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Amniotic Fluid Index in Normal Pregnancy among Meitei Women of Manipur, India

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Abstract:
Amniotic Fluid assessment with the help of Amniotic Fluid Index (AFI) or four quadrant method technique has become an important part of antenatal surveillance. The present study attempts to find out the normal values of AFI at each week of gestation and the upper and lower normal limits among the Meitei women. From the 16th to 25th week, the AFI rose progressively and the peak values were found at the 26th, 27th and 32nd weeks. Thereafter till the 39th week, the AFI appears to decline gradually. The percentile values show progressive rise in the fluid volume at the 5th, 50th and 95th for each gestational week. An occasional decline in the fluid volume was seen at the 5th percentile from the 33rd week, showing mild cases of oligohydramnios among the Meitei women.

Keywords: Amniotic Fluid, Four-Quadrant method, Gestational age, Ultrasonography, Oligohydramnios, Polyhydramnios.

Introduction:

During pregnancy, the growing foetus is cushioned inside a fluid-filled bag within the uterus called the amniotic sac. The wall of the amniotic sac is made up of two membranes called the chorion and the amnion. These membranes keep the foetus safely sealed inside the amniotic fluid during the entire period of pregnancy. The amniotic fluid acts as a protection for the foetus and provides an even temperature, cushions from external trauma and allows free movement necessary for normal development of the lungs. (Ritchie 1995).

Assessment of amniotic fluid is one of the important implications in studying the foetal well-being and it has become an integral component in obstetrics care and pregnancy assessment. Amniotic fluid volume reflects both maternal and foetal status (Brace 1989). Abnormal amniotic fluid volume is associated with adverse outcome to the developing foetus as a case of Polyhydramnios is associated with foetal anomalies and aneuploidy while Oligohydramnios is associated with intra uterine growth retardation, renal anomalies in the second trimester (Chamberlain et al 1984).

The most commonly used method for assessing amniotic fluid volume by ultrasonography is to measure the amniotic fluid index because amniotic fluid index has good correlation with the amniotic fluid volume (Williams et al 1992). Amniotic fluid index or the four-quadrant technique, first described by Phelan et al in 1987, attempts to assess the amniotic fluid carefully, in which a vertical pocket of amniotic fluid in each quadrant of the uterus was summated. The normal AFI value in an uncomplicated normal pregnancy range from 5 to 25 cm. (Phelan et al. 1987). This technique is currently the gold standard since it has shown to be reproducible and non-evasive (Hinh and Ladinshy 2005).

The objectives of the present study is to establish the normal range of gestation specific amniotic fluid index values among the Meitei women and to compare the results with other previously published scientific papers.

Materials and Methods:

The study was carried out at the department of Radio Diagnosis at Regional Institute of Medical Science and Langol View Clinic, Imphal, Manipur. 370 pregnant Meitei women with their age ranging from 18-40 years having uncomplicated singleton pregnancy and gestational period between 16 to 39 weeks were taken for cross sectional study by the use of ultrasonography. No women with medical condition like chronic hypertension, diabetes, and pre-eclampsia were taken.

The technique of Moore and Cayle were used to measure the amniotic fluid index. Using landmark on the maternal abdomen, the uterus was divided into four quadrants; right and left halves by the linea nigra and the upper and lower halves by an imaginary line across the midway between the fundus of the uterus and symphysis pubis. The probe was placed on the abdomen along the mother's longitudinal axis and kept perpendicular to the floor on the sagittal plane. The maximum vertical dimensions of the largest fluid filled pocket in each quadrant were measured and were summed up to get the amniotic fluid index.

Results:

Table No. 1 shows the mean and standard deviation of the AFI values during the gestational period from 16th to 39th week. From the 16th week up to the end of the second trimester ie the 25th week, the mean value of the AFI is found slightly oscillating in an increasing manner. The highest mean value in the first trimester is found at the 23th week with a value of 15.49 cm. and the lowest mean value at the 17th week with a value of 10.53.

At the beginning of the third trimester, there is a peak increase with the AFI value 17.26 cm. and 16.82 cm. at the 26th and 27th weeks respectively. From the 27th week, the AFI values start to decline but again show another peak value 16.05 cm at the 32nd week. After the 32nd week, the mean values of AFI begin to decrease gradually upto 8.64 cm. at the 39th week of gestation.

Table No. 1: Range, Mean and Standard Deviation of Amniotic Fluid Index changes during Pregnancy among the Meitei women.

Gestational Age (In weeks)	N	Range (in cm)	Mean (in cm)	Standard Deviation
16	7	9.81-14.55	11.64	1.46
17	10	4.11-13.34	10.53	2.99
18	3	11.6-16.33	13.17	2.74
19	10	8.62-14.77	12.17	1.99
20	13	12.09-19.0	13.99	1.87
21	13	11.06-17.8	14.69	1.93
22	10	12.16-16.9	14.18	1.61
23	7	12.79-22.4	15.50	3.36
24	12	7.82-19.56	13.93	2.91
25	7	12.24-15.9	14.20	1.38
26	8	13.11-23.91	17.26	3.40
27	7	14.0-18.77	16.82	1.48
28	4	9.14-14.4	11.93	2.19
29	10	13.63-21.17	15.85	2.31
30	14	10.21-17.3	13.49	2.00
31	8	11.7-18.75	14.46	2.53
32	10	12.26-23.84	16.05	3.58
33	14	4.71-15.68	11.31	3.48
34	14	11.04-18.6	14.34	2.27
35	20	5.39-18.68	12.61	3.69

36	28	5.46-17.85	12.52	2.98
37	18	4.36-19.38	12.10	3.90
38	18	6.46-16.62	11.58	2.9
39	4	2.97-14.56	8.65	5.15

Table No. 2 shows the percentile 5th, 50th and 95th percentile value of each gestational week. The highest 5th percentile value is found at the 27th gestational week with a value of 14.0 cm. The highest 50th percentile value is found at the gestational week of 26th with a value of 17.72 cm and seemingly the highest 95th percentile value is found at the gestational week of 26th with a value of 23.9cm. The occurrence of Polyhydramnios is not found in any of the percentiles viz., 5th, 50th and 95th from the 16th to 39th week of gestation. On the other hand, occasional cases of Oligohydramnios (when AFI is less than 5cm) can be seen from the 33rd to the 39th week of gestation, which show a mild condition of Oligohydramnios prevailing among the Meitei women.

Table No.2: Percentiles values of Amniotic Fluid Index (in cm) among the Meitei women.

Gestational Age (in (weeks)	5th percentile	50th percentile	95th percentile
16	9.81	11.41	14.55
17	4.11	11.26	14.23
18	11.58	11.6	16.33
19	8.62	12.81	14.77
20	12.09	13.62	19.02
21	11.06	14.67	17.81
22	12.16	13.61	16.97
23	12.79	14.9	22.45
24	7.82	13.33	19.56
25	12.74	15.02	15.93
26	13.11	17.72	23.91
27	14.0	16.8	18.77
28	9.14	12.08	14.4
29	13.63	15.23	21.17
30	10.31	13.52	17.3
31	11.7	13.95	18.75
32	12.26	14.5	23.84
33	4.71	11.95	15.68
34	11.04	14.4	18.68
35	5.39	12.68	18.68
36	5.46	12.33	17.85
37	4.36	11.65	19.68
38	6.46	11.92	16.62
39	2.97	8.53	14.56

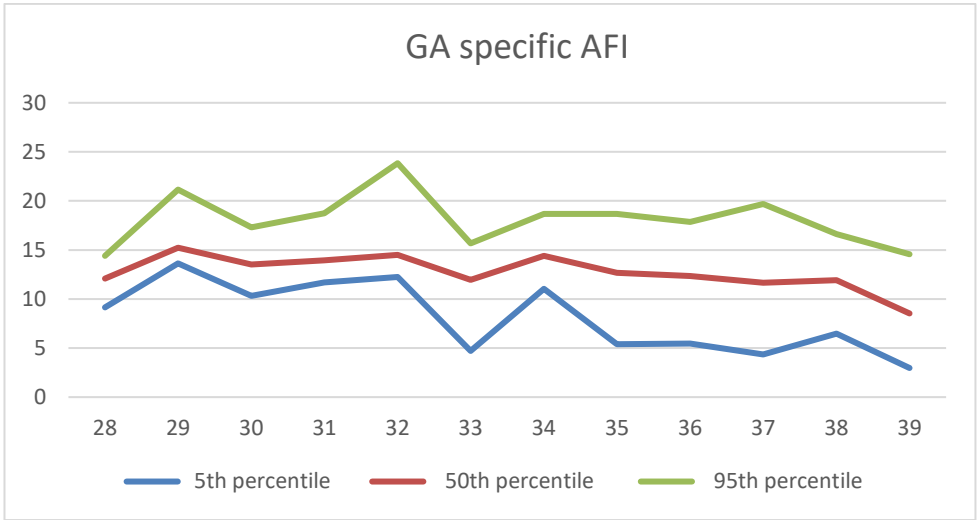

Fig 1. Gestational Age specific distribution of Amniotic Fluid Index

Discussion:

For a better assessment and interpretation of AFI, it is essential to have a reference value for each week of gestation. The reference value of the present study has its own specific values and has variability from other previously established reference ranges of different population. The variability could be due to racial differences, maternal size and intrauterine volume (Ali, 2009).

Khadilkar et al. (2003) reported peak AFI occurs at the 27th week of gestation among Indian women, which is comparable to the present study. Salahuddin et al. (1998) reported that among the Japanese women the peak value of AFI occurs at the 30th week. Birang (2008) reported the peak of AFI at 27th week of gestation among the Iranian women. Ali (2009) also reported that the peak of AFI among the Pakistani women was at the 27th and 31st week of gestation, which is more or less similar to the present study. Chama et al. (2001) established in their study that the peak of AFI was at the 26th week of gestation among the Nigerian women. Alao et al (2007) in their longitudinal study among the southwestern Nigerian women found that the maximum AFI value was at the 41st week while the minimum value at the 25th week, which is a contradictory finding to other previous findings.

Certain similarity of the present study to the previous above works can be seen in the trend of gestational week where the peak AFI value is found, but the absolute value of the mean of the present study for each gestational week differs from the established ranges of the different population studied above.

From the percentiles values mild oligohydramnios can be define from the 33rd week of gestation among the Meitei women, when AFI is lower than 5cm. This condition should be taken in consideration because low level of amniotic fluid can make complications during labour.

Conclusion:

The reference range of AFI used in clinical practice should be based on data obtained from the local population as every different population has their own specific reference range. The values or references will assist the obstetricians in assessing the amniotic fluid conveniently during every week of pregnancy and help in bringing improved foetal and maternal care thereby reducing chances of morbidity and mortality.

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