Introduction

Pregnancies of 294 days duration or more are defined as 'prolonged', 'post-dates', or 'post-term' ***(WHO, 2003)***.

Postdate pregnancies account for about 5 – 10 % of the deliveries and are known to be associated with increased risk for perinatal complications (***Lam et al., 2005a***).

Management of uncomplicated prolonged pregnancies has always been a dilemma. The Cochrane meta-analysis on this topic concluded that induction of labour should be discussed with women after 41 weeks' gestation in health systems in which induction of labour is safe and acceptable (***Palacio et al., 2004***).

The mechanism of fetal complications associated with postdate pregnancy has attributed to progressive placental insufficiency, particularly in the presence of decreased amniotic fluid (***Lam et al., 2005a***).

Placental dysfunction is considered to be the pathophysiologic event leading to intrapartum asphyxia and meconium aspiration. However, the principal mechanism leading to intrapartum fetal distress is umbilical cord compression due to oligohydramnios ***(Dasari et al., 2007***).

Prepartum meconium aspiration is the potential danger in postdate pregnancy. Meconium staining of amniotic fluid serves as a primary ingredient in the lower APGAR scores and higher incidence of meconium aspiration syndrome and fetal distress encountered in the postdate group (***Boisselier et al., 2001***).

Ultrasound examination plays a very important role in the diagnosis of postdate pregnancies which is used for assessment of both gestational age and amniotic fluid volume. The amniotic fluid index (AFI) and biophysical profile (BPP) have both been used to assess fetal well-being (***Magann et al., 2004***).

Doppler information may play a role in the surveillance of uncomplicated prolonged pregnancies. Data from reliable, well – constructed normal curves during this gestational age are lacking (***Palacio et al., 2004***).

A few studies had looked into the Doppler blood flow changes in postdated pregnancies and came up with varying results. Some demonstrated redistribution of blood flow in the fetal cerebral circulation in postdated pregnancies with adverse perinatal outcome, and such brain-sparing phenomenon is thought to result in oligohydramnios (***Selam et al., 2000***).

However, others reported insignificant difference in Doppler indices for postdated pregnancies with and without oligohydramnios ***(Lam et al., 2005a)***.

Evaluation of the cerebral blood flow in the fetus has become an integrated part of the assessment of high-risk pregnancies. The middle cerebral artery (MCA) has been studied extensively, and its Doppler recordings are incorporated regularly into the management of fetuses at risk of developing placental compromise and fetal anemia (***Ebbing et al., 2007***).

Combining the Doppler waveform analysis of the middle cerebral artery (MCA) with that of the umbilical artery (UA) by a common cerebroplacental ratio, i.e. the ratio of their pulsatility indices has been suggested as a useful clinical simplification (***Ebbing et al., 2007***).

A low cerebroplacental ratio reflects redistribution of the cardiac output to the cerebral circulation and has been shown to improve accuracy in predicting adverse outcome compared with MCA or UA Doppler alone (***Vergani et al., 2005***).

Aim of Work

The aim of this study is to assess the predictive values of the changes in amniotic fluid, middle cerebral artery and umbilical artery in uncomplicated postdate pregnancies.

Epidemiology of Post-term Pregnancy

Definition:

The expression of posterm, postdate and postmature are often loosly used interchangeably to signify pregnancies that have exceeded a duration considered to be the upper limit of normal (***Cunningham et al., 2005***).

Although all these terms were officially accepted by the World Health Organization 1994, postmature should be used to describe the infant with recognizable clinical features indicating a pathologically prolonged pregnancy, while postdates probably should be abandoned, because the real issue in many post-term pregnancies is post what dates? Therefore, post-term or prolonged pregnancies are the preferred expressions for extended pregnancies (***Cunningham et al., 2005***).

Definitions in the literature have been ranged from completed 41 weeks (***Rayburn et al., 1997***) to completed 43 weeks (***Beischer et al., 1996***). Several studies considered a pregnancy postdate at the beginning of 41 weeks from the last menstrual period (***Sacks and Freidam, 1986***0.

The standard internationally recommended definition of prolonged pregnancy accepted by both the World Health Organization (WHO) and the international federation of Gynecology and Obstetrics (FIGO) is 42 completed weeks (294 days) or more from the first day of the last menstrual period (LMP), assuming valid dates and a regular 28 day cycle (***Luchas et al., 2004***). This definition was endorsed by the American College of Obstetrians and Gynecologists (1997) (***Cunningham et al., 2005).***

The term "postmaturity syndrome" is the best expression to be used when one is referring the postdate infant with this problem (***sims et al., 2001***).

Incidence:

The incidence of postdating varies according to the definition used, and more important to the dating criteria. The stricter the dating criteria used in confirmation one's due date, the lower is the probability that a postterm pregnancy will be encountered (***Phelan et al., 2001***).

The reported frequencies of prolonged pregnancy range from 4-14% with an average about 10%. The incidence of subsequent post-term birth increases 0% to 27% if the first birth was post-term and to 39% if there had been two previous successive post-term deliveries. The tendency of some mothers to have reported postterm pregnancy suggests that some

prolonged are biologically determined (***Cunningham et al., 2005***).

Mogren et al. (1999) reported that prolonged pregnancy recurred across generation. ***Laursen et al. (2004***) found that maternal, but not paternal, genes influence prolonged pregnancy.

Gardosi et al. (1998) using early pregnancy ultrasound dating found that postterm pregnancies decreased from 7-5% when these pregnancies were dated by LMP to 1.5% when ultrasound dating was used. Thus routine ultrasound in early pregnancy appears to enable better gestations age assessment and reduces rates of induction of labor for postterm pregnancy.

Etiology:

Various theories have been advocated to explain the pathogenesis of the postdate pregnancies as the actual physiologic mechanism responsible for a prolonged pregnancy has not been elucidated and until the mechanisms for the initiation and maintenance of labor are defined more clearly the etiology of the postdate pregnancy will probably remain obscure ***(Ahn et al., 2002***).

♠ Maternal risk factors:

● Inaccurate dating of pregnancy:

It is clear that the most common cause of prolonged gestation is an error in determining the patient's due date. Patient's failure to recall accurately the date of the first day of their menstrual period (LMP) combined with the varying duration of the luteal and follicular phases of the menstrual cycle may result in an overestimation of gestational age (***Smith, 1999***).

Accuracy of dating depends on seeing the patient early in pregnancy, careful menstrual history and several dating tests that all agree (***Spellacy, 1994***).

Most calculations begin with the determination of the last menstrual date. It's important to ask specially for the date of the first day of LMP because the woman may provide the last day

of the flow, which will introduce an error of the expected due date (EDD) of 2 to 7 days. Using Naegeles rule, (i.e., nine months plus one week from the 1st day of the last menstrual period) gives a reasonable estimation for the expected date of delivery. This calculation makes the assumption that ovulation occurs about midcycle or on the 14th day of the 28 day cycle (***Spellacy, 1994***).

Several investigations have demonstrated that an estimated gestational age determined sonographically is more accurate than one based on LMP. This alone allows the reduction in the number of labor induction for potterm pregnancy ***(Cunningham et al., 2005)***. ***Tunon et al. (1999)*** performed sonography in more than 15.000 unselected women at 18 weeks and decreased the postterm delivery from 10% to 4%. In a randomized study of 218 low risk women, ***Bennett et al. (2004)*** using sonography significantly reduced labor induction for postterm pregnancy from 13% to 5%.

For determining gestations age in the first trimester, the crown-rump length is most accurate. The image should be obtained in a sagittal plane and include neither the yolk sac nor a limb bud. If carefully performed, it has a variation of only 3 to 5 days. Between 14 and 26 weeks, the biparietal diameter (BPD) is usually the most accurate parameter, with a variation of 7 to 10 days. By convention, the BPD is measured from the outer edge of the proximal skull to the inner edge of the distal,

at the level of the thalami and cavum septi pellucida the head circumference (HC) also is measured. The femur length (FL) correlates well with both BPD and gestational has a variation of 7 to 11 days in the second trimester the abdominal circumference (AC) is the parameter with the widest variation of 2 to 3 weeks. This is because the AC measurement involves soft tissue rather than bone and is also the parameter most affected by fetal growth. The AC is measured at the skin line in a transverse view of the fetus at the level of the stomach and umbilical vein. By the third trimester, all individual measurements become less accurate. Estimates are improved by taking an average of the various parameters-the BPD, HC, AC, and FL if one measurement is significantly different it can be excluded from the calculation, accuracy can be improved by performing serial examinations and documenting normal interval fetal growth ***(Cunningham et al., 2005***).

When prolongation of pregnancy is adequately documented, its cause is often undetermined and the most likely etiology is biologic variability of the duration of pregnancy (***Smith, 1999***).

● Previous history of postterm pregnancy:

Women with previous prolonged pregnancy have 50% chance of having prolonged pregnancy in a subsequent

pregnancy and that such high recurrence risk suggests a genetic basis for postterm pregnancy (***Ahn and Phelan, 1998***).

The tendency of some mothers to have repeated postterm births suggest that some prolonged pregnancies are biologically determined (***Cunningham et al., 2005***).

● Use of some drugs during pregnancy

It is now clearly established that prostaglandin a uterine stimulant plays a crucial role in the onset and maintenance of human labor. Nonsteroidal anti-inflammatory drugs inhibit the synthesis of these prostaglandins and therefore, their use is though to possibly prolong gestation (***Divon, 2002***).

● Maternal age:

Many studies agreed that advancing maternal age does not appear to influence the incidence of postterm pregnancy. In the mean time, all these studies stated that their findings have been influenced by early intervention (***Bakketeig and Bergsjo 1991***).

● Parity:

Similar to maternal age, parity does not appear to influence the incidence of postdate pregnancy (***Ahn and Phelan, 1998***).

With maternal age held constant, prolonged pregnancies were encountered more frequently among primigravidas and women of high parity (4 or more) (***Eden et al., 2000***).

The incidence of prolonged pregnancies in multigravidas and primigravidas may vary among specific age group. Below the age of 30 years, the incidence for primigravidas is higher than multigravidas, with reversal of the incidence over the age 30 years, and by the age of 35 years, the incidence for multigravidas is almost 4 times as compared with that for primigravidas (**Sawyer et al., 1999**).

● Socio-economic status:

The incidence of prolonged pregnancy is, inversely related to the pregnant women's socio-economic status and education. This means that's the lower her level of education or socio-economic status, the greater the likelihood she would have a postdate pregnancy. Still, this relationship has limited clinical usefulness. For example, it may be more indicative of inaccurate early landmarks due to delayed access to prenatal care rather than due to a person's socio-economic status (***Nwosu et al., 1996***).

● Geographic distribution:

Geographic studies have revealed significant differences in the incidence of postdate pregnancies among Greek and

Italian patients as opposed to the Australians. Although there may be slight variations in the incidence of postdate pregnancies among various ethnic groups, there does not appear to be with a consistently higher rates than another (***Ahn et al., 2002***).

● Race:

A study conduced in France, found that the average length of gestation about 5 days shorter in black populations than white populations. The complication of postmaturity occur sooner in black fetuses and they suggested antepartum fetal surveillance for signs of fetal compromise, perhaps by setting the estimated date of confinement at 275 days after the last menstrual period (LMP) rather the conventional 280 days (***Papiernik et al., 1996***).

In a more recent study by ***Collins et al. (2001***) in Children's Memorial Hospital, Chicago; it was found that African Americans and Mexican Americans have greater postterm delivery rates than do Whites. However, commonly cited individual and community level risk factors account for most of the disparity.

● Hormonal factor:

Prolonged pregnancy could result from variations in the corticotrophin releasing hormone (CRH) system during

pregnancy, such as an alteration in the number or expression of myometrial receptor subtypes, altered signal-transduction mechanisms or increase in the capacity of CRH binding hormone protein to bind and inactivate CRH. Prospective, longitudinal studies have shown that women destined to deliver preterm tend to have a more rapid exponential rise in CRH in mid-pregnancy while women who go on to deliver post-term babies have a slower rate of rise ***(McLean et al., 1995).***

Lastly, contradictory results have been found concerning the significant of these maternal demographic factors. The only interesting feature was the tendency of some mothers to have repeated postterm births (***Cunningham et al., 2005***).

♠ Fetal risk factors:

● Congenital anomalies:

The fetus itself also plays an important part in the initiation of labor. A general characteristic of fetal endocrine maturation is the enhanced activity of the fetal hypothalamic pituitary adrenal (HPA) axis during late gestation. HPA axis development is associated with increased levels of adrenocorticotrophin hormone (ACTH) and adrenal corticosteroids (cortisol) in the fetal circulation, and increased corticotrophin releasing hormone (CRH) in the hypothalamus, propiomelanocortin in the pituitary, and key steroidogenic enzymes in the fetal adrenal. At term, increased levels of

cortisol act on the placenta/trophoblast derived cells to increase expression of prostaglandin H synthase (PGHS), in enhancing output of primary prostaglandins, which will stimulate uterine contractility ***(Challis et al., 2001)***.

The increase in the incidence of fetal anomalies among women who deliver beyond their due date is generally explained by abnormalities of the fetal HPA axis (***Liggins, 2000***).

Major central nervous system (CNS) abnormalities (such as anencephaly) have long been associated with loss of the normal mechanisms that initiate labor at term (***Divon, 2002***).

● Male fetal gender:

Some studies have indicated that woman pregnant with a male fetus have a higher risk of prolonged pregnancy than with the female fetus, 8.5% versus 4% (***Vorherr, 1975***).

In a recent study done by ***Divon et al. (2002***) male fetus gender significantly predisposes to the prolongation of pregnancy.

● Others:

Low vaginal levels of fetal fibronectin at 39 weeks are predictive of an increased likelihood of post-term pregnancy ***(Lockwood et al., 1994)***.