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RESEARCH ARTICLE

STUDY OF AFI MEASUREMENTS IN HIGH RISK PREGNANCIES AND FETO MATERNAL OUTCOME

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Abstract

Introduction: Amniotic fluid acts as a protective layer which exerts a cushion-like effect for the growing fetus against mechanical and biological injury. Amniotic fluid may be regarded as the largest part of the fetal extracellular space, and it provides a more accessible means than fetal blood for investigation of the fetus and its environment. Amniotic fluid assessment is an integral part of the antenatal evaluation of pregnancies at risk for an adverse pregnancy outcome especially in the third trimester.^{1, 2} Detecting the fetus at risk for in utero damage or death, quantifying, and balancing the fetal risk against the risk of neonatal complications from immaturity, and determining the optimal time and mode of intervention are the cornerstone of modern day obstetrics care and perinatal medicine.³

Aim: Study of Amniotic fluid Index Measurements in High- Risk Pregnancies and Outcome

Objectives: To Study the Patterns Of Changes In Amniotic Fluid Index From 32 Weeks Till Delivery In High Risk Pregnancies

To Study The Perinatal Outcome In Relation To APGAR Score.

Materials And Methods: A prospective observational study conducted on 100 patients over a period of 18 months at GMC, Kadapa.

Inclusion Criteria: Single ton pregnancy with gestational age > 32 weeks, Hypertensive disorders, Diabetes complicating pregnancy including Gestational diabetes, Intrauterine growth retardation, Past dates, Liquor abnormalities, Bad obstetric history

Exclusion criteria: Pregnant women with GA < 32 weeks or in labour, Antepartum hemorrhage, Eclampsia, Multiple gestation, Ruptured membranes, Congenital anomalies, Intrauterine fetal death

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Results: This study was observational prospective study, 100 antenatal cases of >32 weeks gestation attending Government general hospital, Kadapa were included. The study individuals was divided into 4 categories based on AFI and the correlation between AFI and variables studied like NST, mode of delivery, colour of liquor, Apgar at 5mts, birth weight, Congenital malformations, NICU admission of babies and neonatal death.

Discussion: The study was prospective observational study, 100 antenatal cases of >32 weeks gestation attending Government general hospital, Kadapa were included. The study individuals was divided into 4 categories based on AFI and the correlation between AFI and variables studied like NST, mode of delivery, colour of liquor, Apgar at 5 mins, birth weight, IUGR, NICU admission of babies and neonatal death.

Introduction:-

Amniotic fluid acts as a protective layer which exerts a cushion-like effect for the growing fetus against mechanical and biological injury. Amniotic fluid may be regarded as the largest part of the fetal extracellular space, and it provides a more accessible means than fetal blood for investigation of the fetus and its environment. Amniotic fluid assessment is an integral part of the antenatal evaluation of pregnancies at risk for an adverse pregnancy outcome especially in the third trimester.^{1, 2} Detecting the fetus at risk for in utero damage or death, quantifying, and balancing the fetal risk against the risk of neonatal complications from immaturity, and determining the optimal time and mode of intervention are the cornerstone of modern day obstetrics care and perinatal medicine.³

Reduced amniotic fluid volume (AFV) is associated with adverse effects such as meconium staining, congenital anomalies, growth retardation, dysmaturity, and fetal asphyxia.⁴⁻⁶ Polyhydramnios is sometimes associated with major fetal anomalies, aneuploidy, macrosomia, and stillbirth. Decreased AFV in those pregnancies without premature rupture of the membranes can reflect a fetus in chronic stress, shunting of blood to its brain, adrenal and heart and away from other organs, which include the kidney, and results in decreased fetal renal perfusion and urinary output. Phelan et al⁷ have recommended that labor induction be considered in patients with oligohydramnios (AFI <5 cm) to reduce the increased risk of fetal death and morbidity. An antepartum amniotic fluid index (AFI) of 5 cm or less is a predictor of adverse perinatal outcome in terms of meconium staining, cesarean section for fetal distress, birth weight, low Apgar scores and cord pH.⁸ AFI of <18 cm is taken as cut-off point for normal limit of AFI. Pregnancy complicated with polyhydramnios is also classified as high risk. AFV can be measured by dye-dilution techniques and by direct quantification at the time of cesarean delivery, but both methods are invasive, require laboratory support, and are measured at the time of operative abdominal delivery, cannot be used serially to evaluate high-risk pregnancies.¹ The limitation of the direct AFV measurement led to the use of ultrasonic AFV estimation. Ultrasonography is noninvasive and can clinically quantitate the AFV. There are various reported ultrasonographic modalities to assess AFV like (1) single deepest pocket (2) 2-diameter pocket, and (3) AFI by 4-quadrant method. Since the introduction of AFI by Phelan et al,⁷ a rapid semi-quantitative assessment of AFV can be performed quickly, is easily taught, and is reproducible.

AFI also facilitated the diagnosis of a congenital anomaly not detected in referring clinics. The antepartum information regarding malformation was valuable for the patients and their health-care providers in deciding on the timing and mode of delivery, determining an etiology of intrauterine or postnatal death, and counseling of future pregnancies.

Aims and Objectives:-

Aim:-

Study of Amniotic fluid Index Measurements in High- Risk Pregnancies and Outcome

Objectives:-

1. To Study the Patterns Of Changes In Amniotic Fluid Index From 32 Weeks Till Delivery In High Risk Pregnancies
2. To Study The Perinatal Outcome In Relation To APGAR Score.

Materials and Methods:-**Study design :**

Prospective observational study

Study Duration:

18 months

Sample size :

100 patients in GGH ,Kadapa

Source of the data:

Government General Hospital,Kadapa

Inclusion Criteria:

1. Single ton pregnancy with gestational age > 32 weeks,
2. Hypertensive disorders
3. Diabetes complicating pregnancy including Gestational diabetes
4. Intrauterine growth retardation
5. Past dates
6. Liquor abnormalities
7. Bad obstetric history

Exclusion criteria:

1. Pregnant women with GA< 32 weeks or in labour
2. Antepartum hemorrhage
3. Eclampsia
4. Multiple gestation
5. Ruptured membranes
6. Congenital anomalies
7. Intrauterine fetal death

Data Collection:-

The study in the department of Obstetrics & Gynaecology was conducted, GGH,Kadapa, from October 2022 to March 2024. 100 high risk pregnant women, attending the antenatal OP clinic, or as directly attendant to labour room, were admitted into the inpatient wards and included in the study.

Results:-

This study was observational prospective study, 100 antenatal cases of >32 weeks gestation attending Government general hospital, Kadapa were included. The study individuals was divided into 4 categories based on AFI and the correlation between AFI and variables studied like NST, mode of delivery, colour of liquor, Apgar at 5mts, birth weight ,Congenital malformations, NICU dmission of babies and neonatal death.

1. The study individuals Mean age of was 24.4 ± 3.79 years. Majority of the high risk women were aged 21 – 25 years i.e., 48% followed by women aged 26 – 30 years in 32%. Only 6% were in the of more than 30 years age group.
2. 23 % of the study individuals were having PIH and Pre-eclampsia. 20% of the study individuals are post dated pregnancy. 17% had Gestational diabetes, 15% had IUGR, 11% had bad Obstetric history i.e., Previous abortions, previous ectopic pregnancy.

Table 1:- Association between risk factor and AFI.

| | Risk factor | <5 | 5 - 18 | 18.1 - 25 | >25 |
|---|--------------------|--------------|---------------|------------------|---------------|
| 1 | Pre-eclampsia/PIH | 5(41.7) | 14(30.4) | 3(7.5) | 1(50) |
| 2 | Post dated | 4(33.3) | 9(19.6) | 6(15) | 1(50) |
| 3 | IUGR | 3(25) | 7(15.2) | 5(12.5) | 0 |
| 4 | Gestational | 0 | 4(8.7) | 13(32.5) | 0 |

| | | | | | |
|---|-----------------------|---|--------|--------|---|
| | Diabetes | | | | |
| 5 | Rh incompatibility | 0 | 3(6.5) | 4(10) | 0 |
| 6 | Bad obstetric history | 0 | 3(6.5) | 8(20) | 0 |
| 7 | Anaemia | 0 | 6(13) | 1(2.5) | 0 |

1. Majority (36%) of the study participants were in the gestational age more than 40 weeks, followed by 39 – 40 weeks in 30%, 37 – 38 weeks in 24%. Only 4% of study participants were in 32 – 34 weeks.
2. 57% of the patients were multipara P2 – P4 while Primipara were 43%. This depicts that HRP were more in multiparous women.
3. Majority of the patients on Non stress test has shown reassuring fetal heart pattern in 62%, while Non assuring fetal heart pattern was seen in 38% of patients.

Table 2:- Non Stress test in High risk pregnancies.

| NST | Number | Percentage |
|------------------|--------|------------|
| Non reactive NST | 38 | 38 |
| Reactive NST | 62 | 62 |
| Total | 100 | 100 |

In 69% of patients, when their liquor is investigated, it was clear while in 31% of the patients it was stained with meconium i.e., 31% babies were at high risk.

Table 3:- Color of liquor in high risk pregnancy women:

| Color of liquor | Number | Percentage |
|------------------|--------|------------|
| Clear | 69 | 69 |
| Meconium stained | 31 | 31 |
| Total | 100 | 100 |

1. 63% of the high risk pregnancies were managed by vaginal delivery, spontaneous or forceps assisted or vacuum assisted. 37% of study participants were delivered by cesarean section.
2. Among 63 patients delivered by vaginal route, 63.5 % were spontaneously delivered, while 19 % by forceps delivery, 17.5% by Vacuum assistance.
3. 24.3 % of the patients on whom LSCS was operated was due to failed induction. In 18.9% of operated patients , severe PIH was the indication followed by 16.2 % each due to Prolonged labour and cephalo – pelvic disproportion, in 13.5% due to fetal distress, 5.4 % each in Antepartum hemorrhage, bad obstetric history.s
4. Majority of the patients delivered normal weight of the baby (2.5 – 4Kgs) i.e., 68%. LBW babies were in 21 % of patients and big babies or Macrosomia(>4Kg) babies in 11% patients.
5. Poor APGAR score was seen in 36% of the babies while babies with good APGAR score were seen in 64% of babies.
6. 67% of the babies were not admitted in NICU where as 33% were admitted in NICU.

Table 4:- Distribution of study participants depending on NICUadmission.

| NICUAdmission | Number | Percentage |
|---------------|--------|------------|
| Not admitted | 67 | 67 |
| Admitted | 33 | 33 |
| Total | 100 | 100 |

1. Among the 11 babies with congenital malformation, 3 were Hydrops fetalis, 2 with Duodenal atresia, 2 Polydactyly, 1 Spina bifida, 1 PUJ obstruction, 1 CTEV, 1 Meningomyelocele.
2. Out of 100 babies delivered, 31 babies were with poor APGAR score , 33 babies were admitted in NICU while 11 babies had congenital malformation and 11 babies died with in 28 days of delivery.
3. Depending on AFI Index, participants were categorized into Oligohydromnias with <5 AFI pocket, Normal with AFI 5 to 18, Polyhyramnios with AFI 18– 25, and Severe Hydromnias in AFI >25.
4. Maternal age with AFI was associated which was statistically significant.
5. Oligohydramnios was seen in 41.7% of patients with Preeclampsia/ PIH, followed by post dated pregnancy in

- 33.3%, and IUGR in 25%. Polyhydramnios was seen
6. mostly in patients with GDM (32.5%) , bad obstetric history in 20%, Post dated pregnancy in 15%, IUGR in 12.5%. Severe hydramnios was seen in mothers with PIH, Post dated pregnancy. between RF and AFI at P <0.05 Statistically significant association
 7. Oligohydramnios was seen in 39 – 40 weeks of gestational age in 41.7%, > 40 weeks in 41.7%. Polyhydramnios was seen in > 40 weeks in 35% followed by 39 to 40 weeks GA in 27.5%. This association between GA & AFI was not statistically significant.
 8. Oligohydramnios was seen mostly in Primipara (75%), normal AFI in Multiparous women (52.2%), Polyhydramnios in 70% of multiparous women, and severe hydramnios seen in multiparous women. Thus parity is associated with AFI and is statistically significant at p <0.05.
 9. In Oligohydramnios patients, 75% of patients have shown non assuring fetal pattern. In polyhydramnios patients, 82.5% of patients have shown reactive NST. In normal AFI patients, 54.3% of patients had reassuring NST. The association between NST test and AFI is statistically significant.
 10. In study individuals with Oligohydramnios, meconium stained liquor was observed in 83.3% of patients. In study individuals with normal AFI scores, clear liquor was seen in 67.4% in polyhydramnios, 85% of patients shown clear liquor. Thus by chi square test it is seen that color of meconium is significantly associated with AFI
 11. LSCS was conducted more in Oligohydramnios i.e., 83.3% and assisted vaginal delivery in rest. In Polyhydramnios patients, vaginal delivery is commonest mode of delivery especially spontaneous vaginal delivery. The mode of delivery is significantly associated with AFI statistically.
 12. The association between indication for LSCS and AFI which was statistically significant.
 13. Among mothers with oligohydramnios, LBW babies were 16.7%. Among mothers with AFI 5 – 18cm, 69.6% were normal weight babies, 21.7% low birth weight babies, 8.7% macrosomia babies. In polyhydramnios patients, 22.5% had low birth weight babies, 12.5 % had macrosomis babies while sever hydramnios a ll babies were weighing > 4 kgs. There is significant association statistically between birth weight of babies and AFI
 14. In Oligohydramnios patients, all the babies were with poor APGAR as per APGAR score at 5 min. In patients with Polyhydramnios, normal APGAR at 5 min in 72.5%. There is a statistically significant association between APGAR and AFI 91.7% of babies got admitted in NICU were the babies born to mothers with Oligohydramnios. Only 13 % babies and 40% babies born to mothers with AFI 5-18 and Polyhydramnios respectively were admitted in NICU. There is statistically significant association between NICU admissions and AFI
 15. There is statistically significant association between congenital malformations and AFI i.e., Polyhydramnios patients were prone for congenital malformed babies.
 16. Neonatal deaths were 15%, 8.3% and 4.3% in Polyhydramnios, Oligohydramnios, normal AFI mothers respectively. All the babies born to severe hydramnios patients died. This was significant statistically difference proving that there is association between Outcome and AFI

Table 5:- Distribution of study participants depending on Outcome.

| Outcome | Number | Percentage |
|-----------------|--------|------------|
| Live | 89 | 89 |
| Neonatal deaths | 11 | 11 |
| Total | 100 | 100 |
| | | |

Discussion:-

The study was prospective observational study, 100 antenatal cases of >32 weeks gestation attending Government general hospital, Kadapa were included. The study individuals was divided into 4 categories based on AFI and the correlation between AFI and variables studied like NST, mode of delivery, colour of liquor, Apgar at 5 mins, birth weight ,IUGR, NICU admission of babies and neonatal death.

Similar results were observed in the study by Sonian Madaan et al.⁹ observed that the 62% majority of subjects were in 21–25 years age group, followed by 27% in the 26–30 years age group, and the least (2%) in age group >31 years. The results of the study conducted by Biradar and Shamanewadi¹⁰ recorded mean age of subjects was 22.4 ± 3.5 year with majority 64% were belonging to the age group 21-25 years.

The study results of Sowmya et al.¹¹ observed average age of study individuals was 22.86 years.

Parity of high risk women:

Distribution of mothers depending on parity. 57% of the mothers were multipara P2 – P4 while Primipara were 43%. This depicts that HR pregnancies more in multiparous women. Similar results were observed by Sonian Madaan et al.⁹ recording 48% study participants were primigravida and 52% were multigravida. Patel et al.¹² observed 58.75% of the study individuals were primipara and 41.25% were multipara.

Biradar and Shamanewadi¹⁰ reported that one third of the study individuals were primigravida and two thirds were multigravida.

Sowmya et al.¹¹ reported that 52% of the participants were primi-gravida and 48% were multigravida.

Association between GA and AFI:

The study by Sonian Madaan et al.⁹ observed that the AFI mean at 34–36 weeks was maximum i.e., 13.1 cm and it decreased to 9.08 cm gradually beyond 40 wks. AFI Mean of patients with weeks 40 of gestation gradually decreased from 12.2 cm to 8.0 cm after weeks 42 (p value < 0.05) implies significant relationship between post-term pregnancy and AFI.

Association between MOD and AFI:

The study conducted by the Biradar and Shamanewadi¹⁰ observed that 62% patients with oligohydramnios underwent LSCS delivery and 38% had vaginal delivery. The study conducted by Sowmya et al.¹¹ noted that 68% of the study participants with oligohydramnios had delivered by LSCS and 32% by the normal delivery.

The study conducted by Ahmar et al.¹³ observed that the MOD was normal VD among 60% study participants with oligos and MOD was LSCS among 40% of the participants.

Association between BW and AFI:

Among study individuals with oligohydramnios, LBW babies were 16.7%. Among patients with AFI 5 – 18cm, 69.6% were normal weight babies, 21.7% LBW babies, 8.7% macrosomic babies. In polyhydramnios patients, 22.5% had LBW babies, 12.5% had macrosomic babies while severe hydramnios all babies were weighing > 4 kgs. There is statistically significant association between birth weight of babies and AFI at significant p < 0.05

The study conducted by Biradar and Shamanewadi¹⁰ observed that the incidence of LBW (< 5. The study conducted by Sowmya et al.¹¹ noted that 48% babies of oligohydramnios mother had birth weight < 2.5 kg.

Association between APGAR at 5 minutes and AFI:

The study conducted by Rashid et al.¹⁴ [25] revealed that the poor APGAR score at 5 min in 46.7% subjects with low Amniotic Fluid Index, the findings were similar to the observations in the study presently.

Association between admission in NICU and AFI:

91.7% of babies got admitted in NICU were the babies born to mothers with Oligohydramnios. Only 13 % babies and 40% babies born to mothers with AFI 5 – 18 and Polyhydramnios respectively were admitted in NICU. There is statistically significant association between NICU admissions and AFI.

The study conducted by Biradar and Shamanewadi¹⁰ observed that 40% new-borns of mothers having oligohydramnios needed NICU admission.

The study results by Sowmya et al.¹¹ noted that 14% of the babies of oligohydramnios mother needed NICU admission.

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