

Factors contributing to oligohydramnios in third trimester of pregnancy and its impact on maternal and perinatal outcome in a tertiary hospital of rural Vadodara

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ABSTRACT

Objectives: The study aimed to find out factors contributing to oligohydramnios in the third trimester of pregnancy, complications associated and its impact on maternal and foetal outcomes. **Method:** This was a retrospective study of 90 primigravidas at Parul Sevashram Hospital during the year October 2019 to September 2020 in the third trimester of pregnancy with AFI <8 cm and fulfilling inclusion and exclusion criteria. **Results:** Most subjects belonged to the age group of 21-25 years (78%). The incidence of oligohydramnios was higher among women who were farmers (54.4%) and from low socioeconomic status (79%), most had a normal vaginal delivery (80%) and the C section rate was 18.9%. All outcomes were live births with no perinatal mortality and the need for NICU admission was 11.1% mostly for observation followed by respiratory distress. The Apgar score recorded in 5 minutes was between 7-10 in 87.8% and for 12.2% the score was between 4-6. Subjects of the lower socioeconomic class had a lesser AFI and this difference was statistically significant ($\chi^2=8.176$, $p=0.017$). When the degree of AFI was associated with various outcomes it was observed that a statistically significant association ($p<0.05$) existed among higher cesarean section rates, prolonged hospital stays, malpresentation, lower birth weight, NICU admissions and prolonged NICU stay duration. **Conclusion:** Oligohydramnios has a significant association with low birth weight. Oligohydramnios is a frequent occurrence nowadays and careful evaluation, intensive parental counselling, foetal surveillance and proper antepartum and intrapartum care are needed for the healthy outcome of the mother and the neonate.

Keywords: Oligohydramnios, AFI, Apgar, NICU, foetal surveillance, low birth weight.

Amniotic fluid is an important and integral part of the healthy survival of the foetus. Amniotic fluid is the fluid surrounding the foetus which helps in various ways like cushioning effect to the foetus from injury, helps to prevent compression of the umbilical cord, regulation of temperature helps in foetal movement, bacteriostatic actions, creating a physical space for musculoskeletal development, promotes normal lung development¹. Amniotic fluid production in the first trimester is derived from foetal and maternal compartments. In the second trimester, it is exclusively from foetal urination. At term, a foetus produces on an average from 500-700ml/day with a slight decline in hourly foetal

urine production after 40 weeks gestation². Disruption of this balance may result in overproduction or underproduction of fluid.²

Oligohydramnios term was first coined by Moore and Coyle in 1990. Phelan JP et al defined oligohydramnios by sonographic findings as the amniotic fluid index less than 5 cm and between 5-8 cm as borderline oligohydramnios or maximum vertical pocket of less than 2 cm.³ Its incidence is 2.3 % of all pregnancies.³ According to Leeman et al, oligohydramnios occurred in about 1 % to 5 % of pregnancies at term⁴.

Factors contributing to oligohydramnios in the third

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trimester are unexplained and incompletely understood but it is assumed to be due to idiopathic, premature rupture of membranes, placental abruption, uteroplacental insufficiency, poor nutrition and congenital anomaly, and iatrogenic.⁵ Increased incidence of intrauterine growth restriction, postdated pregnancy, meconium-stained liquor, malpresentation, umbilical cord compression, abnormal foetal heart decelerations during labour and low Apgar scores and acidosis during birth, operative vaginal delivery, are associated with oligohydramnios⁶. Early detection, as well as management of cases of oligohydramnios, may help in reducing perinatal morbidity as well as mortality and also reduce caesarean rates⁷. Since oligohydramnios has got a significant impact on perinatal outcome and maternal morbidity, oligohydramnios is a severe common complication of pregnancy.⁸

Recently, oligohydramnios is most commonly found in pregnant women. Runoo G et al⁹ in their study observed 70.9% of babies with low birth weight and 43.6% with Apgar score <7 at 5 minutes. Amniotic fluid volume is an indicator of foetal tolerance during labour and its value is inversely associated with perinatal morbidity and mortality. Increased induction of labour and elective caesarean deliveries are currently practised for better perinatal outcomes. Regular antenatal and intrapartum monitoring should be done for the earliest diagnosis of any foetal compromise. If timely interventions are taken, it can reduce perinatal morbidity and mortality. The quantitative measurement of amniotic fluid volume plays a major role in antepartum surveillance.⁹ Regular antenatal and intrapartum monitoring should be done for the earliest diagnosis of any foetal compromise. The decision of termination of pregnancy after analysing the risk of intrauterine asphyxia against those of prematurity should be done for the best outcome.¹⁰ Since, an in-depth analysis is required it was decided to carry out this study.

Objectives -

1. To identify the various factors contributing to oligohydramnios in the third trimester of pregnancy.
2. To evaluate the perinatal outcome in third trimester oligohydramnios, NICU admission, meconium stained liquor and Apgar score.
3. To study the maternal outcome i.e. mode of delivery.

Materials and methods

The study was hospital-based and carried out in a tertiary hospital in rural Vadodara. The study was a retrospective

study carried out for one year from 1st October 2019 to 30th September 2020.

Inclusion criteria -

- 1) Antenatal women >28 completed weeks of gestational age (third trimester)
- 2) Intrauterine singleton live pregnancy
- 3) USG confirmed cases of oligohydramnios with amniotic fluid index < 8 cm.

Exclusion criteria -

- 1) Multifoetal gestation
- 2) Pregnancy <28 completed weeks
- 3) With premature rupture of membranes
- 4) Major cardiac/respiratory illness
- 5) Previous history of caesarean section

According to past studies conducted, the prevalence of oligohydramnios was reported as 1 to 5% of pregnancies at term^{1, 4}. This was also consistent with our hospital records for the past three years which showed a prevalence of 4.4%. Therefore, taking 4.4% as "P" and applying the formula of sample size calculation, which is $n = \frac{Z^2 \times P \times (100 - P)}{C^2}$

Where n=Sample size

Z= 1.96, a constant used at an estimated 5% level of significance

P = Positive character (the prevalence estimated)

C= Margin of error, taken as 3%

The sample size calculated was 180. Out of the calculated sample size, keeping in mind the limitation of resources and the duration of the study, it was decided to select 50% of the calculated sample size which came out to be 90. Therefore, a total of 90 cases were taken as the final sample size.

All the women admitted in the hospital who fulfilled the inclusion criteria were included in the study till the sample size was attained. Transabdominal ultrasonography was done to measure the amniotic fluid index. It was measured by dividing the uterus in four quadrants and the transducer placed on the maternal abdomen along the vertical axis. The vertical diameter of the largest, unobstructed amniotic fluid pocket in each quadrant is measured and then summed up as the amniotic fluid index in centimetres. The enrolled patient was followed until their delivery. Detailed history like age, parity, and comorbid condition was been entered. General examination including haemoglobin level, nutritional status, BMI, and blood pressure was noted. The mode of delivery was recorded. The neonatal outcome, birthweight, NICU admissions, premature delivery and perinatal mortality were recorded. Prior permission from the institutional ethical

committee at Parul Institute of Medical Sciences and Research, Vadodara was taken. The obtained data were entered in an excel sheet and appropriate tests were applied and analysed statistically. These include the calculation of simple proportions and a chi-squared test for establishing the association of variables to find out the impact of risk factors on the maternal and perinatal outcomes.

Results

Table 1: Socio-demographic and clinical features of the study subjects

Age	Frequency	Percent
15-20 Years	10	11.1
21-25 Years	70	77.8
26-30 Years	9	10
31-35 Years	1	1.1
Total	90	100
Occupation		
Housewife	7	7.8
Labourer	33	36.7
Farmer	49	54.4
Sedentary job	1	1.1
Total	90	100
Socio-economic status		
Upper lower	19	21.1
Lower middle	71	78.9
Total	90	100
Chief complaints		
No complaints	11	12.2
Reduced foetal movements	53	58.9
Lower abdominal pain/Back pain	23	25.6
Bleeding per vagina/Abdominal discomfort	2	2.2
Postdated pregnancy	1	1.1
Total	90	100
Gestational age at delivery		
36 weeks	9	10.0
37 weeks	5	5.6
38 weeks	23	25.6
39 weeks	41	45.6
40 weeks	9	10
41 weeks	3	3.3
Total	90	100

Table 1 shows the socio-demographic features of the study subjects. The mean age of the subjects was 23.27 ± 2.04 yrs. The median age was 23 yrs. Most of the subjects were in the age group 21-25 yrs followed by those in the age group 15-20 yrs. Based on occupation there were 54.4% farmers, labourers 36.7%, housewife 7.8% and the remaining 1.1% had sedentary jobs. According to the modified BG Prasad classification of socioeconomic status, 78.9% came under lower middle class and 21.1% came under upper lower class. Based on chief complaints 58.9% came with chief complaints of reduced foetal movements, 25.6% had lower abdominal pain/back pain, 12.2% had no chief complaints, 2.2% had bleeding per vagina/abdominal discomfort, remaining 1.1% had postdated pregnancy. In this study according to gestational age at delivery, 45.6% of subjects delivered at 39 weeks, 25.6% delivered at 38 weeks, 10.0%

delivered at 36 weeks, 5.6% delivered at 37 weeks, and 3.3% at 41 weeks.

Table 2: Details related to delivery/labour of the study subjects

Spontaneous/Induced labour	Frequency	Percent
Spontaneous	58	64.4
Induced	17	18.9
Not applicable	15	16.66
Total	90	100
Indication of induction		
Mild/Moderate oligohydramnios	29	32.2
Severe oligohydramnios	5	5.6
Foetal distress	2	2.2
Not applicable	54	60.0
Total	90	100
Mode of delivery		
Normal delivery	72	80
Instrumental delivery	1	1.1
C section	17	18.9
Total	90	100
Duration of hospital stay		
<48 hours	21	23.3
48-72 hours	45	50
3-5 days	6	6.7
5-7 days	1	1.1
>7 days	17	18.9
Total	90	100
Malpresentations		
Breech	8	8.9
Unstable lie	1	1.1
Nil	81	90
Total	90	100

Table 2 shows details related to the delivery/labour of the subjects. There was spontaneous labour in 64.4% of subjects and induced labour in 18.9%. The indication of induction of labour in 32.2% was mild/moderate oligohydramnios, in 5.6% subjects was severe oligohydramnios and in 2.2% was foetal distress. About 60% got delivered without induction of labour. 80% of subjects delivered normally, there was instrumental delivery in 1.1% and C section was done in 18.9%. The duration of hospital stay in 50% of subjects was 48-72 hours. In 23.3% of women it was <48 hours, in 18.9% was >7 days, and 6.7% was 3-5 days. 90% of subjects had normal presentations, 8.9% of subjects had breech presentations, and 1.1% had unstable lie.

Table 3 shows details related to neonatal health. Almost all the newborns had a low birth weight below 2.5 kg except one who had a normal birth weight. NICU admission was required in about 11% of the cases. In 10% of neonates the duration of NICU stay was <24 hours and the remaining 1.1% was 24-48 hours. The reason for NICU admission in most cases was to keep neonate under observation and in about 1% of cases was for respiratory distress. The Apgar score was recorded in 5 mins and the score was recorded as 7-10 in 88% of neonates and in 12.2% of neonates the score was between 4-6.

Neonatal weight	Frequency	Percent
<1.5 Kg	5	5.6
1.5-2 Kg	69	76.7
2-2.500 Kg	16	16.7
2.500-3.00 Kg	1	1.1
Total	90	100
NICU admission		
No	80	88.9
Yes	10	11.1
Total	90	100
Duration of NICU stay		
<24 hours	9	10
24-48 hours	1	1.1
NA	80	88.9
Total	90	100
Reason of NICU admission		
Under observation	9	10
Respiratory distress	1	1.1
NA	80	88.9
Total	90	100
Apgar score		
4-6	11	12.2
7-10	79	87.8
Total	90	100

Table 4 shows an association of different variables with AFI. The above table shows that subjects of the lower socioeconomic class had a lesser AFI and this difference was statistically significant. When the degree of AFI was associated with various outcomes it was observed that a statistically significant association ($p < 0.05$) existed among higher cesarean section rates, prolonged hospital stays, malpresentation, lower birth weight, NICU admissions and prolonged NICU stay duration with lower AFI scores.

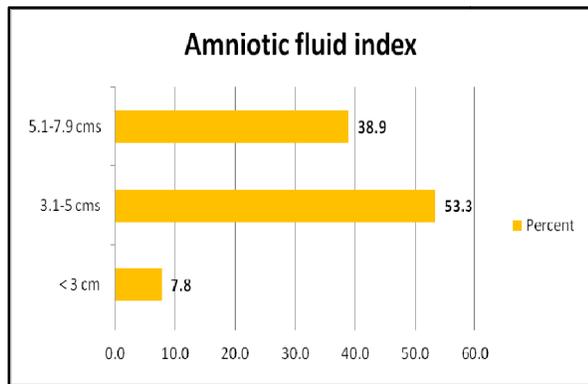


Figure 1: Amniotic fluid index of the study subjects

Figure 1 shows that nearly half of the subjects had AFI of 3.1-5 cm, whereas 38.9% had AFI of 5.1-7.9 cm whereas 7.7% had AFI upto 3 cm. All the study subjects had clear amniotic fluid and no anomaly detected.

Table 4: Association of AFI with different variables among oligohydramnios subjects

Variables	AFI			Total	Chi square	p value
	0-3	4-6	7-10			
Mode of delivery						
Normal	2	39	31	72	11.08	0.026
Instrumental	0	1	0	1		
C- section	4	9	4	17		
Total	6	49	35	90		
Duration of hospital stay						
<48 hrs	1	12	8	21	28.29	<0.01
48-72 hrs	0	23	22	45		
3-5 days	0	4	2	6		
5-7 days	1	0	0	1		
>7 days	4	10	3	17		
Total	6	49	35	90		
Malpresentations						
Breech	2	5	1	8	20.82	<0.01
Unstable lie	1	0	0	1		
No malpresentation	3	44	34	81		
Total	6	49	35	90		
Neonatal weight						
<1.5 kg	1	2	2	5	18.224	0.006
1.5-2 kg	2	39	28	69		
2-2.5 kg	2	8	5	15		
2.5-3 kg	1	0	0	1		
Total	6	49	35	90		
NICU admission						
Not done	3	44	33	80	10.26	0.006
Admitted	3	5	2	10		
Total	6	49	35	90		
NICU duration						
<24 hrs	3	5	2	10	11.102	0.025
24-48 hrs	0	1	0	1		
Not applicable	3	43	33	79		
Total	6	49	35	90		
Socio-economical class						
Upper lower	4	8	7	19	8.176	0.017
Lower middle	2	41	28	71		
Total	6	49	35	90		

Discussion

Amniotic fluid serves as an indicator of foetal wellbeing. Decreased amniotic fluid volume in pregnancies without premature rupture of membranes reflects a foetus in chronic stress with shunting of blood to brain, adrenal glands and heart and away from other organs including kidneys⁹. Decreased renal perfusion results in decreased urinary output and oligohydramnios. Thus assessment of amniotic fluid volume in antenatal period is a helpful tool in determining the women who are at risk for potentially adverse perinatal outcomes.

The present study showed the mean maternal age as 23 years which was similar to studies done by Manisha Sharma, Everett, and Chauhan SP.¹¹⁻¹³ In the present study all women included were primigravida. The prevalence of oligohydramnios was seen more in primigravida according to the study conducted by Mathuriya G et al in the year 2017 and Chaitra et al in the year 2016.¹⁴⁻¹⁵ Whereas, as per the study

done by Casey et al no significant relationship was found of age and parity with oligohydramnios.⁴ The prevalence of oligohydramnios in this study were reported more in women with a gestational age of 35-39 weeks which is comparable to the study conducted by Moses V et al in the year 2016 and Sathyapriya K in 2018.^{10,16}

In this study, 53.3% of women had an amniotic fluid index (3.1-5cm) which was similar to the study done by Manisha Sharma, Chauhan SP, PK Jain, Everette F and Kamlesh R Chaudhari^{11-13,17}. The reason behind decreased AFI is maternal dehydration, placental insufficiency, pre-eclampsia, gestational diabetes, anaemia etc. although in the current study none of these associated factors were found, which could be due to the small sample size. In this study, oligohydramnios were significantly associated with socio-economic status which was similar to a study done by Tiparse A et al.¹⁸

The present study showed that 18.9% were induced with the indication being mild/moderate oligohydramnios compared to studies done by Sharma M, Jandial C et al and Guien et al where 50%, 58% and 56% were induced respectively.^{11, 19-20} The mode of delivery in the current study was 80% normal vaginal delivery and 18.9% C section which was in concordance to Chate P Khatri and in a study by Kamlesh R Chaudhari, whereas, Sharma M reported the main mode of delivery in their study (44%) as C section.^{11,14,21} The study conducted by Sathyapriya K, and Sonal Anto found that in order to improve maternal and foetal outcomes, caesarean section was a highly preferred mode of delivery which was different when compared to the present study in which it was observed that timely and early management of oligohydramnios can help female to deliver normal with better outcomes well.¹⁶

The study conducted by Sharma M, Kamlesh R Chaudhari and Sriya R found that the neonatal weight was <2 kg in around 75% which was almost similar to our study.^{11,17,22} In the present study all babies born were alive. However, the admission of neonatal admission was 11% which is comparable with the study conducted by Casey BM.⁴ 88% of babies born had Apgar scores of 7-10 which was similar to the studies conducted by Guien et al and Chate P Khatri^{20,21}.

In the present study statistical significance was seen in a higher rate of cesarean section with low AFI which was also observed by Chauhan et al and Chaudhari K et al.^{23,24} Prolonged stay was also associated with lower AFI which could be due to more cesarean in that group. Malpresentations were significantly ($p < 0.05$) seen in lower

AFI similar to the study done by Guien et al.²⁰ It was observed in the study that women with lower AFI had delivered babies with lower birth weight, requiring NICU admission and prolonged NICU stay. This association was statistically significant and was also seen in a study done by Joshi H et al.²⁵

Conclusion

With regular antenatal visits, oligohydramnios can be detected early by clinical examination and routine ultrasonography. The causes of reduced amniotic fluid in the third trimester are mostly idiopathic but could be due to maternal dehydration, postdated pregnancies and PIH. Larger sample size is required to have in-depth knowledge regarding the association with these causes. The present study showed that lower AFI levels are associated with higher cesarean section rates, prolonged hospital stays, increased NICU admissions, low birth weight, malpresentation and prolonged NICU stay. With timely intervention and vigilant intrapartum care, the outcome with normal delivery was as good as the cesarean delivery. A balanced decision regarding vaginal delivery and cesarean section should be done so that unnecessary maternal morbidity can be prevented.

Conflict of interest: None. **Disclaimer:** Nil.

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