The Role of Parity on Some Macroscopical and Microscopical Variables in Placentas of Normal and Preeclamptic Women

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ABSTRACT:

BACKGROUND:

The placenta is a dynamic organ, throughout gestation, it continuously undergoes different changes in structure and function to support the prenatal life. The anomalies of the placenta are usually associated with pregnancy complicated diseases which could lead to fetal complications. Hence, a careful examination of placenta in-utero as well as post-partum provides much insight into the prenatal health of the baby and the mother and can give information which could be useful in the management of complications in mother and the newborn, especially in a community like ours, where antenatal mothers still come unbooked to the labour room.

OBJECTIVE:

The aim of the present study was designed to elicit some morphometrical variables of delivered placentas (both gross and microscopic) in normal and preeclamptic pregnancies with regard to the role of parity (birth order) as a physiological change in women's life that may affect placental morphometrical variables.

PATIENTS AND METHODS:

A total of twenty- four placentas were freshly collected. They were grouped into two major groups (normal and preeclamptic) and each group was further subdivided according to parity into primi and multi subgroups (6 placentas for each subgroup). The placentas were grossly examined for (shape, insertion of umbilical cord,diameter and central thickness). Then tissue samples were fixed, processed , sectioned and stained by heamatoxylin and eosin stain to study the following microscopical variables as number of (villi, syncytial knots and fetal capillaries) .

RESULT:

Studying placentas had circular to oval shape. The percentage of central insertion of umbilical cord was increased in control group, mainly in multi one. While marginal insertion was increased mainly in primi preeclamptic. There was a significant reduction in diameter of placentas of preeclamptic group, mainly at primi. The placental thickness was significantly increased in preeclampsia. Statistical analysis for histomorphometrical variables had got an increased in number of villi, syncytial knots and fetal capillaries with preeclampsia and parity. The number of fetal capillaries was significantly increased with preeclampsia (mainly in primi subgroup).

CONCLUSION:

In our study, the definite changes in macroscopical and microscopical variables in placentas of normal and preeclamptic women could be attributed to placental insufficiency especially in preeclamptic group and this may be a compensatory repair mechanisms to factors like hypoxia in order to provide better fetal growth.

KEY WORDS:placenta,preeclampsia,parity, morphology, histomorphometry.

INTRODUCTION:

Placenta enjoys much attention as an organ of union between mother and fetus. Their histological composition was from fetal portion which consists of the villi of the chorion frondosum and maternal portion which is formed by the decidua basalis containing the intervillous space [1,2]. Placenta nearly provides anaccurate record of intrauterine journey of fetus which may undergo morphological and biological deviation [3,4], owing to the needs of fetus growth and in response to pathological conditions [5,6].One such disorder is preeclampsia which is mainly peculiar to human pregnancy and based on a presence of hypertension and proteinuria, occurring after 20

weeks gestation [7,8,9] and affecting 1% to 7% of primiparous women, who have a three times higher risk than multiparous women [10]. Placenta has long been recognized as the necessary compenent for the genesis of syndrome. A well described pathological feature in preeclampsia is a shallow fetal trophoblast invasion into spiral arteries during maternal immunological tolerance to a semiallogenic fetus and placental development [11]. Roberts (2007) suggested stage model for maternal preeclampsia through proposing that placenta produce material(s) in response to reduce perfusion and mechanical factors upon the mother to bring a clinical finding of preeclampsia [12]. Therefore, the aim of this study was designed to elicit some morphometrical variables of delivered placentas (both gross and microscopic) in normal and preeclamptic pregnancies with regard to the role of parity (birth order) as a physiological change in women's life.

PATIENTS MATERIALS AND METHOD:

Experimental study was performed on a group of 24 placentas during period (October 2013- April 2014) which were collected from Obstetrical and Gynecological Department of Baghdad Teaching hospital and Al- Yarmouk Teaching hospital. They were collecting from delivered women who were aging between 27-32 years. Placentas were divided
into 12 control and 12 preeclamptic groups then each group further subdivided according to parity into 6 primi and 6 multi. The criteria related to experimental preeclamptic group were(hypertension ≥ 140/90; proteinuria ≥300 mg in GUE). The placentas were grossly examined for the following variables (shape, diameter, thickness and site of insertion of umbilical cord). Tissue samples were taken from six sites of each placenta and they were fixed with 10% neutral buffered formalin for 24 hours to prepare paraffin embedded blocks [13] and from each tissue block, 5-6 micron thick ribbons were collected and stained with haematoxylin and eosin (H&E) stain to study the number of the following variables (villi, syncytial knots and fetal capillaries). Six random high power fields were chosen from each tissue section to be studied.

Statistical analysis: Statistical Package for Social Sciences version 20 (SPSS v20) was used for data input and analysis. Continuous variables presented as means with standard deviation (M±SD) and discrete variables presented as numbers and percentages. T test for two independent samples was used to test the significance of difference between two means of two independent samples. Fishers' exact test and chi square test of independence was used to test the significance of association between discrete variables.

ANOVA test was used to test the significance of variation of mean of more than two independent samples. Tukey test was used as a Post Hoc test for multiple comparisons of means.

RESULTS:

Gross morphometrical study revealed a higher percentage of circular shaped placentas in multi control and a higher percentage of oval shaped placentas in primi subgroups (mainly preeclamptic one), (fig.1).

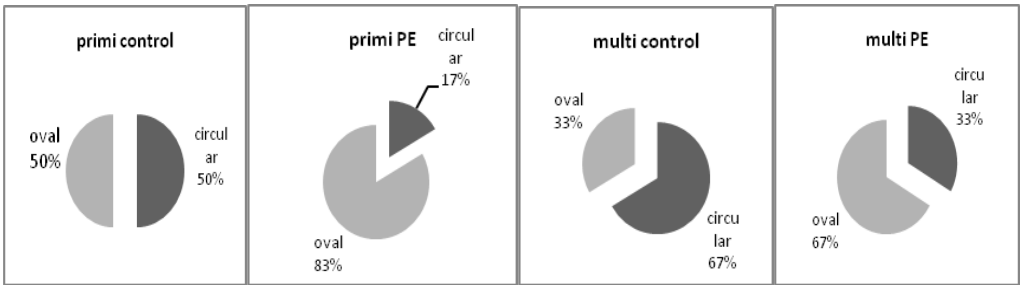

Figure 1: Shows the percentage level for placenta samples' shape in comparable subgroups.

The umbilical cord was 33.3% (centrally, marginally and paracentrally) inserted in primi control subgroup. 50% of multi control subgroup exhibited a central insertion of cord. In preeclamptic (PE) groups, 50% of primi PE revealed a marginal insertion and 50% of multi PE revealed a paracentral insertion(table 1).

Table 1: Shows the percentage level for umbilical cord insertion.

Umbilical Insertion; n(%)	Primi control	Multi control	Primi PE	Multi PE
• Central	(33.3)	(50.0)	(16.7)	(16.7)
• Marginal	(33.3)	(16.7)	(50.0)	(33.3)
• Para-central	(33.3)	(33.3)	(33.3)	(50.0)

Statistical analysis showed that the diameter of placenta was ranged from 19.5cm (primi) to 20.5 cm (multi) in control group. It was significantly decreased in preeclampsia ($p < 0.001$) and it was ranged from 16.2cm (primi) to 16.8cm (multi) , (table 2). The diameter of placenta was negatively correlated with placental thickness and with the number of fetal capillaries (table 4). Additionally, placental thickness was significantly increased in preeclampsia ($p < 0.001$) and it was ranged from 2cm (control) to 3cm (preeclamptic subgroups),(table 2), which was positively correlated with some microscopical variables (numbers of syncytial knots and fetal capillaries) ,(table 4).

Microscopical study of placentas disclosed an increased in number of villi, syncytial knots and fetal capillarieswith parity and preeclampsia. The number of fetal capillaries was significantly increased with preeclampsia (mainly in primi subgroup), ($p= 0.003$), (tables 2,3).

Table 2: Shows macroscopicaland microscopical characteristics of studying placentas in control and preeclamptic (PE) groups.

		Primi control	Multi control	Primi PE	Multi PE	
		M±SD	M±SD	M±SD	M±SD	P Value
	Placenta Diameter (cm)	19.5±0.5	20.5±0.5	16.2±2.2	16.8±0.4	< 0.001
Macroscopic Variables	Placenta Thickness (cm)	2.0±0.0	2.2±0.4	3.0±0.0	3.0±0.0	< 0.001
Microscopic Variables	Number of Villi(n)	12.2±2.7	14.6±4.4	14.1±3.2	15.4±2.5	0.404
	Syncytial Knots (n)	11.4±2.3	14.2±4.4	15.3±4.3	19.2±5.2	0.034
	Fetal Capillaries (n)	5.0±0.3	4.9±0.5	5.9±0.5	5.4±0.4	0.003

- Bold data means that $p \leq 0.05$

Table 3: Shows P values for multiple comparison (among different study subgroups)of some macroscopicand microscopic features of placenta.

		P value for variables				
		Numbers of some macroscopic and microscopic features of placenta				
Index Group	Comparison Group	Placenta Diameter (cm)	Placenta Thickness (cm)	Villi	Syncytial Knots	Fetal Capillaries
Primiparous PE	Primi no PE	0.001	0.000	0.739	0.394	0.010
	Multi PE	0.771	1.000	0.908	0.409	0.247
	Multi no PE	0.000	0.000	0.996	0.964	0.004
Multiparous PE	Primi PE	0.771	1.000	0.908	0.409	0.247
	Primi no PE	0.005	0.000	0.355	0.022	0.402
	Multi no PE	0.000	0.000	0.969	0.200	0.199
Primiparous no PE	Primi PE	0.001	0.000	0.739	0.394	0.010
	Multi PE	0.005	0.000	0.355	0.022	0.402
	Multi no PE	0.486	0.505	0.609	0.672	0.966
Multiparous no PE	Primi PE	0.000	0.000	0.996	0.964	0.004
	Primi no PE	0.486	0.505	0.609	0.672	0.966
	Multi PE	0.000	0.000	0.969	0.200	0.199

Table 4: Shows correlations between microscopic and macroscopic variables.

Variables		Villi	Syncytial Knots	Fetal Capillaries	Placenta Diameter(cm)	Placenta Thickness (cm
Villi	r		0.399	-0.101	-0.205	0.280
	P		0.054	0.640	0.337	0.185
Syncytial Knots	r	0.399		0.153	-0.358	0.558
	P	0.054		0.474	0.086	0.005
Fetal Capillaries	r	-0.101	0.153		-0.766	0.577
	P	0.640	0.474		< 0.001	0.003
Placenta Diameter(cm)	r	-0.205	-0.358	-0.766		-0.764
	P	0.337	0.086	< 0.001		0.000
Placenta Thickness(cm)	r	0.280	0.558	0.577	-0.764	
	P	0.185	0.005	0.003	0.000	

- Bold data means that p≤ 0.05

DISCUSSION:

Gross examination study revealed a higher percentage of circular shaped placentas in multi para which could be due to the fact that the trophoblast invasion , in multipara, is mostly robust in the center of placenta and less is moving towards the periphery in which peripheral villous necrosis is increased and this correlated to appearance of a placenta as circular disc. This result was agreed with Kalifa (2011) [14] and archana et al (2013) [16] who found that circular to oval placentas were the predominant human placental form in normal and well controlled metabolic diseases, including preeclampsia and any shaped deviation was determined by

implantation, apoptosis and abnormal maternal environments. Our different percentage levels of insertion sites of umbilical cord in each subgroups may agreed with Kalifa and Becker opinions [14,17] in that the insertion of cord may be influenced by intrauterine position of placenta . Generally, umbilical cord insertion is structurally impressive but functionally unimportant variable.

In our study, the significant decrease in placental diameter in preeclampsia(mainly in primi) was parallel with Raghunathan et al (2011) [15] and archana et al(2013) [16] who found that the diameter of placenta was one of variables which was directly proportional to diffusion rate in order to provide a better diffusion in preeclampsia. This may contribute to the severity and pathphysiology of preeclampsia under hypoxic condition which was mostly occurred with first birth. The significant increase in placental thickness in preeclampsia found in this study was positively correlated with syncytial knots and fetal capillaries .Our result was agreed with previous studies which were proposed that the length of stem villi were more in multipara and in preeclampsia as a response to mechanical & metabolic effects that result from increased damaging to floating villi by high velocity of blood flow from untransformed spiral arteries under oxidative stress [18,19].

Microscopical variables of studying placentas may be agreed with previous studies who found that fetal villi are a part of the border between maternal and fetal blood which were at term become more smaller with less stroma containing 4-6 fetal capillaries per section , covering with syncytiotrophoblast having nucleus tend to accumulate and shed as syncytial knots with 10% - 30% in normal term pregnancies [20,21]. Our histological finding showed an increased number of placental villi with parity and preeclampsia. This result was in coincidence with previous opinions that proposed a longitudinal growth and coiling of fetal capillaries that bulged inside villous surface, making grape-like branches called terminal villi in order to provide more favorable conditions for fetal growth [16]. In addition to the role of factors like hypoxia in preeclampsia that induced accelerated villous branching [22]. Our study manifested a significant increase in number of syncytial knots with parity and preeclampsia. This result parallels previous studies [23,24,25] which their authors, remarked an increased accumulation of syncytial nuclei as knots through intervillous space in preeclamptic placentas as a structural expression of decreased placental perfusion with advanced gestational aged and or structural expression of hypoxia for inducing syncytiotophoblast membrane modification . Present study revealed a significant increase of fetal capillaries in preeclampsia as compared to controls, mainly in primi subgroups and they were directly correlated with placental thickness. This result was agreed with previous studies who proposed that non branching angiogenesis in placenta which was expressed through third trimester of pregnancy while hypoxia role in preeclampsia may induce upregulation of proangiogenic factors, that altered angiogenesis model to branching nest (multiple sprouting of microvessels producing multiply branched capillaries webs),[26,27].

CONCLUSION:

In our study, the definite changes in macroscopical and microscopical variables in placentas of normal and preeclamptic women could be attributed to placental insufficiency especially in preeclamptic group and this may be a compensatory repair mechanisms to factors like hypoxia in order to provide better fetal growth.

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