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Cutoff point amniotic fluid index and pregnancy prognosis in the third trimester of pregnancy in Shariati Hospital of Bandar Abbas in 2013-14

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ABSTRACT

Background and purpose of study: Amniotic fluid volume varies according to different stages of fetal growth and its different requirements. Disrupted amniotic fluid volume is associated with an increased risk for the fetus. The present research aims to investigate the effect of cutoff point amniotic fluid index on pregnancy prognosis at the third trimester of pregnancy in Shariati hospital of Bandar Abbas. Materials and methods: In the present analytical, cross-sectional research, AFI ≤ 5 cm was considered as oligohydramnios; AFI 5.1-8 was taken as the cut-off point; AFI > 8.1-24 was regarded as normal; AFI > 24 was considered as polyhydramnios. The data were analyzed via SPSS version 16.0 using Chi-squared test, Fisher's test, Mann-Whitney U-test and Spearman's correlation coefficient. P-value was set at ≤ .05 for the significance of data. Findings: Subjects with cut-off point AFI (5.1-8) were 38 (40.4%); those with normal AFI (8.1-24) were 56 (59.6%). The mean score of AFI was 8.85±9.54cm. The mean age of mother participants was 28.01±6.07 yrs. The mean length of pregnancy was 2.04±37 weeks. The mean gravity score was 1.46±2.4. The mean Apgar score 5 minutes after birth was 1.17±8.52. Quantitative variables were compared between the research groups but showed no statistically significant difference (p>.05). Correlation of AFI and the target qualitative variables was assessed and the only significant correlation showed to be between gender and AFI (CI 95%=1.217-6.860, OR=2.88, P=.015). Conclusion: When AFI was at the cut-off point, fetal and infantile consequences were not significantly different from when AFI was normal. The risk level was low and AFI was higher among female than male feta.

Keywords: Amniotic fluid, Amniotic fluid index (AFI), Oligohydroamnios, Perinatal outcome

INTRODUCTION

Amniotic fluid is a very complicated yellowish fluid located between the amniotic sac and the fetus [1]. Enriched with so many growth factors and nutrients, amniotic fluid plays a key role in fetal growth and is essential for lung maturation [2]. Not only does it allow for the normal movement of organs, but it also protects the fetus against uterine pressures and probable external blows. Amniotic fluid plays a role to maintain fetal temperature and the fluid and electrolyte hemostasis [3].

Amniotic fluid volume varies in the growth process according to fetal needs. Disrupted amniotic fluid volume is associated with a rising risk for the fetus [4]. Amniotic fluid index (AFI) is commonly used to estimate amniotic fluid volume. A proper AFI is between 10 and 24 centimeters [5]. If it is below 5 cm, it might be oligohydramnios [6], and in case AFI is above 24 cm, it can represent polyhydramnios [7].

Among factors leading to oligohydramnios are placental insufficiency, anomalous fetal urinary tract and low amniotic fluid volume. Oligohydramnios can cause altered fetal posture (esp. breech presentation), pressed umbilical cord, meconium stained amniotic fluid, inability to change fetal posture from breech to cephalic, difficulty of ultrasound and in its acute state immature lung [8].

According to an investigation conducted by Morris et al., AFI<5 was positively correlated with asphyxia, C-section, low Apgar score and a pH>7 of the umbilical cord. They also reported a positive correlation between AFI<5 and lengthened pregnancy and, therefore, suggested AFI for predicting prenatal problems [9]. In women whose AFI is at the cutoff point, the frequency of occurrence of Intrauterine Growth Restriction (IUGR) showed to be higher. Moreover, they showed to have more prenatal consequences [5]. Cutoff-point amniotic fluid index has been defined in different ways. Luo et al. defined it as between 5-8 cm; Banks and Miller stated it to be between 5.1 and 9.9 cm; Phelan et al. defined it in the range of 5-8 cm in their research [10-12].

Miller and Banks's investigation indicated that women with a cutoff point AFI had a higher risk of IUGR and are faced with more hazardous pregnancies. According to the definitions of fetal distress, meconium stained amniotic fluid, IUGR, upon an independent analysis of each, no statistically significant difference was observed between the groups. There is a higher risk of IUGR and fetal distress in women with a cutoff-point AFI [11]. Moreover, polyhydramnios was observed in about 2% of pregnancies [13]. These all led us to conduct this research to investigate the effect of cutoff point AFI on pregnancy prognosis in the third trimester in Shariati hospital of Bandar Abbas.

MATERIALS AND METHODS

Subjects

The present analytical, cross-sectional study aimed to investigate the effect of cutoff point AFI on pregnancy prognosis in the third trimester. The research population consisted of all pregnant women who referred to Shariati hospital in Bandar Abbas in 2013-14. The inclusion criteria were healthy women pregnant with a singleton with a healthy water bag in their third trimester of pregnancy. They were supposed to have an ultrasound one week prior to delivery. They were hospitalized in Shariati hospital and their delivery was expected to be in cephalic position. The exclusion criteria were polyhydramnios, oligohydramnios, twinning pregnancy, anomaly, rupture of water bag, placenta previa, placental abruption, uterine anomaly, mother's smoking habit, mother's systemic disease and a history of C-section. According to the inclusion and exclusion criteria, 94 subjects were analyzed.

Research protocol

Patients were initially examined by a gynecologist and an assistant and their information was recorded in a checklist comprised of mother's demographic information (mother's age, length of pregnancy, gravity, type of delivery either vaginal or C-section, preterm labor), fetal information (IUGR, amniotic fluid stained with meconium and fetal distress) and infantile information (Apgor score 5 minutes after birth, hospitalization in NICU and infantile respiratory distress) as well as AFI value. All AFIs lower than 5 cm were included. AFI ≤ 5 cm was considered as oligohydramnios; AFI 5.1-8 was taken as the cut-off point; AFI > 8.1-24 was regarded as normal; AFI > 24 was considered as polyhydramnios.

Statistical procedure

The data entered SPSS version 16.0 and were analyzed through Chi-squared test, Fisher's exact test, Mann-Whitney U-test and Spearman's correlation coefficient. P value ≤.05 was taken as the significance level.

RESULTS

The subjects were divided into two groups according to their AFI: 56 subjects (59.6%) with normal AFI (8.1-24 cm) and 38 subjects (40.4%) with cutoff point AFI (5.1-8 cm). The distribution of the qualitative variables is presented in table 1. The mean AFI was 9.54±8.85. The mean age of mother participants was 28.01±6.07 yrs. The mean length of pregnancy was 2.04±37 weeks. The mean gravity score was 1.46±2.4. The mean Apgar score 5 minutes after birth was 1.17±8.52. Quantitative variables were compared between the research groups but showed no statistically significant difference (p>.05) (table 2). Correlation of AFI and the target qualitative variables was assessed and the only significant correlation showed to be between gender and AFI (CI 95%=1.217-6.860, OR=2.88, P=.015). Table 3 indicates these data. Correlation coefficients of AFI and the other quantitative variables are reported in table 4.

Table 1. Distribution of qualitative variables

Variable	Sub-variable	Percentage
Infant's gender	Female	50(%53.2)
	Male	44(%46.8)
	Total	94(100%)
Type of delivery	C-section	59(%62.8)
	Vaginal	35(%37.2)
	Total	94(100%)
IUGR	Yes	7(%7.4)
	No	87(%92.6)
	Total	94(100%)
Amniotic fluid stained with meconium	Yes	3(%3.2)
	No	91(%96.8)
	Total	94(100%)
Need for hospitalization in NICU	Yes	8(%8.5)
	No	86(%91.5)
	Total	94(100%)
Fetal distress	Yes	7(%7.4)
	No	87(%92.6)
	Total	94(100%)
Infant's respiratory distress	Yes	9(%9.6)
	No	85(%90.4)
	Total	94(100%)

Table 2. Analysis of quantitative data

Variable	AFI		P-value
	1.5-8 cm (38)	8.1-24 cm (56)	
Mother's age (year)	28.36±5.91	27.76±6.22	0.700
Length of pregnancy (week)	36.68±1.90	37.21±2.12	0.118
Apgar score 5 minutes after birth	8.63±1.02	8.44±1.26	0.370
Gravity (frequency of pregnancy)	2.34±1.36	2.44±1.26	0.882

Table 3. Analysis of qualitative variables

Variable	Sub-variable	AFI (5.1-8 cm)	AFI (8.1-24 cm)	Total number	P-value	OR	CI 95%
IUGR	Yes	4(57.1%)	3(42.9%)	7(100%)	0.435	2.078	0.438 – 9.860
	No	34(39.1%)	53(60.9%)	87(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Fetal distress	Yes	4(57.1%)	3(42.9%)	7(100%)	0.435	2.078	0.438 – 9.860
	No	34(39.1%)	53(60.9%)	87(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Type of delivery	C-section	28(47.5%)	31(52.5%)	59(100%)	0.071	2.250	0.924 – 5.520
	Vaginal	10(28.6%)	25(71.4%)	35(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Need for hospitalization in NICU	Yes	3(37.5%)	5(62.5%)	8(100%)	0.860	0.874	0.196 – 3.897
	No	35(40.7%)	51(59.3%)	86(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Preterm labor	Yes	15(53.6%)	13(46.4%)	28(100%)	0.910	2.157	0.878 – 5.300
	No	23(34.8%)	43(65.2%)	66(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Gender	Female	26(52%)	24(48%)	50(100%)	0.015	2.880	1.217 – 6.860
	Male	12(27.3%)	32(72.7%)	44(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Amniotic fluid stained with meconium	Yes	1(33.3%)	2(66.7%)	3(100%)	1.000	0.730	0.774 – 8.344
	No	37(40.7%)	54(59.3%)	91(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Infant's respiratory distress	Yes	6(66.7%)	3(33.3%)	9(100%)	0.151	3.312	0.774 – 14.174
	No	32(37.6%)	53(62.4%)	85(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			
Apgar score 5 minutes after birth	<7	4(50%)	4(50%)	8(100%)	0.711	1.529	0.358 – 6.531
	≥7	34(39.5%)	52(60.5%)	86(100%)			
	Total	38(40.4%)	56(59.6%)	94(100%)			

Table 4. Spearman's correlation coefficients

Variable		Mean AFI in the cutoff point AFI group	Mean AFI in the normal AFI group	Mean AFI of total subjects
Apgar score 5 minutes after birth	Correlation coefficient	0.068 (direct)	0.038 (indirect)	0.078 (indirect)
	P-value	0.683	0.780	0.458
Mother's age	Correlation coefficient	0.227 (indirect)	0.167 (direct)	0.016 (indirect)
	P-value	0.171	0.219	0.881
Length of pregnancy	Correlation coefficient	0.192 (direct)	0.168 (indirect)	0.055 (direct)
	P-value	0.249	0.220	0.595
Gravity	Correlation coefficient	0.036 (indirect)	0.131 (direct)	0.099 (direct)
	P-value	0.831	0.336	0.341

DISCUSSION

Amniotic fluid is a transparent fluid surrounding the fetus [14]. If amniotic fluid volume is lower than 500 cc in the 32-36th week of pregnancy [15] or if AFI is below 5 cm before the term labor, it is considered as oligohydramnios [12]. Within about two weeks of delivery due to immature placenta about 12% of pregnant women are faced with oligohydramnios [16]. Amniotic fluid plays a key role in fetal growth and is, therefore, considered a significant index for monitoring pregnancy [17]. Prenatal screening can cut down on the risk of pregnancy consequences concerned with low amniotic fluid volume [18].

In the present research, subjects were divided in two groups based on their AFI, a normal and a cutoff point group. A comparison was then made between these two. The number of cases with IUGR, fetal distress, infantile respiratory distress and preterm labor was higher in the cutoff point AFI group. The difference, however, was not statistically significant. The number of C-sections, need for hospitalization in NICU and AF stained with meconium was lower in the cutoff point group. The difference was yet not statistically significant. The two groups diverged significantly in terms of infant's gender since the majority of infants in the cutoff point group were female and the risk of cutoff point AFI in girls was 2.8 times as high as boys. No statistically significant divergence was observed in terms of the Apgar score 5 minutes after birth.

Within 2013-14, Meghna et al. conducted their prospective observational research and reported infantile respiratory distress in their two research groups, AFI 5-8 and AFI <5 to be respectively 2.4% and 16.1% which was statistically significant [19]. Group division in this study differs from the present research and this can explain part of the different findings. Anad et al. reported a statistically significant difference in Apgar score (1 minute after birth) between infants with AFI<5 (89%) and AFI>5 (20%) [20]. However, in the present research, Apgar score was reported 5 minutes after birth.

In their research on women pregnant with a singleton in their 37-41st week of pregnancy, Singhal et al. compared a group of 50 subjects (the treatment group) with AFI≤5 with another group of 50 subjects (control) with AFI between 6 and 20. No significant difference was observed in terms of AF stained with meconium, need for hospitalization in NICU and an Apgar score 5-7 minutes after birth. However, the two groups differed significantly in terms of C-section and fetal distress [14]. Similar to the present research, this study involved a low sample size. In another study by Voxman et al., 779 pregnant women were investigated in two groups: AFI<5 and AFI>5. No statistically significant divergence was observed between the two groups in terms of meconium, C-section, need for hospitalization in NICU and an Apgar score below 7 [21].

Kreiser et al. investigated the outcome of pregnancies in which only after the 30th week of pregnancy, the subjects faced lowered AFI. In this retrospective research, 150 mothers pregnant with a singleton with a low risk of lowered amniotic fluid volume were included. A comparison was made between the pregnancy outcome of 57 cases with AFI≤5 and 93 cases with a cutoff point AFI (5-7.5). No statistically significant divergence was observed between these two in terms of amniotic fluid stained with meconium and Apgar scores after 5 and 7 minutes of birth. No prenatal mortality had been reported within these two groups [18].

One of the limitations of this study was low sample size. Therefore, it is suggested that similar research be conducted with a bigger sample size and a stronger methodology.

CONCLUSION

No significant difference was observed in terms of fetal and infantile consequences between the normal and cutoff point AFIs. The risk was low in both. AFI was higher in female feta than the male.

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Ethical issues
In all procedures of this research, the subjects who met the inclusion criteria were ensured of the confidentiality of the data they produced.

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