# STUDY OF THE UTERINE ACTIVITY IN PRETERM LABOUR

*Thesis*
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BY
AMINA MOSTAFA

SUPERVISORS

Prof. Dr. MAHER MAHRAN

Prof. of Obst. & Gyn.
Faculty of Medicine
Ain Shams University

Dr. SOBHI KHALIL ABOU LOUZ

Assistant Prof. of Obst. & Gyn.
Faculty of Medicine
Ain Shams University

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY
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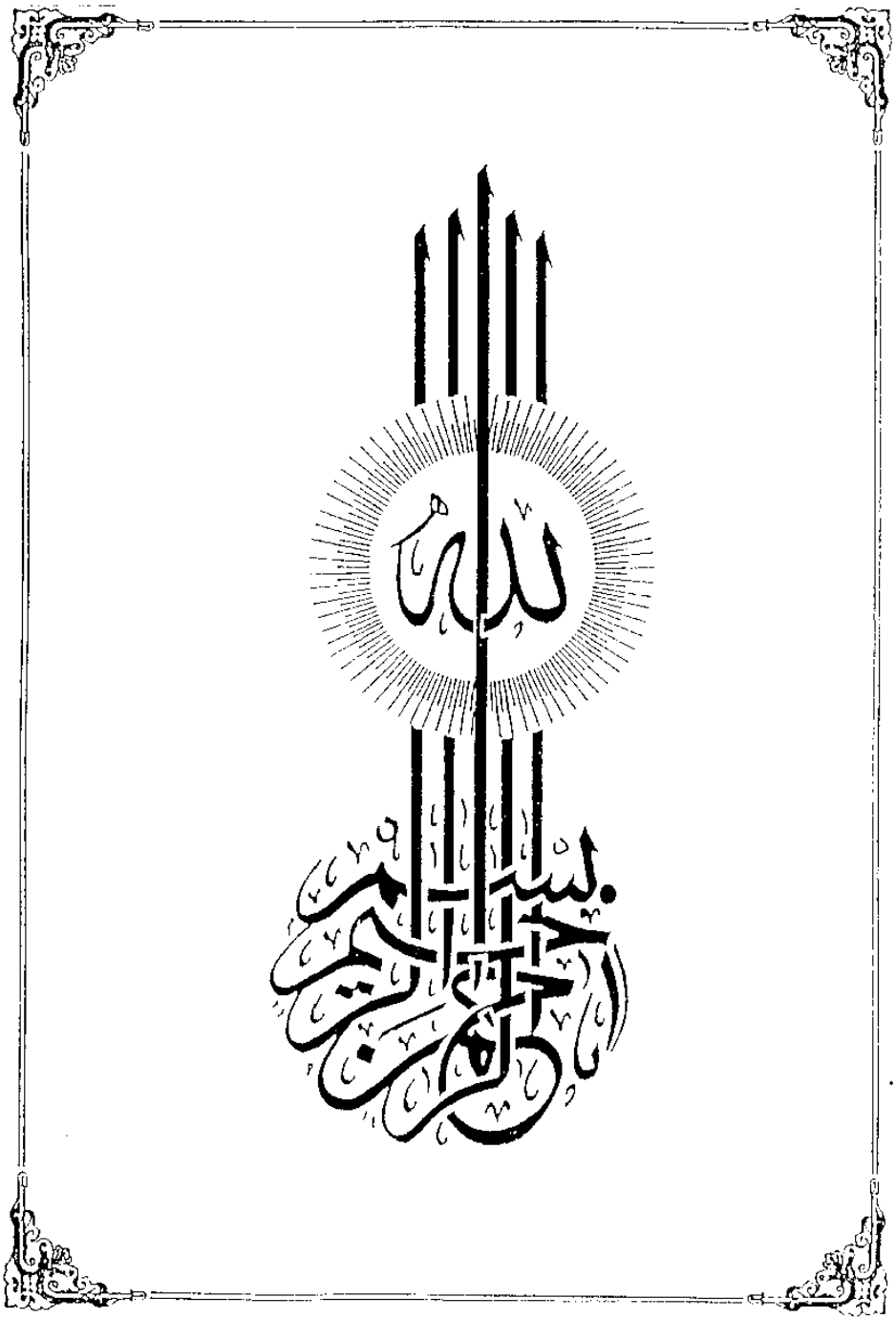

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# INTRODUCTION
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For the past decade there has been a significant improvement in neonatal mortality and morbidity following preterm delivery, (Davies, 1976 - Hack et al, 1979) especially in very low birth weight infants (That is, birth weight less than 1500 gm).

Indeed the prognosis for intact long-term survival continue to be encouraging. Many factors are responsible for this improved outcome.

Initial success has followed the development of the discipline of neonatology with its aggressive approach toward resuscitation, ventilation and intensive care for the preterm infant. At the same time, clinically applicable methods of fetal assessment became available to the obstetrician.

Those caring for the parturient soon came to recognize the fetus as a patient and were forced to reexamine the management of their patients in preterm labour or in whom preterm labour was anticipated, since the "hands-off" approach was no longer justified.

Unfortunately, recent advances in obstetrics have not included the prevention of preterm labour and delivery, effectively.

Prematurity continues to be responsible for more neonatal deaths than any other single cause except congenital malformation. Indeed, if one includes complications of premature labour, such as hyaline membrane disease, intraventricular haemorrhage, is responsible for more neonatal death than any other cause (Rush et al, 1976).

The development and utilization of fetal monitors clearly is a significant advance in obstetric care. The technology of monitoring equipment, however, changes the atmosphere of labour room into that of an intensive care unit (Monica N. Starkman, 1976). Anterpartum fetal heart rate testing is playing an increasing role in the evaluation and management of fetus at risk (Kirk A. Keegan, 1979).

The objective of this thesis is to investigate the uterine activity in cases diagnosed clinically as preterm labour.

# REVIEW OF LITERATURE

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## DEFINITION OF PRE-TERM LABOUR:

Traditionally all new born infants weighing less than 2500 gm were classified as premature. However, over the past two decades, it has become evident that all low birth weights are not born before 37 completed weeks from the first day of the last menstrual period.

Approximately one third of new borns previously classified as premature on the basis of birth weight are now recognized as being born near term but retarded in growth (Grunwald, 1964; Yerushalmy, 1967).

Thus the need arose for terminology that recognized both duration of gestation and weight at birth.

Although all infants weighing less than 2500 gm at birth are classified as low birth weight infants; the new born delivered at gestational age of less than 37 completed weeks (less than 259 days), is now termed preterm (world Health Organization, 1969; American Academy of Pediatrics, 1967).

The calculation of gestational age based on the date of the last menstrual period (L.M.P.) has been regarded with suspicion.

The use of ultrasound (Campbell, 1974; Varma, 1973), and the paediatric assessment of the new born (Dubowitz, Dubowitz and Goldberg, 1970) increase accuracy in determining gestational age.

Thus, the definition of prematurity involves more than singular determination of weight gestation, but rather the complex relationship of the two.

HISTORY OF MONITORING OF UTERINE CONTRACTIONS:

"By means of the woman's efforts, which in strong labour pains, was equal to the weight of 470 pounds; the said head was compressed and moulded". So wrote Laurence Sterne Shandy in 1759.

As Reynolds and associates noted, Sterne's authority for such a statement is unknown (and inaccurate), for it was to be more than 100 years afterward that the first instrument was developed for measuring uterine forces.

Schatz (1872) placed balloons within the uterus in the extraovular space to record intrauterine pressure. These water-filled balloons were connected to kymographs, providing recordings that were used in many American Obstetric text books until recent times.

Westermark (1893) improved substantially upon Schatz's balloons by using small (2 ml) balloons.

Wasenius (1908) studied the depressive effects of ether and morphine on uterine contractions with the Schatz technique.

A number of the early investigators used Voorhees bags attached to a recording system. With such a system, Rucker

(1925) described the effect of epinephrine, pituitary extract, and various anaesthetic drugs on the contracting pregnant uterus.

INTERNAL UTERINE MEASUREMENTS:

Internal uterine measurements were advanced in 1936 by Moir's canalization of the umbilical cord vein after delivery of the infant.

Williams and Stallworthy (England) in 1952 inserted a polyethylene catheter through the cervix of a woman in labour, with a Drew-Smyth catheter. This technique was to become adopted world wide. As one of the first to relate uterine activity to fetal health.

Williams stated that intrauterine pressures beyond 80 torr were invariably associated with fetal distress.

After considerable experience, Williams and Stallworthy concluded that no instrument was as discerning as the experienced hand in assessing the quality of uterine contractions.

In 1952, Caldeyro-Barcia and Alvarez reported on intrauterine measurements made with catheters inserted

directly through the abdominal wall. This same group also studied uterine contractions with balloons in the muscle wall.

Smyth and Wolff in 1960 inserted a "wireless pill" (Peizocrystal) within the amniotic cavity for the measurement of uterine tension.

EXTERNAL UTERINE MEASUREMENTS:

External techniques apparently began in 1896 when Schaeffer constructed an air-containing metal hood to fit over the maternal abdomen with a tube connected to a spirometer.

Numerous devices were introduced in the early twentieth century, in which plungers were used against the abdominal wall.

Rubsamen (1920), Crodel (1927), and Dodek (1932) used a metal ring to rest on the maternal abdomen with a plunger suspended over the center of the ring.

An instrument which apparently made a major impact was that designed by Lorand, introduced in 1936. This was a modification of Frey's hysteronograph with a plunger

connected to a graph by a series of levers and gears. Lornad's instrument was small and was held in place by a belt.

The external multiple transducer allowed Karlson in 1949 to classify uterine contractions as: synchronous (or coordinated), peristaltic (beginning in the fundus), and combined, or all types.

In 1947, Reynolds and colleagues devised a multi-channel tokodynamometer, which they named the "TKD". The TKD was capable of making uterine tension measurements at several points. From these investigators were derived the concepts of fundal dominance, synchronized contractions, and the pacemaker.

PRESSURE CHANGES:

Reynolds and Paul (1954) demonstrated in pregnant sheep that during a uterine contraction fetal blood pressure increased proportionately with uterine tension.

However, even with a severe uterine contraction of 75 torr, the rise in pressure for the fetus is still no more than that which occurs with a gentle submersion in 3 feet of water.

Hendricks showed in 1958 that a rise in intraamniotic pressure is expressed not only within the uterus but also in myometrial tension, with simultaneous rises in maternal central venous pressure, mean blood pressure, and cerebrospinal fluid pressure.

Despite this widespread distribution of pressure it is uncertain as to whether intrauterine pressures are equal throughout the amniotic cavity during a contraction, once the membranes are ruptured.

Neuman and associates (1972) have shown that they are not. Lindgren has also demonstrated that pressures on the fetal presenting part may be several times those measured in the intrauterine cavity during the second stage of labour.

Caldeyro-Barcia and associates coined the term (1952) "Montevideo unit" (number of contractions in 10 minutes x highest torr) to provide graphic portrayel of labour. Others have assumed that Hill's force-velocity equations for a single-chambered pump apply to the uterus (even with ruptured membranes).

These various calculations of uterine work appear to have little to offer in terms of fetal welfare.