Placental Topographic study in Iraqi idiopathic preterm delivery

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Abstract: Background: Preterm delivery (PTD) is well known to be a universal community health problem which has important adverse effects on neonatal mortality and morbidity. In Iraq, idiopathic PTD incidence seemed to be increasing nowadays, hence any research in this circumstance may offer new strategies in the prevention, recognition and managing of this vital event. **Aims:** Comparison of morphologic placental changes of idiopathic preterm delivery with those of normal term delivery could provide an additional method for fast diagnosis of prematurity by the health staff and midwives at the delivery-room which may help in facilitating the immediate management to the neonates so as to decrease incidence of fetal morbidity and mortality. Also classifying a delivery to be preterm; could help in management of the next pregnancy in order to prevent the chance of premature onset of delivery in the successive pregnancies. **Methods:** Ninety placentas from normal vaginal delivery were taken from delivery-room at department of obstetrics and gynecology of Al-Yarmook Teaching Hospital and Al-Khadhraa Private Hospital. These placentas were divided into three groups; 1st group was the control group included placentas of spontaneous term deliveries (n=30) at 37-40 weeks of gestation. The 2nd group consisted of placentas of preterm delivery before 36th week having alive neonates (n=30), and the 3rd group consisted of placentas of PTD gave stillbirths (n=30), then the gross morphological features of placentas were studied. **Results:** Placentas of control group showed significantly elevated average weight as compared to the other two groups (P<0.005), while there was no significant differences among the three groups in the mode of insertion variety of umbilical cord (P>0.05). Conversely, the Thickness and largest diameter of the placenta showed significantly lower values in PTD placentas of stillbirths (P<0.005), nevertheless, the difference was insignificant when the control group was compared with the placentas of PTD with living neonates (P>0.05). **Conclusion:** The preterm delivery is surely related to the placental morphology and this fact may give a prompt hint for the health-staff for instant identification of prematurity so as to aid for fast management of the preterm fetus; hence decreasing the adverse postnatal outcomes.
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1. Introduction:

The World Health Organization (WHO) describes Preterm birth (PTD) as any delivery before the 37th weeks of gestation. It is one of the foremost clinical problems of pregnancies worldwide and it is the leading cause of neonatal mortality and morbidity [1]. The risk of death of a preterm neonate is 120 times greater than that of an infant born at term [2&3]. Moreover, PTD is coupled with severe complications, such as respiratory illness, cerebral palsy, and blindness [4&5]. Formation of placenta is a biological experience which is very important for the embryo, and it represent immunological wonderful relation between two separated individuals; usually without rejection. The fetal growth depends on the functional ability, location and maintenance of placental attachment. It is an organ for the interchange of substance between maternal and fetal blood streams without mixing or corporeal contact of the two blood streams [6]. Preterm birth is a multi-factorial syndrome having a mixture of risk factors. Amniotic infection is one of many risk factors but it is suggested to be infrequent cause of PTD. Instead, most samples of spontaneous PTD may be caused by placenta insufficiency, as in preeclampsia and fetal growth restriction [7]. Trans-placental exchange is dependent on the uterine and umbilical blood flow, of which the rates are also dependent greatly upon vasculature of the placenta, hence; factors that control placental vascular progress would have a dramatic risk on fetal growing maturity, and accordingly on newborn mortality and morbidity [8]. Among the placental causes of death the most causes are the maternal vascular abnormalities, then; to a lesser extent are the fetal vascular abnormalities and the least are the inflammatory lesions. Maternal vascular abnormalities are more common in preterm stillbirths and fetal vascular abnormalities are more common among term stillbirths. Nevertheless in most cases of stillbirths; the

major contributor to death was found in the placentas [9].

2. Methods:

The present study was performed at Department of Obstetrics and Gynecology at Al Yarmook Teaching Hospital from March 2015 to the February 2016 which included 90 Iraqi women, 30 of these women had preterm deliveries with alive neonates, another 30 had preterm deliveries with stillbirths, given that WHO defines preterm birth as any birth prior to 37th wk of gestation [1], and 30 were regarded as the control group; had normal term deliveries (≥ 37th wk of gestation). Gestational age was determined by obstetrician depending on the first day of the last menstrual period (LMP) as well as ultrasound examination, and was validated with assessment of newborn age by neonatologist at birth [10]. Verbal consents were taken from these women having normal vaginal deliveries; to be included at this work under authorization of the department of obstetrics and gynecology at each of Al-Yarmook Teaching Hospital plus Al Khadhraa Private Hospital. These 90 mothers were selected at age ranging between 20-35 years and selected as uncomplicated clients with spontaneous onset of delivery whether term or preterm.

Collection and examination of placentas:

Placentas were collected directly soon after normal vaginal deliveries. The collected placentas were washed by running tap water to removing any blood clots then the membranes were removed. The umbilical cord was excised, leaving a length of about 2 cm from its insertion on the placenta [11]. All placentas were discoid in shape, spongy and friable in consistency (Fig. 1).

The following placental parameters were taken by gross naked eyes for the three studied groups:

1. Weight: placental weight was estimated (in gram) by means of digital weighing-machine.
2. Diameter: the placenta was put in a flat tray. At the outset, the greatest diameter was estimated with a metallic scale graduated in centimeters. Next, the second greatest diameter was measured at a right angle to the first one. Then mean of the two measurements was calculated to be the diameter of the placental profiles in centimeters [12].
3. Thickness: via pushing a long needle, placental thickness was assessed on five points of each placenta. That was done by dividing each placenta, randomly, into three equal zones; a central, middle and peripheral zones by illustration a couple of imaginary circles on its maternal exterior face. The first thickness was taken from the central zone, other two were obtained from the middle zone and last two from the peripheral zone. To finish, the mean of each of five measurements was determined and judged as the thickness of the placenta expressed by centimeter [12].
4. Mode of attachment of cord: it was eccentric, central, or marginal.

Statistical analysis:

Statistical analysis and reporting of obtained data were carried out by using the computerized database structure; Statistical Package for Social Sciences (SPSS V.20) so a computerized software was used for this purpose. Data were reported and presented as number (n), percentage (%), mean ± SD and/or (95% confidence interval) for the normally distributed variables. The statistical significance of difference between mean of a normally distributed variables of two groups was assessed using the independent samples Student's t-test; and the analysis of variance (ANOVA) was used to compare continuous variables between more than two groups.

3. Results and Discussion:

The placentas were examined by naked eye (anatomically) and showed the following morphological features: The shape of the whole samples was roughly discoid (ovoid to round), soft in consistency, all of them had single lobed with 15-20 cotyledons. The parenchyma looked beefy red without any obvious lesions, the chorionic plate was right clear having evenly sized faced vessels and the vascular pattern was diffused in type in all of them. Vessels in the umbilical cords in the entire of them contained two arteries and one vein and uniform white surface with a homogeneous Wharton's jelly. fresh placental weights were verified after removing blood clots and joined membranes.

Placental thickness:

The mean thickness of 30 placentas of term normal deliveries (control group) was found to be (3.17 ± 0.34 cm). In the group of PTD with a live neonates; it was (2.69 ± 0.23 cm), while in group of PTD with stillbirths; it was (1.83± 0.27cm). There was no significance in differences between the term delivery (control group) and group of PTD with alive neonates, yet, there were highly significant differences ($P < 0.005$) between the means of these two groups when compared with the group of PTD having still births, as shown in (Fig. 2).

Weight of placenta: The mean weight of 30 placentas of term normal deliveries (control group) was found to be (527.000± 41.842 gm), in group of PTD with alive neonates it was (458.466± 67.688 gm), and in group of PTD with stillbirths it was (337.333± 102.492 gm). There were significant differences with ($P < 0.005$) among the means of the three studied groups, as shown in table (1).

Largest diameter of placenta:

The mean of the largest diameter of placentas within the group of normal term delivery namely control group was (17.52±1.28 cm), in the group of PTD with alive neonates; it was (17.24±1.06 cm), while in the group of PTD with stillbirths; it was (15.07±1.13cm). Results showed that there was no significant differences between the means of largest diameter of placentas at the term delivery (control) and PTD with alive neonates group, while there were highly significant differences (p<0.005) between these two groups and PTD with stillbirths as shown in (Fig. 3).

Umbilical cord insertion: The frequencies of insertion of the umbilical cord was as follows: in term delivery (control group) the estimated number was exactly; 3 central (10%), 26 eccentric (86.7%) and only one marginal insertion (3.3%). In PTD with alive neonates group; it was 3 central (10%), 25 eccentric (83.3%) and just 2 marginal insertion (6.7%), whilst in PTD with stillbirths group; it was 2 central (6.7%), 28 eccentric (93.3%) and no any marginal. There was no significant difference (P>0.05) among the three groups in the percentage of mode of attachment of the umbilical cord. According to the mentioned data; the incidence of eccentric insertion had the more frequency within the entire studied groups, as shown in (Fig. 4).

Here; the results of macroscopic observations were in line with previous studies worldwide such as that which affirmed; placental weight was significantly different between term and preterm birth of the same-sex fetuses (P<0.05) and there was no effect of sex on placental weight [13]. Others had studied placentas at different gestational ages and found that thickness of all placentas were varied from 1.8 to 3.5 cm with the average is around 2.5 cm, and the average diameter ranged between 14.2 to 17.5 cm, while the weight of the placenta observed was ranging between 321 to 534 gm, whereas the occurrence of central cord attachment was more frequent [6]. Further research reported that out of 101 placentas which were looked at (91 term babies and 10 preterm babies), the mean standard diameter of these placenta was 17.4 cm, the middling thickness was 2.1 cm and the average weight was 528.6 gm [11], whereas the average normal weight of the placenta at term was 508 gm by other research[14]. Also, a study had done in Ukrainian city which studied 1621 placentas obtained from births of at least 28 weeks aged fetuses; who had documented that placental weight was ranging from 100-1000 gm, with a mean of 470 gm [15], and in Asia accounted that placental weight has a mean of 588gm [10], while in Nigerian 1009 placentas were inspected from term deliveries, and stated that the placental weight has range from 300-890 gm, with a mean of 590gm [16]. Others referred that; the placental weight is enlarged in line with the birth weight, and denoted that the average placental weight of 36-40 gestational age is 519 gm and unusual placental weight is usually associated with adverse pregnancy outcomes [17]. Some demonstrated that fetuses with a low placental weight were at considerably greater risk of stillbirth [18]. Others had confirmed that placental actual weight was lower in small for gestational age infants than in appropriate gestational age infants with the same birth weight [19]. In one analysis of 628 placentas from 89 preterm and 539 term deliveries; the placental weight was 170-870 gm, and placental weight was found to be actually linked with gestational age [20]. Other study reported that the placental diameter ranged from 60 mm at third month to 180 mm at term and stated that there is an accompanying increase in the placental weight with increasing gestational age [21]. According to previous researches; there was a significant raise in the placental weight in term group than that of preterm, while the difference of placental thickness between preterm and term placentas was insignificant [22-25]. It was documented that subnormal placental thickness for a particular gestational age may represent a sign of intrauterine growth retardation [26 & 27]. However, others stated that the placenta gets to nearly its greatest diameter for the period of the first half of pregnancy and persist to increase in thickness all through most of the gestational period as a result of the growth of the villi [28, 29]. Whilst it was stated that placental thickness increases with the advances in gestational age in a rather linear way, so that it can be regarded as an indicator of gestational age [30-32]. Nevertheless it was affirmed that the placental thickness augmented linearly until 36 weeks of gestation then, there is a steady decrease [33-35]. Others conducted that enlarged placental weight was related to perinatal death; whereas a small placental weight was related to different medical complications of the mother [36]. Also, stillbirth was found more frequent with small placental weight group when compared with the normal placental weight group [37]. It was described that term placentas usually have weight of 400-600 gm with roughly 18-20 cm diameter and 1.5-2.5 cm thick at term [38]. The connection of the umbilical cord is confirmed to be normally central/eccentric and sporadically marginal [39- 41]. At the present study; there was a strong correlation between preterm delivery and the placenta by reducing its weight, as well a decline in thickness and diameter of placentas at the group of PTD with stillbirths as compared to PTD with living neonates and normal term deliveries. The variation in the placental weight measurement within this sample of Iraqi mothers than the above mentioned worldwide studies; could be due to differences in the methodology of preparing, weight the placenta

together with or without cord clamping and membranes, also ethnicity, environmental factors, and maternal nutritional status, all of these factors may had affected on placental exact weight. In the present study it had been shown that there was a positive correlation between weight and thickness of the placenta in relation to gestational age, but placental thickness was increased until 38 weeks of gestational age and then decreased, so that there was no significance between normal term deliveries and PTD with alive neonates. Thus, placental macroscopic observation may yield some beneficial information on the foundation of preterm delivery. This clearly emphasized the role of placental gross examination to reveal imperative aspects in evaluation the cause of PTD and stillbirth.

Figure 1: Photograph of human placenta after term delivery

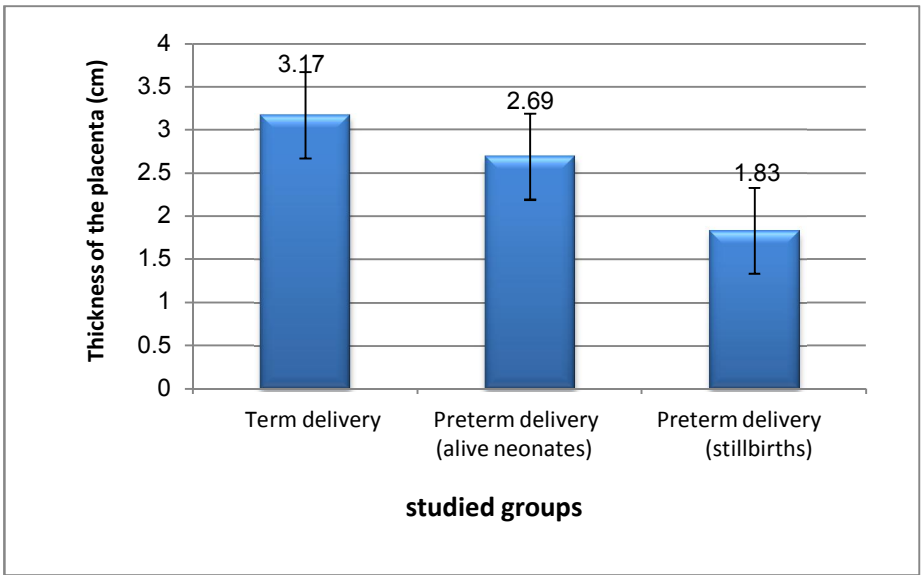

Figure 2: Thickness of the placenta measured in cm

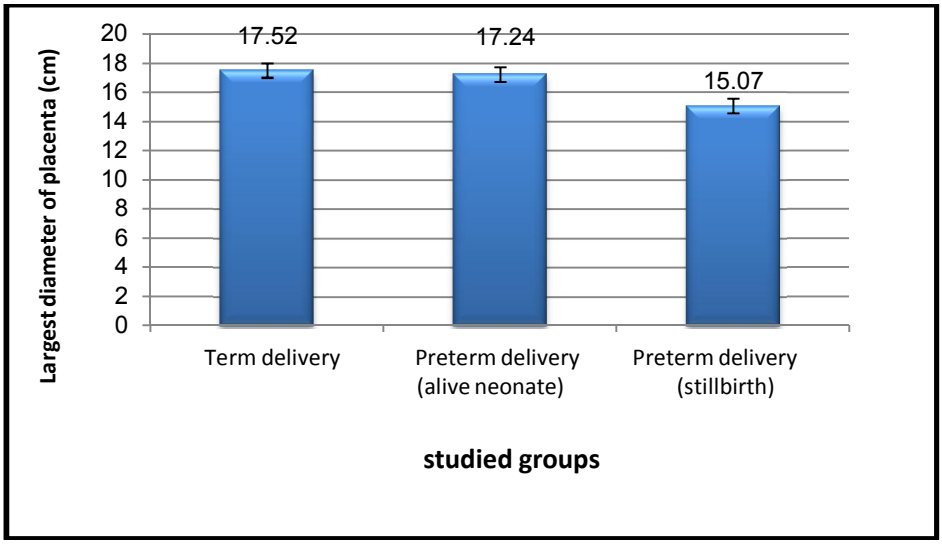

Figure 3: Largest Diameter of placenta (in cm)

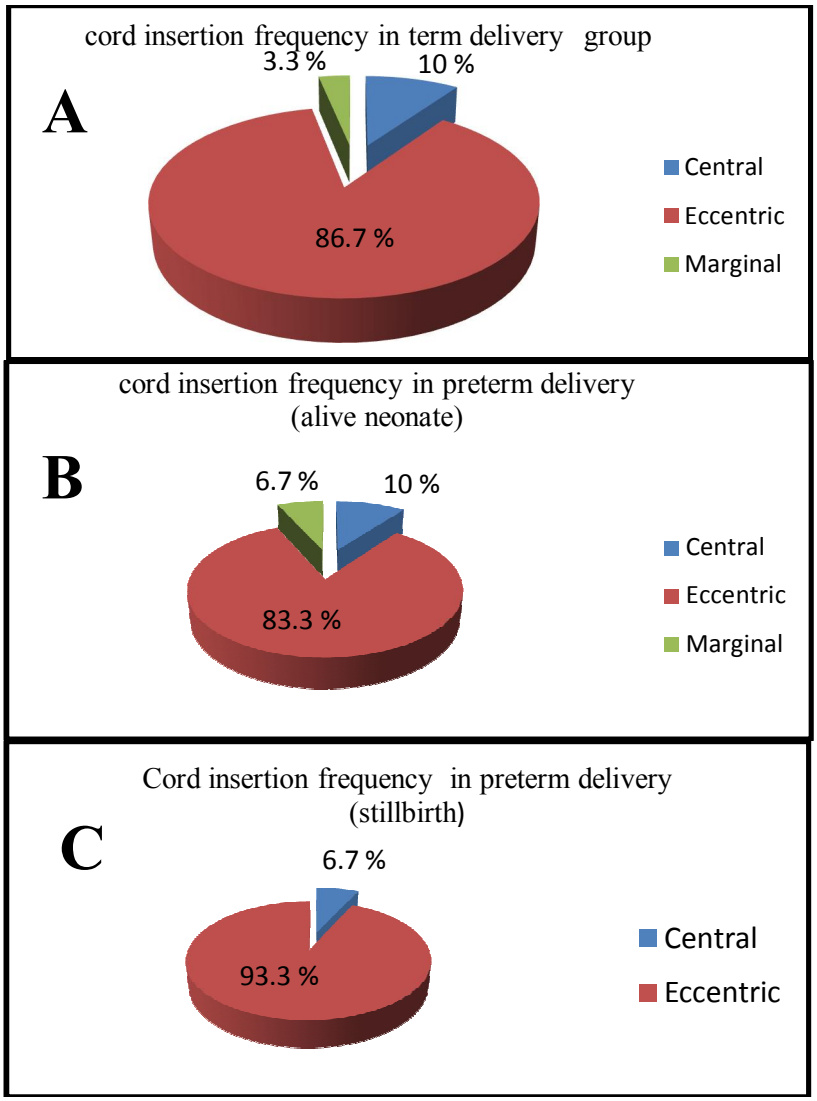

Figure 4: Distribution of umbilical cord insertion, A: Term delivery group, B: Preterm delivery with alive neonates-group, C: Preterm delivery with stillbirths-group

Table 1: Weight of the placenta (in gm)

Studied groups	mean±SD	95% C.I (lower – upper)	ANOVA F value (Pvalue)
Term deliveries (control) N=30	527.000± 41.842	(526.520- 527.479)	49.305 (0.005) *
Preterm delivires (alive neonates) N=30	458.466± 67.688	(457.691- 459.241)	
Preterm deliveries (stillbirths) N= 30	337.333± 102.492	(336.159- 338.506)	
*ANOVA (one way) highly significant at level of significance 0.005.			

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