

STUDY OF PRENATAL DEVELOPMENTAL EVENTS IN FIRST TRIMESTER OF PREGNANCY IN KHYBER PAKHTUN KHUWA AN ULTRASONIC STUDY

Munila Shabnum Khattak¹, Sadaf Ambreen¹, Shabnum Aamir¹, Shahabuddin², Zia Ud Din¹

¹Department of Anatomy, Khyber Medical College Peshawar.

²Department of Anatomy, Khyber Girls Medical College Peshawar.

Available Online 28- March 2019 at <http://www.jkcd.edu.pk>

DOI: <https://doi.org/10.33279/2307-3934.2019.9106>

ABSTRACT

Objective: To study the prenatal developmental anatomy in first trimester of pregnancy in Khyber Pakhtun Khuwa.

Materials and methods: The cross sectional study was conducted on 600 pregnant females visiting the antenatal clinic of Khyber Teaching Hospital Peshawar and Khyber clinic (Jamrud). The duration of study was 6 months. A pregnant women greater than 16 years of age, willing for ultrasound was selected, poor visualization due to technical factors like obesity, surgical scar were excluded. All the patients were enlisted under informed consent. Detailed obstetrical history was taken. The embryos were visualized with the help of abdominal ultrasound. Data were recorded followed by statistical analysis and presented as percentages.

Results: In the present study, 591 cases (98.5%) were single, 8 (1.33%) cases were twin and one case is (0.16%) of triplets. The distributions of normal and abnormal cases were studied in first trimester. The shape of gestational sac was regular in 370(61.66%) and irregular in 230(38.33%) Yolk sacs were identified in 430(71.6%) cases, while in 170(28.33%) of cases yolk sac could not be identified. It could not be identified in 50 (8.33%) of cases due to early pregnancy and in 120 (20%) of cases due to abnormal pregnancy. The Fetal pole was detected in 150(25%) cases and could not be identified in 450 (75%) of cases. The relationship of gestational age, gestational sac and crown rump length in normal pregnancy was observed.

Conclusions: There is linear increase in measurements of fetal growth parameters as the gestational age increases. For the assessment of gestational age in the first trimester, ultrasound is an accurate and useful modality.

Key words: Trimester, Gestational sac, Yolk sac and Crown rump length.

INTRODUCTION

In humans, like other species, new life begins as a single cell. During the developmental process the fertilized egg divides repeatedly, producing many different cells and tissues. A unique feature of the mammalian embryo is that its development is hidden within the uterus and needs to be explored. Luckily, sophisticated methods are now available to monitor it in humans. The dynamics of human fertilization were discovered by scientists in nineteenth century.^{1,2} Ultrasonography has become the method of choice in examination and evaluation of obstetrical patients. It is non-invasive technique and does not use radiation. It is the standard method of evaluating the growth and development of the embryo and the fetus³. Ultrasonic assessment of gestational age has become an integral part of obstetrical practice^{4,5}.

In the first trimester of pregnancy, the two parameters of gestational sac (GS) measurement and crown rump length

(CRL) measurement, are commonly used for the assessment of gestational age.^{6,7,8} The gestational sac is the first recognizable structure seen at 5 weeks gestation by transabdominal ultrasound. Gestational sac is a space, which is echo free having an embryo, fluid and extra embryonic structure. This sac is surrounded by prominent bright echogenic ring.⁹

Yolk Sac is also one of the most important conception structure seen ultrasonically in the first trimester. The gestational outcome is related to the size and shape of yolk sac. The yolk sac provides nutrition, immunologic and hematopoietic functions before the establishment of placental circulation.¹⁰ The presence of embryo in the absence of yolk sac on transvaginal ultrasonography is always abnormal and is associated with embryo death.^{11,12}

The other significant parameter in first trimester is CRL measurement.^{13,14} The CRL measurement in first trimester is considered to be one of the best parameter for estimation of gestational age.^{15,16,17}

The present study is designed to assess the prenatal developmental events in first trimester of pregnancy by using the above mentioned parameters, to facilitate the diagnosis and progress of pregnancy.

Correspondence:

Dr. Munila Shabnum Khattak

Assistant Professor

Anatomy Department, Khyber Medical College Peshawar

E-mail: m.khattak585@gmail.com

Cell # 03339141031

DOI: <https://doi.org/10.33279/2307-3934.2019.9106>

Available Online at <http://www.jkcd.edu.pk>

DOI: <https://doi.org/10.33279/2307-3934.2019.9106> 01

METHODOLOGY

A cross sectional study was conducted to assess the developmental events in embryonic period. The 600 pregnant females visiting the antenatal clinic of Khyber Teaching Hospital Peshawar and Khyber clinic (Jamrud) during the study period were considered for the study. The study duration was six months. All the patients were enlisted under informed consent. Patients unwilling for ultrasound were excluded. Complete obstetrical history of each patient was recorded. The embryos were visualized with the aid of abdominal ultrasound.

The following parameters were mainly focused in the present study.

- i. Gestational sac measurement (Yolk sac and Fetal pole)
- ii. Crown rump length.

Serial ultrasonic measurements were recorded from 5th week to 12th weeks of gestation to assess the gestational age by measuring the gestational sac, yolk sac and crown rump length. The examination was done by transabdominal ultrasound having convex probe of 3.5M HZ frequency. Data were recorded and entered on excel sheet followed by statistical analysis. Percentages were calculated for all variables.

RESULTS

In the current study 591 cases (98.5%) were observed having single pregnancy, 8 (1.33%) cases were of twin pregnancy and one case (0.16%) of triplets (Table 1). The distribution of normal and abnormal cases were studied in first trimester showed that in the category of 5-6 weeks, 120(60%) were normal and 80(40%) cases were abnormal, in 7-8 weeks category 100(50%) were normal and 100(50%) were abnormal while in 9-12 weeks category 150(75%) were normal and 50(25%) were found

abnormal (Table 2). The shape of gestational sac was regular in 370(61.66%) and found irregular in 230(38.33%) of cases. In the present study the distribution of normal and abnormal cases according to gestational age in 5-6 weeks category includes 120(60%) with regular shape GS and 80(40%) with irregular GS, in 7-8 weeks category 100(50%) were having regular shape GS while 100 (50%) cases were irregular in shape, in 9-12 weeks category 150(75%) with regular shape GS and 50(25%) of case were having irregular shape GS. Yolk sacs were identified in 430 (71.6%) cases, while in 170(28.33%) of cases yolk sac could not be identified. It could not be identified in 50 (8.33%) of cases due to early pregnancy and in 120 (20%) of cases, yolk sac could not be seen due to abnormal pregnancy (Table 3).

The detection of yolk sac during different stages of pregnancy showed that in the category of 5-6 weeks, in 100(50%) cases yolk sac could be visualized and in 100 (50%) it could not be seen; in 7-8 weeks category, in 150(75%) cases it was detected and in 50(25%) of cases it could not be identified while in 9-12 weeks category it could be visualized in 180(90%) cases and could not be detected in 20(10%) of cases. The Fetal pole was detected in 150(25%) cases and could not be identified in 450 (75%) of cases (Table 4).

The relationship of gestational age, gestational sac and crown rump length in normal pregnancy was observed. The measurement of gestation sac varied unevenly from 5-9 weeks. Maximum increase was seen in 6-7 weeks category which was 8 mm while 6mm increase was observed in the 8th week category and an increase of 7.6mm was noted in 9th week category. The relationship of crown rump length and gestational age revealed increase in length of 6.5 -16 mm per week and maximum increase was seen in 12-13 weeks category (Table 5).

Table 1: Percentage of gestational sacs seen during first trimester

S. No	No of gestational sacs	No of Cases	% age
1	Single Gestation Sac	591	98.5
2	Twin Gestation Sac	8	1.33
3	More than two	1	0.1

Table 2: Distribution of normal and abnormal cases observed in the first trimester of pregnancy (n = 600)

S. No	Weeks	Total no of cases	Normal	%	Abnormal	%
1	5-6	200	120	60	80	40
2	7-8	200	100	50	100	50
3	9-12	200	150	75	50	25

Table 3: Detection of yolk sac during first trimester (n = 600)

S. No	Identification	No of cases	%	
1	Seen	430	71.66	
2	Not seen	Early pregnancy	50	8.33
		Abnormal	120	20

Table 4: Identification of fetal pole during the first trimester (n = 600)

S. No	Identification	Total no of cases	%
1	Visualized	150	25
2	Not visualized	450	75

Table 5: Mean gestational sac measurement and measurement of CRL at different gestational ages

Gestational age in weeks	Gestational sac in mm Mean ± SD	CRL in mm Mean ± SD
5	14.17 ± 2.37	—
6	18.87 ± 0.34	—
7	23.775 ± 0.436	10.9 ± 3.64
8	32.7 ± 0.495	16.345 ± 0.89
9	40.34 ± 0.661	23.54 ± 1.465
10	—	33.9 ± 1.97
11	—	43.99 ± 0.721
12	—	55.94 ± 3.98



Figure 1: Showing measurement of CRL

DISCUSSION

The current study has been undertaken to assess the prenatal developmental events in pregnancy with transabdominal ultrasound. The smallest gestational sac measurement reported by Hellman et al 1969 by transabdominal ultrasound was 10mm for 5 weeks and 17mm for 6 weeks. While in the present study, it was observed that at 5 weeks, the gestational sac measured was 13mm and at 6 weeks gestational sac measurement was 19mm.¹⁸ The difference in the measurement might be that, these studies were carried out in different racial groups.

Kurtz et al 1992 by using transabdominal approach, reported that smallest mean sac diameter was 10mm at which yolk was identified while a study by Nyber et al 1988 showed that a yolk sac was imaged when MSD (mean sac diameter) was more than 20mm, both these studies concluded that yolk sac was always present in normal pregnancies and it could also be visualized in abnormal pregnancies. The absence of yolk sac after the certain MSD it is always a sign of abnormal pregnancy.^{19,20} The current study is in agreement to Nyber et al study which shows that yolk sac is identified when MSD was greater than 24mm perhaps this difference can be explained as these studies are carried out in different regions.

In the present study the correlations between CRL and gestational age is very much consistent with the findings of Robinson and Flemings in which for 7th week of gestation, the CRL was 10mm, for 8th week it was 16mm, for 9th week it was 24mm, for 10th week it was 33mm, for 11th week it was 44mm and for 12 week it was 56mm. The study carried out by MacGregor et al and Drumm et al 1976 showed that in 8th week CRL was 12mm and 17mm, 9th week it was 21mm and 24mm, for 10th week the CRL was 31mm and 32mm, for 11th week CRL was 41mm and 43mm and for 12th week it was 51mm and 53mm respectively.^{7,21} This disagreement between different

studies might be due to difference in ethnicity and nutritional factors. This linear growth showed a closed agreement with published charts from Pakistani cohort studies and the studies from other countries.²²

CONCLUSIONS

The main objective of this study was to see the prenatal developmental events by an ultrasound.

Following conclusions are drawn.

1. There is linear increase in measurements of fetal growth parameters as the gestational age increases.
2. For the assessment gestational age in the first trimester, ultrasound is an accurate and useful modality.

REFERENCES

1. Pinto V, Wankelmuth M, D'Addario V. Donald School Textbook of Ultrasound in Obstetrics and Gynecology. AsimKurjak, Frank A Chervenak, First Ed, Jaypee Brothers, New Delhi, India. 2004;142-155.
2. Garrison FH, BLOCKER Jr TM. An introduction to the history of medicine. Plastic and Reconstructive Surgery. 1976 Apr 1;57(4):510.
3. Moore KL, Dalley AF, Agur AM. Clinically oriented anatomy. Lippincott Williams & Wilkins; 2007;pp44.
4. Kalish RB, Thaler HT, Chasen ST, Gupta M, Berman SJ, Rosenwaks Z, Chervenak FA. First-and second-trimester ultrasound assessment of gestational age. American journal of obstetrics and gynecology. 2004 Sep 1;191(3):975-8.
5. Govoni AF. Diagnostic Radiology; A Textbook of Medical Imaging: Donald G. Grainger, David Allison, Andreas Adam, Adrian D. Dixon (Editors), London, UK: Churchill Livingstone, imprint of Harcourt Publishers 2008;pp77.

6. Beazley JM, Underhill RA. Fallacy of the fundal height. *Br Med J*. 1970 Nov 14;4(5732):404-6.
7. MacGregor SN, Tamura RK, Sabbagha RE, Minogue JP, Gibson ME, Hoffman DI. Underestimation of gestational age by conventional crown-rump length dating curves. *Obstetrics and gynecology*. 1987 Sep;70(3 Pt 1):344-8.
8. Shan BP, Madheswaran M. Revised estimates of ultrasonographic markers for gestational age assessment of singleton pregnancies among Indian population. *International Journal of Advanced Science and Technology*. 2010 Apr;17:1-2.
9. deCrespigny LC, Cooper D, McKenna M. Early detection of intrauterine pregnancy with ultrasound. *Journal of ultrasound in medicine*. 1988 Jan;7(1):7-10.
10. Tan S, İpek A, Pektas MK, Arifoğlu M, Teber MA, Karaoğlanoğlu M. Irregular yolk sac shape. *Journal of Ultrasound in Medicine*. 2011 Jan 1;30(1):31-6.
11. Nyland TG, Mattoon JS. Small animal diagnostic ultrasound. *Elsevier Health Sciences*; 2002.;pp1080–96.
12. Varelas FK, Prapas NM, Liang RI, Prapas IM, Makedos GA. Yolk sac size and embryonic heart rate as prognostic factors of first trimester pregnancy outcome. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2008 May 1;138(1):10-3.
13. Loughna P, Chitty L, Evans T, Chudleigh T. Fetal size and dating: charts recommended for clinical obstetric practice. *Ultrasound*. 2009 Aug 1;17(3):160-6.
14. Bagratee JS, Regan L, Khullar V, Connolly C, Moodley J. Reference intervals of gestational sac, yolk sac and embryo volumes using three-dimensional ultrasound. *Ultrasound in obstetrics & gynecology*. 2009 Nov 1;34(5):503-9.
15. Robinson HP, Fleming JE. A critical evaluation of sonar "crown-rump length" measurements. *BJOG: An International Journal of Obstetrics & Gynaecology*. 1975 Sep;82(9):702-10.
16. Callen P. *Ultrasonography in Obstetrics and Gynecology*; (4th ed), Philadelphia: WB Saunders 2000;pp70-146.
17. Kalish RB, Chervenak FA. Sonographic determination of gestational age. *The ultrasound review of obstetrics and Gynecology*. 2005 Jan 1;5(4):254-8.
18. Hellman LM, Kobayashi M, Fillisti L, Lavenhar M. Growth and development of the human fetus prior to the twentieth week of gestation. *American Journal of Obstetrics & Gynecology*. 1969 Mar 15;103(6):789-98.
19. Kurtz AB, Needleman L, Pennell RG, Baltarowich O, Vilaro M, Goldberg BB. Can detection of the yolk sac in the first trimester be used to predict the outcome of pregnancy? A prospective sonographic study. *AJR. American journal of roentgenology*. 1992 Apr;158(4):843-7.
20. Nyberg DA, Mack LA, Harvey D, Wang K. Value of the yolk sac in evaluating early pregnancies. *Journal of ultrasound in medicine*. 1988 Mar;7(3):129-35.
21. Drumm JE, Clinch J, MacKenzie G. The ultrasonic measurement of fetal crown-rump length as a method of assessing gestational age. *BJOG: An International Journal of Obstetrics & Gynaecology*. 1976 Jun;83(6):417-21.
22. Zaidi S, Shehzad K, Omair A. Sonographic foetal measurements in a cohort of population of Karachi, Pakistan. *JPMA. The Journal of the Pakistan Medical Association*. 2009 Apr;59(4):246-9.