

Uncertain Date

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Introduction:

This article is a description paper based around the development of midwifery practice to determine gestational age as accurately as possible to plan antenatal and prenatal care including decision on pregnancy termination and route of delivery.

Brinholz (1984) brings an example of unfortunate case where an older primigravida had a sonographic study during the early second trimester with concordant age estimates of biparietal diameter (BPD) and last menstrual period (LMP). She was restudied some months later because of vaginal bleeding. The projected gestational age was 39 weeks, but it was reported by sonography as 36 weeks on the basis of the BPD. Induction was delayed, and she was restudied a month later. The foetus was postmature, but was dated sonographically as 38 weeks. Intrauterine death occurred shortly thereafter. (Brinholz, 1984).

In most Iranian maternity hospital settings two types of information in the record of the birth are used to measure gestational age: the date of the last menstrual period (LMP) and the clinically estimated (CE) gestational age. Gestational age can be estimated clinically by means of ultrasound, fundal height measurement, certain events like quickening or fetal heart tone detection, pattern of maternal weight gain and so on.

The importance of using either method is to eliminate some apparent gestational age- birth weight inconsistencies. Midwives rely on the most accurate source of

information. For example if a woman has had irregular menses before pregnancy, the clinically estimated gestational age is more reliable. When the only available clue to gestational age is a single ultrasound in 38 weeks, LMP gains more consideration.

A study for comparing gestational age based on LMP and CE, (a total of 97,241 live births to Alaskan residents) suggests that using the CE gestational age for births with less than 32 weeks gestation may be the preferred measure for gestational age, at least from a statistical standpoint. (Mitchell, 2000)

Calculation of the expected data of delivery

1- **Nägele's Rule:** This was developed in the 1850's by Dr. Nägele, who determined that the average human pregnancy was 266 days from conception, or 280 days (40 weeks) from the first day of the of the last menstrual period. To calculate this, one should add 7 days, and then subtract 3 months from LMP.

$((\text{LMP} + 7 \text{ days}) - 3 \text{ months}) = \text{Expected Date of Delivery}$

Example: $((\text{the LMP on } 1^{\text{st}} \text{ April} + 7 \text{ days}) - 3 \text{ months}) = \text{January } 8$

This "rule" doesn't take into account the fact that many women are uncertain of the date of their last menstrual period, not all women have 28 day cycles, and not all women ovulate on day 14 of their cycle.(Durham,2002)

2- **Mittendorf Rule:** In an article in 1990, Mittendorf showed that an average pregnancy is 269 days for mothers who've given birth before. Non-Caucasian women have shorter pregnancies than Caucasian; for example, African-American women average 266 days.

To calculate "Mittendorf's Rule", one should add 15 days for first time Caucasian women, or add 10 days if non-white or this is not the first baby. Then subtract 3 months. (Mittendorf,1990)

$((\text{LMP} + 15 \text{ days}) - 3 \text{ months}) = \text{Expected Date of Delivery for first time pregnant Caucasian women}$

Example: $((\text{LMP on } 1^{\text{st}} \text{ April} + 15 \text{ days}) - 3 \text{ months}) = \text{January } 16$

The Nagele rule is based on 280 day-from-LMP gestational age while Mittendorf believe multiparas and non-white women deliver 5 days in advance.

3- Ultrasound:

Ultrasound can be used to determine gestational age. Measurement of a Crown-Rump Length during the first trimester (1-13 weeks) will give a gestational age that is usually accurate to within 3 days of the actual due date. During the second trimester (14-28 weeks), measurement of the biparietal diameter will accurately predict the due date within 10-14 days in most cases. In the third trimester, the accuracy of ultrasound in predicting the due date is less, with a plus or minus confidence range of as much as 3 weeks. (Mitchell,2000)

Femur length measurements can have a correlation coefficient of 0.995 with gestational age in a group of healthy foetuses with known date of conception, but cranial measurement variability was not reduced equivalently. Nevertheless, it still cannot be used exclusively because it may be relatively short in the presence of growth retardation, or long when growth acceleration has occurred, introducing comparable errors in age estimate if the underlying growth pattern is not appreciated. (Brinholz,1984)

4- Heart Tones: Fetal heartbeat can be heard through Doppler starting at 9-12 weeks and by stethoscope at 18-20 weeks. (Durham, 2004). This event, however, is less accurate because the mother is not permanently attached to a Doppler device so the first heart beat can not be clued definitely.

5- Fundal height: This is the distance from the symphysis pubis joint to the fundus of uterus. Fundal height can be a rough estimate of gestational age. Typically, from week 24 to week 34, fundal height in centimetres correlates with weeks of gestation. For example, at 28 weeks, the fundus is probably about 28 cm. This is known as MacDonald's Rule (Cunningham, 2005).

If a tape measure is unavailable, some rough guidelines can be used:

- At 12 weeks, the uterus is just barely palpable above the pubic bone, using only an abdominal hand.
- At 16 weeks, the top of the uterus is 1/2 way between the pubic bone and the umbilicus.
- At 20-22 weeks, the top of the uterus is right at the umbilicus.
- At full term, the top of the uterus is at the level of the ribs. (xyphoid process).
(picture1)

6- Quickening: Some believe the baby will come five months after quickening, the first time the mother feels the baby move. This is hard to evaluate, as women can be more or less sensitive to these sensations, and may notice them at different times in their pregnancies. (First time mothers typically notice movement around 18-20 weeks. Mothers who have been pregnant before notice it as early as 16 weeks.)(Durham, 2004)

7-Length of foetus: It should not be confused with the length of fundal height. This is only estimated on ultrasound.

a- Crown-Rump Length: CRL is measured in first half of pregnancy; that is, up to 20 weeks measure from the Vertex to Coccyx. The fetal length is more helpful in prematurity than in post maturity, because after term the confidence interval for estimation surpasses 3 weeks (Mitchell,2000)

b- Crown-Heel Length : According to Haase (AIPPG,2007) from the end of 20 weeks in the second half of pregnancy, CHL in cm is the result of multiplication of the number of lunar month at the time of the assessment by 5:

e.g., 8th month x 5 =40 cm

CHL in the first half of pregnancy is the number of lunar months x 4.

e.g., 4x4=16 cm.

Normally, at the end of the following weeks gestation:

12w=7cm

16w=18-27cm

24w=28-34cm

28w=35-38cm

32w=39-41cm

36w=42-44cm

40w=50-53cm

After 20 weeks, the fetal length in inches is equal to half of the number of gestational age in weeks.

e.g., at 28wk =14 inches.

Before 20-24wks, the height of the fundus from pubic symphysis to umbilicus multiplied by $\frac{2}{7}$ equals duration of pregnancy in lunar months or $\times \frac{8}{7}$ =duration of pregnancy in weeks.

8-Estimation of fetal weight in grams:

Johnson's Formula (applicable only in Vertex presentation):

Fundal height (cm) above the pubic symphysis minus 12 if Vertex above Ischial Spine or minus 11 if below Ischial Spines- should be multiplied by 155. This will be fetal weight in grams.

e.g., $32-12 \times 155$ (155 is constant) $\Rightarrow 20 \times 155=3100$ gms

9-Changes in Weight Gain:

Normally there is a steady increase in weight of a pregnant woman until the last 2-3 weeks of pregnancy. The woman stops gaining weight at about term. It may remain stationary or may begin to fall which means that pregnancy is at least mature (Brookside, 2006).Diagram 2 can illustrate this trend (Schwartz,2007).

In normal pregnancy –the weight gain should not exceed $2 \frac{1}{2}$ kilograms in any one month or 0.9 kg in a week. The maximum permissible weight gain throughout the whole period of pregnancy is about 10 or 11 kg (about 24 lbs) although $12 \frac{1}{2}$ kg is allowed— $\frac{1}{3}$ rd of this weight—increases in the first 20 weeks, and another $\frac{1}{3}$ rd in the next 10 weeks. The Remaining $\frac{1}{3}$ rd would be gained between 30 weeks to term (Brookside, 2006).

10- The age from conception: The date of conception from a basal body temperature chart or known time of intercourse is the best measures for gestational age determination. But, relatively few women can state the events.

Gestational age, which is the clinical standard, is equal to conceptual age plus 2 weeks and is based on an average occurrence of ovulation on the 14th day of a regular 28 day cycle. Term is at 40 weeks with a clinically acceptable range of 37-42 weeks (Cunningham, 2005).

Conclusion:

It is essential to realize that gestational age assignment is an interpretation; it does not follow directly from any set of measurements in late pregnancy. One should consider different means of collecting data to find an abnormal growth pattern.

Emanuel Friedman (1981) has designed an algorithm for cases of unknown LMP. This algorithm is presented in Diagram1 which concludes this topic.

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Diagram one: Algorithmic approach to an accurate estimation of gestational age (Friedman,1981)

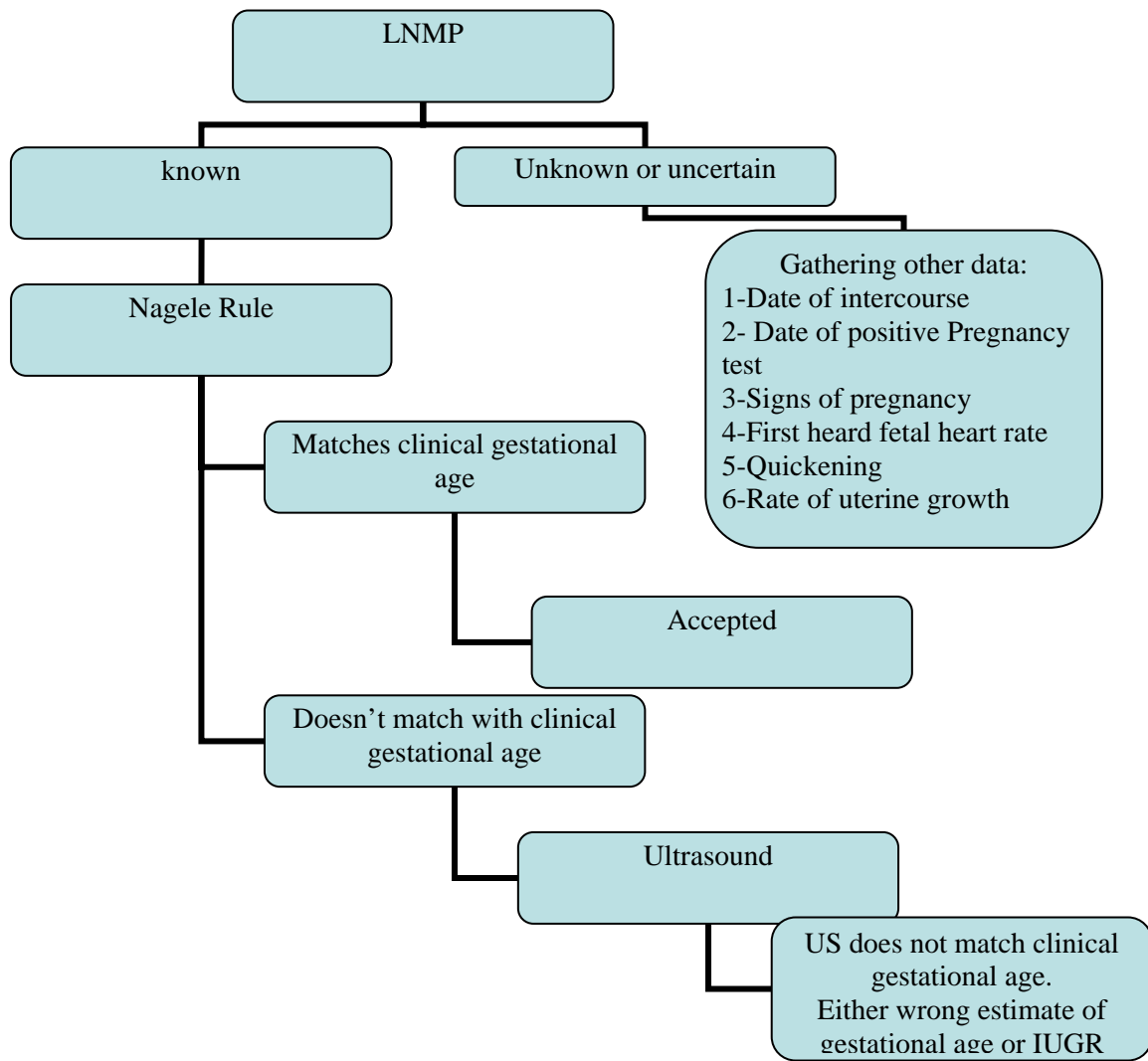
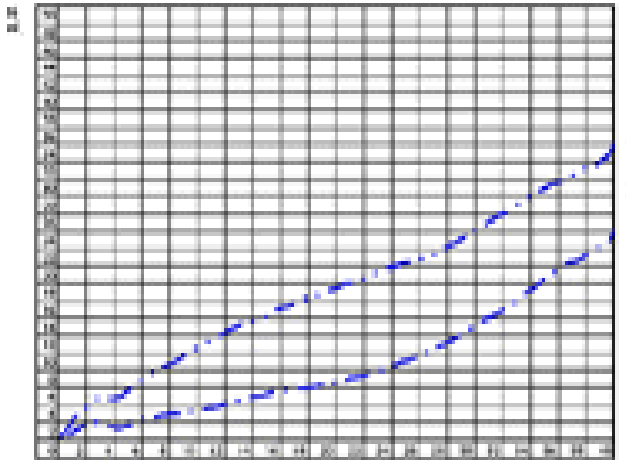


Diagram2: Pregnancy weight gain pattern (y-axis is pregnancy weight, x-axis is gestation in weeks) (Schwarz,2007)



Picture one: MacDonald's Rule (cm of fundal height = weeks gestation)
(Brookside, 2006)

