 44 women diagnosed with oligohydramnios, 6 (13.63%) newborn baby had low APGAR score (<5 at 1 minute, <7 at 5 minute). 5 (11.36%) newborn baby have <2.5kg weight and 6(13.63%) baby was admitted in NICU/SCBU followed by 1(2.27%) with congenital anomaly and NND. While in case of polyhydramnios among 16 cases, 2 newborn babies (12.5%) were admitted in NICU/SCBU, and 1(6.25%) case with congenital anomaly and low APGAR score (<5 at 1 minute and <7 at 5 minute).

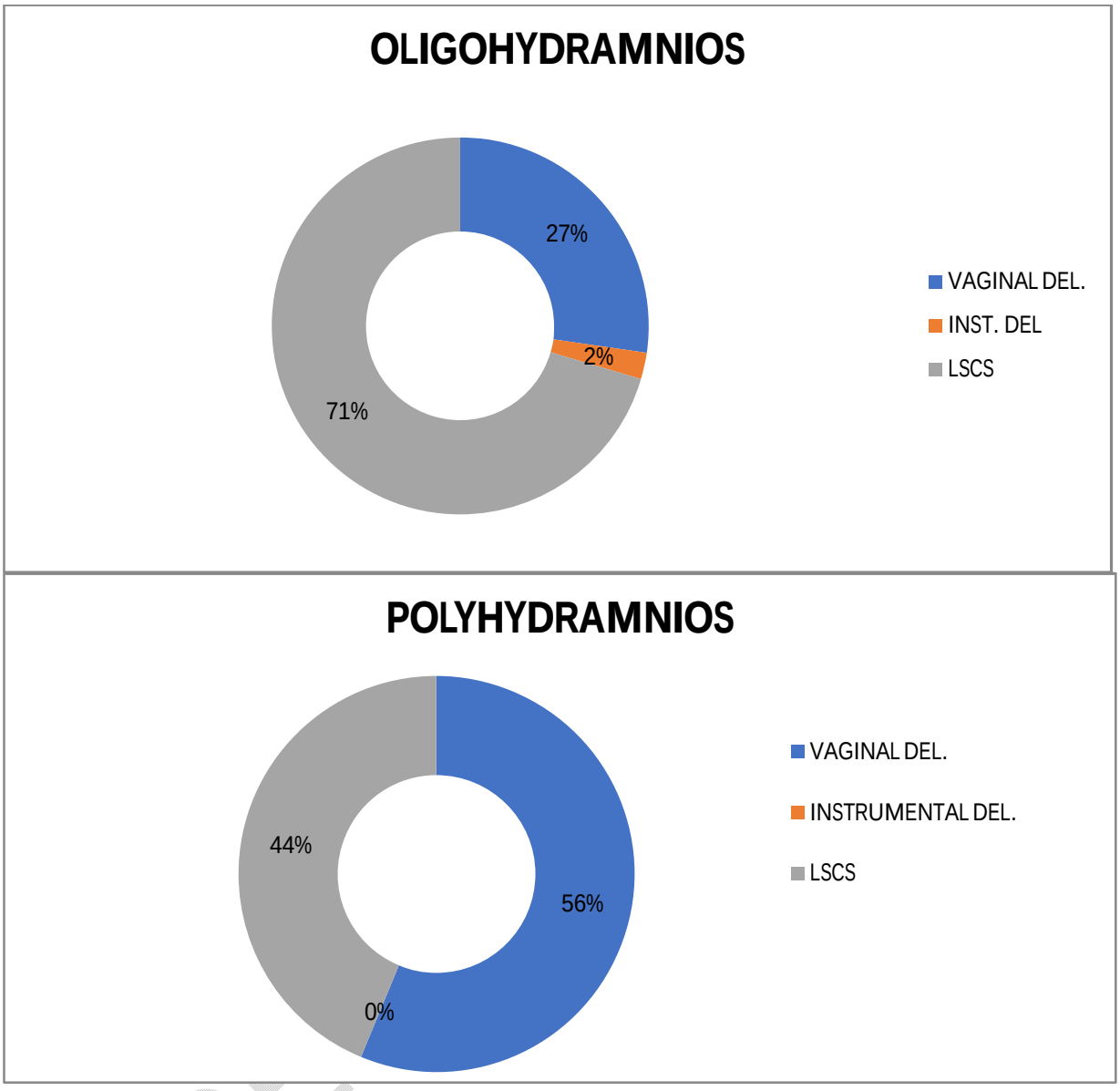


Figure no 3: Mode of Delivery of the patient with abnormal AFI

In a total of 44 cases of oligohydramnios, 26 (70.46%) underwent LSCS, 12(27.27%) had vaginal delivery, and 1(2.27%) had instrumental delivery. Whereas in 16 cases of polyhydramnios, 9(56.25%) had vaginal delivery, 7(43.75%) had LSCS.

DISCUSSION

Polyhydramnios is relatively less common complication in pregnancy compared to oligohydramnios in clinical practice. In a total of 60 cases, 44 cases of oligohydramnios were

present in our present study. In this study incidence of polyhydramnios was 2% and was comparable and similar to Bundgaard A et all [12]while incidence was slightly low in Rajgire AA et all[13]with 1.5% case of polyhydramnios, and slightly higher in Pri-Paz Set all[14], with incidence of polyhydramnios of 2.3%.

Oligohydramnios is a relatively common complication in pregnancy and is usually encountered in clinical practice. Total 44 cases of oligohydramnios were present in the present study. In this study incidence of oligohydramnios was 5.35% and was comparable to Mishra et al[15], with incidence of 0.5-5%. Shiva Lingaiah et al[16], Gaikwad et al[17]reported incidence of 3-7%, 3-8% which was slightly higher than the present study. Rajinder K et all[18], Goyal et al[19], reported incidence of 10%, 15%, respectively which were higher than the present study.

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Most common maternal condition associated with oligohydramnios out of 44 cases, Post-dated pregnancy was 36.36%, PROM 13.63% followed by PIH 6.81% which is similar to Neethika Raghuwanshi et al[20] with post maturity>42 wog have highest percentage of oligohydramnios (35.7%), PE(10.7%), eclampsia(3.5%) and PROM(21%). Maximum cases of oligohydramnios were most commonly observed in in post maturity followed by PIH and PROM. Similarly, a study done by Guin G et all[21] most common maternal factors was post maturity with 38.5% followed by PROM with 30%. While stude done by Raghuwanshi N et all[20] about 50% case were of post maturity followed by PIH 30% and PROM 30% which were higher compared to our study.A case study done by Guin G et all[21]had DM (20%) and (17%) of PIH which is almost similar to our study. Tajinder K et al[18]conducted the study in which diabetes mellitus (14.3%), PIH (14.3%), Rh incompatibility (14.3%).

In our study foetal risk factors in case of oligohydramnios each 1 cases of GIT, CNS, CVS abnormalities contributed to 2.27% with overall 7% of anomaly which was similar to Kaur Tajinder et al[18] study in which in case of oligohydramnios group, renal anomalies (6.4%) and spina bifida 1.6% complication were seen with overall 8 % of abnormality. Kaur Tajinder et al[18] in case of oligohydramnios group, renal anomalies (6.4%) and spina bifida 1.6% complication were seen. The variation in maternal and fetal risk factors have been reported in various studies in the pregnant women from observational studies in different countries. The varying result may be due to difference in geographical areas, lifestyle, literacy rate and socioeconomic status.

In our study Among 44 women diagnosed with oligohydramnios ,4 women (9.09%) had PE/PIH. 1 woman (2.27%) had post-partum hemorrhage, anaemia and UTI. Whereas in case of polyhydramnios,2 cases (12.5%) have PPH followed by each 1(6.25%) case of GDM and renal complication and maternal fever with dyspnoea. A study done by Guin G et all[21]found that diabetes was around 5% and PPH 20% in case of polyhydramnios. Another study done by Sonak Met al[22,] the most common maternal complication associated with polyhydramnios was preterm labor (46%), followed by malpresentation (11%), atonic PPH (10%), PROM (9%), eclampsia (7%), abruptio placenta (6%) and dyspnea 4%, which was slightly more as compared to our study group. Whereas in case of oligohydramnios in a study done by Guin G et all[21] shows about 21% of fetal congenital anomaly.

In case of fetal outcome, among 44 women diagnosed with oligohydramnios, 6 (13.63%) newborn baby had low APGAR score (<5 at 1 minute, <7 at 5 minute). 5 (11.36%) newobrn baby have <2.5kg weight and 6(13.63%) baby was admitted in NICU/SCBU followed by 1(2.27%) with congenital anomaly and NND. While in case of polyhydramnios among 16 cases, 2 newborn babies(12.5%) were admitted in NICU/SCBU, and 1(6.25%) case with congenital anomaly and low APGAR score(<5 at 1 minute and <7 at 5 minute) which is similar to our study done by Preshit Chate et al[23] in which Thick meconium(46%), low Apgar score at 5 min.(16%), birth weight <2.5 kg(12%), admission to NICU(4%), congenital anomalies & neonatal mortality(2%).Similarly, study done by Kaur Tajinder et al[18], Low APGAR score of < 7 at 1 minute was considerably high in both oligohydramnios and in polyhydramnios subjects. The incidence of IUD and macrosomia was significantly high in polyhydramnios group.Radhamani S et al[24] had APGAR of <7 at 5 minutes. 17.7% had birth weight of <2.5 kg and 6.9% of babies required which NICU admission.

In case of mode of delivery, in a total of 44 cases of oligohydramnios ,26(70.46%) underwent LSCS, 12(27.27%) had vaginal delivery, and 1(2.27%) had instrumental delivery. Whereas in 16 cases of polyhydramnios, 9(56.25%) had vaginal delivery, 7(43.75%) had LSCS which was similar to study done by Varghese et al[25] in which each group mode of delivery was as, In group 1 about 8% cases had labour induction, 16% delivered vaginally and 84% had LSCS. In group 2 about 24% had labour induction, 29% delivered vaginally and 71% had LSCS and in group 3, 50% had labour induction, 50% delivered vaginally and 50% had LSCS. In case of

polyhydramnios study done by SonakM et al[22]in which 62% cases of polyhydramnios delivered by cesarean section while 38% cases delivered vaginally. 57% control with normal fluid volume delivered vaginally while 43% had cesarean section in which case was similar to our study which is slightly higher than our study. Another case studied by Radhamani S et al[24,] Tajinder K et al[18]in cases of isolated oligohydramnios 55.4%, 52.4% had vaginal delivery, 44.6% and 38.1% underwent LSCS While in case of polyhydramnios group caesarean section,instrumental delivery and normal delivery was 28.6 % which were low as compared to our study.

CONCLUSION

In this research study of 60 cases, the prevalence of polyhydramnios was noted to be 2% and oligohydramnios was noted to be 5.33%. Both conditions were more common in women in the age range of 20 to 24 years. Most of the cases were first time pregnant women. Oligohydramnios was most often observed in post-term pregnancies, whereas polyhydramnios was most often connected with diabetes and hypertension that resulted from pregnancy. Maternal and neonatal adverse effects included preeclampsia, postpartum haemorrhage, low APGAR score, low birth weight and NICU admission. Ultrasound and Doppler assessments made at or after 37 weeks' gestation were useful in identifying high risk foetuses, therefore enabling appropriate delivery decisions to be made and improve maternal and foetal outcomes in pregnancies with abnormal levels of Amniotic Fluid.

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