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The Use of Tricolour Measuring Tape as a Predictor of Birth Weight

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In the present study, we determined the association between fundal height and actual birth weight. Standard fundal height was measured on 650 pregnant women who were hospitalized in Fayaz Bakhsh and Imam Ali Hospitals in Karaj Iran for delivery. All measurements were performed within the 1 last day of pregnancy. Inclusion criteria were normal and term pregnancy, cephalic presentation of fetus, empty bladder and maternal weight less than 90 kg. For each centimeter of fundal height between minimum (27 cm) and maximum (41 cm) at least 30 pregnant women were selected simple randomly and the mean of actual birth weight were calculated for them. A prospective linear regression was found between fundal height and actual birth weight ($r=0.72$; $p< 0.001$) correct estimation of birth weight was obtained in 455 (70%) of cases. For actual birth weights in the normal range, our results showed that the normal range of fundal height was 28 to 38 centimeters (macrosomia >38 cm and low birth weight <28 cm). We propose a tape which has a red range (>38 cm) for predicting an macrosom infant, a green range (28-38 cm) for indicating normal birth weight and a yellow range (<28 cm) for indicating low birth weight.

Key words: Tricolour measuring tape, predictor of birth weight

INTRODUCTION

Perinatal mortality rate serves as the most sensitive index of maternal and neonatal care. It also reflects the general health and sociobiological features of mothers and infants^[1].

Weight is the most crucial factor for predicting risk of mortality and morbidity of neonates during their first year of life^[2]. Estimating of fetal weight antenatally is crucial for two reasons :

- Planning preventive measures when the obstetrician predicts an unwanted situation such as respiratory distress syndrome or hypoglycemia in a low birth weight neonate. Obstetricians can reduce the risk of mortality and morbidity of the mothers and neonates by referring them to a tertiary level medical center.
- Managing making appropriate decision for best situation^[3].

The estimation of fetal weight is important when the physician must decide whether to allow delivery to proceed as a natural event, to induce labour, to use tocolytic agents, or to perform cesarean section^[4]. The antenatal diagnosis of fetal growth disorder is well known to be difficult^[5]. Measures for the prediction of birth weight include symphysis fundal height, maternal height, prepregnancy weight, weight gain and mid-upper arm circumference^[6] tape measurement of symphysis fundal height has been suggested as a screening test for the detection of fetal growth retardation, macrosomia and multiple pregnancy^[7]. It is regarded as a simple, inexpensive and noninvasive procedure can assist clinicians in identifying pregnancy complication such as fetal growth aberration, multiple gestation, amniotic fluid volume, disorders, hydatidiform mole and errors in estimating gestational age^[8]. The measurement of symphysis fundal height has been considered a simple and attractive screening method to estimate fetal size^[9]. With more evaluation, this simple method will find a place in the day to day management of antenatal mothers especially in rural communitise. This method may also be useful in larger hospitals where more advanced facilities may not be readily available^[10].

The aims of the present study were to determine the association between symphysis fundal height and birth weights and designing the tricolour coded tape based on results. By giving these institutions simple guidelines, high risk patients could be referred to secondary and tertiary obstetric centers without delay. This may help in preventing maternal morbidity and mortality.

MATERIALS AND METHODS

Based on our estimate 650 pregnant women who were hospitalized for delivery in Fayase Bakhsh and Imam Ali Hospitals in Karaj, Iran, 1998 were choosen simple randomly.

All measurements were performed within the 1 last day of pregnancy. Inclusion criteria were normal and term pregnancy, cephalic presentation of fetus, empty bladder and maternal weight less than 90 kg. Mothers with any type of disease (e.g., diabetes mellitus, renal or heart failure, poly or oligohydramnios, placental abruption, documented fetal congenital anomalies and twin or multiple fetuses) were not included in the study.

Fundal height measurement was performed according to a standard method by trained personnel. Fundal height was defined as the distance between the uppermost part of the pubic symphysis to the uterine fundus, which was determined by palpation and percussion. All patients has urinated within the half an hour prior to fundal height measurement. The parturient women were in the supine position with slight flexion of the knees. The breathing patterns of the mothers were normal and their abdomens were relaxed. This method was adapted from Engstrom who noted a considerable variation in measurements and recommended a uniform method for measurements. For each centimeter of fundal height between minimum (27 cm) and maximum (41cm) at least 30 pregnant women were selected and the mean of actual birth weight were calculated for them.

Actual birth weight (± 10 g) was entered into the same form after delivery. This form included also some demographic data about the patients. The statistical package was used to measure correlation, linear multiple regression and to assess performance of the screening test.

RESULTS AND DISCUSSION

Six hundred and fifty women who were selected in this study had a normal singleton delivery (266 primipara, 384 multipara). The mean \pm SD of age (year) in parturient women was 24 ± 4.8 Year. The mean of symphysis fundal height in total population was 33.6 ± 2.7 cm (in primiparada 32.8 ± 2.4 and in multipara 34.2 ± 2.8). Statistical tests showed the significant difference between symphysis fundal height in two groups ($p < 0.001$).

The mean of actual fetal birth weight in total population was 3060 ± 344 g (in primipara 2978 ± 192 g and in multipara 3142 ± 496 g). Statistical tests showed

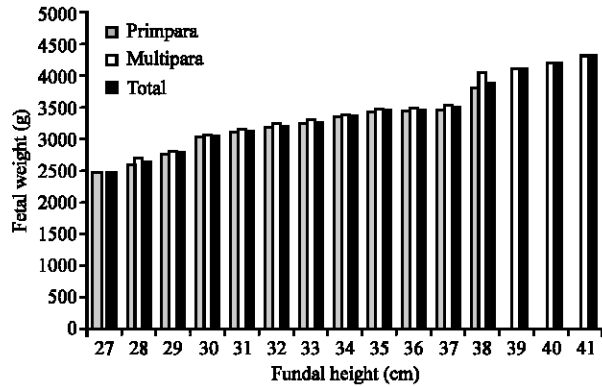


Fig. 1: Mean of birth weight in each centimeter of fundal height

significant difference between the actual fetal birth weight in two groups ($p < 0.001$).

The correlation between actual birth weight and measure of symphysis fundal height in total population was 0.72 (in primipara 0.73, in multipara 0.71) ($p < 0.001$) (Fig. 1).

There was a linear relation based on regression equations between symphysis fundal height and actual birth weight:

$$\text{Fetal weight} = 11.50 \times \text{symphysis fundal height (mm)} - 552.95$$

(in total population)

$$\text{Fetal weight} = 12.15 \times \text{symphysis fundal height (mm)} - 753.69$$

(in primipara)

$$\text{Fetal weight} = 11.21 \times \text{symphysis fundal height (mm)} - 432.79$$

(in multipara)

We made a correct estimation of birth weight in 455 cases in (70%). For actual birth weights in the normal range (2500-4000 g), our results showed that the normal range of fundal height was 28 to 38 cm (macrosomia >38 cm and low birth weight <28 cm).

At a cut-off level of 28 cm for symphysis fundal height, the detection rate for birth weight below 2500 g was 68% and the false positive rate was 10%. At a cut-off level of 38 cm for symphysis fundal height the detection rate for birth weight above 4000 g was 74% and the false positive rate was 4%.

Statistical tests showed significant difference between the mean of fetal birth weight in two kind of delivery (in cesarean section 3425 ± 445 g, in normal delivery 3259 ± 415 g) ($p < 0.001$).

Mean fundal height in this study were substantially lower than those reported in some studies such as: 34.5 cm^[10], 36.2 cm^[11], 36.3 cm^[4]. The divergence between

these studies might be explained by differences in variables such as the selection of reference population, the number and selection of patient studied and criteria used to define abnormality^[8].

Detection rate, false positive rate given a positive result in this study in predicting fetal weight. A comparison of measurements of symphysis fundal height with a single measurement of fetal abdominal circumference by ultrasound in the third trimester for predicting of fetal growth retardation showed a slightly higher (76 and 83%, respectively) detection rate^[12].

This study demonstrated a good correlation between symphysis fundal height and birth weight. Waleraven^[5] had used similar method and found 0.74 correlation between symphysis fundal height and birth weight. Mohanty^[13] studied the usefulness of parturient fundal height as a predictor of low birth weight and obtained 0.740 correlation between symphysis fundal height and birth weight. Bothner *et al.*^[14] found a good correlation between symphysis fundal height measurements and birth weight.

For actual birth weight in the normal range, our results showed that the normal range of fundal height was 28 to 38 cm. For a fundal height measurement outside of this range, an abnormal and a high risk delivery should be expected. A simple symphysis fundal height measuring tape, could be designed for use in antenatal care. Based on the results of this study, we purpose a tape which has a red range (>38 cm) for predicting an macrosom infant, a green range (28-38 cm) for indicating normal birth weight and a yellow range (<28 cm) for indicating low birth weight. A health worker should be aware that the infant may be small, for whatever reason. They should be able to measure fundal height and refer women to hospital for further assessment.

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