

Prospective study of yolk sac size and shape as a predictor in first trimester pregnancy outcome at a tertiary hospital

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Abstract

Background: Pregnancy is a unique experience in every woman's life. Primary yolk sac forms at an approximately 24 days of menstrual age. Before complete establishment of placental circulation, the yolk sac has nutritional, endocrine, metabolic, immunologic and hematopoietic functions essential in early embryonic life. Present study was conducted to study yolk sac size and shape as a predictor in first trimester pregnancy outcome at tertiary hospital. **Material and Methods:** Present study was a prospective, observational study carried out patients with singleton pregnancy with 6 to 9 weeks of gestational age, with previous first trimester spontaneous abortion/abortions and with previous live births, willing to participate in present study. **Results:** In this study, 200 pregnant women were studied. Majority of cases belong to 25-30 years (51.5%) of age group, mean age was 25.96 ± 3.23 years. 51% of the study population was primigravida and 49% cases were multigravida. In the present study 30% of the cases were associated with previous abortion and 70% had no history of previous abortion. Majority of the cases were with normal yolk sac diameter (83 %) while 17% cases had abnormal yolk sac diameter (YSD). 9% subjects had abnormal yolk sac shape and 91% had normal shape. In 78% cases pregnancy continued, 1.5% had complete abortion and 6% and 14.5% had incomplete and missed abortion respectively. The difference between the mean yolk sac diameters between normal and abnormal outcome was statistically significant. Abnormal yolk sac diameter (>6mm and <3mm) was compared with pregnancy outcome, sensitivity of predicting an abnormal outcome was 72.73%, specificity was 98.72%, PPV was 94.12% and the NPV was 92.77% with an accuracy of 93%. The P value was 0.001 and hence statistically significant. In this study abnormal yolk sac shape had 34.09% sensitivity of predicting an abnormal outcome, specificity of 98.08%, PPV of 83.33% and the NPV of 84.07%, with an accuracy of 84%. The P value was 0.001 and hence statistically significant. **Conclusion:** The yolk sac size is a better predictor of abnormal pregnancy outcome as compared to yolk sac shape and large yolk sac size (>6 mm) is a better predictor of abnormal pregnancy outcome as compared to small yolk sac size (<3mm).

Keywords: Mean Sac Diameter (MSD), Crown Rump Length (CRL), Yolk Sac Diameter (YSD), first trimester

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Received Date: 24/03/2021 Revised Date: 11/04/2021 Accepted Date: 02/05/2021

DOI: <https://doi.org/10.26611/10121831>

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Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 04 June 2021

INTRODUCTION

Pregnancy is a unique experience in every woman's life. This situation is particularly distressing to those patients with history of threatened or recurrent abortion who abort despite resting in the hospital for many weeks.¹ Pregnancy is a dynamic process during which a lot of changes occur. Precise distinction between normal pregnancy and pregnancy loss in early gestation remains a clinical test, as approximately 30-40% of implanted pregnancies results in spontaneous abortion during first trimester². Primary yolk sac forms at an approximately 24 days of menstrual age. Before complete establishment of placental circulation, the yolk sac has nutritional, endocrine, metabolic,

How to cite this article: Alka B Patil, Sara Shaikh, Vijay Patil. Prospective study of yolk sac size and shape as a predictor in first trimester pregnancy outcome at a tertiary hospital. *MedPulse International Journal of Gynaecology*. June 2021; 18(3): 40-43.

<http://medpulse.in/Gynaecology/index.php>

immunologic and hematopoietic functions essential in early embryonic life³. The diameter of a yolk sac is usually 3-4 mm and increases in size up to the 10th or 11th week of gestation, after which it starts disappearing.^{4,5} Ultrasonographic evaluation of the yolk sac can be beneficial in confirmation of an intrauterine pregnancy and prediction of gestational outcome through assessment of its shape, size, and internal structure. Further studies on measurement of yolk sac size and shape and its association with normal and abnormal pregnancy outcome could help as an early predictor of pregnancy outcome. Present study was conducted to study yolk sac size and shape as a predictor in first trimester pregnancy outcome at tertiary hospital.

MATERIAL AND METHODS

Present study was a prospective, observational study carried out in the Department of Obstetrics and Gynecology, ACPM medical college, Dhule. Study was carried out from December 2017 to October 2019. Study approval was taken from institutional ethical committee.

Inclusion Criteria

All patients with singleton pregnancy with 6 to 9 weeks of gestational age, willing to participate in present study.

Exclusion Criteria

- Women with structural anomalies of uterus and cervix, uterine fibroid
- Patients with known medical disorders causing abnormal pregnancy outcome.
- Pregnancy with large sub-chorionic haemorrhage. Molar/ Multi-embryonic pregnancy.
- Not willing to participate, Lost to follow up

Study was explained to patients and written, informed consent was obtained from all patients for participation, transvaginal sonography. Transvaginal sonography was done in all study subjects, measurements such as Mean Sac Diameter (MSD), Crown Rump Length (CRL), Yolk Sac Diameter (YSD) were taken, cardiac activity were noted. These patients were followed up every 15 days according to the gestational age till 12 weeks of gestation. Yolk sac was considered normal when diameter is between 3mm and 6mm with rounded structure and an anechoic center that is surrounded by a uniformly thick and well defined echogenic wall. Abnormal yolk sac was having size <3mm or >6mm, irregular shape. Yolk sac diameter was measured using electronic calipers and measuring outer to outer diameter. Pregnancy outcome was normal if pregnancy is carried up to 12 completed weeks of gestation, and pregnancies that aborted were regarded as abnormal outcome. Outcome of these patients having normal yolk sac configuration and abnormal yolk sac configuration were further studied. The data was entered into Microsoft Excel spreadsheet. Analysis was

done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. Descriptive statistics included computation of percentages, means and standard deviations. Chi-square test and fisher exact test were used for qualitative data whenever two or more than two groups were used to compare. Level of significance was set at P≤0.05.

RESULTS

In this study, 200 pregnant women were studied. Majority of cases belong to 25-30 years (51.5%) of age group, mean age was 25.96 ± 3.23 years. 51% of the study population was primigravida and 49% cases were multigravida. In the present study 30% of the cases were associated with previous abortion and 70% had no history of previous abortion.

Table 1: Age and previous abortion distribution

Age group(years)	Frequency	Percent (%)
20-25	78	39.0
25-30	103	51.5
30-35	19	9.5
Previous abortion		
NIL	140	70.0
1	46	23.0
2 or more	10	7.0

In this study, majority belongs to the 7 + 0 weeks to 7 + 6 weeks of gestation (40.5%), followed by 8+ 0 weeks to 8 + 6 weeks (32.5%). Majority of the cases were with normal yolk sac diameter (83 %) while 17% cases had abnormal yolk sac diameter (YSD). 9% subjects had abnormal yolk sac shape and 91% had normal shape. 4 cases had no cardiac activity at the time of first ultrasound examination. In our study, in 78% cases pregnancy continued, 1.5% had complete abortion and 6% and 14.5% had incomplete and missed abortion respectively. 77% cases had no any PV bleeding and 23% cases had PV bleeding, amongst which 28 cases had abortion and 18 had normal outcome.

Table 2: Distribution of general characteristics

Gestational age in weeks	Frequency	Percent
6 + 0 weeks to 6 + 6 weeks	47	23.5
7 + 0 weeks to 7 + 6 weeks	81	40.5
8 + 0 weeks to 8 + 6 weeks	65	32.5
9 weeks	7	3.5
Yolk sac Size		
Abnormal	34	17.0
Normal	166	83.0
Yolk sac shape		
Abnormal	18	9.0
Normal	182	91.0
Cardiac activity		
Absent	4	2.0
Present	196	98.0
Outcome		
Aborted	44	22.0
Complete	3	1.5

Incomplete	12	6
Missed	29	14.5
Continued	156	78.0
PV bleeding		
Present	46	23%
Absent	154	77%

The probability of abnormal outcome in the current pregnancy increases with increased in the number of previous abortions. The incidence of abnormal outcome was 15.7 %, 26.1 % and 60% in patients with no history of previous abortions, history of previous one abortion and previous two abortions respectively.

Table 3: Comparison of previous abortion and study outcome at 12 weeks

study outcome AT 12 WKS	ABORTION					Total
	0	1	2	3	4	
Aborted	22 (15.7%)	12 (26.1%)	6 (60 %)	3 (100 %)	1 (100 %)	44 (22 %)
Continued	118 (84.3%)	34 (73.9% %)	4 (40%)	0	0	156 (78 %)
Total	140	46	10	3	1	200

Chi square test=26.26, p value=0.001 (S)

In our study 44 cases had abnormal outcome, out of which 34.1% had abnormal yolk sac shape and 65.9% cases had normal yolk sac shape .Out of 156 cases with normal pregnancy outcome, 1.9% cases had abnormal yolk sac shape and 98.1% had normal yolk sac shape.

Table 4: Comparison of yolk sac shape and study outcome

Yolk sac shape	Study outcome at 12 wks.		
	Aborted	Continued	Total
Abnormal	15 (34.1%)	3 (1.9%)	18 (9 %)
Normal	29 (65.9%)	153 (98.1%)	182 (91 %)
Total	44	156	200

Chi square test=43.36, p value=0.001 (S)

As the gestational age advances from 6 to 9 wks. of gestation, mean yolk sac diameter increases from 3.85mm to 4.94mm. Mean gestational sac diameter increases from 17.98mm to 35.24mm. Mean crown rump length increases from 6.48 to 22.87mm . There was a statistically significant difference between the gestational age and mean yolk sac diameter (P value 0.002), gestational age and mean gestational diameter (P value 0.002) and gestational age and mean CRL (P value 0.002).

Table 5: Comparison of gestational age with mean yolk sac size, G-Sac Size And CRL

	Gestational age	Mean \pm SD	P value
YOLK SAC (mm)	6 + 0 weeks to 6 + 6 weeks	3.85 \pm 0.81	0.002 (S)
	7 + 0 weeks to 7 + 6 weeks	4.47 \pm 1.08	
	8 + 0 weeks to 8 + 6 weeks	4.52 \pm 1.20	
	9 weeks	4.94 \pm 0.22	
	Total	4.36 \pm 1.08	
G-SAC(mm)	6 + 0 weeks to 6 + 6 weeks	17.98 \pm 2.04	0.002 (S)
	7 + 0 weeks to 7 + 6 weeks	23.77 \pm 2.77	
	8 + 0 weeks to 8 + 6 weeks	30.89 \pm 2.73	
	9 weeks	35.24 \pm 1.42	
	Total	25.13 \pm 5.81	
CRL(mm)	6 + 0 weeks to 6 + 6 weeks	6.49 \pm 2.79	0.002 (S)
	7 + 0 weeks to 7 + 6 weeks	11.04 \pm 1.94	
	8 + 0 weeks to 8 + 6 weeks	18.45 \pm 2.66	
	9 weeks	22.87 \pm 0.98	
	Total	12.79 \pm 5.50	

The difference between the mean yolk sac diameters between normal and abnormal outcome was statistically significant. No significant difference was noted for mean gestational sac diameter and mean CRL compared to abnormal outcome.

Table 6: Comparison of yolk sac diameter, gestational sac diameter and CRL

	Mean \pm SD			
	ABORTED	CONTINUED	T	P value
YOLK SAC (mm)	4.94 \pm 2.01	4.20 \pm 0.51	17.76	0.001 (S)
G-SAC(mm)	25.93 \pm 5.92	24.90 \pm 5.78	1.08	0.29
CRL(mm)	13.32 \pm 5.17	12.65 \pm 5.60	0.51	0.47

Abnormal yolk sac diameter (>6mm and <3mm) was compared with pregnancy outcome, sensitivity of predicting an abnormal outcome was 72.73%, specificity was 98.72%, PPV was 94.12% and the NPV was 92.77% with an accuracy of

93%. The P value was 0.001 and hence statistically significant. In this study abnormal yolk sac shape had 34.09% sensitivity of predicting an abnormal outcome, specificity of 98.08%, PPV of 83.33% and the NPV of 84.07%, with an accuracy of 84%. The P value was 0.001 and hence statistically significant.

Table 7: Abnormal yolk sac shape and size as a predictor of pregnancy outcome

Statistic	Abnormal yolk sac shape	Abnormal yolk sac diameter (>6mm and <3mm)
Sensitivity	34.09%	72.73%
Specificity	98.08%	98.72%
Positive Predictive Value (*)	83.33%	94.12%
Negative Predictive Value (*)	84.07%	92.77%
Accuracy (*)	84.00%	93.00%

DISCUSSION

The first trimester of pregnancy is a vital time as the pregnancy gets established. Pregnancy is a dynamic process during which a lot of changes occur. Precise distinction between normal pregnancy and pregnancy loss in early gestation remains a clinical test, as approximately 30-40% of implanted pregnancies results in spontaneous abortion during first trimester². This is best studied through ultrasound. Ultrasound has not only changed the medical approach to spontaneous miscarriage but also the patient's perception of normal and abnormal fetal development in utero. Numerous sonographic signs of predictors of poor outcome have been described by various authors, including an excessively large, excessively small, or irregular shaped gestational sac, a low implantation site, a large or irregular yolk sac^{1,3}, a weak decidual reaction^{3,4}, and a slow embryonic heart rate⁵. In first trimester, yolk sac is primary source of exchange between mother and fetus before placental circulation is established. Gross changes in yolk sac morphology and size therefore could indicate significant dysfunction of its maternofetal transport system and may be indicator of impending embryonic demise³. First trimester ultrasound measurement of yolk sac size and shape, proved to be an important, helpful and non-invasive tool in the investigation, diagnosis as well as the follow up of pregnant females in their early pregnancy. It can provide reassurance for many patients anxious about the health of their pregnancy and allows the physician to provide appropriate care and adequate close follow up for those with indicators of a possible unhealthy pregnancy.

CONCLUSION

Study of measurement of yolk sac size and shape between 6-9 weeks of gestation can be used as a valuable tool in predicting outcome of pregnancy. The yolk sac size is a better predictor of abnormal pregnancy outcome as compared to yolk sac shape and large yolk sac size (>6 mm) is a better predictor of abnormal pregnancy outcome as compared to small yolk sac size (<3mm).

REFERENCES

1. Siddiqi TA, Caligaris JT, Miodovnik M *et al.*: Rate of spontaneous abortion after first trimester sonographic demonstration of fetal cardiac activity. *Am. J. Perinatol.* 1988; 5(1): 1-4.
2. Cepni I, Bese T, Os cal P, Budak E, IdiM, AksuMF, Significance of yolk sac with vaginal sonography in the first trimester in the prediction of pregnancy outcome. *Acta Obstetriciaet Gynecologica Scandenevia* 1997; 76:969-972.
3. Lindsay DJ, Lovett IS, Lyons EA *et al.* Yolk sac diameter and shape at endovaginal US: predictors of pregnancy outcome in the first trimester. *Radiology.* 1992; 183:115-118.
4. Küçük T, Duru NK, Yenen MC, Dede M, Ergün A, Başer I. Yolk sac size and shape as predictors of poor pregnancy outcome. *J Perinat Med.* 1999; 27: 316-320.
5. Khaled S. Mousa, Amr Mohamed El- Helaly and Mahmoud Abd El- Aziz. The Value of Yolk Sac Diameter at Vaginal Ultrasonography as a Predictor of the First Trimester Pregnancy Outcome. *Life Sci J.* 2014; 11:236-240.

Source of Support: None Declared
Conflict of Interest: None Declared