The Professional Medical Journal
www.theprofesional.com

DOI: 10.17957/TPMJ/17.3704

ORIGINAL PROF-3704

AMNIOTIC FLUID ASSESSMENT;

DYNAMIC ROLE OF ULTRASONOGRAPHY IN AMNIOTIC FLUID ASSESSMENT IN PREGNANCY IN PAKISTAN

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Article received on:
31/10/2016
Accepted for publication:
15/06/2017
Received after proof reading:
08/09/2017

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ABSTRACT… Objectives: To assess amniotic fluid volume in second and third trimester of pregnancy in Pakistani population. **Period:** Three months. **Setting:** Talha ultrasound, Multan. **Material and Methods:** I have started my work by collecting data from the month of November, 2015 to February, 2016. The machines which have been used for data collection were Xario and Z-5 ultrasound Doppler machines with transabdominal (3.5-5MHz) probes. A group of 100 Pakistani married female patients of different age groups was included. These patients were having normal criteria of second and third trimester (14-40 weeks gestational age). **Results:** 100 married female patients were selected having different age group. There were no significant difference found in the means of large pocket volume and four pocket volumes of second and third trimester of pregnancy. **Conclusion:** Ultrasound plays an important role in assessment of amniotic fluid volume. If there is one unit change in large pocket volume (LPV) than four pocket volume (FPV) will change by 2.37 and 2.146 in second and third trimester, respectively.

Key words: Amniotic fluid, polyhydramnios, oligohydramnios

Article Citation: Ali A, Shoukat M, Bashir MU, Danyal A. Amniotic fluid assessment; Dynamic role of ultrasonography in amniotic fluid assessment in pregnancy in pakistan. Professional Med J 2017;24(9):1365-1375. **DOI:** 10.17957/TPMJ/17.3704

INTRODUCTION

Amniotic fluid or liquor amniotic is the liquid contained by amniotic sac of pregnant female. It surrounds the developing embryo, protects it from shock and helps in healthy fetal growth. After conception, the amniotic sac which is also known as amnion starts to form on 12th day. This amniotic sac swells as the fetus grows. It is the set of membranous tissues that forms during early pregnancy. It is also known as bag or bag of water. The fluid in sac creates temperature control. It is twice by a degree warmer than normal body temperature.[1]

Amnion is composed of two layers which surround and protects the baby, enclosing the amniotic cavity. It is first among the three embryonic cavities (amnion, chorion, & yolk sac) to develop. The outer layer is of amniotic ectoderm which is made up of single stratum of flattened, ectodermal cells, and the inner layer is made up of prismatic ectoderm of the embryonic disc. Further the amniotic ectoderm is covered by a thin layer of mesoderm that is connected to mesodermal lining of chorion through the body stalk. The combination of ectoderm and mesoderm is known as somatopleure which give rise to both the amniotic and chorionic membranes. These layers have blood supply to the different regions, the ectodermal tissues supplies to the epithelial cells & the mesodermal cells supply blood to form this epithelium. The amniotic membrane separates the amniotic cavity from the cytotrophoblast, this amnion appears on 8th day of human development.

The amniotic fold is formed when the primitive digestive tube of embryo joins the yolk sac & the somatopleure folds move upward, the fold tips meet and fuse over the dorsal aspect of embryo forming the amniotic cavity. The two layers of amniotic fold become completely separated, the inner layer forms the amnion & the outer layer forms the false amnion or serosa. The extra embryonic coelom is the space between amnion & serosa. At the early stage of development the amnion is in direct contact with embryo but at fourth or fifth week of gestation amniotic fluid

begins to accumulate within it. Gradually, this fluid increases in quantity and causes the amnion to expand & to ultimately adhere to inner surface of chorion.[2]

LITERATURE REVIEW

During the early pregnancy, the composition of amniotic fluid is similar to that of fetal plasma. During first trimester, fetal urination or swallowing does not contribute to the volume of amniotic fluid. First of all fetal urine and fetal lungs help in formation of amniotic fluid. Amniotic fluid volume is age dependent and reaches its peak during 36-38 weeks of gestation.[3]

The amniotic fluid is measured by two methods, four quadrant methods and by measuring largest vertical pocket. In Pakistan normal range of amniotic fluid volume lies between 5-22. In pregnancy disorders amniotic fluid production also occur, the major abnormalities are polyhydramnios and oligohydramnios. Polyhydramnios is defined as excessive amniotic fluid volume in which AFI is more than 22 or in other words more than 8cm in single vertical pocket. Oligohydramnios is defined as decreases in amniotic fluid volume, when AFI is less than 5 or single pocket is less than 2cm. there are multiple causes of oligohydramnios. These abnormalities are associated with increased risk of perinatal mortality and morbidity.[4]

The amniotic fluid is the most important thing in the valuation of fetal well-being. The appearance of amniotic fluid is anechoic in nature, sometimes it contain echogenic particles which make it hazy in appearance. (Figure-1,2)

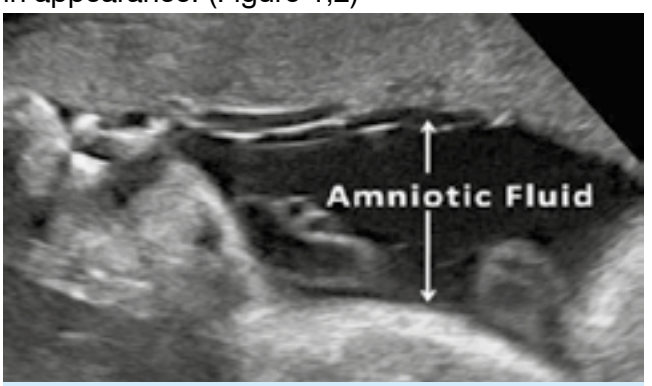


Figure-1. Clear or normal appearance of amniotic fluid.

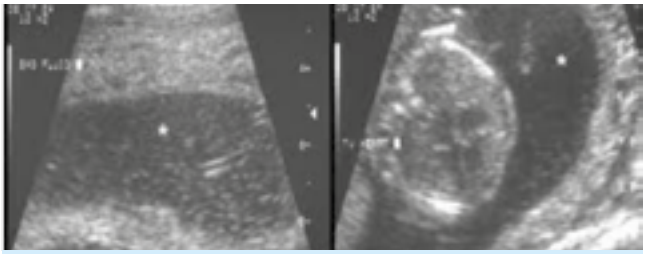


Figure-2. Echogenic or hazy appearance of amniotic fluid.

These echogenic particles are due to vernix in third trimester, intra-amniotic hemorrhage and infection. The amniotic fluid volume is measured by using three techniques i-e Quantitative, Semi quantitative and subjective. Semi quantitative measurement is further divided into two techniques, first is named as largest vertical pocket, this method helps in later stages of gestation. This measurement is done at right angle of uterine wall. A pocket depth of 0-12cm is considered as oligohydramnios, 2.1-8cm as normal and more than 8cm as polyhydramnios.

There are some draw backs in amniotic fluid estimation. The most common errors are excess of transducer pressure, maternal obesity, floating particles in fluid. Uterine and myometrium contractions also cause underestimation of amniotic fluid volume.[5]

Amniotic fluid is a complex substance essential to the fetal well-being. By the 8th weeks of gestation fetal kidneys make urine, shortly thereafter fetal swallowing begins, however, neither fetal urination nor swallowing contributes significantly to the content of volume of AF until the second half of pregnancy.[6]

Urine has observed in fetal bladder as early as 11th weeks trans-abdominally and 9th weeks transvaginally. Fetal urine results in progressively hypotonic fluid that contains a large amount of urea, uric acid and creatinine as the fetal kidneys mature.[7]

In the early fetal period, amniotic fluid volume and fetal size are related in linear fashion.[6] At 12th weeks gestation, the average volume is 60ml, by 16th weeks it becomes 175ml.[7] Amniotic fluid

volume increases from about 25ml at 10th weeks to about 400ml at 20th weeks. At third trimester, the net increase of amniotic fluid is only 5-10ml/week. By 28th weeks of gestation, amniotic fluid reaches a volume of approx. 800ml where it plateaus near term and therefore decline to approx. 400ml at 42th weeks.[6] Amniotic fluid is formed by fetal lungs fluid about 100 ml per day. At term inspiratory flow in the fetus is approx.200ml/kg/day up to 600 to 800 ml/day.[7]

Methods to measure amniotic fluid index

Mostly, the sonographer can evaluate amniotic fluid volume by five methods.[8]

Subjective evaluation

In this method sonographer directly evaluate amniotic fluid volume by observing amniotic fluid pockets. This is also known as eyeball assessment. It is easy to measure amniotic fluid during third trimester as fetal abdomen is close to anterior and posterior wall of uterus. But when the examination is performed by not so experienced sonographer, biometric measurement might be helpful in diagnosis of normal or abnormalities of amniotic fluid volume.[8]

Single deepest pocket

In 1981 Manning et al, introduced the concept of amniotic fluid volume determination using the depth of single deepest maximum vertical pocket visible during scanning. They gave normal ranges of amniotic fluid volume, they defined oligohydramnios or reduced fluid volume as MVP as <1cm. later on, Chamberlain et al defined MVP of 2 to 8 cm as normal. This suggests that volume less than 2cm is considering as oligohydramnios and pocket volume more than 8cm as polyhydramnios. When maximum vertical pocket is in normal range perinatal mortality is 2-4/1000; mortality rate increases 13fold when amniotic fluid volume decreases (pocket less than 2cm) and increases 47folds when sever oligohydramnios (MVP <1cm) is present.

Two diameter pocket

In 1992, Magann introduced this two diameter pocket method. In this method the maximum vertical pocket is multiplied by horizontal diameter of same pocket. The pocket must be free of umbilical cord and fetal parts. According to this method normal amniotic fluid volume lies between 15.1 to 50cm^2, polyhydramnios as more than 50cm^2 and oligohydramnios as 0 to 15cm^2. During this study, Magann did comparison between largest vertical pocket (LVP), largest transverse pocket (LTP) and the mean amniotic fluid diameter (MAFD), then he concluded that up to the second trimester mean amniotic fluid diameter is the parameter that shows the highest correlation coefficient (r=0.99) and the lowest intra and inter-observer variability 0.21 and 0.36 cm, respectively.[8]

Amniotic Fluid Index

In 1987, Phelan et al proposed this method in which four largest pockets are sum to get total volume of amniotic fluid in uterus. In this method uterus is divided into upper, lower, right and left quadrant by using umbilicus and lineanigra as reference points where they intersect each other at right angles. During the examination ultrasound transducer must be in sagittal plane to the patient, it should not be angled according to maternal abdominal curvature. For this purpose color flow Doppler ultrasound should be used because the loops of umbilical cord are not visible on grey scale. In this method normal amniotic fluid index is considered between 8.1 to 18cm, very low volume < 5cm and very high > 18cm.[9]

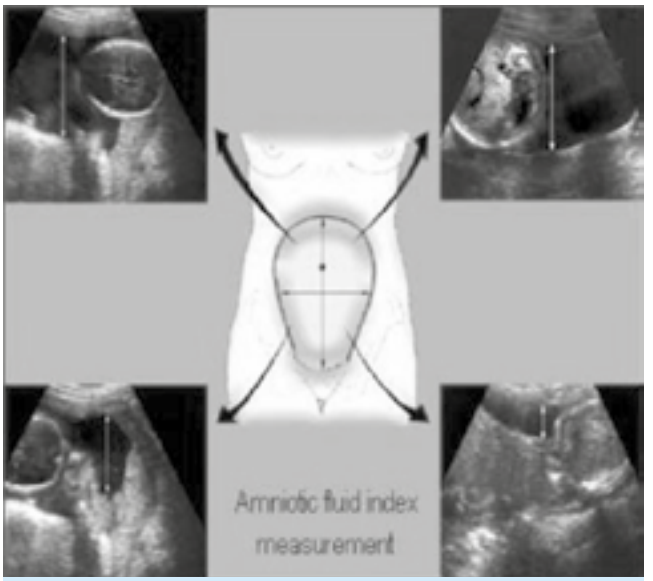


Figure-3. Method to measure amniotic fluid index.

Four Quadrant Method

This is the most widely used method in 1990s. It is important due to its simplicity, easiness and readily available for semi- quantitative measurement of amniotic fluid volume. The amniotic fluid is undoubtedly evolved from other semi quantitative methods, used in the main for the diagnosis of oligohydramnios. Some of these are based on measurement of largest vertical pocket of amniotic fluid, for which the normal curve is defined by a single cut-off point, independently of gestational week: 1cm for Manning, 2cm for Chamberlain and 3cm for Crowley. This method is based on subdivision of abdomen into four quadrants. It is difficult to perform this method in second trimester, although in third trimester subdivision of abdomen in to four quadrants does not pose a problem. The largest vertical pocket of each quadrant is sum to get amniotic fluid index and AFI can be get after 20th weeks of gestation. In one study, Gramellini et al have been shown that the AF volume is increasing by 10ml per week at 8th weeks, by 25mL per week at 13th weeks and by a maximum of 60ml per week at 21st weeks of pregnancy. After 22nd weeks' gestation, the increase in AF volume drops significantly, with zero increase at 33rd weeks' gestation.[10]

Modification of ultrasound quantification

The use of color Doppler has been added as a means to identify the umbilical cord in amniotic fluid in an effort to better diagnose oligohyramnios. Using dye-determined AFV as the benchmark, Magann, et al compared gray scale ultrasonography to Doppler color ultrasonography and found that Doppler not only over-diagnosed oligohydramnios, but labeled 37% of women with normal AFV as having oligohydramnios. The use of color Doppler is not recommended when evaluating amniotic fluid volume.[11]

MATERIALS AND METHODS

I started my work by collecting data from the month of November, 2015 to Febuary, 2016. This study was conducted at Talha Ultrasound Centre Multan. The machines which have been used for data collection were Xario and Z-5 ultrasound Doppler machines with transabdominal (3.5-5 MHz) probes. A group of 100 Pakistani female married patients of different age groups was included. The patients having normal criteria of second and third trimester (14-40 weeks gestational age) were added. In each patient transabdominal ultrasound was carried out in supine position. The method used for assessment of amniotic fluid volume was four quadrant method. According to this method, 4 imaginary pockets were formed by drawing a horizontal and a vertical line using umbilicus as center point. Probe was vertically placed in each pocket. Each pocket was free of loops of umbilical cord and fetal parts, for this purpose color Doppler was used. The largest vertical length of each pocket of fluid was measured in each quadrant and then added to the others. An amniotic fluid index between 5.5- 22 was considered normal. An amniotic fluid index < 5.5 was considered as oligohydramnios and an amniotic fluid index > 22 was considered as polyhydramnios. Only normal measurement of amniotic fluid index was included in my study.

There is no patient identification and an individual patient detail is published. Permission of ultrasound from the department at the area of study is taken to use the patient data. All the data collected during study is stored in personal computer, data collecting sheets are protected. The statistical analysis of data is carried out by using statistical package for social sciences. (Spss-20).

RESULTS

Descriptive measure

The mean gestational age of the 100 patients included in the study was 202.74 $\pm$34.80 with range (101-272). Table-I

Among 100 pregnant ladies 40 (40%) was in second trimester and 60 (60%) was in third trimester. Table-II

The mean gestational age of 40 females for second trimester was 168.58 $\pm$19.98 with range 101-196. Large pocket volume of 40 females for second trimester has mean 4.72 ($\pm$0.88) with range 3.10 – 6.60. The mean volume for four

pockets was observed 14.67 ±2.80 with range 8.20 -21.60. Table-III
The mean gestational age of 60 females for third trimester was 225.52 ±21.21 with range 198 – 272. Large pocket volume for third trimester shows mean 4.91 ± 1.29 with range (2.7- 3.9). The mean volume for four pocket volume was 14.09 ±3.35 with range 7.6 – 21.1. Table-IV

Among 100 pregnant ladies 96 (96 %) patients have echo free(clear) amniotic fluid and only 4 (4%) have hazy appearance of amniotic fluid. Table- V

Among 100 patients 84 (84%) have no complaint regarding their health, 13 (13%) have low blood pressure, 2 (2%) have high blood pressure and only 1 (1%) was suffering from diabetes. Table-VI

Cross tabulations

In second trimester 38 (95%) among 40 was echo free, and only 2(5%) shown hazy appearance. In third trimester 58 (96.6%) among 60 was echo free while 2 (3.3%) appeared hazy. Table-VII

There were 35 (87.5 %) in second trimester who have no complaints, 5 (12.5%) have low blood pressure. In third trimester 49 (81.6%) females have no complaints, 8 (13.3%) having low blood pressure, 2 (3.3%) with high blood pressure and only 1 (1.6%) have diabetes. Table-VIII

In second trimester 34 patients with echo free pattern have no complaints, 4 patients with echo free pattern have low blood pressure, 1 patient with hazy appearance has no complaint and 1 has low blood pressure. No patient in second trimester was suffering from high blood pressure and diabetes. In third trimester 49 patients with echo free pattern have no complaints, 6 patients have low blood pressure, 2 patients with echo free have high blood pressure, 1 patient with echo free has diabetes and only 2 patients with hazy appearance of amniotic fluid have low blood pressure, no patient in third trimester have high blood pressure or diabetes. Table-IX

Analytic studies

There were no significant difference found in the means of large pocket volumes of two trimester second and third as t = -0.855 (DF =98) with p-value =0.395. Table X

The sample provide us no evidence of significant difference between means of four pocket volumes of second and third trimester as t = 0.93 with p-value = 0.355. Table XI

A regression model is observed between large pocket volume and four pocket volume in second trimester. The four pocket volume depends upon large pocket volume. This model 74% clearly depicts the explained variation in dependent variable.

The result of ANOVA F = 48.267 (df= 1) with p= 0.000 < 0.05 is significant

$$Y = \alpha + \beta(X)$$

FPV (second trimester) = 3.467 + 2.371 (LPV)
X = LPV (Independent variable)
Y = FPV (Dependent variable

If there is one unit change in LPV (second) than FPV (second) will change by 2.37.Table XII

A regression model is observed between large pocket volume and four pocket volume in third trimester. The four pocket volume depends upon large pocket volume. This model 83% clearly defines the explained variation in dependent variable.

The result of ANOVA F = 129.637 (df=1) with p= 0.000 < 0.05 is significant.

$$Y = \alpha + \beta(X)$$

FPV (third trimester) = 3.552 + 2.146 (LPV)
X = LPV (independent variable)
Y = FPV (Dependent variable)

If there is one unit change in LPV (third trimester) than FPV (third trimester) will change by 2.146. Table XIII

	No. of patients	Range	Minimum	Maximum	Mean	Standard Deviation	Standard Error
Large Pocket Volume	100	6.60	2.70	9.30	4.83	1.15	0.11
Four Pocket Volume	100	14.00	7.60	21.10	14.32	3.14	0.31
Gestational Age	100	171.00	101.00	272.00	202.74	34.80	3.48

Table-I. Descriptive measure

	No. of Patients	Percentage
Second Trimester	40	40%
Third Trimester	60	60%
Total	100	100%

Table-II. Trimester

	No. of patients	Range	Minimum	Maximum	Mean	Standard Deviation	Standard Error
Large Pocket Volume	40	3.50	3.10	6.60	4.72	0.88	0.14
Four Pocket Volume	40	13.40	8.20	21.60	14.67	2.80	0.44
Gestational Age	40	95.00	101.00	196.00	168.58	19.98	3.16

Table-III. Descriptive measure of second trimester

	No. of patients	Range	Minimum	Maximum	Mean	Standard Deviation	Standard Error
Large Pocket Volume	60	6.60	2.70	9.30	4.91	1.29	0.16
Four Pocket Volume	60	13.50	7.60	21.10	14.09	3.35	0.43
Gestational Age	60	74	198.00	272.00	225.52	21.21	2.74

Table-IV. Descriptive measure of third trimester

	Frequency	Percentage
Echo free	96	96%
Hazy	4	4%
Total	100	100%

Table-V. Echo pattern of amniotic fluid

	Frequency	Percentage
Nil	84	84%
Low B.P	13	13%
High B.P	2	2%
Diabetic	1	1%

Table-VI: Any relevant complaint

Trimester	Echo Free (%)	Hazy (%)	Total
Second Trimester	38 (95 %)	2(5%)	40
Third Trimester	58 (96.6%)	2 (3.3%)	60

Table-VII. Cross- Tabulation trimester, echo pattern of amniotic fluid

	Complaints				
Trimester	Nil	Low B.P	High B.P	Diabetic	Total
Second Trimester	35(87.5%)	5(12.5%)	0 (0%)	0 (0%)	40
Third Trimester	49(81.6%)	8 (13.3%)	2 (3.3%)	1 (1.6%)	60
Total	84	13	2	1	100

Table-VIII. Cross-tabulation trimester relevant complain

Trimester			Complaints				Total
			Nil	Low B.P	High B.P	Diabetic	
Second Trimester	Ecopatteren of Amniotic Fluid	Echo free	34	4	0	0	38
		Hazzy	1	1	0	0	2
	Total		35	5	0	0	40
Third Trimester	Ecopatteren of Amniotic Fluid	Echo free	49	6	2	1	58
		Hazzy	0	2	0	0	2
	Total		49	8	2	1	60

Table-IX. Cross tabulationtrimester, relevant complaint

	Trimester	N	Mean	Std. Deviation	Std. Error Mean
Large pocket volume	Second trimester	40	4.7250	.88455	.13986
	Third trimester	60	4.9117	1.29851	.16764

Analytic Statistics
Table-X. Group Statistics

Independent Samples Test									
	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Large pocket volume	5.762	.018	-.794	98	.429	-.18667	.23510	-.65321	.27988
Equal variances assumed									
Equal variances not assumed			-.855	97.937	.395	-.18667	.21832	-.61992	.24658

	Trimester	N	Mean	Std. Deviation	Std. Error Mean
Four pocket Volume	Second trimester	40	14.6680	2.80334	.44325
	Third trimester	60	14.0917	3.35232	.43278

Table-XI: Group Statistics

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Differ-ence	Std. Error Differe-nce	95% Confidence Interval of the Difference	
									Lower	Upper
Four pocket volume	Equal variances assumed	2.722	.102	.898	98	.372	.57633	.64204	-.69778	1.85044
	Equal variances not assumed			.930	92.959	.355	.57633	.61949	-.65386	1.80653

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.467	1.640		2.115	.041
	LPV second	2.371	.341	.748	6.947	.000
a. Dependent Variable: FPV second						

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748[a]	.560	.548	1.88489

a. Predictors: (Constant), LPV second
b. Dependent Variable: FPV second

Anova[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	171.482	1	171.482	48.267	.000[b]
	Residual	135.007	38	3.553		
	Total	306.489	39			

a. Dependent Variable: FPV second
b. Predictors: (Constant), LPV second

Table-XII. Model Summary

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.467	1.640		2.115	.041
	LPV second	2.371	.341	.748	6.947	.000

a. Dependent Variable: FPV second

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.686	1.87981

a. Predictors: (Constant), LPV third

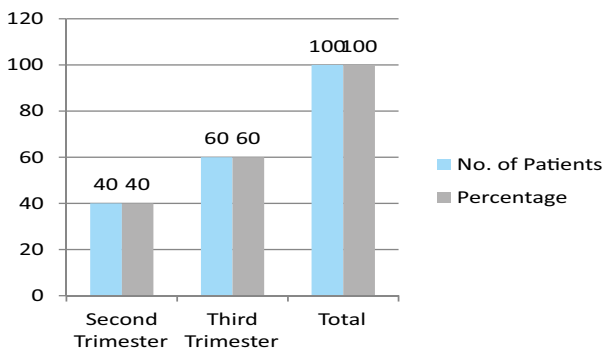
Table-XIII. Model Summary

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	458.093	1	458.093	129.637	.000[b]
	Residual	204.953	58	3.534		
	Total	663.046	59			

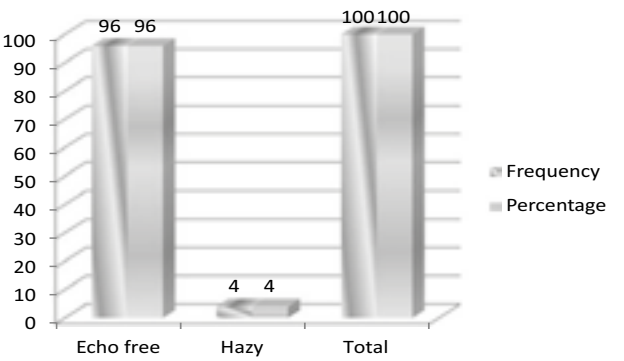
a. Dependent Variable: FPV third
b. Predictors: (Constant), LPV third

Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.552	.957		3.711	.000
	LPV third	2.146	.188	.831	11.386	.000

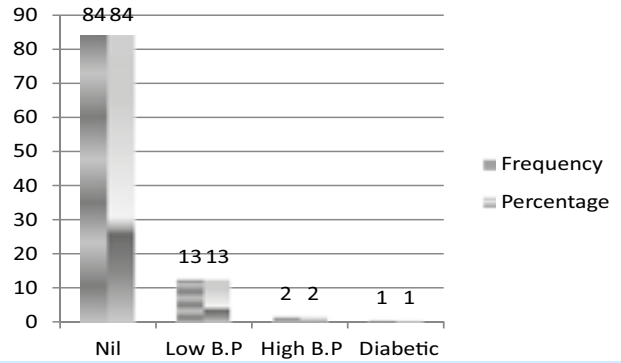
a. Dependent Variable: FPV third



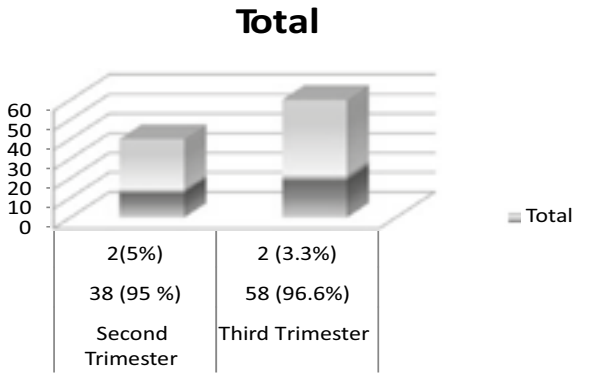
Graph-II. Trimester



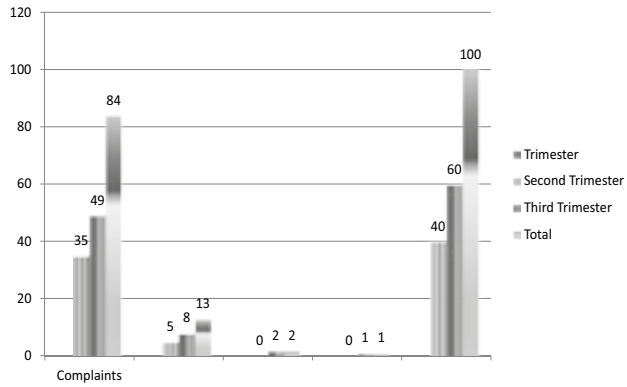
Graph-V. Echo pattern of amniotic fluid



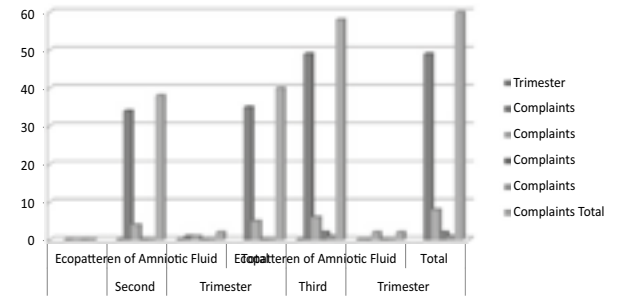
Graph-VI. Any relevant complaint



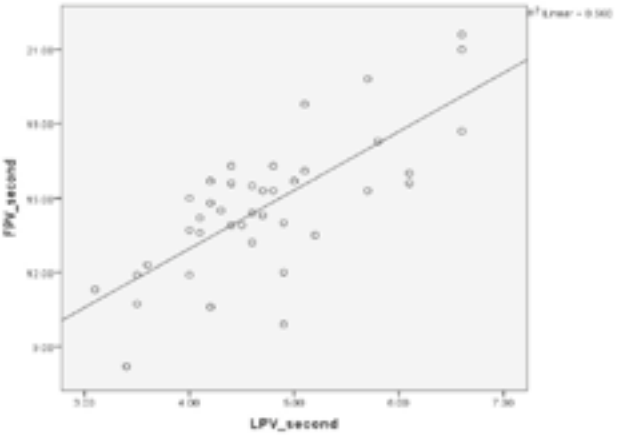
Graph-VII. Tabulation



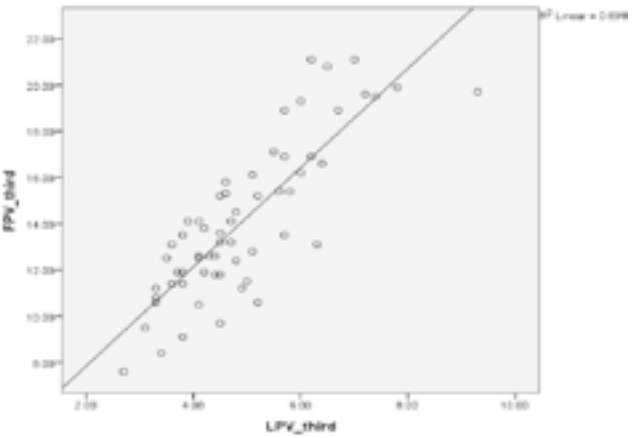
Graph-VIII- Cross-tabulation trimester relevant complain;



Graph-IX. Cross tabulationtrimester, relevant complaint



Graph: XII. FPV and LPV
LPV = Largest Pocket Volume of second trimester.
FPV =Four Pocket Volume of second trimester.



Graph: XIII. FPV and LPV
FPV = Four Pocket Volume of third trimester.
LPV = Largest Pocket Volume of third trimester.

DISCUSSION

It is an observational cross sectional study. The objective of my research work was to observe role of ultrasound in assessment of amniotic fluid in second and third trimester of normal pregnancies and to evaluate the effect of amniotic fluid volume on pregnancy outcome. Amniotic fluid index should be assessed either qualitatively or quantitatively at every antenatal ultrasound examination because abnormalities of amniotic fluid volume are associated with a variety of pregnancy complications. Ultrasound techniques used to estimate the adequacy of amniotic fluid volume include the single deepest pocket (SDP) and amniotic fluid index (AFI). Amniotic fluid volume estimation is an important part of

routine obstetric sonography. We compared amniotic fluid volume estimation obtained using two commonly employed sonographic methods subjective visual assessment and amniotic fluid pocket measurements. Estimates obtained using both methods correlated closely.[12]

Ultrasound provides pregnant women with important medical information. The purpose of my study is to establish a normative scale of amniotic fluid index (AFI) or four quadrant amniotic fluid indexes throughout gestation in uncomplicated singleton pregnancies. In the assessment of amniotic fluid volume research of 100 patients conclude that only 4% patients have hazy appearance of amniotic fluid while 96% patients have normal appearance of amniotic fluid.[13]

The data of these patients shows that amniotic fluid volume in second trimester increases progressively while there is slight reduction in amniotic fluid volume of third trimester. Statistically correlation between large pocket volume and four pocket volumes is proved that if there is one unit change in large pocket volume than four pocket volume will change by 2.37 and 2.146 in second and third trimester, respectively. It is concluded that the ultrasound plays a key role in fulfillment of the aims of my research work as it was to assess amniotic fluid volume and its effect on pregnancy outcome. According to international studies there is decrease in volume of third trimester of pregnancy as compared to second trimester; it is also proved in my research work. It is concluded that only 4% population of Pakistan has hazy appearance and 96% population have clear appearance of amniotic fluid. Colour Doppler ultrasound also plays a vital role in making pockets of amniotic fluid. It is used to avoid umbilical cord loops and fetal parts. Ultrasound has vast role in assessment of amniotic fluid volume.[14,15]

CONCLUSION

The objective of my study was to evaluate the role of ultrasound in assessment of amniotic fluid volume in second and third trimester of pregnancy in Pakistani population; I concluded that amniotic fluid index and single deepest vertical pocket are the more commonly employed techniques for assessing adequacy of amniotic fluid. According to this amniotic fluid index less than 5.5 is considered as oligohydramnios and more than 22 is considered as polyhydramnios. The normal range of amniotic fluid index lies within 5-22.

Recommendation

Further study should be conducted to standardize the value of coefficient of regression in both trimesters, second and third.
Ultrasound should be recommended to those females, who do not show labour pains after 38 or 39 weeks to get the measurement of amniotic fluid volume till delivery.

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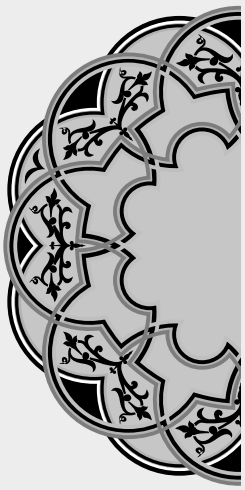

"It's difficult to follow your dream. It's a tragedy not to."

Unknown

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