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ORIGINAL ARTICLE

PLACENTAL MORPHOLOGY IN LOW BIRTH WEIGHT INFANTS

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ABSTRACT: OBJECTIVE: Study of placental morphological changes in intrauterine growth restricted babies. **MATERIAL & METHODS:** The Study was carried out at Mahatma Gandhi Medical College & Hospital, Jaipur, from January 2011 to January 2012. The placentae were collected from 50 cases of mothers of normal for date babies &50 cases of mothers of IUGR babies. Placental changes studied in both the groups, grossly and histopathologically. **RESULTS:** The placentae were collected from fifty mothers of normal for date babies & fifty mothers of growth restricted babies. It was observed that mean placental & fetal weights were 385 + 15gm in IUGR as compared to control group 500 + 15 gm Total gross & microscopic pathology in each group were 46% & 94% respectively in IUGR group as compared to 8% each in control groups. Mean fetal weight was low in IUGR group in relation to socioeconomic status, smoking & various disease factors. **CONCLUSION:** Gross morphology and histopathology of placentae were studied. Gross changes were developmental anomalies, placenta extrachorialis 2% & placenta bipartite 2%. Mean placental diameter in IUGR group was found to be less 15.58 cms as compared to 18.48cms in control group. Tesselation and subchorionic fibrosis was present in 70% & 76% in IUGR group which was found to be less as compared to 90% & 94%in control group[1].Calcification, infarction and retroplacental haematoma were present in 54%, 56% & 26% in IUGR which was found more in comparison to 24% &12%in control group. It was concluded that placental pathology was found more in IUGR as compared to control group.
KEYWORDS: IUGR. (Intra uterine growth retardation)

INTRODUCTION: IUGR is defined as birth weight below tenth percentile of estimated gestational age. In India 15-30% of babies born at term are ''small for date'', undernutrition and toxaemia of pregnancy are considered to be important maternal causes. In India, about 6-8% of the pregnancies belong to the high risk category .National Institute of Child Health and development defined High risk pregnancy as one that threatens the health and life of the mother and foetus.

The placenta is the vital organ for maintaining pregnancy and promoting normal foetal development. There are many well established causes of IUGR, such as maternal disorders like pre-eclampsia, foetal intrauterine infections, congenital malformations, chromosomal anomalies etc. this study reviews the significance or importance of morphological, histological and quantitative histomorphometric changes of placentas associated with IUGR.

The methodical study of growth rate of normal fetuses and their placentas to ascertain the interrelationship through the stages of intrauterine life was first undertaken by Hamilton and Girmes.[2]

Factors for low birth infants can be divided in to maternal and placental.

Maternal Factors are: Pregnancy with medical diseases, Diseases related to pregnancy, Obstetrical conditions & miscellaneous factors.

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Medical diseases are hypertension, chronic renal diseases, heart diseases, diabetes, venereal diseases, infections like rubella, herpes simplex, toxoplasmosis. The diseases related to pregnancy include Toxaemia, Eclampsia, Anaemia, Rh incompatibility and obstetrical conditions like Placenta praevia, Abruptio placentae, multiple pregnancy and post maturity. Miscellaneous factors- smoking, alcoholism, inadequate maternal nutrition, teratogenic drugs, radiation, genetic defects and chromosomal disorders.

Placental Causes: Infarction, Premature separation of placenta, haemangiomas, thrombosis of fetal vessels, presence of single umbilical artery and vascular terminal villi.

Human placenta is hemochorial and it is the only organ in the body which contains maternal and fetal tissues. The study of placenta is an opportunity to obtain information about the two individuals, the mother and fetus.

Importance of placental study in IUGR is to know about in placental morphology, caused by medical diseases, diseases during pregnancy, obstetrical conditions and other miscellaneous factors which in turn cause IUGR.

MATERIAL & METHODS: The study ''placental morphology in low birth infants'' was carried out at Mahatma Gandhi Medical College, Jaipur. The placentae were collected from 50 cases of mothers of normal for date babies & 50 from mothers of IUGR babies, in the department of obstetrics & gynaecology from January 2011 to January 2012 & during this period placentae were studied grossly and microscopically.

The cases were divided into two main groups.

Group 1: Control group. Fifty patients were included in this group, who had delivered between 37-40 weeks of gestation & baby birth weight was 2.5kgs or more.

Group 2: IUGR group.(includes mothers of growth retarded babies) fifty patients included, who delivered low birth weight infants i.e. less than 2.5kgs at term.

Maternal history: Detailed history, including name, age, socioeconomic status, occupation, nutritional status, history of smoking& alcoholism.

Past history of medical illnesses especially genitourinary system, hypertension, endocrinological diseases such as diabetes and tuberculosis noted. Present study has been undertaken to assess the morphology and histology of placenta from mothers of PIH and other medical illnesses to correlate the findings with those from normal pregnancies.[3]

Detailed obstetrical history and antenatal examination done.

Neonatal history: APGAR scoring at one minute & 5 minutes was done, sex, weight, crown heel length, head circumference and chest circumference.

Placental morphology: Gross examination of placenta, membranes and cord was done just after delivery. The membranes were examined, color of membranes and its attachment noted.

Cord was examined for length, mode of insertion, number of vessels, shape of placenta, dimensions, color, thickness and other gross features of placenta. A transverse block of cord was cut

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after lighting it at a point 3cms above the placental insertion. Weight of placenta was taken after removing blood clots.

Placenta is then cut into vertical stripes of not more than 1cm thickness, each slide is examined for gross lesions and blocks for histological examinations were cut from all visible lesions. Tissue was fixed in 10% formaline saline solution for 18 to 24 hours and then sent to laboratory for histological examination.

OBSERVATION & DISCUSSION: The relation of age of mother with weight of placenta, foetal weight and placental pathology (gross and microscopic) in IUGR & normal group.

Age of Mother in yrs.	I.U.G.R. Group								Control Group							
	Total cases		Mean wt. of placental (gm)	Mean foetal wt. (gm)	Placental Gross		Pathology Microscopic		Total Cases		Mean Wt. of Placental (gm)	Mean foetal wt. (gm)	Placental Gross		Pathology Microscopic	
	No	%			No	%	No	%	No	%			No	%	No.	%
15 – 20	10	20	422.5 SD=119.28 P = <0.001	2090 SD =.233 P = >.10	5	21.73	9	19.14	9	18	496.11 SD = 60.3	2930 SD =.278	1	25	-	-
21 – 25	18	36	405 SD=197.27 P = <0.001	2120 SD =.308 P= <0.001	8	34.78	18	38.29	29	58	501.03 SD = 57.94	2870 SD = 0.306	3	75	4	100
26 – 30	18	36	411.11 SD=126.14 P = <0.001	2150 SD =.160 P = <0.01	6	26.08	16	34.04	10	20	502 SD = 85.21	2980 SD = 0.329	-	-	-	-
31 – 35	4	8	350 SD=40.82 P = <0.001	2000 SD =.81 P = <0.01	4	17.39	4	8.51	2	4	525 SD = 35.35	3150 SD = 0.212	-	-	-	-

Table 1 shows the relation of age of mother with weight of placenta, foetal weight and placental pathology (Gross and microscopic) in IUGR and normal group

Total incidence of gross placental changes in IUGR group = 46%
Total incidence of gross placental changes in control group = 8%
Total incidence of Microscopic changes in IUGR group = 94%
Total incidence of Microscopic changes in control group = 8%

Table no-1 shows that maximum number of cases i.e. 72% were between 21-30 years age group, 20% were in 15-20 years & 8% were between 31-35 years in IUGR group as compared to maximum cases ie58% in21-25 years & number of cases in age group of 15-20 years & 26-30 years were almost equal i.e. 18% & 20% and only 4% of cases were between 31-35 years.

Mean placental weight in every age group was less than mean placental weight in control group i.e. 422.5gms, 405gms, 411.11gms and 350gms in IUGR group in comparison to 496.11gms, 501.03gms, 502gms and 525gms in control group. In these entire group P values were highly significant (P<0.001).

Mean foetal weights in every age group was less than mean foetal weight in control group i.e. 2090gms, 2120gms, 2150gms and 2000gms in IUGR group in comparison to 2930gms, 2870gms, 2980gms, 3150gms in control group, except in age group 15-20years, P values were significantly statistically (P<0.01), while it is highly significant in age group of 21-25 years (P<0.001).

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Total gross pathological changes seen in IUGR group were 46% as compared to control group i.e. 8% maximum incidence of gross pathological changes in placenta were 60.86% in age group of 21-30 years, 21.73% and 17.39% in age group 15-20 years and 31-35 years in IUGR group as compared to control group where only 8% cases were having gross pathology in 15-25 years. In control group, it was not at all seen in age of 26-35 years, only 4 cases were in age group of 15-25 years, in 15-25 years 25% i.e. (one case) and in 21-25 years 75% i.e. (3 cases out of total four). P values were highly significant, x^2 after Yates correction = 44.1 df = 1, $P < 0.001$.

Gross pathology present in IUGR group were, smaller size of placenta 12%, presence of extensive infarction 16%, false knots 4%, true knot 2%, Battledore insertion of placenta 6%, velamentous insertion 2%, and placenta extra chorialis 2%.

Total microscopic pathological changes seen in IUGR group were 94% as compared to control group i.e. 8%. Maximum incidence of microscopic placental pathology were 72.33% in age group of 21-30 years and 19.14% and 8.51% in 15-20 years and 31-35 years in IUGR group as compared to 8% in age group of 21-25 years in control group. Microscopic changes were present in 4 cases of control group, in 3 cases i.e. 75% gross pathology was found while in one case no gross pathology was seen. P values were highly significant X^2 after Yates correction = 74.02 df = 1 $P < 0.001$.

Inclusive all age group, P values are highly significant in relation to gross and relation to gross and microscopic pathological change in placenta in IUGR group as compared to control group.

Microscopic changes were increased syncytial knots count 90%, cytotrophoblastic proliferation 36%, hypovasculatiry 48%, infarctions 58%, clumping of Villi 4% thickening of blood vessels 2%, fibrinoid necrosis 30% inflammatory cells in villi 26% and perinillous fibrin deposition 20%.

Findings in present study were similar to that of Dawson L, Vijay Lakshmi S, Salham B. Histopathological changes in cases of IUGR[4] and according to them there in an adverse-effect on the new born at both extremes of child bearing age. Highest incidence of low birth weight has been found among mothers under age of 20 years and incidence falls, as the age of mother increases and it increases after the age of 30-35 years.

Placenta is said to be affected by ageing process, because as the age advances pregnant women are more prone to develop hypertensive disease, chronic vascular diseases, PET, Eclampsia and anaemia and these affect placenta in their turn causing IUGR.

Various diseases like hypertension, diabetes, PET and Eclampsia, which are related to advanced maternal age may cause placental ischemia and cause reduced placental blood flow leading to chronic hypoxia and chronic subnutrition to fetus, Donald, (1979)[5].

Table2 shows relation of mean placental weight, foetal weight and placental foetal weight ratio in IUGR and control group.

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TABLE 2- CORRELATION OF VARIOUS FACTORS OF IUGR WITH PLACENTAL AND FOETAL WEIGHT

SL. No.	Case type	Total no. of cases		Mean placental weight in gms	Mean foetal wt. (gms)	Placental foetal wt. ratio
		No.	%			
I.	Normal	50	100	499.3 SD = 67.1	2918 SD = 0.302	0.170
II.	IUGR (different disease factors)	50	100			
	1. PET & Eclampsia	9	18	408.3 SD = 119.89 P < 0.001	2088 SD = 0.247 P <0.001	0.195
	2. Hypertension	8	16	390 SD = 70.9 P < 0.001	2175 SD = 0.128 P <0.001	0.179
	3. Anaemia	7	14	461.42 SD = 174.68 P > 0.10	2220 SD = 0.075 P <0.001	0.207
	4. APH	3	6	308.33 SD = 112.73 P < 0.001	1720 SD = 0.63 P <0.001	0.178
	5. Twins	4	8	462.5 SD = 160.07 P > 0.10	2050 SD = 0.12 P <0.001	0.221
	6. U.T.I.	1	2	300	2300	0.130
	7. Chronic Fever	1	2	475	2140	0.221
	8. Idiopathic IUGR	17	34	398.52 SD = 42.78 P < 0.001	2150 SD = 0.17 P <0.001	0.185

Table 2 shows that in control group, the mean placental weight was 499.3gms, mean foetal weight was 2918gms and placental foetal weight ratio was 0.170.

Little (1960)[6] also studied placental foetal weight relationship and obtained placental-foetal weight ratio as 0.148, 0.140, 0.155 respectively

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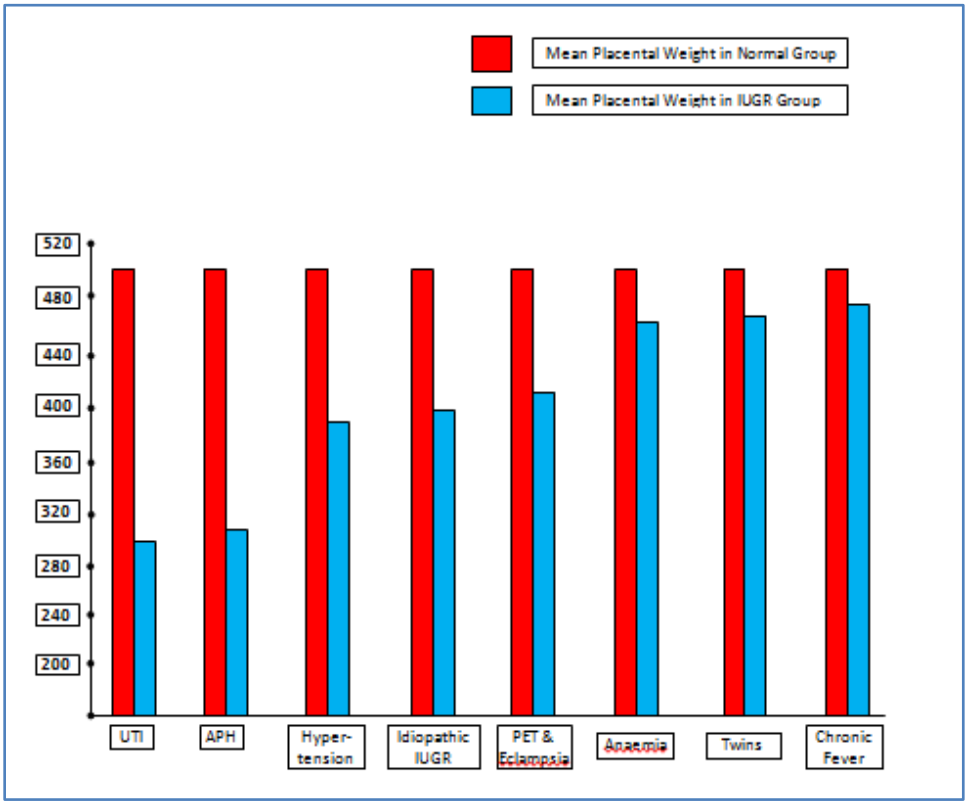
(GRAPH 1) MEAN PLACENTAL WEIGHT IN NORMAL & IUGR GROUP



IUGR GROUP – VARIOUS DISEASE FACTORS

Placental weight were normal in control group, that is mean placental weight were 500 + 15 gm as compared to IUGR group with various disease were low.

Similarly a decrease in foetal weight and a slightly higher placental foetal weight ratio in cases of toxaemia was observed by Thomson et al – (1969)[7].

Gross Changes:

1. Developmental anomalies were placenta extrachorialis 2% and placenta bipartite 2%.
2. Shape of placentae were almost round 86%, 12% oval, and 2% placenta extra chorialis in IUGR group in comparison to 94% round, 4% oval, 2% placenta bipartite, i.e. oval placentae were found to be more in IUGR group.
3. Mean placental diameter in IUGR group was found to be less 15.58 cm. as compared to 18.48 cm in control group. In IUGR group small placentae are usually seen.
4. Tessellation and subchorionic fibrosis was present in 70% and 76% in IUGR group which was found to be less as compared to 96% and 94% in control group.
5. Calcification, infarction and retroplacental haematoma were present in 54% and 26% in IUGR which was found to be more in comparison to 24% and 12% in control group respectively. Wigglesworth demonstrated that placental infarct of more than 5% area had been a key factor in causing low birth rate.[8]
6. Insertion of cord was eccentric 68%, central 24%, battledore 6% and velamentous 2% in IUGR group as compared to 90% central and 10% Eccenteric in control group, i.e. Eccenteric

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insertion was found to be more in IUGR group. According to Bjoro[9], velamentous insertion of cord, single umbilical artery and placental infarct occurred more frequently in placentas with IUGR.

7. Length of cord was ranging from 45.5-69.1 cm in IUGR group while it was 57.92 cm in control group.

Microscopic Changes: Immature villi were mostly seen in toxaemia, hypertension, anaemia and idiopathic IUGR, cytotrophoblastic proliferation was seen in toxaemia, hypertension, anaemia, high syncytial knot count was seen in toxaemia, hypertension and anaemia, vasculosyncytial membrane counts were low in pet and eclampsia, anaemia, tweins, idiopathic IUGR, hypovasoular villi were seen in toxaemia and hypertension, excess stromal fibrosis was seen in toxaemia (77.77%), hypertension (25%), anaemia (25%) and idiopathic IUGR (31.59%), excess fibrinoid necrosis was seen in cases of PET, anaemia, hypertension, idiopathic IUGR, undue thickening of basement membrane was seen in cases of hypertension (12.5%), and idiopathic IUGR (10.74%) perivillous fibrin deposition (more than 5%) was seen in toxaemia (11.12%), hypertension (25%), anaemia (28.57%), idiopathic IUGR (23.52%) and inflammation of villi was seen in toxaemia (30%), hypertension (37.5%) and idiopathic IUGR (21.48%).

Aherne and Dunnill[10] dealt with quantitative aspects of placental structure. They observed that at term, abnormally small infants' placentas had reduced mean volumes. Thomson et al[11] remarked that placental weight was a poor indicator of placental adequacy. Mirchandani et al observed that syncytial knotting; trophoblastic membrane thickening, villous stromal fibrosis, and fibrinoid necrosis were noted in placentas of IUGR fetuses.[12]

Placental pathology was found more in IUGR as compared to control group.

SUMMARY & CONCLUSION: The present study was conducted in dept. of Obstetrics & Gynaecology of Mahatma Gandhi Medical College and Hospital, Jaipur. Placentae were collected from fifty mothers of normal for date babies and fifty mothers of growth retarded babies. The gross morphology and histopathology of placentae were studied.

- Mean placental and foetal weight were low in IUGR group as compared to control group in relation to age, parity, weight and height of mother. There is a definite relation between various maternal factors and weight of placenta & foetus.
- Total gross and microscopic pathology in each group were 46% and 94% respectively in IUGR group as compared to 8% each in control group. There is a definite relation between various maternal factors and placental pathology in IUGR group.
- Mean foetal weight was low in IUGR group as compared to control group in relation to socioeconomic status of mother. Maximum placental pathology was seen in class III.
- In the placenta of a patient who was smoker, both gross and microscopic pathology were seen.
- Mean foetal and placental weights in relation to various disease factors were low in comparison to control group, and placental foetal weight ratio was increased in all groups, except UTI.

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