Comparison of the first trimester ultrasound and Parikh's formula in determining the expected date of delivery: A prospective study

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Abstract

Introduction: The Parikh's formula is a calculation method that considers menstrual cycle duration in women who have an unusual interval of menstruation cycle. Since the accurate estimation of gestational age affects pregnancy outcomes, the present study aimed to compare the first trimester ultrasound and Parikh's formula in determining the Expected Date of Delivery (EDD).

Materials and methods: A prospective study was done among pregnant women referred to health centers of Borujerd, Iran, in 2014. All pregnant women with menstrual cycle less than 22 days and more than 35 days were included in the study and follow up to delivery time. Women with situations impacting the fetus development were excluded from the study. First trimester ultrasound was done at 7-13 week of last menstrual period and measured the Gestational Sac (GS) and Crown Rump Length (CRL). The gestational age was calculated by Parikh's formula. The association between the variables under study and gestational age were tested using chi-square test. The Pearson correlation coefficient was used to evaluate the correlation between the variables

Results: Overall, 300 women participated in the study. The gestational age calculated by the methods of the study, namely, the first trimester ultrasound and Parikh's formula had no statistically significant difference (271.8 ± 0.99 and 275.2 ± 1.2 days in the first trimester ultrasound and Parikh's formula, respectively) (P=0. 625). The Pearson correlation coefficient showed a positive correlation between the GS (r = 0.645) and CRL (r = 0.768) measured by the first trimester ultrasound and gestational age calculated by the Parikh's formula.

Conclusion: The Parikh's formula is recommended to use the calculation of the EDD in women who have an unusual interval of menstruation cycle and no access to ultrasound in the first trimester.

Keywords: Crown rump length, Gestational age, Gestational Sac, EDD

Introduction

Pregnancy is defined as the time during which one or more fetus develops inside a woman. A normal pregnancy, usually last about 40 weeks from the Last Menstrual Period (LMP) (1, 2).

Accurate determination of gestational age affects pregnancy outcomes. It is particularly essential for determining viability in premature and postdates deliveries (3). There are various methods for calculating the Gestational Age (GA) and the Expected Date estimation of Delivery (EDD) including the first trimester ultrasound (4), the Naegele's formula and the Parikh's formula (5).

However, the ultrasound is an important tool to assess the gestational age (7), but also, it is limited in developing countries. Only 24% of pregnant women undergo ultrasonic evaluation during their pregnancies.

The Naegele's formula has been proposed by a German obstetrician, which estimates the EDD from the LMP by adding one year, subtracting three months, and adding seven days to that date. The result is approximately 280 days or 40 weeks from the start of the LMP (8). A previous study reported that Naegele's formula is likely affected by variation in ovulation and breastfeeding (9). Therefore, the estimation of gestational age based on Naegele's formula has lower accuracy in low literacy population (6).

The Parikh's formula is another calculation method that considers menstrual cycle duration. However, Naegele's formula assumes an average cycle length of 28 days, but also, it is not accurate for everyone. Consequently, researchers used in the Parikh's formula for calculated the EDD. Parikh's formula is calculated by adding nine months to the start of the last menstrual period, subtracting twenty one days and adding the duration of previous cycles (10). Parikh's formula can reduce significantly errors in calculating the EDD (5).

Considering the effects of accurate determination of gestational age on pregnancy and delivery outcomes, the present study aimed to compare the first trimester ultrasound and Parikh's formula in determining the EDD in pregnant women referred to health centers of Borujerd, Iran, during 2014.

Materials and methods

A prospective study was planned among pregnant women referred to health centers of Borujerd, Iran, during 2014. All pregnant women with menstrual cycle less than 22 days and more than 35 days were included in the study and follow up to delivery time. Women with impacting situation of fetus development, including maternal diabetes, hypertension, ovulation induction and In Vitro Fertilization (IVF) were excluded from the study .

First trimester ultrasound was done for estimating gestational age of 7-13 week of LMP by an expert sonographer and ultrasound devices Honda HS- 4000. The Gestational Sac (G.S) and Crown Rump Length (CRL) were measured by ultrasound. Also the gestational age was calculated by Parikh's formula by adding nine months to the start of the LMP, subtracting twenty one days and adding the duration of previous cycles.

Prenatal care carried out based on the Iranian Ministry of Health guidelines for all participants in the study. Participants received Iron and Calcium supplements commencing after the first trimester. Body Mass Index (BMI) was calculated from weight at first trimester of pregnancy using the standard formula: [weight (kg) . height (m) ^{2}]. All women with a BMI below18.5 kg.m2 were classified as underweight, normal weight for BMI of 18.5 – 24.9 kg.m^2, overweight 25–29.9 kg.m^2 and obese ≥ 30 kg.m^2.

Statistical analysis

The association between variables and gestational age were tested using the Chi - square test with Yates correction. The Pearson Correlation Coefficient was used for evaluating the correlation between variables. P-value ≤ 0.05 was considered for statistically significance.

Results

A total of 300 women was participated in the study. Ten women withdrew follow up (seven cases for abortion at first trimester and three cases were referred for delivery to other cities). Therefore, the end analysis was carried out on 290 participants. The Mean ± SD age of participants was 24.3 ± 7.6 with range 20-40 years. Participants characteristics' are presented in table 1.

Table 1. The participants' characteristics enrolled in the study.

Characteristic	Mean ± SD (*n*=290)	Range
Maternal age (year)	24.3 ± 7.6	20- 40
Maternal weight (Kg)	62.8 ±10.1	51.4-81.9
Maternal BMI (kg. m^2)	23.7 ± 4.6	19.9-29.4
Gestational age (week)	9.7± 1.9	14-7

SD: Standard deviations, BMI: Body mass index.

The participants were divided according to the gravidity into two groups. The primigravid was the most common group of participants (62%) and 38% of all participants were multigravida (29% of all participants experience the second pregnancy and 9% of all have the third or more pregnancies).

The Mean ± SD gestational age calculated by two methods of the first trimester ultrasound and Parikh's formula was not statistically significant difference with 271.8 ± 0.99 and 275.2 ± 1.2, respectively (P= 0.625).

The Pearson correlation coefficient showed a positive correlation between the G.S (r = 0.645) and CRL (r = 0.768) measured by first trimester ultrasound and the gestational age calculated by Parikh's formula.

Discussion

In the present study evaluated the relationship between dimensions measured by first trimester ultrasound and the gestational age calculated by Parikh's formula among pregnant women referred to health centers of Boroujerd, Iran, during 2014. The results indicate that there was a positive correlation between G.S and CRL measured by first trimester ultrasound and the gestational age calculated by Parikh's formula in women with menstrual cycle less than 22 days and more than 35 days.

Today, gynecologists and midwives calculated the EDD based on a 280 day from LMP (11). Although this calculation is valued in women who had regular menstrual intervals, faced with an unusual interval menstruation can cause a hitch to estimate the EDD (12).

On the other hand, it should not forget that the new information including; the reproductive biology, perinatal epidemiology, and medical imaging have caused prenatal service providers face the challenges of the estimated delivery date (11).

However, the previous studies have been introduced the CRL measurement at 7 -13 weeks of pregnancy as a very accurate estimation of the gestational age (13, 14), but also, it is required to use other methods to estimate the delivery date when the ultrasound in the first trimester of pregnancy is not available. Today, the Parikh's formula is recommended to use the calculation of the EDD in women who suffer an unusual interval of menstruation cycle and has not access to ultrasound in the first trimester. As well as, the Parikh's formula is considering as a method for confirming the accuracy of G.A reported by ultrasound (5).

Conclusion

The Parikh's formula is recommended to use the calculation of the EDD in women who suffer an unusual interval of

menstruation cycle and has not access to ultrasound in the first trimester.

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