Anatomical and Histological Features of Placentae of Different Age Groups.

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Abstract:

Objectives: To study the structure of placentae of different age groups and relate that to the newborn baby and the mother.

Methods: 112 placentae samples were investigated during the period from August 2007 to August 2008 under light microscope for mother aged 15 - 45 years old.

Results: It was found that normal placental shapes had no correlation to mother age, while abnormal shapes were found more in young age groups. The better placental measured parameters were found in mother age 20-24 years. The percentages of abnormal umbilical cord insertion were very high compared to other studies. Babies' gender had a correlation with the placental thickness; male babies have thicker placentae than females. Male babies have longer umbilical cords with wider diameter than females. Light microscope picture showed the chorionic villi with isolated fetal blood vessel were higher in number in 20-24 years old mothers than other, and the package arrangement increased with age.

Conclusions: The best placental parameters both grossly and histologically found in mothers aged 20-24 years old. Mothers younger than 20 years old found to have abnormal insertions of the umbilical cord.

Keywords: Placenta; mother age; umbilical cord; placentae location.

Introduction:

The placenta is a temporary, membranous vascular organ that develops in female during pregnancy, lining the uterine wall and partially enveloping the fetus, to which it is attached by the umbilical cord [1]. It is known as the baby's house, and the umbilical cord as the string of life [2].

The placenta is a unique and highly specialized structure that has very important series of functions during pregnancy as respiration, nutrition, excretion, protection, storage and endocrine [3,4]. The microscopic images of human placenta obtained in the 1830s, and revealed the presence of epithelial lining separating fetal from maternal blood, which was in later years interpreted as trophoblastic layer [5]. Most of the anatomical and histological descriptions of the placenta depend on the time of term and parturition. The present investigation will based on study the structure of placenta in different age groups and relate that to the newborn baby and the mother.

Materials & Methods:

112 placentae were studied anatomically and histologically during the period from August 2007 to August 2008. The histological study included by light microscope. Samples were studied thoroughly and the mother ages were 15 - 45 years old. These samples were selected according to special exclusion and inclusion criteria, and then divided into 7 groups according to their ages, 5 years intervals between each group. Placental samples were placed on a towel, cleaned and then studied according to a questioner prepared for each mother. Regarding the umbilical cords, the type of insertion to the placenta, their lengths, diameters, knots were recorded. Baby's gender and weights were also mentioned as follows:

Mother:

Name: Age: Parity:
Date of delivery:

Baby:

Gender: wt: kg

Placenta:

Shape: Discoid Oval
Bilobed Succenturiate
Diameter: cm
Thickness: cm
Weight: gm

Umbilical cord:

Insertion: Central Eccentric
Marginal Velamentous
Length: cm
Diameter: cm
Knots: Yes No
Wharton's jelly: normal amount small amount
large amount

Placental samples for histological study were taken and fixed in 10% formalin and then processed further for light microscope study.

Results:

A-Anatomical findings of the placenta:

More than 90% of the placentae have either discoid or oval shape **(Figure 1, Table 1).**

Table (1) The numbers and percentages of the Placental shapes.

Mother's age groups (years)	Placental shapes								Total	
	Discoid	%	Oval	%	Succenturate	%	Bilobed	%	No.	%
15 – 19	9	45.0	9	45.0	2	10.0	0	0	20	100
20 – 24	7	35.0	10	50.0	3	15.0	0	0	20	100
25 – 29	11	55.0	9	45.0	0	0	0	0	20	100
30 – 34	8	40.0	10	50.0	2	10.0	0	0	20	100
35 – 39	5	38.5	7	53.8	0	0	1	7.7	13	100
40 – 44	7	70.0	3	30.0	0	0	0	0	10	100
> 45	5	55.6	3	33.3	1	11.1	0	0	9	100
Total	52	46.5	51	45.6	8	7.1	1	0.8	112	100

Discoid placenta.

Oval placenta.

Figure (1) Normal shapes of the Placenta.

Diameter, thickness and weights of placentae are shown in **Table (2).** Umbilical cord insertions of the different age groups are in **Table (3).** Umbilical cord lengths and diameters and its distribution among various age groups are shown in **Table (4).** Umbilical cord knots whether true or false knots were found in only 23 (25.56%) of the 112 placentae samples, but not more than two knots were found in each umbilical cord. Wharton's jelly estimation as small, normal and large amounts were found to be 23 (20.54%), 79 (70.54%), and 10 (8.92%) respectively.

Table (2): The means of the placental diameters, thicknesses and weights.

Mother age groups (years)	Placental diameter (cm) Mean±SD		Placental thickness (cm) Mean±SD		Placental weight (cm) Mean±SD	
15 – 19	20.65	2.48	2.67	1.08	591.60	0.98
20 – 24	22.20	2.42	2.93	1.35	673.50	0.88
25 – 29	21.00	2.05	2.23	0.91	612.50	0.75
30 – 34	20.75	2.38	1.70	1.00	575.75	0.79
35 – 39	19.85	1.91	2.08	1.52	620.00	0.64
40 – 44	20.20	1.40	1.95	0.97	562.00	0.37
> 45	20.33	1.80	2.00	0.90	498.88	0.71

Table (3): The numbers and percentages of the umbilical cord insertions.

Mother's age(years)	Umbilical cord insertion								Total	
	Central	%	Eccentric	%	Marginal	%	Velamentous	%	No.	%
15 – 19	2	10.00	6	30.00	9	45.00	3	15.00	20	100
20 – 24	8	40.00	7	35.00	4	20.00	1	5.00	20	100
25 – 29	5	25.00	8	40.00	6	30.00	1	5.00	20	100
30 – 34	5	25.00	9	45.00	5	25.00	1	5.00	20	100
35 – 39	6	46.20	3	23.10	2	15.40	2	15.30	13	100
40 – 44	5	50.00	4	40.00	1	10.00	0	0	10	100
> 45	5	55.60	2	22.20	2	22.20	0	0	9	100
Total	**36**	**32.14**	**39**	**34.83**	**29**	**25.89**	**8**	**7.14**	**112**	**100**

Table (4) The means of the umbilical cord lengths and diameters.

Mother age group (years)	Umbilical cord length (cm) Mean±SD		Umbilical cord diameter (cm) Mean±SD	
15 – 19	50.30	11.29	0.79	0.32
20 – 24	56.80	7.69	0.83	0.48
25 – 29	49.80	10.06	0.71	0.27
30 – 34	55.35	9.53	0.76	0.27
35 – 39	50.46	8.46	0.69	0.25
40 – 44	56.80	11.84	0.55	0.15
> 45	55.44	6.48	0.47	0.06

There was significant positive correlation between baby's weights and placental diameter, but there was no significant correlation with the placental thickness (**Table 5).** Also there was significant correlation between babies' weight and the umbilical cord length, while no correlation was there with umbilical cord diameter **(Table 6).** Significant correlation was found between babies gender and placental thickness, placenta in male babies were thicker than in females, but no relation was found between babies gender and their placental diameters and weights **(Table 7).** Umbilical cords were longer and wider in males than in females (**Table 8).**

Table (5): The correlation between the babies' mean weight and the placental means diameter, thickness and weight.

Mean babies' weight (gm)	**Mean**(cm) **placental diameter**	**Correlation**	**Mean**(cm) **placental thickness**	**Correlation**	**Mean**(gm) **placental weight**	**Correlation**
3289.29	20.85	0.41**	2.28	0.04*	600.33	0.48**

**Correlation is significant.

*Correlation is non significant**.**

Table (6): The correlation between the babies' mean weight and the umbilical cord means length and diameter.

Mean baby's wt. (gm)	**Mean umbilical cord diameter (cm)**	**Correlation**	**Mean umbilical cord length** (cm)	**Correlation**
3289.29	0.72	0.14*	53.29	0.19**

**Correlation is significant for the length of the umbilical cord.

* Correlation is non significant for the diameter of the umbilical cord.

Table (7) The correlation between the babies gender and the placental means diameter, thickness and weight.

Babies gender	**Placental diameter (cm) Mean±SD**		**Placental thickness (cm) Mean±SD**		**Placental weight (cm) Mean±SD**	
Male	21.15	2.32	2.30	0.90	594.55	116.37
Female	20.48	2.12	2.25	0.86	607.50	124.16
significance	0.75*		0.003**		0.96*	

****statistical significant difference ($p < 0.05$).**

***statistical nonsignificant difference.**

Table (8): The means of umbilical cord diameters and lengths in male and female babies.

Babies gender	Umbilical cord length (cm) Mean±SD		Umbilical cord diameter (cm) Mean±SD	
Male	0.75	0.32	56.14	9.27
Female	0.68	0.33	48.22	8.27

B-Histological findings of the placenta:

The general net like arrangement of chorionic villi in the intervillous spaces filled with maternal blood was clear **(Figure 2).** While at higher magnification, the chorionic villus showed clear syncytiotrophoblast with the underlying interrupted cytotrophoblast. Nuclei were stained dark blue and irregular in shape for the syncytiotrophoblast and cytotrophoblast respectively. The villi were with a connective tissue core and fibrin cells. The fetal blood vessels were filled with fetal blood **(Figure 3).** In some areas, the chorionic villi contained few nuclei, with an attenuated syncytium, which appeared the villi with a thin covering and absent cytotrophoblast.

The fetal blood vessels in the core of chorionic villi were arranged either as an isolated form (single or two) or packed (3 or more) **(Figure 4).** The number of isolated and packaged fetal blood vessels according to age group are shown in **Table (9).**

It is clear that the highest numbers of isolated blood vessels were found in age group 20-24 years and was around 60s, while in the other age groups were 40-50. But, the chorionic villi with package blood vessels have a proportional increment with mother ages.

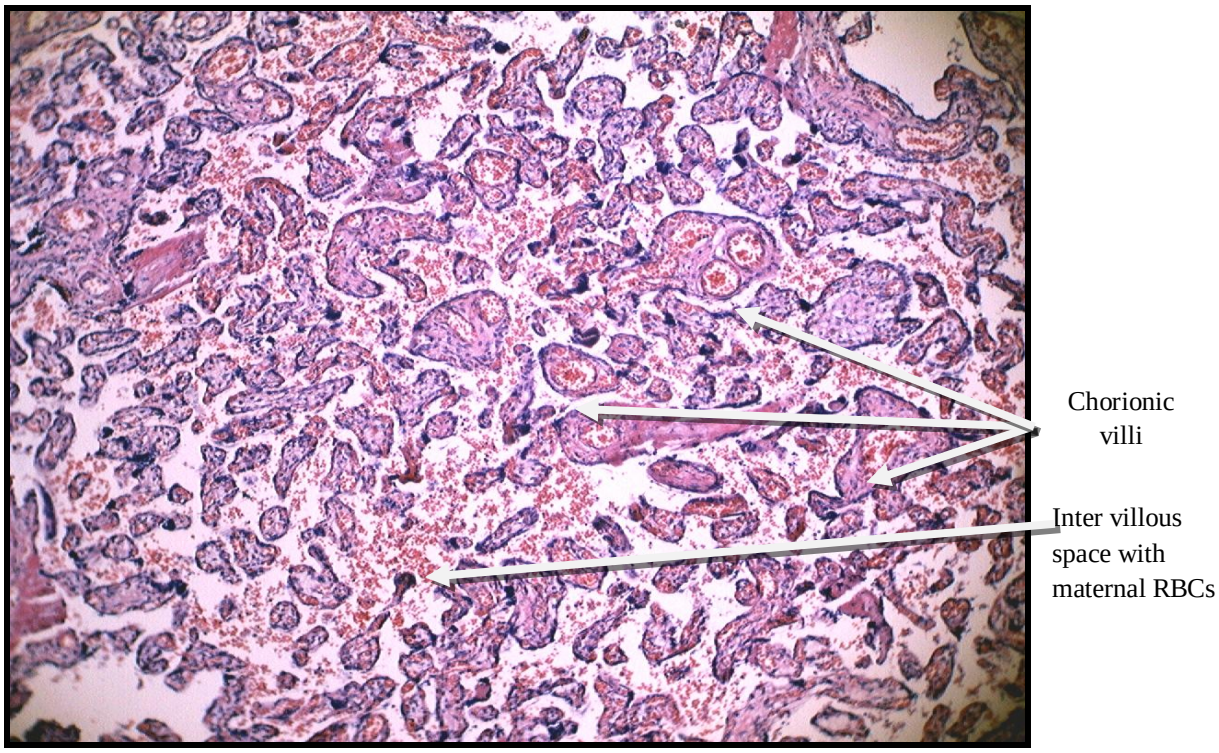

Figure (2) Placental chorionic villi (H&E),(x100)

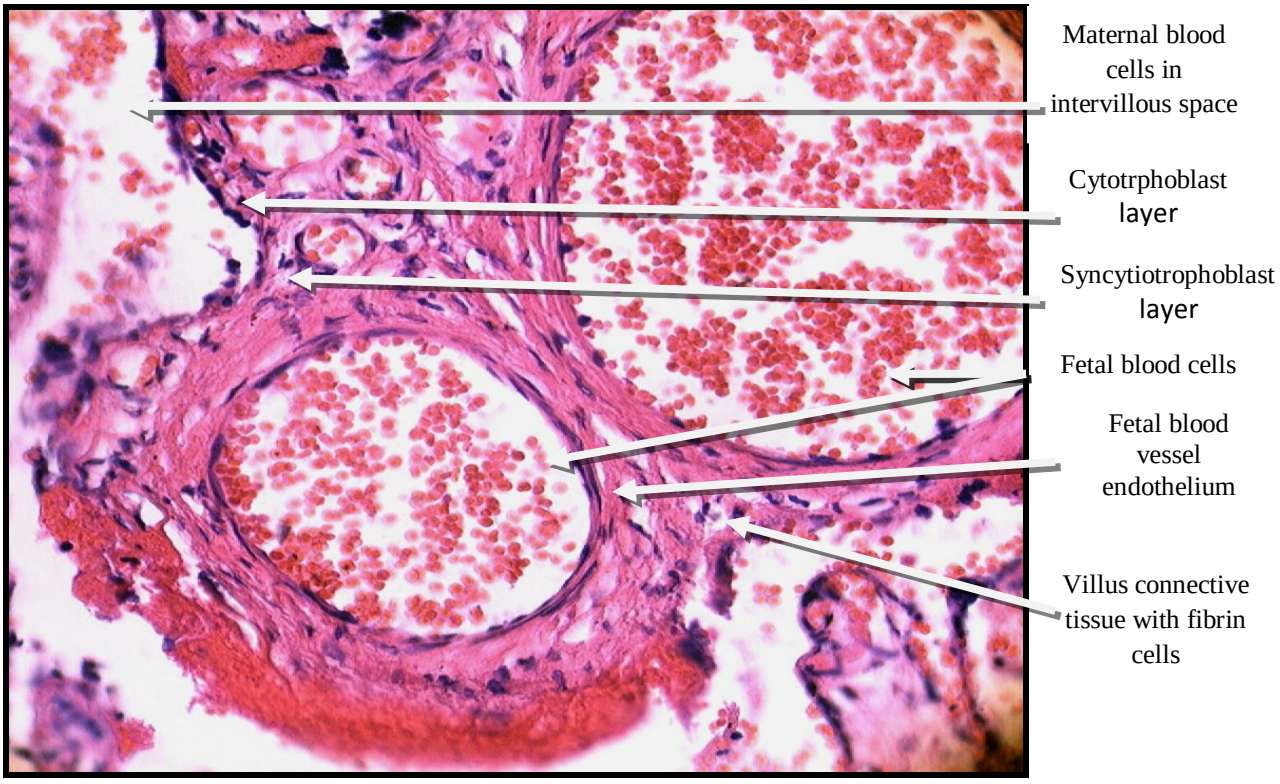

Figure (3) Chorionic villus (H&E),(x400).

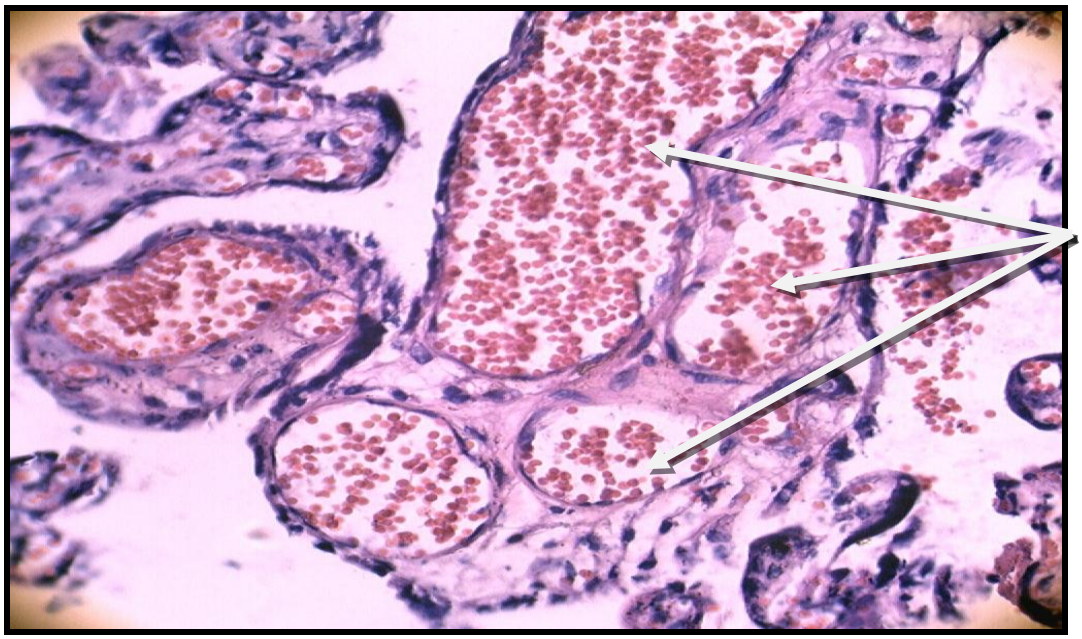

Figure (4) Chorionic villus with fetal blood vessel package (H&E), (x400).

Table (9) Number of chorionic villi with isolated (Iso*) and Package (Pac) blood vessels and their means for the different age groups.**

Age groups (years)	Number of chorionic villi blood vessels										Mean
	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		
	Iso	Pac	Iso	Pac	Iso	Pac	Iso	Pac	Iso	Pac	
15-19	39	13	35	10	45	16	46	17	38	10	40.6*
											13.2**
20-24	60	14	67	11	65	10	69	10	62	13	64.6*
											11.6**
25-29	57	10	55	11	53	12	56	14	54	14	55.6*
											12.2**
30-34	45	16	49	17	50	12	43	14	46	15	46.6*
											14.8**
35-39	50	14	47	20	55	16	53	15	48	15	50.6*
											16.0**
40-44	49	25	40	22	43	27	45	20	50	20	45.4*
											22.8**
>45	50	21	56	24	52	25	58	26	57	24	54.6*
											24.0**

Discussion:

Placental anatomical shapes were varied from discoid to oval which considered as the normal variant in the majority of cases. These results were in agreement with many studies [6,7,8]. But there was no relation between maternal age and the placental shape.

The placental mean diameter was 21 cm (mean 15-28 cm); thickness was 2.3 cm (1.5-5 cm), weight was 600 gm (400-900 gm). These values were within the ranges proved in many previous studies [9,10,11]. These parameters were best in mothers aged 20-24 years, which clarify this group as the best age group of having a healthy placenta. Because these values started to decrease in the older age groups. Mariem et al [12] found that mother with older age groups tends to have low weight placentae with low weight babies. Significant proportional relation was found between

the baby's weight and the placental weight and diameter, and these results agreed with previous studies [13,14,15,16,17]. But no relation was found between the baby's weight and placental thickness (18). The present study showed that the male babies have thicker placentae than females, which was also proved in previous studies [19].

Umbilical cord insertion was normal (central, eccentric) in most cases [20,21]. While abnormal insertions (marginal, filamentous) were found in the young age groups (15-19 years). This was in disagreement with previous studies [22,23], who mentioned that abnormal insertions increases with mother age. Umbilical cord lengths and diameters were 53 cm (range 27-75 cm) and 0.7 cm (range 0.3-2 cm) respectively. These values were within the normal values and ranges of other studies [24,25,26]. Significant proportional correlation was found between the baby's weight and the mean umbilical cord length, while non significant correlation was found with the mean diameter. These results disagreed with Raio et al [27], who found a significant relationship between the baby's weight and umbilical cord diameter. Male babies were found to have longer and thicker umbilical cord than female. These findings are in agreement with the studies of Mills et al [28] and Sarwono et al [29].

Highest number of chorionic villi with isolated fetal blood vessels appeared in placentae of aged group 20-24 years old. Packaged blood vessels in the chorionic villi increased with increase mother's age. This may be due to compensate the physiological effect of aging which means more arrangement better function. The study showed no effect of maternal age on the diameter of chorionic villi neither on the number of blood vessels or syncytial knots. This was supported by the study of Peter et al [30], who said that, the number of syncytial knots and the chorionic villus diameter depends on the slide section rather than the real number or diameter.

Conclusions:

The best parameters regarding the placenta both grossly and histologically found in mothers aged between 20-24 years old which reflected on the baby's weight and health. Mothers younger than 20 years old discovered to have more abnormal insertions of the umbilical cord. Mothers older than 24 years old have decrement in the umbilical cord diameter, placental weight and in the number of chorionic villi with isolated blood vessels.

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