Placental thickness and its correlation to gestational age in Nepalese woman: a hospital based study

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ABSTRACT

Introductions: Gestational age is estimated on the basis of last normal menstrual period and the measurement of foetal growth parameters by ultrasonography. The lack of accurate recollection of the last menstrual period and dependence of growth parameters on intra-uterine environment, physical and mental well-being of the mother, maternal nutrition and genetic factors leads to the over or under estimation of gestational age. The aim of this study was to investigate the correlation between placental thicknesses (PT) in normal singleton Nepalese foetuses.

Methods: This was a cross sectional study of ultrasound measurement of placental thickness during 2nd and 3rd trimester pregnancy from April 2015 to October 2015 at Department of Radiology, Suraksha Hospital, Biratnagar, Nepal. All viable singleton uncomplicated pregnancies, history of regular menstruation with known LNMP were included. Microsoft Excel and SPSS 17 were used for data analysis. Pearson's correlation analysis was used for correlation between placental thickness and gestational age. Statistical tests were two-tailed with $p < 0.01$ as statistical significance.

Results: There were 592 pregnant women who met the criteria. Placental thickness increased by 0.86 mm in every week of increase in gestational age. The maximum mean PT of 40.42±1.05 mm was observed at 39th week. There was a significant positive correlation between placental thickness and gestational age, correlation coefficient r=0.986 (P<0.001).

Conclusions: PT was found to be a reliable alternative predictor in calculating gestational age. Measurement of PT should be done routinely during obstetrics ultrasonography.

Keywords: antenatal ultrasound,gestational age, placental thickness, singleton pregnancy,

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INTRODUCTIONS

Placenta is a disc-shaped organ that facilitates nutrient and gaseous exchange between pregnant woman and foetus. Placenta is approximately 3cm thick, weighs 500-600gm and measures 15-25 cm in diameter.[1] Placental thickness (PT) is reported as a reliable indicator in calculating gestational age (GA).[2]

The GA is a key indicator to evaluate growth and development of foetus and is measured from the first day of last normal menstrual period (LNMP) to the current date of pregnancy. It depends on an accurate recollection of LNMP and could be over or under estimated.[1]

Ultrasonography (USG) is also used to estimate GA in different time period of pregnancy by measuring size and volume of gestational sac, crown-rump length, bi-parietal diameter, femur length, abdominal and head circumferences. These growth parameters are affected by insufficient nutrients reaching foetus through placenta.[3]We aim to investigate the relationship between PT and GA in normal singleton pregnancy in Nepalese woman.

METHODS

This was a cross sectional study done on pregnant woman who attended antenatal check-ups during April 2015 to October 2015 at Department of Radiology, Suraksha Hospital, Biratnagar, Nepal. All viable singleton uncomplicated pregnancies, and history of regular menstruation with known LNMP who had USG at Radiology and Imaging Department were included. All USGs were performed on GE logic 3 expert scanner with 3.5 MHz convex array transducer.

Exclusion criteria were multiple pregnancies, known maternal disease, gestational diabetes, hypertension (systemic and pregnancy), foetal anomalies, placenta previa, placental anomalies and poor visualization of the placenta.

Placental thickness was measured in millimetres at the level of the umbilical cord insertion. The myometrium and sub-placental veins were excluded. All the subjects were examined in supine position with a full urinary bladder.

Microsoft Excel and SPSS 17 were used for data analysis. Pearson's correlation analysis was used for correlation between PT and GA. Values were expressed as mean±sd (standard deviation). Statistical tests were two-tailed with $p < 0.01$ as statistical significance.

RESULTS

There were 592 pregnant women who met the inclusion criteria. Age ranged from 19 to 32 years, with 375 (63.34%) in age group 20-25 years, (Table 1). There were 303 (51.18%) posteriorly located placenta.

The PT increased by 0.86 mm every week with increase in GA and maximum mean PT was 40.42±1.05 mm at 39th week. The mean PT during 2nd trimester was 24.24±3.77 mm, range 17.69mm to 31.17mm (Table 2). The mean PT during the 3rd trimester was 36.63±3.15 mm, range 29.56mm and 42.22mm respectively (Table3).

The Pearson correlation coefficient (r=0.986, P<0.001) showed linear association of increase in PT with increasing GA (Figure 1). The correlation coefficient for 2nd and 3rd trimester were r=0.958 and r=0.929 respectively, p value <0.001 (Table4).

Table 1. Age of pregnant women with normal singleton pregnancy		
Age	**Subjects (n)**	**%**
<20	100	16.89
20-25	375	63.34
26-30	104	17.57
>30	13	2.20
Total	592	100

Table 2. Placental Thickness (PT) during 2nd trimester 14-26 weeks gestational age (GA) in normal singleton pregnancy (n=278)

GA (Weeks)	Subjects (n)	Mean PT (mm)	Maximum PT (mm)	Minimum PT (mm)
14	9	18.23±0.33	18.73	17.69
15	21	18.74±0.40	19.69	18.09
16	12	20.55±0.57	21.45	19.66
17	27	21.60±0.34	22.22	20.93
18	7	22.86±0.75	23.75	21.75
19	26	23.73±0.51	24.36	22.35
20	22	24.73±0.49	25.61	23.73
21	29	24.90±0.57	25.98	23.84
22	15	26.02±0.66	26.92	24.56
23	27	26.79±0.45	27.51	25.92
24	26	28.09±0.44	28.65	26.87
25	28	28.61±0.43	29.23	27.62
26	29	30.31±0.64	31.17	28.56

Table 3. PT during 3rd trimester 27-40 weeks GA in normal singleton pregnancy (n=314)

GA (Weeks)	Subjects (n)	Mean PT (mm)	Maximum PT (mm)	Minimum PT (mm)
27	30	30.55±0.54	31.65	29.56
28	34	31.47±0.40	32.15	30.44
29	27	32.95±0.71	34.37	31.56
30	25	35.04±1.31	36.88	32.67
31	31	36.41±0.78	37.45	34.91
32	19	36.88±0.54	37.95	36.11
33	24	36.85±0.58	37.95	36.02
34	27	37.24±0.61	38.12	36.04
35	22	37.32±0.57	38.35	36.35
36	18	38.25±0.83	39.35	36.33
37	17	39.15±0.89	40.77	37.45
38	15	40.06±0.80	41.15	38.21
39	18	40.42±1.05	42.22	38.41
40	7	40.23±0.65	41.31	39.31

Table 4. t-Test results for 2nd and 3rd trimesters for correlation coefficient

Trimester	N	Correlation Between PT and GA (r)	Sig. (2-tailed)
2nd	278	0.958	0.000<0.001
3rd	314	0.929	0.000<0.001
Both 2nd and 3rd	592	0.986	0.000<0.001

DISCUSSIONS

Our data shows strong positive correlation between the increase in PT and increasing GA, with weekly increase of 0.86mm and reaching a maximum of 40.42±1.05 mm at 39th week.

In the eighth week of pregnancy, the early placenta is visible on USG as a generalized thickening around the gestational sac.[4,5] At 9th week of development, the placenta undergoes major changes to fulfil the increased demands for nutrition.[1] Maternal nutrition influences

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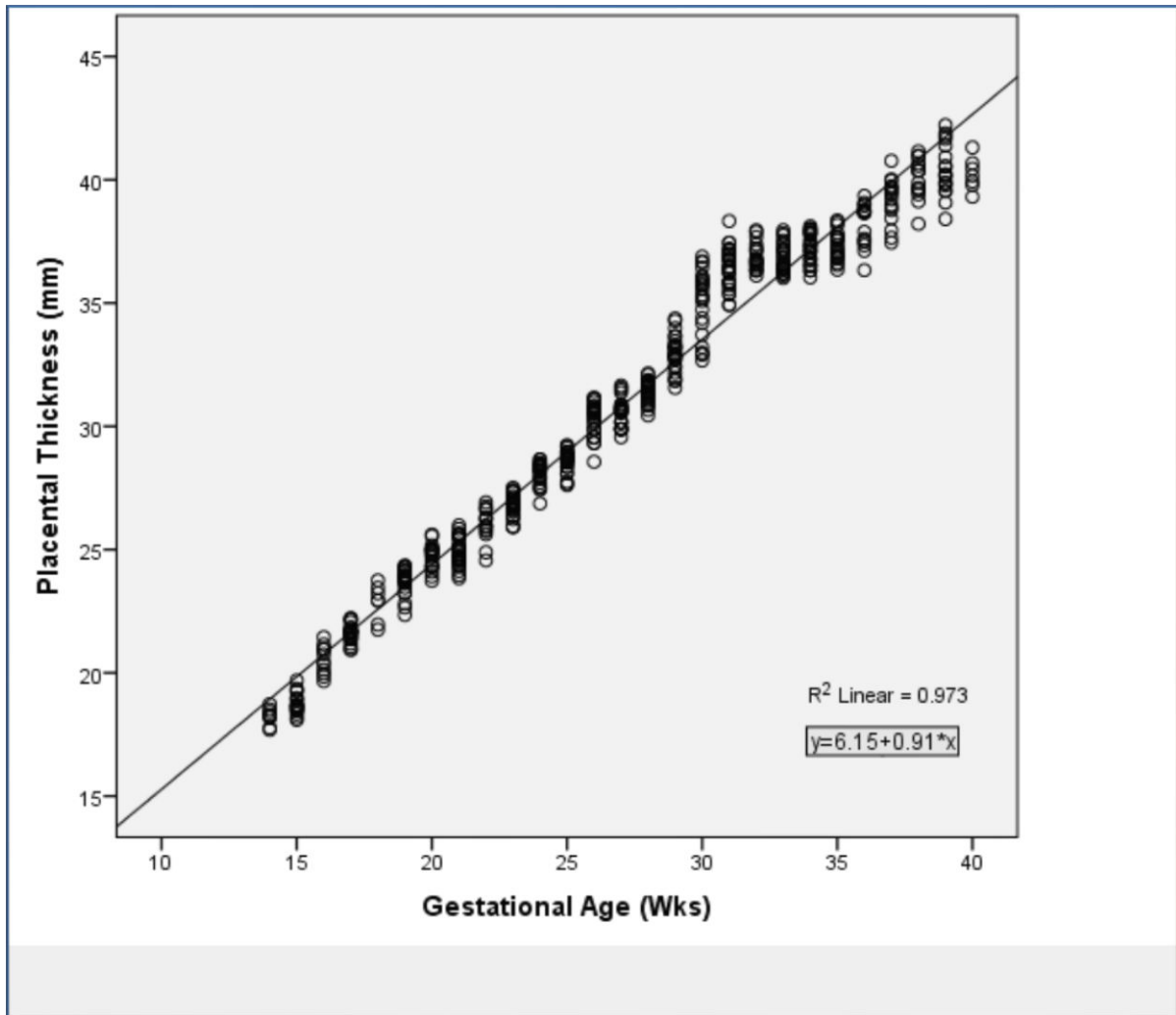Journal of Patan Academy of Health Sciences. 2017 Dec;4(2):53-57.

Figure 1. Correlation between PT and GA of singleton pregnancy (n=592)

the rate of nutrient delivery through the placenta and plays a critical role in foetal growth and development.[6] Possibly due to inadequate nutrition, study suggests that Nepalese newborns are smaller than Indian and Canadian newborns in weight, length and head circumference.[7]

Thick placentas are related with gestational diabetes, intrauterine infection and hydrops fetalis while thin placenta are associated with intrauterine growth retardation (IUGR).[3] Dombrowski showed that perinatal morbidity and mortality was increased in thick placenta.[8] The placental thickness should be approximately equal in millimetres to weeks of gestation but normally do not exceeds 40mm.[9] In our study of singleton pregnancy, the maximum mean PT of was 40.42±1.05 mm at

39th week of gestation. Placental thickness of less than 2.5cm is usually associated with IUGR.

The gestational age is difficult to estimate in case of unusually large or small foetus.[10] The size of uterus in early pregnancy and the height of the uterus in later pregnancy do not necessarily reflects GA calculated by LNMP. When cycle is irregular or the women experiences bleeding in about 14 days after fertilization due to the erosive activity of implanting blastocyst, GA is difficult to estimate. The USG parameter of PT correlates well with GA and is particularity helpful in unknown or irregular menstrual history.[11] Our study showed the good linear increment in the placental thickness of 0.86 mm weekly.

The GA is estimated, during early 1st trimester of 5th to 7th week, by gestational sac and later in 7th to 12th week, by crown rump length. During 2nd trimester, 15th to 19th week, biparietal diameter is assessed. This is because the growth of the foetal head is rapid and variations are minimal during second trimester. However, during 3rd trimester, the foetal growth parameters varies widely due to the non-uniformity of foetal growth.[12] Our study shows a strong correlation between placental thickness and gestational age along the whole length of the fetal development. Therefore, PT could be an important parameter for prediction of foetal growth.

CONCLUSIONS

Our data shows strong positive correlation between the increase in placental thickness and increasing gestational age in singleton pregnancy, with weekly increase of 0.86 mm and reaching maximum of 40.42±1.05 mm at 39th week.

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