

Concept of placenta with special reference to attachment of nabhinadi (umbilical cord) and its relationship with fetal birth weight

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Abstract

Background: Apra (Placenta) is a vital organ of higher mammals which is attached to the Garbhashaya (uterus) and is connected to the fetus through the Nabhinadi (umbilical cord). The examination of Apra (placenta) and its attachment to umbilical cord soon after its expulsion in the third stage of labour, gives a clear idea of what had happened with it in the intrauterine period of its existence. Apra, by virtue of its appearance and functions described in Ayurveda can be well correlated as placenta; and Rasavahininadi or Nabhinadi to the umbilical cord.

Objective: To evaluate the variation in placental attachment of umbilical cord and its relation to fetal birth weight. As congenital anomalies are often associated with umbilical cord insertion anomalies, early identification of the same can pick congenital anomalies

Materials and Methods: For the conceptual study, Ayurvedic classical and modern texts, books on the contemporary science, journals, presented papers and internet were reviewed. For clinical evaluation 39 specimens were collected after proper approval from the Department of Obstetrics and Gynaecology, Alva's Health Centre, Moodbidri, for the assessment of placental attachment with umbilical cord and its diameter, thickness, perimeter, weight along with length of umbilical cord.

Discussion and Conclusion: Common attachment of umbilical cord to placenta is central. It varies at many times of attachment. Both Apra and Nabhinadi along with placenta are interrelated with each other in determining the fetal growth. There exists a positive relationship on attachment of Nabhinadi to Apra and fetal birth weight.

Key words

Apra, Nabhinadi, Placenta, Umbilical cord, Velamentous insertion of cord, Furcate

Introduction

Ayurveda describes Apra as an organ which nourishes the fetus through its attachment with the mother by Nabhinadi.¹ The normal growth and development of the fetus depend on the successful integration in functions of placenta, umbilical cord, amniotic fluid and fetal organ systems. Garbhaposhana is the main function of Apra via Nabhinadi.² Apra with Nabhinadi are vital organs for maintaining pregnancy and promoting normal fetal development. Examination of placenta and umbilical cord at birth can aid in identifying life threatening conditions of baby at birth.

Placenta³ is a fleshy structure that develops mostly from fetal chorionic tissue (arising from trophoblast) and maternal decidua during pregnancy. It lies implanted on uterine wall and is connected with fetus through umbilical cord in the amniotic cavity thus maintains pregnancy and carries vital fetal functions. It also brings enormous changes in the mother, mainly through its diverse hormones, to adapt the mother to the fetal needs.

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Fetal growth is dependent on oxygen and nutrient-transfer capacity of the placenta, which is highly associated with the vascular network development within the chorionic villi facilitating nutrient exchange and determining resource allocation and this organ is fundamental to fetal growth. The placental insufficiency accompanying abnormal cord insertion may increase the susceptibility to perinatal risk often associated with these conditions. Thus, it is hypothesized that optimal placentation will result in a central insertion of the umbilical cord which in turn allows an optimal growth of the fetus throughout gestation. This study aims to examine if the site of umbilical cord insertion within the placenta of singleton pregnancies could be correlated to the newborn birth weight at term and to its individual growth potential.

Materials and Methods

Study setting

The study was carried out in the Department of Obstetrics and Gynecology of Alva's Health Centre, Moodbidri.

Inclusion criteria

39 consecutive singleton deliveries after 38 weeks of gestation (WG) (from June 2013, to September, 2013), were taken for the study.

Exclusion criteria

Any history of complications during gestational period, multiple babies, any history of systemic illness or any other systemic ailments, any visible wear and tear to placenta at time of birth were excluded.

Methodology of study

During time of collection of the placentas, weight, diameter, perimeter, thickness, attachment and length of umbilical cord, weight and sex of new born, with APGAR score and gestational frequency of volunteer were recorded in the chart. The selected neonatal items were as follows: gestational age at birth (in days), baby's gender, size, and weight, and cord insertion site. Four categories were used: central insertion, peripheral insertion, marginal and membranous or velamentous. Attachment within 1cm circumference from midpoint of diameter is considered as central attachment. Attachments within 2cm from the edge of placenta is considered as marginal attachments. Attachments in between central and marginal is considered as peripheral. Attachments by membrane are velamentous and those umbilical cord which bifurcate before insertion are furcate. Each new born was individually assessed for growth and adjusted to its gestational age according to the infant's growth potential.

Instruments used

The weight of each placenta was determined by an electronic balance in kilograms and then recorded against its specific number. The indirect method used for measuring the central thickness of the placenta because of the destructive nature of direct method. A tooth pick was used to pierce the placenta from the chorionic plate to the basal plate. The central point of the placenta was determined by measuring the diameter with a plastic ruler and the midpoint thus calculated. A thick cotton thread was used to outline the perimeter of each placenta with accuracy.

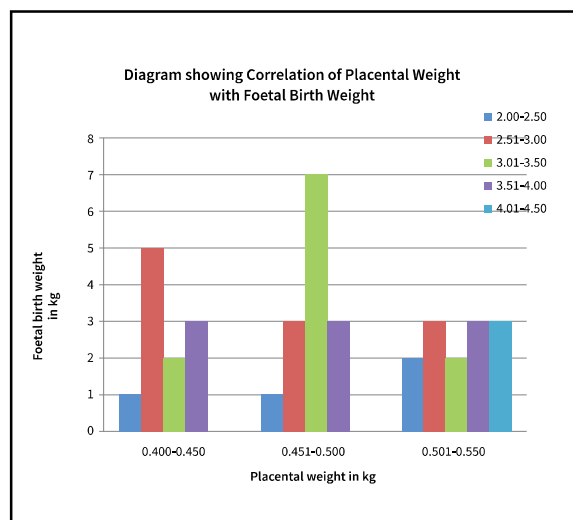
Statistical methods

Variables were described as mean and standard deviation (SD) for continue quantitative data, number and proportion for qualitative data, and median and interquartile range for discrete quantitative data. The normality was checked with histogram of the sample data. The linear correlation between two variables by using Pearson's correlation coefficient.

Results

The mean placental weight obtained was 492.18 gm with SD of 35.740 gm. In this study, the mean placental thickness observed was 1.846 cm with SD of 0.3267 cm. The mean placental perimeter obtained in the present study was 59.13 cm with SD of 4.561cm.

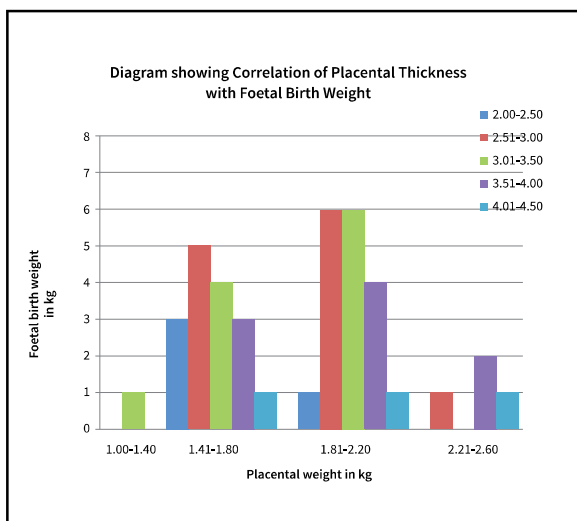
Graph 1: Correlation between fetal birth weight and placental weight



In the present study Pearson's correlation coefficient obtained is, $r=0.238$ and p value is 0.145. There is positive correlation between fetal birth weight and placental

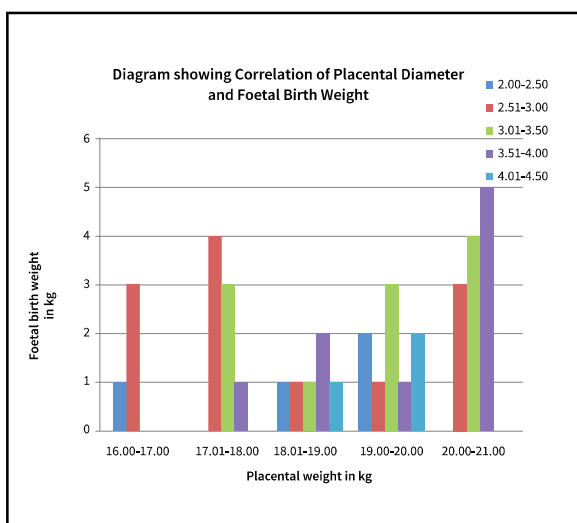
weight, but as the $p > .05$, it is not statistically significant.

Graph 2: Correlation between fetal birth height and placental thickness



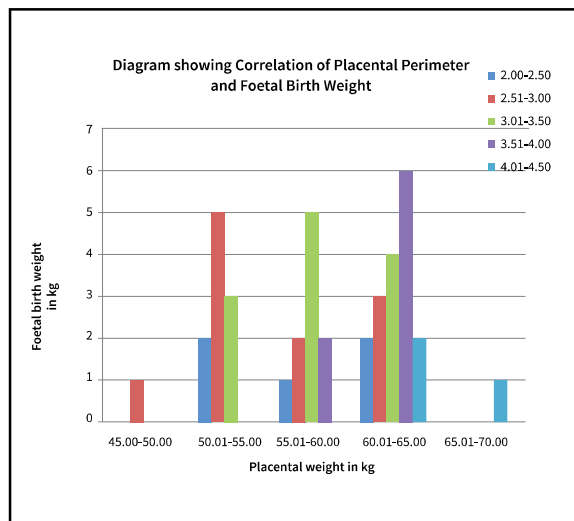
In the present study the Pearson's correlation coefficient obtained is $r=0.280$ and $p=0.084$. There is positive correlation between fetal birth weight and placental thickness, but as the $p > .05$, it is not statistically significant.

Graph 3: Correlation between fetal birth weight and placental diameter



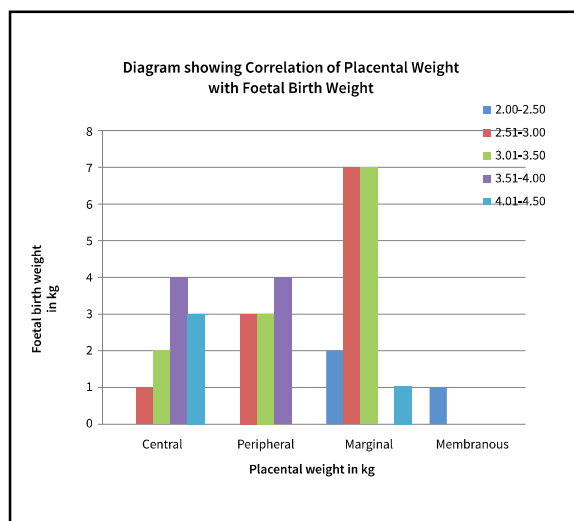
In the present study the Pearson's correlation coefficient obtained is $r=0.357$ and p value is, $p=0.026$. As $p < .05$, with positive correlation (r), the placental diameter is having higher statistically significant positive correlation with the fetal birth weight.

Graph 4: Correlation between fetal birth weight and perimeter of the placenta



In the present study the Pearson's correlation coefficient (r) obtained is $r=0.501$ and p value is 0.001. As $p < .05$ with positive correlation coefficient (r), the perimeter of the placenta is having high statistically significant positive correlation with the fetal birth weight.

Graph 5: Correlation between fetal birth weight and attachment



In the present study the t -value obtained is, $t=-3.764$, and the p value is $p=0.002$. As the $p < .05$, the difference in mean fetal birth weight with central, peripheral, marginal and membranous umbilical cord attachment is having high statistical significance.

Discussion

The placental weight gives us an idea about the nutritional status of the fetus. This is used to obtain the feto-placental weight ratio. Comparing the average placental weight obtained in the present study with the previous studies such as study done by Udainia et al. in 2001 (mean placental weight as 495 ± 114.11 gm with a range of 700 gm – 250 gm 104),⁴ M Asgharnia et al. in 2008 (mean placental weight 529.72 ± 113 gm with a range of 1200 – 250 gm 105)⁵ and Peter Kwabena Appiah in 2009 (563.47 ± 132.31 gm with a range of 315 to 933 gm 108.),⁶ the mean placental weight reported by Udainia et al., (2001)⁴ is close to the mean obtained. The Gray's anatomy textbook has given the mean placental weight as 470 gm with a range of 200-800 gm, which is close to present study⁷. The thickness of the placenta may give indirect information on the fetal-placental ratio. It may give an indication of the amount of substances (nutrients, gases) that is exchanged between the fetus and the mother. And thickness of the placenta is having a significant positive correlation with the weight of the baby. A study done by Peter Kwabena Appiah (2009)⁶ observed the mean placental thickness as 2.65 cm (SD=0.55) with a range of 1.3 cm to 6.0 cm and P. O Abu et al. (2009)⁸ using ultra sonography observed the mean placental thickness at 39th week as 4.51 ± 0.637 cm. Another study was done by G. Reghunath et al. (2011)⁹ observed the mean placental thickness as 2.1 cm. By comparing, the placental thickness obtained by G. Raghunath et al. (2011)⁸ is very close to the present observation. The mean thickness

observed Peter Kwabena Appiah (2009)⁶ and P. O Abu et al. (2009),⁸ are higher than present study. Gray's anatomy textbook has given the placental thickness as 2.5 cm and clinical anatomy by regions by Snell is given it as 2.5

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STATEMENT OF OWNERSHIP AND OTHER PARTICULARS ABOUT "VAIDYARATNAM JOURNAL OF AYURVEDIC MEDICINE"

Title	: Vaidyaratnam Journal of Ayurvedic Medicine	Editor Name	: Dr. P.C. Muraleemadhavan
Regn No.	: KERENG/2019/78329	Editor Address	: Aparna, Vidya Nagar Ayyanthole P.O., Thrissur Kerala - 680003
Language	: English	Printing Press Address	: Ebnezer Print Pack(P) Ltd Industrial Development Plot, Velakkode, Mundur Thrissur - 680 541, Kerala.
Periodicity	: Four Monthly	Owner Name	: Vaidyaratnam Ayurveda Foundation
State	: Kerala	Place of Publication	: Vaidyaratnam Ayurveda Foundation, Vaidyaratnam Road, Thaikkattussery P.O., Ollur, Thrissur - 680 306, Kerala.
Publication District	: Thrissur		
Price	: Rs. 175/- Per copy		
Publisher Name	: E.T. Neelakandhan Mooss		
Publisher Address	: Eledath Thaikkattu Mana Thaikkattussery P.O., Ollur - Thaikkattussery Dist. - Thrissur-680 306, Kerala.		
Printer Name	: E.T. Neelakandhan Mooss		
Printer Address	: Eledath Thaikkattu Mana Thaikkattussery P.O., Ollur - Thaikkattussery Dist. - Thrissur-680 306, Kerala.		

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