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Original Article

Maternal Height in Pregnancy and Labour: Findings in Two Populations of Booked Pregnant Women Attending A Teaching Hospital in South West Nigeria

SULE-ODU A. Okanlawon,[1] JAIYESIMI E.O.,[1] ADEJUMO A. Olusola,[2] AKISEKU A. Kazeem,[1] Kehinde Adeleke[1]

[1]*Department of Obstetrics and Gynaecology, Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun State, Nigeria.* [2]*Department of Community Health and Primary Health Care, Lagos State University Teaching Hospital, Ikeja, Lagos State, Nigeria*

Corresponding Author
Prof. SULE-ODU A. Okanlawon, Department of Obstetrics and Gynaecology, Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun State, Nigeria.
Tel: +234 803 409 8564
adewalesuleodu@yahoo.com

ABSTRACT

Introduction: Maternal height may be a reflection of a woman's general health and nutritional status from childhood and it may serve as one of the major determinants of a successful conduct of labour and delivery. So knowledge of the height of a pregnant woman can give an insight to the capacity of the pelvis for a successful vaginal delivery or otherwise. This study aims to investigate the significance of height of pregnant women in pregnancy and labour. **Materials and Method**: This is a retrospective cross-sectional study of 1061 booked pregnant women. They were grouped into study and control groups. **Results**: The control were significantly heavier at booking, even though the control booked earlier than the study group. The Caesarean section rate was significantly higher in the study than the control. The study group had significant higher rate of preterm deliveries than the control. Babies of the control had significant higher Apgar score in the first minute of life than the study group. Perinatal death was significantly higher in the study group when the two groups were controlled for age and parity. **Conclusion**: Short maternal height is an independent risk factor for adverse pregnancy and delivery outcomes and so they should be monitored closely during pregnancy and labour. **KeyWords**: Maternal Heaight, Pregnancy outcomes, Preterm delivery, Perinatal death, Close monitoring.

Introduction

Maternal morbidity and mortality remain a major challenge to health care systems worldwide especially in developing countries. In 2010 an estimated 287,000 maternal deaths occurred worldwide, bulk of these numbers were avoidable

deaths and in developing countries.[1] Obstructed labour and its complications still ranks high among the causes of maternal and perinatal morbidity and mortality in the developing countries especially in Sub-Sahara African countries where majority of these cases are under-reported.[2]

Complications of pregnancy and labour are often seen in rural areas in these resource restricted countries where a large percentage of pregnancy and delivery are not supervised by skilled attendants, couple with delay in the decision to seek for care and/or delay in arrival at an appropriate health care facility.[2]

Identifying women at risk of these complications during ante natal visits is sine qua non in mitigating the problems associated with these risks. One of the major determinants of a successful conduct of labour and delivery is the measurement of pregnant women's height. The height of a pregnant woman can give an insight to the capacity of the pelvis to deliver the new born successfully through the vagina or the abdomen.

Maternal height may also serve as a reflection of a woman's general health and nutritional status from childhood.[3,4] This has been used along with other parameters to identify parturients of potential labour obstruction and thus reduce the incidence of maternal and perinatal morbidity and mortality experienced in our environment.[4]

Studies have shown that shorter women, combine with other factors such as estimated fetal weight are associated with increased delivery complications which may results in maternal and fetal morbidity and mortality.[4-9]

Maternal height is one of the simplest measurements to take into consideration to design a simple-to-use risk indicator or screening tool which can be adopted for use in rural areas in order to predict delivery outcome and prompt referral of the pregnant women to better manned and equipped facilities for delivery.

Materials and methods

This is a retrospective study, carried out at the Department of Obstetrics and Gynecology, Olabisi Onabanjo University Teaching Hospital from January 2017 to December 2018. It was a retrospective study of 1061 pregnant women without any obstetric and medical complications and who had their antenatal care supervised and delivered at this hospital.

These women were divided into groups based on their height. The study group comprises of women whose height were 150cm or less and the control group who were women with heights of 151cm or more. Variables such as age, parity, gestational age at delivery, mode of delivery, maternal and perinatal outcomes were retrieved from the case files of the women.

Results

Table 1 showed the socio-demographic and parity of the pregnant women. The bulk of the women in the study group (68.9%) were within the age group 25-34 years old and 69.2% in the control group. The mean age for both study and control groups were 29.0±5.1 years and 29.3±5.0 years. Whereas the parity showed that majority (55.3%) of the patients in the study group were within para 1-2, while that of the control was 47.2%. The mean parity for the study and control groups were 1.3±1.2 and 1.3 ± 1.3 respectively.

Table 2 illustrated the mean gestational age and maternal weight at booking. The mean gestational age of the study and control groups were 23.1±8.3wks and 22.1±8.5wks respectively. A good percentage of both groups booked their pregnancy at 14-26 weeks gestation. While in the weight section, it showed that the women in the control group were significantly heavier than the study group at booking. (64.8±14.0 vs 56.6±11.2; t-0.839; $p<0.001$).

Table 3 depicted the gestational age at delivery and outcome of the stages of labour. Majority of the women had their deliveries from 37 week to 40 weeks, with the mean gestational age at delivery of 34.7±8.4wks and 38.1±4.1wks respectively for the study and control groups and the difference was significant. (t-2.424; $p<0.021$).

Eight-point seven percent (8.7%) of the study group were in the first stage of labour for over 18 hours compared 9.1% of the control. The mean

duration in hours of the first stage of labour for the two groups were 9.5±5.5 and 10.1±5.7 respectively. While in the second stage of labour, 8.3% of the study and 0.4% control spent over 120 minutes in the second stage of labour.

In table 4, the mode of delivery and indications for Caesarean section were discussed. In the study group previous Caesarean section (60.0%) and cephalopelvic disproportion (15.0%) were the major indications for Caesarean section, however, previous Caesarean section(37.6%) and malpresentation(17.6%) were the main indications for caesarean delivery in the control group and the differences for previous malpresentation and previous Caesarean birth in the two groups were statistically significant (P<0.05).

Table 5 illustrated that babies of the control group were heavier than the study group. Also, when babies weighing 2.4kg or lower were compared in the two groups the difference was not significant.

The study group recorded significantly lower mean Apgar score at one minute than the control (6.4±2.4 vs 7.0±1.9; t-2.101; P<0.036). There was no significant difference between the Apgar scores of the two groups at five minutes of life.

In tables 6[a] & [b], maternal and perinatal outcomes following delivery were highlighted. No mortality was recorded in the study group while 4(0.4%) death was recorded in control group. These deaths were attributed to hypertension 2(8.31) and abruption placenta 2(8.37).

Perinatal death in the study group was 14.3% and while 5.8% was recorded in the control and the difference was not significant.

When the two groups were not controlled for parity and age, the Crude Odd Ratio (COR) for Caesarean Section was 3.7 (2.0-6.6; 95%CI) and the difference was significant (P<0.001) and when controlled for parity and age the Adjusted Odd Ratio (AOR) was 4.2 (2.2-8.0; 95%CI) and the difference was still significant (P<0.001).

For Perinatal deaths in this study, the COR was 2.7(0.9-8.2; 95%CI) and the difference did not reach significant level (P=0.090) and but when the two groups were controlled for parity and age the difference reached significant level (4.5; 1.4-14.6; 95%CI; P=0.012).

Table 1: Socio-Demographic and Parity of Pregnant Women

Age (yrs)	Study Group		Control Group		T-test	P
	N	%	N	%		
<20	1	2.2	20	(2.0)		
20 - 24	6	13.3	126	12.7		
25 - 29	16	35.6	381	38.4		
30 - 34	15	33.3	306	30.8		
≥35	7	15.6	159	16.0		
Mean±SD	29.0±5.1		29.3±5.0		0.190xx	0.849
Total	**45**		**992**			

Parity	Study Group		Control Group		T-test	P
	N	%	N	%		
0	14	29.8	366	36.1		
1-2	26	55.3	479	47.2		
3-4	6	12.8	149	14.7		
>4	1	2.1	20	2.0		
Mean±SD	1.3±1.2		1.3±1.3	0	0.083xx	0.934
Total	**47**		**1014**			

xx - Student t-test x - Chi Squared test [] - Fischer's exact P Value

Table 2: Gestational Age and Maternal Weight at Booking

Gestational	Study Group		Control Group		T-test	P
Age (wks)	N	%	N	%		
≤13	5	14.3	149	16.3		
14-26	17	48.6	487	53.2		
27-40	13	37.1	272	29.7		
>40	0	0	7	0.8		
Mean±SD	23.1±8.3		22.1±8.5		0.733xx	0.464
Total	**35**		**915**			
Maternal	**Study Group**		**Control Group**		**T-test**	**P**
Weight (kg)	**N**	**%**	**N**	**%**		
≤45	7	16.3	37	4.1		
46-55	17	39.5	199	21.8		
56-65	10	23.3	304	33.3		
66-75	5	11.6	201	22.0		
76-85	3	7.0	101	11.1		
86-95	1	2.3	46	5.0		
>95	0	0.0	25	2.7		
Mean±SD	56.6±11.2		64.8±14.0		3.839xx	<0.001
Total	**43**		**913**			

Table 3: Gestational age at delivery and Outcome of the Stages of labour.

Gestational	Study Group		Control Group		T-test	P
Age (wks)	**N**	**%**	**N**	**%**		
≤36	11	30.6	111	13.3		
37-40	21	58.3	580	68.0		
>40	4	11.1	162	19.0		
Mean±SD	34.7±8.4		38.1±4.1		2.424xx	0.021
Total	**36**		**853**			
First Stage	**Study Group**		**Control Group**		**Chi-square**	**P**
Duration (hours)	**N**	**%**	**N**	**%**		
<2	1	4.3	9	1.3		
2-12hours	17	73.9	516	74.8		
13-18	3	13.0	102	14.8		
>18	2	8.7	63	9.1		
Mean±SD	9.5±5.5		10.1±5.7		0.508xx	<0.611
Total	**23**		**690**			
Second Stage	**Study Group**		**Control Group**		**Chi-square**	**P**
Duration (minutes)	**N**	**%**	**N**	**%**		
<30	18	75	675	96.2		
31-60	4	16.7	23	3.3		
61-120	0	0.0	1	0.1		
>120	2	8.3	3	0.4		
Mean±SD	17.3±15.3		12.2±21.0		1.142**	0.254
Total	**24**		**702**			

Table 4: Mode of Delivery and Indication for Cesarean Section

Delivery	Study Group		Control Group		Test	P
Mode	**N**	**%**	**N**	**%**		
SVD	23	46.9	759	75.1		
Caesarean Secton	25	51.0	225	22.3	21.284x	<0.001
Assisted delivery	1	2.0	27	2.7		
Total	**49**		**1011**			

Indication	Study Group		Control Group		
	N	%	N	%	
Foetal distress	1	5.0	17	8.1	**1.000#**
Malpresentation	0	0.0	37	17.6	0.050#
CPD/Obstructed labour	3	15.0	30	14.3	1.000#
Failed Induction	1	5.0	5	2.4	**0.2665#**
Previous C/S	12	60.0	79	37.6	**0.050**
Multiple gestation	0	0.0	14	6.7	**1.000#**
Antepartum Haemorrhage	1	5.0	8	3.8	**1.000#**
Severe Preeclampsia	1	5.0	4	1.9	**0.5657#**
Prolonged Labour	0	0.0	3	1.4	**0.3681#**
HIV Infection	0	0.0	6	2.9	**1.000#**
Poor progress of labour	1	5.0	7	3.3	**1.000#**
Total	**20**		**210**		

= Fischer's exact p value

Table 5: Birthweight and Apgar Scores at delivery.

Birth	Study Group		Control Group		T-test	P
Weight (kg)	**N**	**%**	**N**	**%**		
≤2.0	4	8.3	47	4.6	1.38822x	0.25
2.1-2.4	3	6.3	53	5.2	1.1675x	0.50
2.5-3.9	41	85.4	854	84.5		
4.0-4.5	0	0.0	46	4.5		
>4.5	0	0.0	11	1.1		
Mean±SD	2.9±0.6		3.2±1.7		0.981**	0.327
Total	**48**		**1011**			

APGAR	Study Group		Control Group		T-test	P
Scores at 1 minute	**N**	**%**	**N**	**%**		
0	2	4.3	25	2.5		
1-4	6	12.8	72	7.1		
5-7	14	29.8	370	36.6		
8-10	25	53.2	543	53.8		
Mean±SD	6.4±2.4		7.0±1.9		2.101xx	0.036
Total	**47**		**1010**			

APGAR	Study Group		Control Group		T-test	P
Scores in 5 minutes	**N**	**%**	**N**	**%**		
0	2	4.3	24	2.4		
1-4	1	2.1	23	2.3		
5-7	3	6.4	74	7.3		
8-10	41	87.2	888	88.0		
Mean±SD	8.5±2.2		8.7±1.9		0.738xx	0.461
Total	**47**		**1009**			

Table 6a: Maternal and Fetal Outcome

Maternal Outcome	Study Group		Control Group		T-test	P
	N	**%**	**N**	**%**		
Mortality						
Alive	45	100.0	1005	99.6	0.179	1.000 #
Dead	0	0	4	0.4		
Total	45		1009			
Morbidity						
Yes	2	4.4	24			
No	43	95.6	981	2.4	0.754	0.307#
Total	**45**		**1005**	**97.6**		

Fetal	Study Group		Control Group			
Outcome	**N**	**%**	**N**	**%**		
Alive	24	85.7	500	94.2		
Dead	4	14.3	31	5.8		
Total	**28**		**531**			

Table 6b: Association between heights of mothers with mode of delivery, maternal outcome, fetal outcome and maternal mortality after controlling for age and parity

Variable	Short stature	Normal stature	COR (95%CI)p	AOR** (95%CI)p
Mode of Delivery				
C/S	25 (52.1)	225 (22.9)	3.7(2.0-6.6) <0.001	4.2(2.2-8.0), <0.001
SVD	23 (47.9)	759 (77.1)		
Total	48	984		
Maternal Outcome				
Dead	9)0.0)	4 (0.4)	Undefined, 1.000#	Undefined
Alive	45 (100.0)	1005 (99.6)		
Total	45	1009		
Maternal Morbidity				
Yes	2 (4.4)	24 (2.4)	1.9(0.4-8.1), 0.316#	2.1(0.5-9.4), 0.323
No	43 (95.6)	981 (97.6)	1	
Total	45	1005		
Perinatal Outcome				
Dead	4 (14.3)	31 (5.8)	2.7(0.9-8.2), 0.090#	4.5(1.4-14.6), 0.012
Alive	24 (85.7)	500 (94.2)	1	
Total	28	531		

NB: COR = Crude odds ratio
AOR = Adjusted odds ratio (odds ratio after adjusting for parity and Age)

Discussion

Good pregnancy outcomes have been attributed to the level of care and support a pregnant woman receives during antenatal clinic and labour session. This study compared delivery outcomes among those whose height were 150cm or less and those whose height were 151cm or more in Olabisi Onabanjo University Teaching Hospital, Sagamu, South West Nigeria.

In this study, majority of the pregnant women were within the age group of 25 - 34 years and this is consistent with previous studies, as this coincides with active reproductive age of women.[10]

The women who booked from 14 to 26 weeks gestation constitute a large percentage of women in both groups and this is consistent with the fact that more women are becoming more aware of the need for early antenatal booking as a tool to improving obstetric and perinatal outcomes.

Despite this encouraging findings, 37.1% and 29.7% of the women in the study and control groups respectively booked for antenatal care in the third trimester and this could be as a result of wrong perception of feeling healthy and so no need to book early or just for them to book so as to deliver in a tertiary hospital setting because of the availability of skilled labour hands. This assertion was corroborated by Adekanle et al.[11]

Studies have linked short statured women to increased risk of poor obstetric outcomes.[12,13] In this study, there was significant increased preterm delivery in the study group when compared to the control. This was similar to a study done in Sweden where the team observed that decreasing maternal height was associated with progressive increase in the odds of having preterm infant.[13] Different

theories have also been postulated as to the cause of this finding and this include the theory of short cervical length,[13] socio-economic status,[14] phenotypic influences[15] and genetic influence.[15] However, it has been generally accepted that anatomic constraints are more likely in spontaneous and idiopathic preterm deliveries.[13,14,15]

This study also showed that short women are at increased risk of having cesarean delivery when compared to women of normal height. Kotingo et al. established in their study a 3-fold rise in cesarean section among short statured women when compared to control cases.[16] This necessitate the need to be extra vigilant when a woman with short stature is in labour. However, in another study it was reported that there was no significant difference in the mode of delivery in both groups of patients.[17]

Maternal short stature as a risk factor for low birth weight has also been reported in some studies,[12,13,14] but our study did not find any statistical significance when the weight of babies born to short statured mothers were compared with mothers of normal height, although the mean birth weight in the study group was lower than that of the control. However, in a study by Kotingo et al. which found a statistically significant lower birth weight in babies of women with short stature when compared with women of the control population.[16]

In the first minute of life, the newborns of the control group had significant higher Apgar score than the newborns of the study group. This significant difference can be as a result of increased risk of preterm deliveries and relative longer duration of second stage of labour found in women with short statured height. However, by five minutes of life both babies had achieved better Apgar scores, although the neonates of the control group still maintain a non-significant better mean Apgar score.

Four women died in the control group while none was recorded in the study group. These deaths were attributed to severe pregnancy induced hypertension in two women who have had normal course of antenatal period just for them to develop uncontrollable high blood pressure. The other two deaths were due to abruption placentae with development of disseminated intravascular coagulopathy with end organs failure. Overall we think the maternal outcomes on both sides are still good and this is likely to be due to the effect of antenatal attendance and their labour monitored by skilled personnel. The maternal mortality in this study is low when compared to the findings of a study carried out in this institution about two decades ago.[18] The study recorded a maternal mortality ratio of 1936.1 per 100,000 live births and this was attributed to large number of unbooked pregnant women and women with medical conditions that were included in the study and these were excluded in this study.

The short statured women perinatal outcome was poorer than the control even though without significant difference but when the two populations were controlled for age and parity the difference reached significant level meaning that newborns of short statured women are of higher risk of perinatal deaths than the control despite the two populations being subjected to modern antenatal and delivery care at our facility.

In conclusion, we have demonstrated that short maternal height is an independent risk factor for adverse pregnancy and delivery outcomes.

With the acknowledge of this association, a simple risk assessment tool can be designed to identify pregnant women with likelihood of developing complications during pregnancy, labour and delivery. In that respect short statured women should be monitored closely during pregnancy and when in labour to identify early signs of cephalopelvic disproportion.

The limitation of this study is the small number of the study group compared to the control. But that may not necessarily affect the outcome of the study in that:

1. The study was designed specifically for the number of years in review without prejudice to the number that will be available per group.
2. The small population of the study group could be a reflection of better nutrition and health care in our catchment area because both the government and the people know that health is

wealth and foremost of good health is nutrition and both have committed substantial resources in this direction in the past two decades. So, the female gender coming up with restricted growth and with limited pelvic capacity is on the decrease.

3. Appropriate statistical methods were applied in the process of statistical analysis to take care of the small number of the study group.

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