Effect of Maternal Body Mass Index on labor progress in nulliparous women

Thesis

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By

Ahmed EL-Sayed Ahmed

M.B., B.Ch. (December 2004)

Faculty of medicine, Cairo University

Resident of Obstetrics & Gynecology

AL-Mokatam hospital (Health Insurance Organization)

Supervised By

Prof. Gamal Abd EL-Samei

Professor of Obstetrics & Gynecology

Cairo University

Prof. Amal Shohayeb

Professor of Obstetrics & Gynecology

Cairo University

Dr. Amir Arabi

Lecturer of Obstetrics & Gynecology

Cairo University

Faculty of Medicine

Cairo University

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قَالُوا سُبْحَانَكَ
لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا
إِنَّكَ أَنتَ
الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

الآية (٣٢) سورة البقرة

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Ahmed El-sayed Ahmed

Dedication

To my parents, My wife

Hoping that this work may be of any

Compensation for all the sacrifices, efforts, care

and love given to me by them.

Abstract

Objective:

To compare labor pattern by body mass index (BMI) in nulliparous women and that may help optimize labor management and ultimately impact the cesarean delivery rate.

Study Design:

Six hundred (600) pregnant nulliparous women during labor with a singleton term cephalic gestation were assigned in one of the following 3 groups based on their body mass index (BMI) and each group contained 200 women. Repeated-measures analysis constructed average labor curves by BMI categories for those that reached 10cm. The median duration of labor by each centimeter of cervical dilation was computed for normal range group, underweight and obese women and used as a measurement of labor progression.

Results:

- For nulliparas, Labor progressed more slowly with increasing admission BMI. These effects were significant for the active phase of labor (i.e. 4 to 10 cm cervical dilatation) and overall were more pronounced for nulliparas as BMI increases. The mean traverse times to progress from 4 cm to 10 cm was (4.09) hours for BMI < 18.5 kg/m^2 compared to (5.36) hours for BMI 18.5-29.9 kg/m^2 and (6.08) hours for BMI ≥ 30.0 kg/m^2.
- The mean rate of cervical dilatation was (1.53 cm/hr) for BMI < 18.5 kg/m^2 compared to (1.23 cm/hr) for BMI 18.5-29.9 kg/m^2 and (1.08 cm/hr) for BMI ≥ 30.0 kg/m^2.

Conclusion:

Labor proceeds more slowly as BMI increases suggesting that labor management be tailored to allow for these differences.

Keywords: Body mass index, Labor curves, Obesity, Underweight, Pregnancy

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List of Abbreviations

BMI	Body Mass Index
WHO	World Health Organization
NCD	Non communicable Diseases
PCOS	Polycystic ovary syndrome
SHBG	Sex hormone-binding globulin
GWG	Gestational Weight Gain
IOM	Institute Of Medicine
LGA	Large-for- gestational-age
PIH	Pregnancy-induced hypertension
GDM	Gestational diabetes mellitus
CEMACH	Confidential Enquiry into Maternal and Child Health
NTDs	Neural tube defects
IVF	In Vitro Fertilization
NCEP	National Cholesterol Education Program
IUGR	Intra uterine growth restriction
AGA	Average- for- gestational-age
PROM	Premature rupture of the membranes
SGA	Small- for- gestational-age
ACOG	American College of Obstetricians and Gynecologists
GLUT	Glucose transporter
EDD	Estimated Date of Delivery
SD	Standard Deviation
MN	Mid Noon
OA position	Occepito-Anterior position
AML	Active management of labor
IOL	Induction Of Labor
CPD	Cephalopelvic disproportion
CD	Cesarean delivery
CS	Cesarean section
VBAC	Vaginal birth after cesarean section
US	Ultrasound
WT	Weight
HT	Height
Kg	Kilogram
M	Meter
Cm	Centimeter

Introduction

Introduction

Labor at term may best be regarded physiologically as an event initiated by the removal of the inhibitory effects of pregnancy on the myometrium rather than as an active process governed by uterine stimulants **(Norwitz et al., 1999)**.

Labor is a clinical diagnosis characterized by regular, painful uterine contractions that increase in frequency and intensity and associated with progressive cervical effacement or dilatation. More specifically, it is associated with a change in the myometrial contractility pattern from irregular ‘‘contractures’’ (long-lasting, low-frequency activity) to regular “contractions’’ (high-intensity, high-frequency activity).In normal labor at term, there seems to be a time-dependent relationship between these elements: the biochemical connective tissue changes in the cervix usually precede uterine contractions, which, in turn, precede cervical dilatation **(Norwitz et al., 1999)**.

All approaches to the systematic assessment of labor are grounded in the concept that it is possible to evaluate the progress of labor by analyzing the relationships among cervical dilatation, fetal descent, and elapsed hours in labor. The relationship between cervical dilation and the time elapsed in labor is described by a sigmoid-shaped curve **(Friedman, 1954)**.

The characteristics of the labor curve do not differ among ethnic or racial groups, but there are significant differences between the labor curves of nulliparous and multiparous women **(Duignan et al., 1975)**.

In classic studies, Friedman determined the average duration for each stage of labor in both nulliparous and multiparous women and calculated the maximum duration of each stage, defined as two standard deviations from the mean.

By comparing a parturient's rate of cervical dilatation with the normal profile described by Friedman, it is possible to detect abnormal labor patterns and identify pregnancies at risk for adverse events. This task can be facilitated by the use of a partogram.In this way, abnormal labor patterns can be identified easily and appropriate measures taken **(Studd et al., 1973)**.

At the beginning of the second stage of labor the mother usually feels a desire to bear down with each contraction. This abdominal pressure, together with the force of the uterine contractions, expels the fetus. The second stage generally takes from 30 minutes to 3 hours in primigravid women and from 5–30 minutes in multigravid women. The median duration is 50 minutes in a primipara and 20 minutes in a multipara. These times may vary depending on the pushing efforts of the mother, the quality of the uterine contractions, and the type of analgesia (**Carol et al., 2003)**.

Several factors may influence maternal pushing performance that occurs during the second stage of labor, including body mass index(BMI), fetal weight, myometrial thickness, maternal position, and oxytocin augmentation (but not parity) **(Buhimschi et al., 2002)**.

Obesity has become epidemic all around the world. the prevalence and degree of obesity have increased rapidly over the last several decades **(sukalich et al., 2006)**. In the United States, the rates have more than doubled in the past 25 years from 15% in 1980 to 32.9% in 2004. Moreover, nearly one third of women of reproductive age are obese, and approximately 6% are extremely obese **(Ogden et al., 2006)**.

Obesity has also created reproductive adversity. Many obesity-related illnesses complicate pregnancies. Moreover, maternal obesity is associated with excess fetal growth, which increases the likelihood of cesarean section and of birth injury, as well as potential life-long health risks **(McMillen et al., 2008)**. Studies show that obese pregnant women are at increased risk for gestational diabetes, preeclampsia, eclampsia, cesarean section, fetal macrosomia, instrumental delivery, fetal distress, antepartum stillbirth and early neonatal death **(Cedergren et al., 2004)**.

Obese women have been found to have longer labors, are more likely to have inadequate contraction patterns during the first stage of labor, and are more likely to receive oxytocin for labor induction and augmentation **(Vahratian et al., 2004)**.

Many studies have demonstrated a strong relationship between maternal obesity and the risk of cesarean delivery **(Ducarme et al., 2007)**.The reasons for this high cesarean rate are, however, not entirely clear. It relates in part to the association of obesity with diabetes and hypertension, which themselves predispose to the need for cesarean **(Perlow et al., 1992)**. In addition, the high prevalence of fetal macrosomia among obese women probably leads to more cesareans for cephalopelvic disproportion **(Kliegman et al., 1985)**. Another study found that women whose BMI was more than 30 were six times more likely to have a cesarean section for cephalopelvic disproportion or failure to progress. These factors do not, however, explain completely the high obesity-related cesarean rate noted in most studies **(Young et al., 2002)**.

High cesarean rates have been found in otherwise low-risk obese women **(Kaiser et al., 2001)**, and multivariate analyses support obesity as an independent risk factor associated with cesarean delivery **(Roman et al., 2008)**. A possible