

## PLACENTAL CO-EFFICIENT IN NEPALESE POPULATION AND IT'S CLINICAL RELEVANCE

Shekhar Kumar Yadav <sup>\*1</sup>, Ratindra Nath Shrestha <sup>2</sup>, Arun Dhakal <sup>3</sup>, Gulam Anwer Khan <sup>4</sup>.

<sup>\*1</sup> Assistant Professor, Department of Anatomy, Chitwan Medical College, Bharatpur, Nepal.

<sup>2</sup> Professor and HOD, KIST Medical College, Kathmandu, Nepal.

<sup>3</sup> Assistant Professor, Chitwan Medical College, Bharatpur, Nepal.

<sup>4</sup> Assistant Professor, Department of Anatomy, Chitwan Medical College, Bharatpur, Nepal.

### ABSTRACT

**Background:** The placenta is a functional unit between the mother and the fetus. Placental coefficient is a method to correlate the weight of a baby and the placenta. Any pathological events that concern the mother and the fetus tend to influence the normal function of the placenta as revealed in different studies by many authors.

**Aim:** The aim of the study was to examine and assess placental coefficient of the normal placenta and also in pathological conditions which included diabetes mellitus, anaemia and hypertension.

**Materials and Methods:** The freshly delivered placentas for this study were obtained from department of Gynaecology and Obstetrics, Tribhuvan Hospital Teaching Hospital. The study was conducted on a total of 100 freshly obtained placenta, out of them, 15 were from diabetic mothers, 15 from anaemic mothers and 15 from hypertensive mothers. The placental co-efficient was obtained by dividing placental weight in grams by birth weight in grams.

**Results:** The mean weight of placenta was  $546.9 \pm 81.38$  gm. The mean neonatal weight was  $3.00 \pm 0.4$  kg. The result shows statistically significant difference between weight of placenta ( $p=0.001$ ) and placental coefficient ( $p=0.001$ ) of anemic and non-anemic mothers. Similarly statistically significant difference was obtained between weight of placenta ( $P=0.003$ ) and neonatal weight in diabetic ( $P=0.016$ ) and non diabetic. Statistically significant difference was not observed in hypertensive and normotensive placenta.

**Conclusion:** Findings of the study shows the assessment of placenta very much essential as normal pregnancies can also show significant placental changes. Systemic illness alters the placental morphology and adequate treatment of systemic illness may therefore be necessary to normal placental function.

**KEY WORDS:** Placenta, Parameters, Diabetes mellitus, Anaemia, Hypertension.

**Address for Correspondence:** Dr. Shekhar Kumar Yadav, Assistant Professor, Department of Anatomy, Chitwan Medical College, Bharatpur, Nepal. **E-Mail:** [shekhar\\_np1@hotmail.com](mailto:shekhar_np1@hotmail.com)

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### INTRODUCTION

The Placenta is an organ which maintains the pregnancy and promotes normal fetal development. Researchers have emphasized the benefits associated with the anatomical

examination of the placenta since a long time. The placental coefficient correlates the weight of a baby and the placenta. The examination of the placenta in utero as well as postpartum, gives valuable information about the state of

fetal well being [1].The clinical indications for placental examination have no gold standards, systemic illness in pregnancy is known to have effects on many important organs of the body including placenta. The present study was undertaken to assess the placental coefficient in Nepalese population . Diabetes, hypertension and anaemia were included in the systemic illness in the study and the differences in placental weight and placental coefficient in normal and pathological condition was noted.

## MATERIALS AND METHODS

The study was conducted in the Department of Anatomy, TUTH in a sample size of 100 freshly delivered placenta obtained from the Department of Gynecology, soon after their expulsion, both from normal deliveries and caesarean sections. The sample size for this study was 100 human placentas, calculated according to the prevalence of systemic illness in pregnant ladies visiting the Gynaecology ward. Study was started after obtaining permission from Institutional Review Board, (Research Department) and the Professor and Head of Obstetrics and Gynecology Department. Informed consent was taken from the parents of the baby. Inclusion criteria was set which included normal primigravid and multigravid cases between 18 to 39 years, gestational age being 38 to 42 weeks and the pathological factors which complicated pregnancy with or without medications were hypertension, pregnancy induced hypertension(PIH),Diabetes mellitus, gestational diabetes and Anaemia. Detailed history of mother such as parity, address, occupation, marital history, previous obstetric history, past history of major illness, present medical history and habits were recorded on a proforma. Mothers were examined for B.P, pulse, anaemia, jaundice etc. Their investigation reports were checked (blood sugar, hemoglobin levels ) Mothers with Hb 10g/dl or less and diagnosed as anaemic were included as anaemic mothers, mild, moderate and severe were not specified. Previously established diabetes mellitus and gestational diabetic cases were included.

Hypertensive mothers and pregnancy induced hypertensive cases had their blood pressure

ranging from 140/90mm. to 160/110 mm of Hg and above were included. All placentas were collected immediately after delivery. The placenta was washed properly by tap water and clots were removed from the maternal surface and gently pressed dried with filter paper. Umbilical cord was cut leaving a length of 1cm from its placental site of insertion and membranes were trimmed. Then the placenta was weighed on an electronic digital weighing machine. The weight of placenta was measured in grams. The neonatal weight was obtained after weighing the newborn along with warm clothes, the weighing machine was tallied with the clothes to be wrapped for accurate value. The placental co-efficient was obtained by dividing placental weight in grams by birth weight in grams

## RESULTS

The study was conducted on a total of 100 freshly obtained placenta out of which 94 were circular and 6 were oval in shape. Infarction, placental cyst, umbilical cord knots or other abnormalities were not observed in this study. Descriptive statistics was used to determine the mean values , obtained values are shown in tables.

**Table 1:** Descriptive statistics.

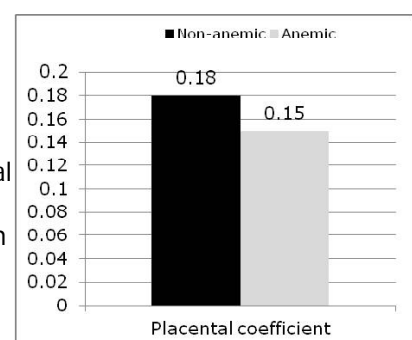
	Mean	SD	Minimum	Maximum
Placental weight (gm)	546.98	81.38	325	816
Neonatal weight (kg)	3	0.4	2.2	4
Placental coefficient (PCO)	0.18	0.02	0.09	0.24

**Table 2:** Descriptive statistics for anaemic and non-anaemic cases.

	Study group	Mean	SD	Minimum	Maximum	P value
Placental weight (gm)	Anemic	427.8	84.7	325	506	0.001*
	Non-anemic	553.25	76.65	400	816	
Neonatal weight (kg)	Anemic	2.86	0.57	2.4	3.7	0.406
	Non-anemic	3.01	0.39	2.2	4	
Placental co-efficient	Anemic	0.15	0.05	0.09	0.2	0.001*
	Non-anemic	0.18	0.018	0.15	0.24	

\*: Statistically significant

**Fig. 1:**  
Bar diagram showing placental coefficient in anaemic and non anaemic.



**Table 3:** Descriptive statistics for diabetic and non-diabetic cases.

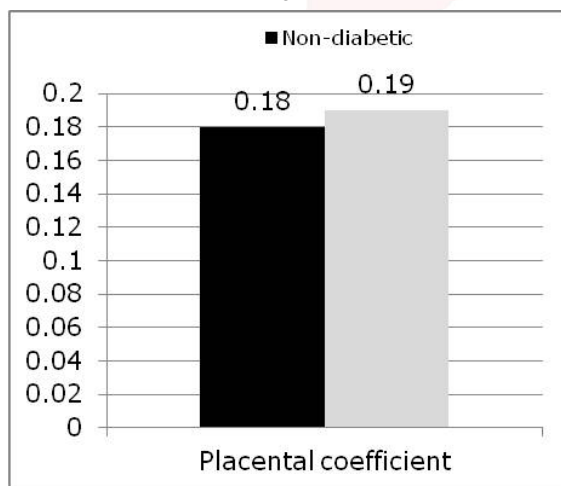
Parameters	Study group	Mean	SD	Minimum	Maximum	P value
Placental weight (gm)	Diabetic	634.43	45.87	584	704	0.003*
	Non-diabetic	540.39	79.77	325	816	
Neonatal weight (kg)	Diabetic	3.36	0.21	3	3.6	0.016*
	Non-diabetic	2.98	0.4	2.2	4	
Placental co-efficient	Diabetic	0.19	0.013	0.17	0.21	0.355
	Non-diabetic	0.18	0.019	0.09	0.24	

\*: statistically significant

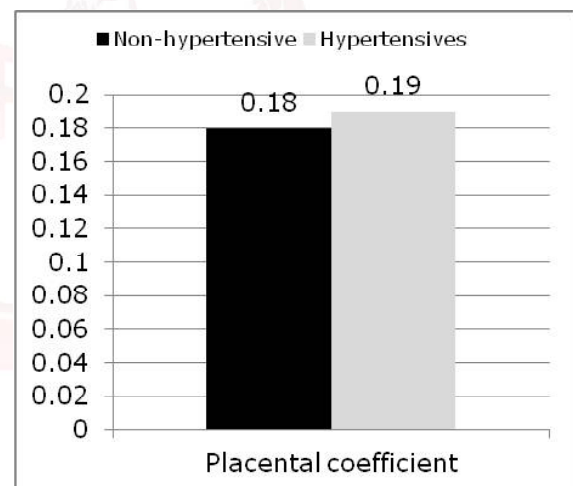
**Table 4:** Descriptive statistics for hypertensive and normal cases.

	Study group	Mean	SD	Minimum	Maximum	Pvalue
Placental weight (gm)	Hypertensive	541.6	84.7	480	690	0.88
	Non-hypertensive	547.26	81.65	325	816	
Neonatal weight (kg)	Hypertensive	2.86	0.38	2.5	3.4	0.406
	Non-hypertensive	3.01	0.402	2.2	4	
Placental co-efficient	Hypertensive	0.19	0.02	0.17	0.2	0.425
	Non-hypertensive	0.18	0.02	0.09	0.24	

**Fig. 2:** Bar diagram showing placental coefficient in diabetic and non diabetic group.



**Fig. 3:** Bar diagram showing placental coefficient in hypertensive and non-hypertensive group.



## DISCUSSION

Mother was a patient to be cared for and fetus remained merely a maternal appendage for a long time in the past, the concept of fetus as a patient has occurred rapidly over last few decades, presumably best method to correlate the weight of the baby and the placenta is by assessing the placental coefficient. Normally it is 0.10 to 0.2, the average being 0.15 [2]. This correlated well with the present study. The present study showed an average placental coefficient of  $0.18 \pm 0.020$  in normal group,  $0.15 \pm 0.45$  in anaemic group,  $0.19 \pm 0.013$  in diabetic group and  $0.19 \pm 0.025$  in hypertensive group as shown in Table 1,2,3 and 4, which coincides with the normal value and this resulted

from positive correlation between the placental and birth weight in all groups. Placental co efficient outside the normal range is shown to be associated with perinatal adverse effects [3]. The growth and the survival of fetus in utero seems directly related to formation ,development and maturation of the placenta. The weight of placenta is of considerable importance and much information can be gathered by proper weight recording. It is functionally significant as it is related to villous area and foetal metabolism. The weight of placenta is of considerable importance and much information can be gathered by proper weight recording. It is functionally significant as it is related to villous area and foetal metabolism . The present study

showed decreased weight in anaemic group and increased weight in diabetic group whereas no significant change in hypertension group, among which p value was statistically significant in diabetic and anaemic cases. Dadhich A [4] in another study stated Eclampsia and chronic hypertension are the hypertensive conditions of pregnancy. Both of these disorders affect the maternal health and as placenta is derived from both maternal and fetal components so any disorder in mother should affect the placenta. In their study. Eclampsia severely affected the weight, diameter, thickness and number of cotyledons whereas chronic hypertension affected only the placental weight significantly but not the diameter, thickness and number of cotyledons. Thus, eclampsia had more severe effect on morphology of placenta than chronic hypertension. In their study the mean weight of placenta in normal groups was 491.44 and in hypertension group was 419.72, the result was similar to our present study [4].

Morphometric parameters of placenta like weight, volume were significantly lower in hypertensive group as compared to normal group and were statistically significant ( $p < 0.01$ ). This study had similarities to the study conducted by Majumdar et al and Virupaxi R.D et al. Majumdar S, Dasgupta H, Bhattacharya K, Bhattacharya A [5] in an article reveals that the foetal weight is significantly less in the hypertensive group than the control group and the morphometry of placenta i.e weight, surface area and volume show significantly lower values in the study group than the control normotensive group.

Chowdhury A, Anwar S, Meherunnessa Begum, K Nahid Eva, Fahmida Shahnaz [6] in their study showed higher mean value in (Established Diabetes mellitus) EDM group. The differences did not reach a significant level though. The neonatal weight in control and EDM group were  $2.95 \pm 0.53$  and  $3.05 \pm 0.52$  respectively. The neonate did show a tendency towards being heavier in EDM group, but did not reach the statistically significant level. There was a significant positive correlation between the neonatal weight and the parenchymal volume in control and EDM group [6]. The result was similar to our study which did show a positive correlation between the neonatal weight and

placental weight.

In our study the mean neonatal weight in diabetics were higher than in normal group and statistically significant. Teasdale [7] suggested that increased nutritional supply through the placental due to its structural enlargement in diabetic placenta may be the reason for higher birth weight in the babies of diabetic mother. Fahima Akhter, Laila Anjuman Banu, Roxana Ferdausi [8] in another study supported that the gross morphological structure of the placentas in Gestational Diabetic mother did not present any specific, constant or uniform pattern of abnormality. Therefore, it is difficult to establish a clear cut correlation between the placental changes and diabetic state in the mother during pregnancy. However, increased placental weight found in gestational diabetic mother have supported that these changes may be a long term compensatory mechanism, aiming to secure a sufficient nutrient supply to support the growth of large-for-gestational age (LGA) fetus.

Mahamuda Begum, Abu Sadat Mohammad Nurunnabi, Shamim Ara, Gul Newaz Begum [9] stated that maternal anaemia had frequently been interpreted as evidence of compensatory hypertrophy for reduced oxygen supply. It is possible in the way that foetal hypoxaemia develops due to lower haemoglobin concentration in placental circulation, usually stimulates placental growth. Maternal anaemia causes the development of a big placenta [10]. Our present study revealed low placental and neonatal weight in anaemic group. In the present study the product movement correlation between the placental weight and birth weight indicated a positive correlation in all systemic illness groups as well as in normal groups. The higher the placental weight, higher is the birth weight and vice versa as shown in the Table 1, 2, 3 and 4.

## CONCLUSION

Placental co efficient is an important factor in quantitative determination of placenta and normal pregnancy can also show significant placental changes. Examination of placenta by obstetrician and pediatrician can be very helpful to throw light into prenatal life and provide information for proper management and



care of mother and her offspring. The present study strengthens the concept of evolution of fetus as a patient and not just a maternal appendage.

**Conflicts of Interests: None**

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