ejpmr, 2017,4(11), 462-473

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

MORPHOMETRIC STUDY OF PLACENTA IN MEDICAL DISORDERS OF PREGNANCY

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Article Received on 15/09/2017 **Article Revised on 05/10/2017** **Article Accepted on 25/10/2017**

ABSTRACT

Introduction— We studied the various pathological changes in placentae in medical disorders of pregnancy and compared with those of normal placentae and its fetal outcome. **Objectives**- To correlate the pathological changes of Placentae with the fetal outcome and mode of delivery. **Material and Methods**— 400 placentae were studied in 2 years period from women who delivered at labour room of our rural Govt. medical college hospital, Ambajogai, Maharashtra, India. Of these, 200 were from normal term pregnancy (control group) and 200 from women having medical disorder during or associated with pregnancy that were randomly selected (study group). The gross and microscopic features of both groups were studied and their findings correlated with the mode of delivery and fetal outcome. The feto-placental ratio and placental coefficient were evaluated. **Results**- The majority of Placentae from medical disorders in pregnancy show pathological changes directly in proportion to severity of medical disorder and correlate positively for increase in fetal jeopardy, fetal distress, Perinatal deaths and low Apgar scores, and increase in Caesarean deliveries. **Conclusions**— Gross and microscopic examination of Placentae should be performed in all cases of medical disorders in pregnancy where pregnancy outcome is abnormal.

KEYWORDS: Medical disorders of pregnancy, placentae, pathological changes.

INTRODUCTION

Placenta is an organ, so vital in its function to the development of baby, is commonly discarded "after birth" may yield information of prognostic significance for the new born.[1]

Placenta is essentially a fetal organ which functions to support growth of the fetus, interact with two individuals, the mother and the fetus. Placenta is also a potent endocrine, immunologic and metabolic organ. Scientific interest in the placenta also evolves from its enormous diversity of form and function.[2] Placenta is the most accurate record of Infant's perinatal experiences.[3] So, the study of placenta gives valuable clue in cases of adverse fetal outcome. The placenta, despite its ubiquity, is often overlooked as a potential source of information of clinical value and is relatively unexplained for biomedical researches.[4]

The present "Morphometric study of placenta in medical disorders in pregnancy" is conducted in rural area of Maharashtra, India where often the antenatal women are un-booked, come late for Antenatal care, with full-blown complications of these disorders. We have attempted to study the various pathological changes in placentas in medical disorders in pregnancy. These changes are compared with those of normal placentae. The pathological changes are correlated with the mode of delivery and fetal outcome.

AIMS AND OBJECTIVES

To study the various pathological (macroscopic and microscopic) in placentae in different medical disorders in pregnancy, to compare these changes in placentae of normal pregnancy and to correlate the pathological changes with the mode of delivery and fetal outcome.

MATERIAL AND METHODS

This prospective study was carried out at Dept of Obstetrics and Gynaecology in collaboration with the Dept of Pathology in Swami Ramanand teerth rural medical college, Ambajogai during July 2006 to Nov 2008. Total 400 placentae were studied. 400 placentae were studied in 2 years period from women who delivered at labour room of our rural Govt. medical college hospital, Ambajogai, Maharashtra, India. Of these, 200 were from normal term pregnancy (control group) and 200 from women having medical disorder during or associated with pregnancy that were randomly selected (study group). The systemic disorders were

Pregnancy induced Hypertension, Chronic hypertension, anemia, heart disease, diabetes mellitus, hepatitis, tuberculosis, asthma, thyroid disorders, epilepsy, connective tissue diseases.

Detail obstetric & medical history, complete systemic and obstetric examination was done. Necessary Blood and biochemical investigations related to the medical disorders were done. The placentae were examined after delivery. The blood clots if any were removed and clots weighing more than 50 gm were weighed.

Gross examination

- rule out any abnormality.
- maximum diameter in cm.
- weight
- membranes—insertion, colour.
- umbilical cord- length, knots.
- fetal surface- Intact/ lacerated, complete/ incomplete.
- calcification, infarction, retroplacental haematoma, succenturiate cotyledons—yes/no.
- any other abnormality noted.

Microscopic examination

a. **Abnormalities of trophoblasts**: Increased syncitial knots, cytotrophoblastic cell proliferation, Fibrinoid degeneration of Villi, basement membrane thickening.
b. **Abnormalities of stroma**: Villous stromal fibrosis, villous edema.
c. **Abnormalities of villous vessels**: Avascular villi, hyper / hypovascular villi, thrombosis of villi.
d. **Abnormalities of villous maturation**: Villous immaturity, accelerated villous maturation.
e. Infarction.
f. Calcification
g. **Any other abnormality**: Lymphocytic infiltration, caseous necrosis.

In case of Tuberculosis, microbiological examination of placental abscesses was done by Ziel Neelsen staining for acid fast bacilli. Examination of newborn included weight, Apgar score at 5 min, congenital anomalies.

Feto-placental ratio and Placental coefficient were calculated by the following formulae—
Feto-placental ratio= fetal weight (gm) / placental weight (gm)
Placental coefficient= placental weight (gm) / fetal weight (gm)
Fetal mode of delivery (normal or Caesarean) was noted. Baby weight, Apgar score, congenital anomalies were seen.

Fetal outcome was compared with the placental pathology. Correlation was made regarding mode of delivery and fetal outcome with the placental pathology. Statistical significance was analyzed by using tests of standard error of difference between two proportions and standard error of difference between two means.

Inclusion criteria

1) Control group- cases of uncomplicated pregnancies without any medical disorders in pregnancy.
2) Pre-eclampsia-
a) Mild- blood pressure> 140/90mmhg to 160/100mmhg with proteinuria (1+) and/or pathological odema.
b) Severe- blood pressure> 160/110 mmhg with proteinuria(>2+) and/or pathological odema with / without warning symptoms.
c) Eclampsia- pre-eclampsia with convulsions.
3) Anemia-
a) Mild- Hb 8-10 gm%
b) Moderate- Hb 7 to 7.9gm%.
c) Severe- Hb < 6 gm %.
4) Heart disease-
a) Compensated- (NYHA Class 1)- asymptomatic with Heart disease.
b) Decompensate- (NHYA class II, III, IV)- symptomatic with Heart disease
5) Diabetes Mellitus- criteria for diagnosis- impaired glucose tolerance and diabetes with 75 gm oral glucose tolerance test (American diabetic association)—

Values in plasma (mg%)

Time	Normal tolerance	Impaired GTT	Diabetes
Fasting	<110	More or = 110 & 126	More or = 126
2 hrs post prandial	< 140	More or = 140 & 200	More or = 200

6) Asthma- women with diagnosed asthma irrespective of receiving glucocorticoids or not.

Exclusion criteria

1) Cases with multiple pregnancies.
2) Cases with more than one medical disorder in pregnancy.

OBSERVATIONS

In all Observation tables given below* indicates significant value.

Table No. 1: Distribution of Medical Disorders.

Sr. No.	Medical Disorder	No. of Cases	%
1	PIH	70	35
2	Chronic HT	07	3.5
3	Anemia	60	30
4	Heart Disease	15	7.5
5	Diabetes mellitus	04	02
6	Hepatitis	13	6.5
7	Tuberculosis	03	1.5
8	Asthma	13	6.5
9	Thyroid disorders	04	02
10	Epilepsy	11	5.5
	Total	200	100

PIH was the major cause seen followed by Anemia.

Table No. 2: Age Distribution.

Age in years		16-20		21-25		26-30		31-35		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control Group (n=200)		74	37	102	51	24	12	0	0	200	100
Study Group (n=200)	PIH (n=70)	23	32.85	38	54.28	5	7.14	4	5.71	70	100
	Chronic HTN (n=7)	0	0	1	14.28	4	57.14	2	28.57	7	100
	Anemia (n=60)	22	36.66	30	50	8	13.33	0	0	60	100
	Heart Disease (n=15)	5	33.33	9	60	1	6.66	0	0	15	100
	Diabetes (n=4)	0	0	0	0	2	50	2	50	4	100
	Hepatitis (n=13)	5	38.46	7	53.84	1	7.69	0	0	13	100
	Tuberculosis (n=3)	0	0	2	66.66	1	33.33	0	0	3	100
	Asthma (n=13)	4	30.76	8	61.53	1	7.69	0	0	13	100
	Thyroid disorders (n=4)	0	0	1	25	2	50	1	25	4	100
	Epilepsy (n=11)	2	18.18	9	81.81	0	0	0	0	11	100

Most of the cases were in 16-25 years age group, except diabetes and thyroid, mostly in 26-35 years age group.

Table No. 3: Gravida wise distribution.

Gravida		Primi		Second		Third		Fourth and above		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control Group (n=200)		76	38	76	38	40	20	8	4	200	100
Study Group (n=200)	PIH (n=70)	39	*55.71	17	*24.28	9	12.85	5	7.14	70	100
	Chronic HTN (n=7)	1	14.28	2	28.57	4	*57.14	0	0	7	100
	Anemia (n=60)	10	*16.66	27	45	13	21.66	10	*16.66	60	100
	Heart Disease (n=15)	6	40	5	33.33	4	26.66	0	0	15	100
	Diabetes (n=4)	1	25	2	50	1	25	0	0	4	100
	Hepatitis (n=13)	4	30.76	5	38.46	4	30.76	0	0	13	100
	Tuberculosis (n=3)	1	33.33	1	33.33	0	0	1	33.33	3	100
	Asthma (n=13)	4	30.76	3	23.07	5	38.46	1	7.69	13	100
	Thyroid disorders (n=4)	1	25	2	50	1	25	0	0	4	100
	Epilepsy (n=11)	3	27.27	6	54.54	2	18.18	0	0	11	100

PIH was seen more in Primigravidae and 2nd Gravidas (79.99%) and chronic hypertension was seen more commonly in multigravidae (57.14%).

Table No. 4: Gestational Age at the time of delivery.

Gestational age in weeks		24-28		29-32		33-36		37-40		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control Group (n=200)		16	8	24	12	32	16	128	64	200	100
Study Group (n=200)	PIH (n=70)	6	8.57	10	14.28	9	12.85	45	64.28	70	100
	Chronic HTN (n=7)	0	0	0	0	1	14.28	6	85.71	7	100
	Anemia (n=60)	2	3.33	6	10	19	31.66	33	55	60	100
	Heart Disease (n=15)	0	0	1	6.66	2	13.33	12	80	15	100

	Diabetes (n=4)	**1**	**25**	**0**	**0**	**1**	**25**	**2**	**50**	**4**	**100**
	Hepatitis (n=13)	**0**	**0**	**0**	**0**	**3**	**23.07**	**10**	**76.92**	**13**	**100**
	Tuberculosis (n=3)	**0**	**0**	**0**	**0**	**1**	**33.33**	**2**	**66.66**	**3**	**100**
	Asthma (n=13)	**0**	**0**	**0**	**0**	**1**	**7.69**	**12**	**92.3**	**13**	**100**
	Thyroid disorders (n=4)	**1**	**25**	**1**	**25**	**0**	**0**	**2**	**50**	**4**	**100**
	Epilepsy (n=11)	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**100**	**11**	**100**

36% of cases in Control group had Preterm deliveries. In study group, 35.72% of PIH cases, 45% of Anemia cases, 50% of Diabetes and Thyroid cases, 33.34% of Tuberculosis cases had Preterm deliveries. All Epileptics had Full term deliveries.

Table No. 5: Distribution of maximum diameter of Placenta.

Maximum diameter of Placenta (cm)		**6-10**		**11-15**		**16-20**		**21-25**		**Total**	
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Control Group (n=200)		**24**	**12**	**34**	**17**	**96**	**48**	**46**	**23**	**200**	**100**
Study Group (n=200)	**PIH (n=70)**	**7**	**10**	**38**	***54.28**	**21**	***30**	**4**	***5.71**	**70**	**100**
	Chronic HTN (n=7)	**0**	**0**	**5**	***71.42**	**2**	**26.57**	**0**	**0**	**7**	**100**
	Anemia (n=60)	**0**	**0**	**9**	**15**	**44**	***73.33**	**7**	***11.66**	**60**	**100**
	Heart Disease (n=15)	**0**	**0**	**0**	**0**	**11**	***73.33**	**4**	**26.66**	**15**	**100**
	Diabetes (n=4)	**0**	**0**	**1**	**25**	**0**	**0**	**3**	***75**	**4**	**100**
	Hepatitis (n=13)	**1**	**7.69**	**11**	***84.61**	**1**	***7.69**	**0**	**0**	**13**	**100**
	Tuberculosis (n=3)	**1**	**33.33**	**2**	**66.66**	**0**	**0**	**0**	**0**	**3**	**100**
	Asthma (n=13)	**0**	**0**	**8**	***61.53**	**4**	**30.76**	**1**	**7.69**	**13**	**100**
	Thyroid disorders (n=4)	**2**	**50**	**2**	**50**	**0**	**0**	**0**	**0**	**4**	**100**
	Epilepsy (n=11)	**0**	**0**	**9**	***81.81**	**2**	**18.18**	**0**	**0**	**11**	**100**

In the study group, the placentae were larger in Heart disease, Anemia (16-20cm) and in Diabetics, 75% had > or equal to 21 cm.

Table No. 6: Summary of both Macroscopic and Microscopic placental changes in different medical disorders in pregnancy.

Macroscopic Change	Control Group (n=200)		PIH (n=70)		Chronic HTN (n=7)		Anaemia (n=60)		Heart Disease (n=15)		Diabetes (n=4)		Hepatitis (n=13)		Tuberculosis (n=3)		Asthma (n=13)		Thyroid (n=4)		Epilepsy (n=11)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Infarction	22	11	28	*40	4	*57.14	2	*3.33	0	0	1	25	0	0	0	*0	3	23.07	0	0	0	*0
Calcification	40	20	32	*45.71	5	*71.42	21	35	7	*46.66	3	*75	3	23.07	2	66.66	4	30.76	2	50	2	18.18
Retroplacental haematoma	0	0	8	*11.42	1	14.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microscopic Change																						
Syncytial knots	22	11	56	*80	6	*85.7	14	*23.33	1	6.66	3	75	9	*69.23	1	33.33	1	7.69	1	25	3	27.27
Cytotrophoblastic proliferation	6	3	54	*71.14	5	*71.42	0	*0	0	*0	3	*75	0	*0	0	*0	0	0	0	0	0	*0
Fibrinoid Degeneration	20	10	45	64.28	5	71.42	16	26.66	1	6.66	2	50	5	38.46	1	33.33	4	30.76	2	50	0	0
Basement membrane thickening	12	6	48	*68.57	5	*71.42	0	*0	0	*0	0	*0	0	*0	0	*0	4	30.76	0	0	0	*0
Stromal Fibrosis	16	8	39	*55.71	3	42.85	34	*56.66	3	20	0	0	10	*76.92	1	33.33	5	*38.46	2	50	2	18.88
Villous edema	0	0	3	4.28	0	0	0	0	8	*53.33	3	*75	0	0	0	0	0	0	0	0	0	0
Hypervascular villi	20	10	5	7.14	0	*0	46	*76.66	10	*66.66	2	50	0	*0	1	33.33	3	23.07	1	25	0	*0
Hypovascular villi	14	7	4	5.71	0	*0	0	*0	0	*0	0	*0	8	*61.53	0	*0	4	30.76	0	0	0	*0
Villous immaturity	28	14	1	1.42	0	0	6	*10	4	*26.66	2	*50	0	0	0	0	0	0	2	50	0	0
Infarction	34	17	30	*42.85	4	*57.14	7	11.66	0	*0	0	*0	0	*0	0	*0	2	15.38	1	25	3	27.27
Calcification	36	18	23	*32.85	4	*57.14	20	*33.33	9	*60	0	*0	4	30.76	1	33.33	3	23.07	2	50	3	27.27
Endarteritis obliterans	0	0	0	0	1	14.28	12	20	0	0	0	0	0	0	0	0	2	15.38	1	25	0	02

The Summary of both Macroscopic and Microscopic placental changes in different medical disorders in pregnancy is shown in above table.

Table 7. Distribution of placental weight.

Placental weight in gm		≤ 350		351-450		451-550		551-650		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control Group (n=200)		28	14	28	14	138	69	6	3	200	100
Study Group (n=200)	PIH (n=70)	28	*40	25	*35.71	17	*24.28	0	0	70	100
	Chronic HTN (n=7)	2	28.57	5	*71.42	0	0	0	0	7	100
	Anemia (n=60)	0	0	18	*30	42	70	0	0	60	100
	Heart Disease (n=15)	0	0	2	13.33	13	86.66	0	0	15	100
	Diabetes (n=4)	0	0	1	25	1	*25	2	50	4	100
	Hepatitis (n=13)	4	30.76	9	*69.23	0	0	0	0	13	100
	Tuberculosis (n=3)	3	*100	0	0	0	0	0	0	3	100
	Asthma (n=13)	0	0	11	*84.61	2	*15.38	0	0	13	100
	Thyroid disorders (n=4)	2	50	2	50	0	0	0	0	4	100
	Epilepsy (n=11)	1	9.09	9	*81.81	1	*9.09	0	0	11	100

In cases group, heart disease (86.66%) and Anemia (70%) had placenta weighing 451-550 gm. among Diabetic cases, 50% of patients had placentae weighing > or = to 551 gm.

Table No. 8: Distribution of birth weight of babies.

Birth weight (gm)		501-1000		1001-1500		1501-2000		2001-2500		2501-3000		3001-3500		3501-4000		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Control group(n=200)		0	0	6	3	14	7	44	22	98	49	38	19	0	0	200	100
Study Group (n=200)	PIH (n=70)	2	2.85	5	7.14	4	5.71	24	34.28	28	40	5	*7.14	2	2.85	70	100
	Chronic HTN (n=7)	0	0	0	0	0	0	2	28.57	5	71.42	0	0	0	0	7	100
	Anemia (n=60)	0	0	0	0	3	5	28	*46.66	29	48.33	0	0	0	0	60	100
	Heart Disease (n=15)	0	0	1	6.66	0	0	4	26.66	9	60	1	6.66	0	0	15	100
	Diabetes (n=4)	0	0	0	0	1	25	0	0	2	50	1	25	0	0	4	100
	Hepatitis (n=13)	0	0	0	0	0	0	4	30.76	9	69.23	0	0	0	0	13	100
	Tuberculosis (n=3)	0	0	0	0	0	0	3	*100	0	0	0	0	0	0	3	100
	Asthma (n=13)	0	0	0	0	0	0	4	30.76	7	53.84	2	15.38	0	0	13	100
	Thyroid disorders (n=4)	0	0	0	0	2	50	0	0	2	50	0	0	0	0	4	100
	Epilepsy (n=11)	0	0	0	0	0	0	2	18.18	8	72.72	1	9.09	0	0	11	100

As compared to Control group, babies with weight < 2500 gm were observed more commonly in PIH (49.98%), Anemia (51.66%) and thyroid disorders (50%). All Tuberculosis cases had birth wt < 2500 gm. In other cases, most babies weighed > 2500gm.

Table No. 9: Feto-placental ratio and Placental coefficient.

Group	Mean birth weight (gms)	Mean placental weight (gms)	Feto-placental ratio	Placental coefficient
Control Group	2619	446.3	5.86	0.17
PIH	2474.28	*399.42	6.19	0.16
Chronic HTN	2557.14	*370	6.91	0.14
Anemia	2518.33	*467.83	5.38	0.18
Heart Disease	2566.66	*488	5.25	0.19
Diabetes	2625	520	5.04	0.19
Hepatitis	2615.38	*364.61	7.17	0.13
Tuberculosis	*2400	*326.66	7.34	0.13
Asthma	2769.23	*403.84	6.85	0.14
Thyroid disorders	*2175	*325	6.69	0.14
Epilepsy	2718.18	*381.81	7.11	0.14

As compared to Control group, foeto-placental ratio was increased in all Cases except Diabetes, Anemia and heart disease, in which it was decreased. Placental coefficient was decreased in all Cases when compared to Control group, except in diabetes, anemia and heart disease in which it was increased.

Table No. 10: Fetal outcome in medical disorders.

Fetal outcome		Low Apgar		Perinatal death		Uneventful	
		No.	%	No.	%	No.	%
Control Group (n=200)		24	12	28	14	158	79
Study Group (n=200)	PIH (n=70)	18	*25.71	11	*15.71	42	*60
	Chronic HTN (n=7)	1	14.28	1	14.28	6	85.71
	Anemia (n=60)	14	23.33	4	06.66	46	76.66
	Heart Disease (n=15)	4	26.66	1	6.66	11	73.33
	Diabetes (n=4)	0	*0	1	25	3	75
	Hepatitis (n=13)	1	7.69	1	7.69	12	92.3
	Tuberculosis (n=3)	1	33.33	1	33.33	1	33.33
	Asthma (n=13)	1	7.69	0	*0	12	92.3
	Thyroid disorders (n=4)	1	25	2	50	1	25
	Epilepsy (n=11)	1	9.09	0	*0	10	90.9

In present study, the adverse foetal outcome was statistically significant in PIH cases. 25.71% had low apgar scores, 15.71% had perinatal deaths in PIH cases. No perinatal death was seen in asthmatic and epileptic cases as compared to 14% in the Control group.

Table No. 11: Correlation of fetal outcome with macroscopic changes in study group.

Macroscopic change	Low Apgar score (n=42)		Perinatal deaths (n=22)	
	No.	%	No.	%
Placental weight (gm)				
≤ 350	10	23.8	15	68.18
351 - 450	24	57.14	4	18.18
451 – 550	15	35.71	3	13.63
551 – 650	0	0	0	0
Infarction	11	26.19	9	40.9
Calcification	17	40.47	11	50
Retroplacental haematoma	4	9.52	5	22.72

With placental wt < 451 gm, 80.94% patients had low apgar score and 86.36% had perinatal deaths. Macroscopically, in Cases group, Perinatal deaths showed infarcted placentae (40.9%), calcified areas (50.0%) and retroplacental haematomas (22.72%).

Table No. 12: Correlation of fetal outcome with microscopic changes.

Microscopic change	Low Apgar score (n=42)		Perinatal deaths (n=22)	
	No.	%	No.	%
Syncytial knots	23	54.76	16	72.72
Cytotrophoblastic Proliferation	17	40.47	9	40.9
Fibrinoid Degeneration	25	59.52	14	63.63
Basement membrane thickening	18	42.85	8	36.36
Stromal Fibrosis	28	66.66	17	77.27
Villous edema	4	9.52	5	22.72
Hypervascular villi	19	45.23	9	40.9
Hypovascular Villi	3	7.14	3	13.63
Villous immaturity	10	23.8	5	22.72
Infarction	12	28.57	10	45.45
Calcification	22	52.38	14	63.63
Endarteritis Obliterans	3	7.14	1	4.54

In cases having Perinatal deaths, increased syncitial knots(72.72%), fibrinoid degeneration (63.63%), stromal fibrosis (77.27%), endarteritis oblirterans (4.54%) and hypovascular villi (13.63%) were seen.

Table No. 13: Distribution of Mode of delivery.

Mode of delivery		Vaginal deliveries		Caesarean deliveries				Total	
				For fetal distress		For CPD and other indication			
		No.	%	No.	%	No.	%	No.	%
Control Group (n=200)		168	84	6	3	26	13	200	100
Study Gro0up (n=200)	PIH (n=70)	51	72.85	12	*17.14	7	10	70	100
	Chronic HTN (n=7)	6	85.71	0	0	01	14.28	7	100
	Anameia (n=60)	49	81.66	3	5	8	13.33	60	100
	Heart Disease (n=15)	11	73.33	2	13.33	2	13.33	15	100
	Diabetes (n=4)	3	75	0	0	1	25	4	100
	Hepatitis (n=13)	12	92.3	0	0	1	7.69	13	100
	Tuberculosis (n=3)	3	100	0	0	0	0	3	100
	Asthma (n=13)	10	76.92	1	7.69	2	15.38	13	100
	Thyroid disorders (n=4)	3	75	1	25	0	0	4	100
	Epilepsy (n=11)	8	72.72	1	9.09	2	18018	11	100

17.41% (significant)cases of PIH required Caesarean section for Foetal distress. Control had only 3% Caesarean sections.

Table No. 14: Correlation of caesarean deliveries for fetal distress with pathological changes in Placentas.

Placental pathology	Control group (n=6)		PIH cases (n=12)	
Macroscopic changes				
Infraction	1	16.66	6	50
Calcification	2	33.33	5	41.66
Retroplacental hematoma	0	0	0	0
Microscopic changes				
Syncytial knots	1	16.66	8	*66.66
Cytotrophoblostic proliferation	0	0	9	*75
Fibrinoid Degeneration	2	33.33	7	58.33
Basement membrane Thickening	0	0	10	*83.33
Stromal Fibrosis	0	0	06	*50
Villous edema	0	0	0	0
Hypervascular villi	2	33.33	0	0
Hypovascular Villi	0	0	2	16.66
Villous immaturity	0	0	0	0
Infarction	0	0	5	*41.66
Calcification	0	0	4	*33.33
Endarteritis obliterans	0	0	0	0

In cases of PIH, patients who required caesarean section for foetal distress had increased syncitial knpots, cytotrophoblastic proliferation, Basement membrane Thickening, Stromal Fibrosis, Infarction, Calcification on microscopic examination of placentas which was significant as compared to Control group.

DISCUSSION

Placenta is the only vital organ in perinatal life which can be examined without hazards either to the mother or to the baby. The placenta is the paradox, as it is one of the most easily available organs for the examination, yet one of the least studied.

The placental changes in medical disorders

Placental changes in pre-eclampsia and eclampsia

On macroscopic examination, Bandana Das et al[5](1996) observed that infarctions and retro-placental haematomas were higher in hypertensive placentas and the changes were directly proportional to the severity and duration of disease process. Salgado SS et al[6](2008) found that the frequency of placental infarcts was significantly higher in hypertensive group (30%) compared to normotensive group(18.7%). However, Moldenhauer JS et al[7] (2003) found that the rates of abruption placentas were not different between the two groups. In present study, placental infarcts were seen in 40% of hypertensives and retroplacental haematomas in 11.42% hypertensives which was significantly higher as compared to 11% and 0% respectively in Control group. Thus our findings correlate with those of the above studies.

Microscopically, Li C et al[8](2000) observed that difference in pathological changes of placental bed between normal term pregnancy and severe pregnancy induced hypertension groups were significant in terms of the proliferation of cytotrophoblasts, numbers of the

placental villi with syncitial knots, thickness of basal lamina, fibrinoid necrosis and deposition of matrix, stromal odema and fibrosis of villi and the vascular numbers of villi. Majumdar S et al[9](2005) found that in moderate to severe PIH cytotrophoblastic proliferation, syncitial knot formation, fibrin knot formation were present in greater amounts in hypertensive placentas. Marina Kos et al[10](2005) found infarcts at various stage and volume in 63 cases(22.6%), accelerated maturation in 42 cases (15.1%), mixed finding in 18 cases (6.5%), intervillous thrombosis in 15 cases immaturity f villi in 6 cases (2.1%). Peilin Zhang et al[11] (2006) observed fibrinoid medial necrosis in 21.4% of placentas, placental infarctions in 32.3% and intervillous thrombosis in 18.9% of cases.

In present study, microscopically increased syncitial knots were seen in 80%, cytotrophoblastic proliferation in 77.14%, fibrinoid degeneration in 64.28%, basement thickening in 68.57%, stromal fibrosis in 55.71%, hypermature villi in 20%, infracted areas in 42.85% and calcified areas in 32.85% cases which were statistically significant as compared to Control group. Thus, our findings correlate with those of above studies except microscopic pathologies observed more frequently in our study than in other studies,. This could be due to most of the unbooked cases reporting late at the hospital with full blown underlying pathologies.

Placental changes in chronic hypertension

According to Fox[12](1978) Placental changes in chronic hypertension and PIH are almost same except an obliterative endarteritis of the fetal stem arteries is seen less frequently in hypertensive placenta and there is less tendency to form excess of syncitial knots, stromal fibrosis, retroplacental haematomas and villous fibrinoid necrosis as compared to PIH cases. Bandana Das et al[5](1996) found that morphologically placentas of PIH are more severely affected than placentas of Essential hypertension. Rosana R.M et al (13) the number of knots presented a positive correlation with the length of time and severity of the hypertensions during gestation and the fibrin deposit was greater in an all hypertensive syndromes of pregnancy. In present study, microscopically, infarcted and calcified areas were seen in 57.14% and 71.42% of cases and retroplacental haematomas were seen in 14.28% of Cases having chronic hyperetension as compared to 40%, 45.71% and 11.42% of cases respectively in cases of pre eclampsia and eclampsia while on microscopic examination increased syncitial knots were seen in 85.7% cases and increased syncitiotrophoblastic cells, fibrinoid degeneration and increased basement membrane thickening in 71.42% of cases, infarcted and calcified areas seen in 57.14% of cases which were seen more frequently than in cases of pre-eclampsia and eclampsia.

Placental changes in Anemia

In present study, the placental diameter was > 20 cm in 11.66% of Anemic cases which was statistically significant as compared to Control group which correlates with that observed by Apnei Huang et al[14](2001). Increased syncitial knots were seen in 23.33% of cases, fibrinoid degeneration in 26.66% of cases, stromal fibrosis in 56.66% of cases, hypervascular villli in 76.66%, endarteritis obliterans in 20 and calcified areas in 33.33%, which was statistically significant as compared to Control group. These findings correlate with those of Rangnekar and Darbari[15](1993) and Dhall U[16](1994). But, increased syncitial knots, fibrinoid degenerationand calcifications which were found in contrast to Rangnekar and Darbari[15](1993). In present study, may be due to early senescence changes in these placentas as 45% of Anemia cases of Our study had preterm deliveries and 51.66% had low birth weight babies.

Placental changes in Anemia

According to Fox[17](1978) in women with well compensated Heart disorder, during pregnancy, the placenta is usually normal in all respects but in those with decompensated heart disease the placenta tends to be larger than usual. Histological abnormalities in those placentas were slight villous odema and marked congestion of villous vessels. Zaichenko Si[18](1997) studied 20 uteri, 80 Placentas and the hearts of 66 normal fetuses from rheumatic mothers and observed the development of dyschronosis in the placenta and fetal heart. In the present study, placental diameter was increased in 33.33% with decompensated heart disease as compared to 25% in compensated hearty disease. Microscopically, all pathologies were seen with increased frequency in placentas with decompensated heart disease as compared to placenta of compensated heart disease. Villous odema and hypervascular villi were seen in all cases with decompensated heart disease while it was seen in 41.66% and 58.33% of cases with compensated heart disease. All these findings correlate with those of above studies.

Placental changes in Diabetes

Tewari k et al[19](1997) observed in their study that placenta of Diabetes showed villous odema and immaturity which causes increase in thickness and delay in maturational grades. Daskalakis G et al[20](2008) observed in their study that presence of degenerative lesions such as fibriniod necrosis and vascular lesions like chorangiosis was apparent, mainly in diabetes group. Villous immaturity as an indication of chronic foetal hypoxia was significantly increased in the placentas of women with diabetes compared with the Control group.

In the present study, Diabetic placentas showed increase syncitiotrophoblastic knots, cytotrophoblastic proliferation and villous odema in 75% of cases which was significantly more than Control group. Fibrinoid degeneration, hypervascular villi and villous immaturity was seen in 50% of cases. All these findings correlate to those of above studies.

Placental changes in Hepatitis

Komarova D V et al[21](1993) found that in viral hepatitis placentas showed lymphocytic infiltration of varying degrees and vasculitis and inclusions in the nulei smilar to those found in the liver affected with viral hepatitis. LiuY eta l[22](2004) found the incidence of fibrinoid necrosis and chorionic hyperemia in foetal infection group to be 29% and 50% respectively which was higher than those in control group (9% and 15%).

In the present study, in cases having Hepatitis increased syncitial knots, stromal fibrosis, fibrinoid degeneration and hypovascular villi were seen in significantly increased frequency as compared to control group. lymphocytic infiltration of villi was seen in 69.23% of cases. All these findings correlate to those of above studies.

Placental changes in Tuberculosis

Michael F. Cantwell et al[23](1994) in their case report of 2 cases of Congenital tuberculosis found the placenta showing acid fast bacilli(AFB) and inflammatory cells in an intervillous thrombus. According to RMS Wong et al[24](2007), placenta may develop caseous lesions in maternal tuberculosis and if these lesions burst into amniotic cavity may lead to congenital tuberculosis by aspiration of these contents. In present study also, caseous lesion were seen in 2 of 3 cases with **T**uberculosis and AFB were recovered from these cases by Z-N staining. Microscopic pathologies like increased syncitial knots, stromal fibrosis, fibrinoid degeneration and hypervascular villi were seen. All these findings correlate to those of above studies.

Placental changes in Asthma

Mayhew TM et al[25](2008) observed that compared to non-asthmatic controls, asthmatics had reduced absolute volumes of foetal cappliaries which was most marked in those with moderate/ severe asthma. Those using low and high doses of inhaled glucocorticoids and those making greatest use of inhaled glucocorticoids also had villi which were hypovascularised in terms of capillary: villous length ratios.

In the present study as stated in above study, 75% of cases of asthma using glucocortioids regularly had calcified areas on macroscopic examination and on microscopic examination had fibrinoid degeneration stromal fibrosis, calcifications and in 50% endarteritis obliterans. These pathological changes were not significant in cases of asthma not using steroids regularly. All these findings correlate to those of above studies.

Placental changes in Thyroid disorders

Pavlova TV at al[26] (2006) observed that placental changes in Thyroid disease were villous immaturity, fibrinoid degeneration, sclerosis and alternative processes. Dysadaptive changes were mostly observed in Thyrotoxicosis and hyperthyroidism. Present study also showed the dysadaptive morphological changes in 1 of 2 cases with thyroid disorder in pregnancy.

Placental changes in Epilepsy

Semczuk –Sikora A, Samczuk M[27][28](2004) found that only toxic concentrations of valproic acid caused morphological changes in placental tissue including microvascular degeneration of cytoplasm, atrophy of syncitiotrophoblasts, colliquative necrosis of some mesenchymal cells. S.W. Sonneveld, J. F. Correy[28](2008) found that epilepsy was associated with an increased risk of Antepartum haemorrhage (4.9%). In present study, placentas in epileptic cases did not show any significant pathological changes as compared to control group. Also, Antepartum haemorrhage in the form of Abruptio was not seen in present study, the reason may be that booked epileptic cases were given regular anti-epileptic treatment with single drug in minimum required dose and unbooked cases also did not receive drugs in toxic doses. None had folic acid deficiency to cause abruptio placentae.

Correlation of foeto-placental weight

Bandana Das at al[5](1996) observed that foeto-placental ratio was diminished in PIH cases. K.M. Godfrey at al[29] (14991) found that in maternal iron deficiency Anemia, large placental weight was associated with low maternal haemoglobin. Taricco E et al[30] (2003)found that significantly higher placental weights and significantly lower fetal / placental weight ratios were found in gestational diabetes mellitus pregnancies. In present study, compared to Control group, the mean placental weight decreased in all cases except in diabetes, anemia and heart disease. So, the feto-placental ratio was increased in all cases except in diabetes, anemia and heart disease. And the placental coefficient (placental weight/ birth weight) was decreased in all cases compared to Control group, except in diabetes, anemia and heart disease. These findings correlate with above studies.

Correlation of fetal outcome with placental changes

Kovalovszki L, Villanyi E, benko G[31](1990) observed that the percentage of edematous villi were significantly higher in the group of newborns requiring resuscitation and correlated positively with oedema of villi severity. Mardi K, Sharma J[32](2003) found that the infarction and intervillous fibrin deposition were much higher in IUGR placentas. Gediminmas Meejus[33] (2005) found that multiple placental infarctions (49.2%) dominated in study group (birth wt< 10 th percentile). In present study, 80.94% of patients had low Apgar scores and 86.36% had Perinatal deaths with placentas < 450 gm. In cases with Perinatal deaths, microscopically, increased syncitial knots(72.72%), fibrinoid degeneration (63.63%) and stromal fibrosis(72.72%) of cases. All these findings correlate with above studies.

Correlation of placental weight with mode of delivery
Udainia A, Bhagwat SS, Mehta[34] (2004) found that placental infarcts were seen in all severe PIH and 92.5% in mild PIH. Sujatha S, Dalgado and Pathmeswaran A[6](2008)found that the frequency of placental infarcts was significantly higher in hypertensive groups(30%) compared to in normotensive groups(18.7%).

In present study, Caesarean section was required in 17.14% of Cases of pre-eclampsia and eclampsia for fetal distress which was significant as compared to Control group and in other disease no significant difference was observed between Cases and Controls thereby matching the findings of above studies.

Limitations of study
1) Due to non-availability, Study could not be done with electron microscopy. Stereological studies could not be done.
2) No case of connective tissue disorder was available for Study though included in it.

Future scope of Study
Literature available to us at present on placental studies with fetal outcome does not correlate directly the relationship between the pathological changes in placenta and need for Caesarean deliveries for fetal jeopardy or fetal distress due to placental changes. More studies are needed to confirm this association and found significant, role of preventive measures to decrease development of these changes and in turn Caesarean deliveries.

CONCLUSION
The majority of Placentae from medical disorders in pregnancy show pathological changes directly in proportion to severity of medical disorder and correlate positively for increase in fetal jeopardy, fetal distress, Perinatal deaths and low Apgar scores and increase in Caesarean deliveries. Gross and microscopic examination of Placentas should be performed in all cases of medical disorders in pregnancy where pregnancy outcome is abnormal. The potential benefits of placental examination include clarification of placental pathological features, improved management of subsequent pregnancies by diagnosing pathological conditions that may have risk of recurrence or even may be preventable or treatable.

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