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Morphometric Variations in the Shape of Human Term Placenta and Site of Insertion of Umbilical Cord under the Influence of Ethnicity

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ABSTRACT

Objective: This comparative or analytical study is designed to compare the gross morphological features of human term placenta in five ethnic groups. Indo – Ariyan (Mohajir) Punjabi, Aryodravidian (Sindhi). Scythodravidian (Pakhtun) Turko– Iranian (Baloch). **Study Design:** Descriptive cross-sectional study. **Place and Duration of Study:** The study was conducted in the department of Anatomy. Basic Medical Sciences Institute (BMSI). Jinnah Post Graduate Medical Centre (JPMC) Karachi. From June 2012 to June 2014. **Methodology:** Five ethnic groups were included in the study. Fifty placentae were collected in total. Placentae were divided in 5 groups. 10 placentae were collected in each group. Group-A: Indo–Ariyan (Mohajir) = 10 was divided in 10 subgroups A_1–A_{10}, Group-B: Punjabi= 10, Subgroups B_1 – B_{10}, Group–C: Aryodravidian (Sindhi) = 10, Subgroups C_1–C_{10}, Group–D: Scythodravidian (Pakhtun) = 10 Subgroups D_1–D_{10}, Group–E: Turko–Iranian (Balochi) = 10, Subgroups E_1–E_{10}, Gross features of placentae were studied in detail & compared. **Results:** In shape of placenta 18 were circular in shape, A-3, B-6, C-3, D-3, D-8, E-7, E-9. 24 placentae were oval in shape A-2, A-9, B-3, C-2, D-6. In 4 cases A-10, B-5, C-8, triangular shape was observed. B-9 placenta was observed with succenturiate lobe. B-10, Placenta was having two complete lobes & E-2, bilobate placenta with second lobe comparatively short. Regarding results of site of attachment of umbilical cord 29 cases were found with e eccentric attachment of cord, 7 placentae with central attachment of cord, 14 placentae with marginal insertion. **Conclusion:** Shape of placenta & site of insertion of umbilical cord is a variable factor under the influence of ethnicity.

Keywords: Ethnicity, Indo-Ariyan, Aryodravidian, Scythodravidian, Turko–Iranian, Bilobate, Succenturiatelobe.

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INTRODUCTION

The word placenta is a Latin word meaning a flat plate or cake. It begins to meet the demands of the embryo as early as the 3rd week of intrauterine life, even before the mother is aware of her pregnancy.[1] Morphologically it is partly of fetal origin, the trophoblast and partly of maternal origin, the decidua.[2] The human full-term placenta is a discoid shaped organ measuring 15-20 cm in diameter. It has two surfaces a fetal surface and a maternal surface. When viewed from maternal side 15-20, slightly bulging areas "The Cotyledons" are recognizable.[2] Fetal surface is covered by amnion with the umbilical cord attached to its centre. The umbilical vessels radiate out on the fetal surface from the umbilical cord below the amnion. The peripheral margin is continuous with the fetal membranes, which consists from outside inwards of fused decidua parietal is, decidua capsularis, chorion leave and amnion. Abnormalities in the shape of placenta have been encountered accidentally. Bi-discoidal shape placenta is formed when it consists of two discs, placenta biparieta or bilobata is formed when it is divided into two lobes. Placenta membranacea of diffuse is when chorionic villi persist all around the blastocyst and it is thin, placenta succenturiata is formed when small part of the placenta is separated from the rest of it. Fenestrated placenta presents with hole in the disc. When the chorionic plate on the fetal side of the placenta is smaller than the basal plate and the fetal surface of such a placenta presents a central depression surrounded by a thickened greyish white ring, it is called a circumvallate placenta when the ring coincides with the placental margin the condition is sometimes described as circummarginate placenta.[3]The umbilical cord connects the fetus with the fetal surface of placenta. A fully developed umbilical cord is approximately average of 50-60 cm long at full term and 1-2cms in diameter. Normally umbilical cord contains two arteries and one vein surrounded by Wharton's Jelly, all enclosed in a layer of amnion. The cord deserves attention right from the first trimester. The umbilical cord normally inserts to the center.[5] However, it is usually eccentric and occasionally even marginal in position. Rarely, however, does it insert into the chorionic membranes outside the placenta called velamentous insertion.[6] Present study has been undertaken to record the data on shape of placenta and site of insertion of umbilical cord and correlate findings in five ethnic groups i.e. Indo-Ariyan, Punjabi, Aryodravidian, Scythodravidian, Turko-Iranian and aim is to see ethnic variations. Several studies were conducted to assess the association between maternal factors and fetal growth. Despite the fundamental role played by the placenta as a metabolic

regulator of supply of all nutrients necessary for fetal growth, relatively fewer information is available about the influence of ethnicity on the development and structure of the placenta. Ethnicity is one of the maternal factors that can affect the fetal and placental development. However, its influence is frequently masked by socioeconomic and demographic disparities, as well as by the variable degree of miscegenation.[4]

METHODOLOGY

Study Design: This is comparative cross-sectional study.

Place of Study: This study was conducted in the Department of Anatomy in Basic Medical Sciences Institute, Jinnah Post Graduate Medical Centre, Karachi.

Duration of Study: June 2012 to June 2014.

Methods: Fifty samples of full term, normal human placentae were collected from second stage labour room of Gynaecology & obstetrics department of Jinnah Post Graduate Medical Centre.

This study designed to compare gross features of placenta in five ethnic groups: Indo-Aryan (Mohajir), Punjabi, Aryodravidian (Sindhi), Scythodravidian (Pakhtun), Turko-Iranian (Balochi).

Study Population: Population of Karachi is characterized by cultural plurality and ethnic heterogeneity. Lingual and territorial affiliation is the major attribute of ethnic groups here. In Karachi Aryodravidian (Sindhis) is only fifth largest ethnic group outnumbered by Indo-Aryan (Mohajir), Punjabi, Scythodravidian (Pakhtun), Turko-Iranian (Balochi).

Sample Technique: A structured self-administered performa was used & carefully looked for gross features after immersing & fixation in 10% formaline.

Case Selection: Subjects who fulfilled the inclusion criteria were consecutively enrolled into the study.

Data Analysis: Data was analyzed using the SPSS statistical package, version 17. Data presentation was in tables.

Inclusion Criteria

- Normal human full-term placentae of patients delivered between 37-40 weeks of gestation.
- Normal human full-term placentae not complicated by any other disease e.g. hepatitis, A, B, C tuberculosis, Malaria, any history of long illness, history of P/V bleeding, Diabetes, HTN, smoking.
- Full term placentae of singleton pregnancy.
- Patients included must be a resident of Karachi.
- Patients included must be having haemoglobin more than or equal to 10 gm/dl at the time of delivery.
- Patients should be belonging to Indo-Ariyan, (Mohajir), Punjabi, Aryodravidin (Sindhi) Scythodravidian (Pakhtun), Turko-Iranian (Balochi)
- Patients of almost similar weights and heights.

Exclusion Criteria

- Placentae from extreme maternal age < 18 years > 40 years are not included in this study.
- Placentae not preserved within 40 minutes of delivery.
- Placentae from fetuses of birth weight less than 2.5 kg.
- Placentae delivered after caesarean sections.
- Placentae from patients with extreme gravidity, grand multipara.
- Placentae from patient chewing pan, gutka.
- Placentae from patients of premature rupture of membranes.

Placentae were divided in five groups, ten placentae in each:-

Code of group	Ethnic group	No. of patients
Group-A	Indo-Aryan (Mohajir)	10
Group-B	Punjabi	10
Group-C	Aryodravidian (Sindhi)	10
Group-D	Scythodravidian (Pakhtun)	10
Group-E	Turko-Iranian (Balochi)	10

Just after delivery, placenta was placed in kidney tray, washed in running water, clots were removed & then examined to ascertain its appearance, shape, color, consistency as well as any alteration of parenchyma, cord & membranes. Placentae were allowed to fix for 24-48 hours in 10% formal saline solution. Then various other parameters were measured which become more prominent after 24-48 hours of fixation, site of insertion of umbilical cord, shape of placenta, abnormality on fetal / maternal surface, placental calcification if any.

RESULTS

Gross features of placentae were carefully observed in all five groups. Differences were noted and compared statistically where possible. Variants of shapes observed were circular A-3, B-6, C-3, D-3, D-8, E-7, E-9 as shown in photograph No. 2, 7, 11, 13, 16, 18, 19, oval shape is seen in A-2, A-9, B-3, C-2, D-6 as shown in photograph No. 1, 3, 5, 10, 15, triangular shape is seen in A-10, B-5, C-8 as shown in photograph No. 4, 6, 12, bilobed placenta is seen in B-10, in photograph No. 9 and placenta with succenturiate lobe as in photograph No. 8 are findings.

In table-1 out of 50 placentae 18 (36%) were circular in shape. Oval shape of placentae was observed in 24 (48%) of cases slightly oval was observed only in one subject (2.0%).

Table 1: Shape of placenta

Shape of placenta	Frequency	Percent
Circular	18	36
Oval	24	48.0
Slightly oval	1	2.0
Triangular	4	8
Placentae succenturiate lobe	1	2.0
Bilobed placenta two comp. Lobes	4	8
Total	50	100.0

Triangular shape was found in 4 cases (8%)
As shown in Photograph No. 2

One placenta (2.0%) of group-B (B-9) was observed with succenturiate lobe as shown in photograph No. 8 Four (8%) bilobate placentae were observed with two complete lobes as shown in B-10 and E-2 with insertion of umbilical cord in between two lobes as in photograph No. 9.
In 29 subjects (58%) it was eccentric in 7.
All the samples of placentae were carefully examined for site of insertion / attachment of umbilical cord. In 50 samples of placentae 29 (58%) were observed with eccentric insertion of umbilical cord as shown in table -3.

Table 2: Shape of placenta in five ethnic groups (n=10)

Group	Parameters	Frequency	Percent
Indo-Iranian A	Circular	5	50.0
	Oval	4	40.0
	Slightly oval	1	10.0
Punjabi B	Circular	4	40.0
	Oval	2	20.0
	Triangular	2	20.0
	Placentae succenturiate lobe	1	10.0
	Bilobed placenta two comp. Lobes	1	10.0
Aryodravidian C	Circular	3	30.0
	Oval	7	70.0
Scythodravidian D	Circular	3	30.0
	Oval	5	50.0
	Triangular shape	2	20.0
Turko-Iranian E	Circular	2	20.0
	Oval	7	70.0
	Bi lobed	1	10.0

Table 3: Site of attachment in total cases

Umbilical cord insertion	Frequency	Percent
Eccentric	29	58.0
Central	7	14.0
Marginal	14	28.0
Total	50	100.0

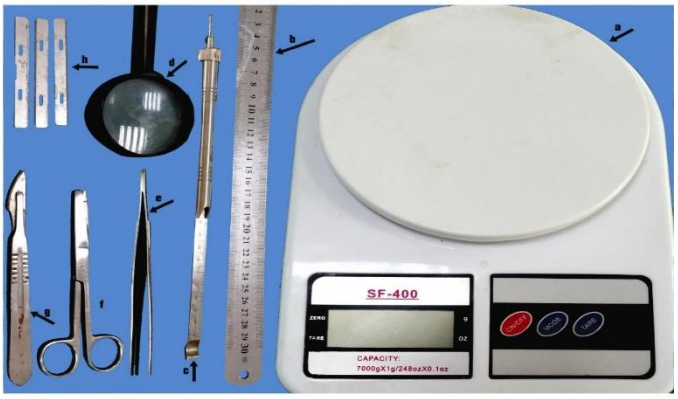
In 7 (14%) number of cases central insertion of umbilical cord was observed. In placenta with succenturiate lobe Photograph No. 8 and bilobate placenta (E-2) insertion of umbilical cord was seen in the centre of bigger lobe. In bilobate placenta with 2 equal lobes (B-10) Photograph No. 9 insertion of umbilical cord was observed in the centre of two lobes. Frequency and percentage of insertion of umbilical cord in total cases is shown in figure 2.
In 10 cases of group A, eccentric insertion of umbilical cord was observed in 6 placentae as shown in photograph No. 1, 2, 4 central insertion of umbilical cord was observed in 2 placentae while marginal insertion of umbilical cord was observed also in 2 cases as shown in photograph no. 3 (Table 4).
In 10 cases of group B eccentric insertion of umbilical cord was seen in 2 cases as shown in photograph No. 5, central insertion was observed in 2 placentae, marginal insertion in 4 cases as shown in photograph No. 6 and 7 (Table 4) central insertion in bigger lobe and bilobate placenta were observed in 2 placentae (Photograph no. 8 and 9).
In 10 cases of group C, eccentric insertion of umbilical cord was observed in 7 placentae as shown in photograph No. 10, 11, 12 while marginal insertion of umbilical cord was observed in 3 placentae (Table 4).
In 10 cases of group D, eccentric insertion of umbilical cord was observed in 6 placentae as shown in photograph No. 13, 15, 16 while marginal insertion of umbilical cord was observed in 4 placentae.
In 10 cases of group E, eccentric insertion of umbilical cord was observed in 8 placentae as shown in photograph No. 18, 19 marginal insertion of umbilical cord was observed in only one placenta.
While insertion was observed central in bigger lobe in bilobate placenta (E-2, photograph no. 17). Frequency and percent of insertion of cord in 5 ethnic groups shown in table 4.

Table 4: Insertion of cord in five ethnic groups (n=10)

Group	Insertion of cord	Frequency	Percent
Indo-Iranian A	Eccentric	6	60.0
	Central	2	20.0
	Marginal	2	20.0
Punjabi B	Eccentric	2	20.0
	Central	2	20.0
	Marginal	4	40.0
	Central in bigger lobe	2	20.0
Aryodravidian C	Eccentric	7	70.0
	Marginal	3	30.0
Scythodravidian D	Eccentric	6	60.0
	Marginal	4	40.0
Turko-Iranian E	Eccentric	8	80.0
	Marginal	1	10.0
	Central in bigger lobe	1	10.0

Table 5: Gender distribution of cases in 5 ethnic groups (n=10)

Ethnic groups	Gender	Frequency	Percent
Indo-Iranian A	Male	5	50.0
	Female	5	50.0
Punjabi B	Male	5	50.0
	Female	5	50.0
Aryodravidian C	Male	5	50.0
	Female	5	50.0
Scythodravidian D	Male	5	50.0
	Female	5	50.0
Turko-Iranian E	Male	5	50.0
	Female	5	50.0



Photograph 1: Laboratory equipment for examination of placenta:

a- Digital electronic weighing scale.
b- Measuring scale.
c- Depth guage.
d- Hand lens.
e- Forceps.
f- Scissor.
g- Scalpel.
h- Sharp blades.

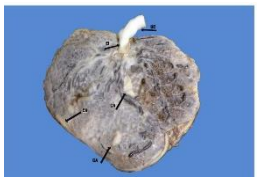
Photograph 1: A photograph of normal full term human placenta of group A-2 (Oval) showing roughly oval shape of placenta with eccentric insertion (EI) of umbilical cord (UC).

Photograph 2: A photograph of full term normal circular shape placenta of group A-3 (Circular) with eccentric insertion (EI) of cord, amnion (Am) and chorionic vessels (CV) are visible.

Photograph 3: A photograph of full term normal human placenta of group A-9 (Oval) showing oval shape of placenta with marginal insertion (MI) of umbilical cord (UC).

Photograph 4: A photograph of human full term triangular placenta of group A-10 (Triangular) showing calcified area.

Photograph 5: A photograph of full term normal oval shape placenta of group B-3 (Oval) with eccentric insertion of umbilical cord.



Photograph 6: A photograph of normal full term human placenta of group B-5 (Triangular) showing triangular shape with marginal insertion (MI) of umbilical cord (UC) and three calcified areas (CA).

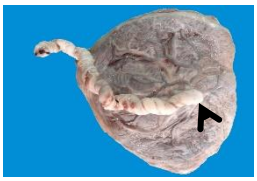
Photograph 7: A photograph of normal full term human placenta of group B-6 (Circular) showing circular shape and marginal insertion (MI) of umbilical cord.

Photograph 8: A photograph of normal full term human placenta of group B-9 [Placenta with succenturiate lobe (SL)], insertion of umbilical cord (UC) in bigger lobe (bL). A false knot (fKn) is also visible (Black arrow).

Photograph 9: A photograph of full term normal bilobed human placenta of group B-10 (Bilobed) nearly oval shape with central insertion (CI) of umbilical cord (UC) showing a false knot (fKn) in umbilical cord.

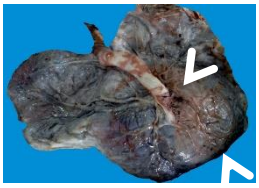
Photograph 10: A photograph of human full term normal human placenta of group C-2 (Oval) roughly oval with eccentric insertion (EI) of umbilical cord (UC) showing meconium stained fetal surface (msf) and some area with clotted blood (cB) (Black arrow).

Photograph 11: A photograph of normal full term normal circular shape placenta of group-C-3 (Circular) with eccentric insertion (EI) of cord.



Photograph 12: A photograph of full term normal triangular shape placenta of group C-8 (Triangular) with eccentric insertion (EI) of umbilical cord. Chorionic vessel prominent.

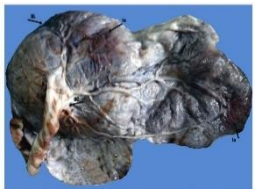
Photograph 13: A photograph of normal full term normal human placenta of group-D-3 (Circular) showing circular shape and eccentric insertion (EI) of umbilical cord (UC).



Photograph 14: A photograph of human full term bilobed placenta of group D-5 (Bilobed) showing one bigger and one smaller lobe insertion of umbilical cord in centre of bigger lobe (BL).

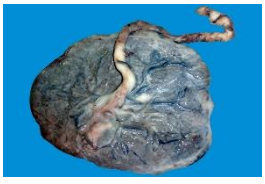
Photograph 15: A photograph of full term normal human placenta of group D-6 (Oval) showing oval shape with eccentric insertion (EI) of umbilical cord.

Photograph 16: A photograph of full term normal human placenta of group D-8 (Circular) showing circular shape and eccentric insertion (EI) of umbilical cord (UC).



Photograph 17: A photograph of human full term bilobed placenta of group E-2 (Bilobed) showing infracted areas (Ia) insertion of umbilical cord in (UC) in bigger lobe (Bl).

Photograph 18: A photograph of normal full term normal circular shape placenta of group E-7 (Circular) with central insertion of umbilical cord.



Photograph 19: A photograph of full term normal human placenta of group-E-9 (Circular) with roughly circular shape and eccentric insertion (EI) of umbilical cord.

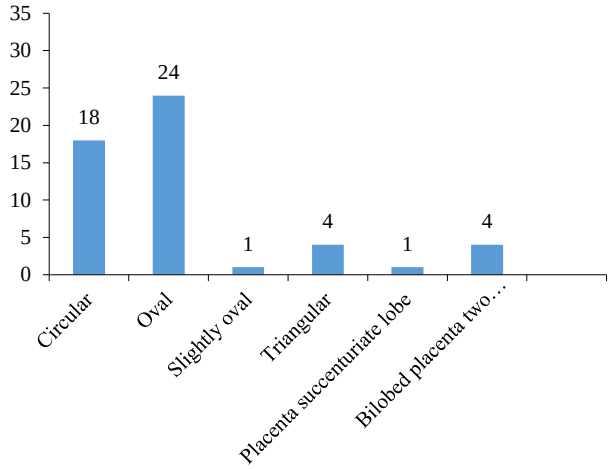


Figure 1: Shape of Placenta

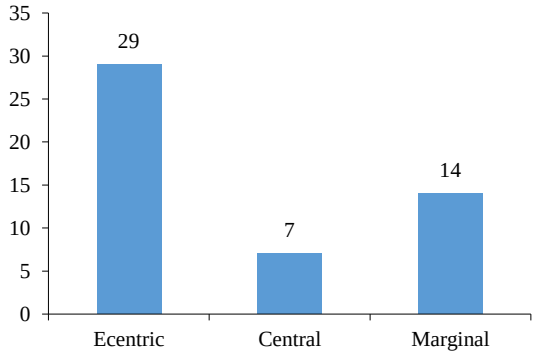


Figure 2: Site of attachment of umbilical cord in total cases

DISCUSSION

In our study 48% placentae were oval in shape, 18% were circular, 8% cases with triangular shape, 2% with succenturiate lobe while bilobate placenta was in 8% of cases.

Study of shape of placenta in five ethnic groups showed mostly circular or oval shape, two placenta in group B and two placenta in group D were triangular in shape. One placenta of group B was with succenturate lobe. One bilobate placenta was observed in group B and one in group E.

Circular and oval shape of placenta is found in accordance with Sudha et al 2012.[7] The author stated shape of placenta in normal subjects is either circular or oval. Sudha et al 2012 also found triangular shapes of placenta as a variant in shapes like kidney, heart and triangle.[7]

Succenturiate lobe is common finding in normal subjects as stated by Elsy (2011)[8], author find 12 cases of accessory lobe in 96 total normal subjects. Another study conducted by Suzuki et al (2008)[9] demonstrated that succenturiate lobes of placenta are related with assisted reproduction technology. Not in accordance with the present study. However, our study is in accordance with Chihara (2000)[10] who reported succenturiate lobe of placenta in normal subjects and no complication is related with it.

Elsy et al (2011)[8] reported four cases of bilobed placenta in 95 normal subjects while conducting morphological study of placenta in uncomplicated pregnancies in India. Author also noted that bilobate placentation occurred with undue frequency in women of high gravidity and in patients with a previous history of infertility. Multigravidity may be the cause of bilobate placenta in our study.

Insertion of umbilical cord in 58% cases were observed with eccentric insertion of umbilical cord, in 14% cases insertion of umbilical cord was central while it was marginal in 28% cases.

Our results of insertion of umbilical cord are in accordance with Khaled et al (2009),[11] they demonstrated that eccentric insertion of the cord is found more commonly than central insertion, they reported incidence of eccentric insertion ranging from 48 to 75%, exactly coincide with our study. They reported marginal insertion (the so-called battle dore placenta) is less common than eccentrically placed cord.

While comparing insertion of umbilical cord in 5 ethnic groups eccentric insertion was in 60%, 70%, 60% and 80% in group A, C, D and E respectively. Only in group B eccentric insertion was in 20% cases. While central insertion was in 20%, 20% and 10% in group A, B and E while no central insertion was seen in group C and group D. marginal insertion was seen in 20%, 40%, 30%, 40% and 10% in group A, B, C, D and E respectively. All the results coincide with studies of Khaled et al (2009). Author reported umbilical cord typically inserts centrally, but accentric and marginal insertions are as common as central.

No significant difference of insertion of cord was seen in five ethnic group except 20% eccentric insertion of group B.

CONCLUSION

Shape and site of attachment of umbilical cord showed some changes in all five groups included in this study.

Shape of placenta, site of insertion of umbilical cord and central thickness of placenta are variable factors under the influence of ethnicity.

REFERENCES

1. Sudha R, Kumar S, Jebakani CF. Study of shape of placenta and its relation to placental weight in normal and complicated pregnancies. Nat J Basic Med Sci. 2012;3(3):209-15.
2. Saga Z, Minhas LA, Rana R. Gross characteristic of Human placenta at low and high attitudes. PAFMJ. 2009;59(1):155-60.
3. Salmani D, Purushothaman S, Somashekara SC. Study of structural changes in placenta in pregnancy-induced hypertension. J Nat Sci Biol Med. 2014;5(2):352–5.
4. Premoli G AC, Sala M, Matheus M, Lopes RA. Influence of ethnicity on human term placenta. The Internet Journal of Gynecology and Obstetrics. 2005;6(1):1-6.
5. Anjum A, Suseelamma D, Saritha S & et all. Study of Morphological variations of 50 Placentae with umbilical cords and its developmental relevance. Int J Anat Res. 2015;3(3):1259-66.
6. Sadler TW, Leland J. Redmond S, Tosney K, Burgoon J, Cheschier N, Imseis H, Langman's Medical Embryology 11th 3rd. Lipincott Williams & Wikins 2010; pp 101.
7. Sudha R, Sivakumar V, Jebakani CF. Study of shape of placenta and its relation to placental weight in normal and complicated pregnancies. Natro J Basic Medical Sciences. 2012;(4):145-9.
8. Elsy B, Mathew S, Marickar YMF. A morphological and microscopic study of human placenta in uncomplicated pregnancies. Pushpagiri Med J. 2011; 2(2):188-94.
9. Suzuki S, Igarashi M. Clinical significance of pregnancies with succenturiate lobe of placenta. Arch Gynecol Obstet. 2008;277(4):299-301.
10. Chihara H, Otsubo Y, Ohtay, Araki T. Prenatal diagnosis of succenturate lobe by ultrasonography and colour Doppler imaging. Arch Gynecol Obstet. 2000;263(3):137-8.
11. Khaled ME, Andrew T, Aaron MF, Peter SL, Ronald O, Bude, Joel F, Platt and Christine OM. Imaging of placenta: a multimodality pictorial review. J Conti Med Edu in Radio. 2009;29:1371-91.

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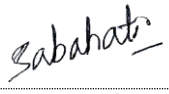
Dr. Sabahat Gul Assistant Professor, Anatomy Quaid-E-Azam Medical College, Bahawalpur	Data Collection, Manuscript Writing, Whole research work	
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