International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2021; 5(5): 28-32
Received: 09-07-2021
Accepted: 21-08-2021

Dr. Chandrashekar K
Assistant Professor, Department of OBG, VIMS, Ballari, Karnataka, India

Dr. Shiva Kumar HC
Associate Professor, Department of OBG, VIMS, Ballari, Karnataka, India

Dr. Chandrasekhar T
Professor, Department of OBG, VIMS, Ballari, Karnataka, India

Corresponding Author:
Dr. Shiva Kumar HC
Associate Professor, Department of OBG, VIMS, Ballari, Karnataka, India

A study to recognize and rule out the possibility of a CPD using simple maternal anthropometric measurements at an early stage of labor

Dr. Chandrashekar K, Dr. Shiva Kumar HC and Dr. Chandrasekhar T

DOI: https://doi.org/ 10.33545/gynae.2021.v5.i5a.1011

Abstract
It was a prospective observational study. Primigravidae over 37 weeks' gestation attending the Obstetrics and Gynecology department at St. John's Medical College Hospital during a one and a half year period with a singleton pregnancy in vertex presentation were included. Several anthropometric measurements like height, pre pregnancy weight, BMI, foot length, bis acromion diameter, inter trochanteric diameter, Michaelis Rhomboid – transverse and vertical diameter, SFH and abdominal girth were taken in 135 primigravidae. Fetal weight was estimated. Differences in these measurements between the vaginal delivery and CPD groups were analyzed. Based on multivariate analysis the risk factors for CPD in the study group were height < 152 cm, BMI > 23 kg/m2, foot length ≤23cm, Michaelis Rhomboid transverse diameter < 25 cm, inadequate pelvis and estimated fetal weight ≥ 3000g. If the risk assessment score developed with the positive predictors is < 6, it probably indicates a high chance of CPD and increased risk of caesarean delivery.

Keywords: anthropometric measurements; cephalopelvic disproportion; risk assessment score

Introduction
Ante partum diagnosis of CPD has given way to prediction, or designation as 'high risk.' Pregnant women with short stature, suspected small pelvis, or who are carrying large babies, are normally subjected to a trial of labor. In some parts of the world, where health services are distant from homes or road transport is a problem, women may be advised to give birth in a hospital, because of their increased risk for CPD and caesarean delivery [1]. There is general consensus that CPD, with very few exceptions, should only be diagnosed after a properly conducted trial of labor. In terms of research, there is little place for refinement of what is already known about height, shoe size and pelvimetry [2].

CPD is an important cause of a subnormal cervical dilatation rate, irrespective of the nature of the disorder – arrest, protraction, or crossing an alert or action line on partogram. It is accepted that if progress in labor is poor, the problem is caused either by ineffective uterine contractions or mechanical obstruction, or, very rarely, true cervical dystocia [3]. Generally, the simple correction of poor uterine activity will result in normal progress and delivery if there is no CPD. This may be done by amniotomy or oxytocin infusion or both. Failure to progress in such circumstances indicates CPD. This is well known and is not likely to be challenged [4].

Correction of ineffective uterine activity is not necessarily safe. In multiparae, rupture uterus is a significant risk when oxytocin is used to augment labor in the presence of CPD. Some questions to reflect:

- Is it fair to augment labor in a primigravida when there is evidence of CPD and when contractions appear to be clinically adequate?
- What constitutes evidence of CPD? Is it a high head in labor, the suspicion of a large baby, occipitoposterior position, moulding, caput succedaneum, deflexion, asynclitism or some or all of these?

A prospective study, with a non-participant researcher making clinical observations as described above, would provide greater clarity on the predictive value for CPD of a number of intrapartum clinical findings.

Methodology

The height, bis-acromial, foot length, vertical and transverse diameters of the Michaelis rhomboid, symphysis-fundal height and abdominal girth were measured for each woman. Height was recorded on a stadiometer with an accuracy of 0.5cm and a measuring tape was used for the various anthropometric measurements as mentioned in the study.

The transverse diameter of the Michaelis sacral rhomboid was measured between the two posterior superior iliac spines. The vertical diameter of the rhomboid was measured between the L5 spine (one space below the L3–L4 disc which is in line with the uppermost point of the iliac crest) and the upper limit of the natal cleft. With the patient lying supine with knees flexed, fundal height was marked after correcting uterine dextro-rotation. Then, with the patient's knees straightened, the distance from the symphysis to the point marked (symphysis-fundal height) was noted. The abdominal girth was measured with a measuring tape at the level of the umbilicus.

Fetal weight was estimated using Johnson's formula which is calculated from the symphysis-fundal height in centimeters – a constant according to level of fetal head engagement ×155. Mode of delivery was recorded as normal vaginal, instrumental vaginal (forceps, vacuum extraction) and cesarean delivery.

Intra-observer reproducibility alone was evaluated (only one investigator).

Data was entered in Excel and the analysis was done using SAS version 9.1.3. Continuous variables were reported using mean +/- standard deviation for the normally distributed variables otherwise median and inter quartile range were used. Categorical variables were reported using number and percentages. Chi-square test was done to test the association between outcomes (Type of Delivery) with categorical variables. Independent test was used to compare the clinical variables such as age, gestational age, birth weight and so on between the normal and LSCS groups. ANOVA was used to compare the clinical characteristics between Normal, instrumental and LSCS groups. All the analysis was considered statistically significant at 5% level (P value <0.05).

Results

Table 1: Frequency and percentage distribution of gravid women according to their BMI

BMI (kg/m^2)	Frequency	Percentage
Below 21.9	41	30%
21.9	3	2%
Above 21.9	91	68%
Total	135	100%

P value: 0.0015

Out of 135 gravid women, 91(68%) had BMI above 21.9 kg/m^2, 41 (30%) below 21.9 kg/m^2 and the remaining 3(2%) of the subjects had a BMI of 21.9 kg/m^2.

Table 2: Frequency and percentage distribution of gravid women according to their Foot Length

Foot length (cm)	Frequency	Percentage
Below 22.94	90	67%
22.94	27	20%
Above 22.94	18	13%
Total	135	100%

P value: < 0.0001

More than half, 90 (67%) of the gravid women had a foot length of below 22.94 cm and a little less than quarter percent27 (20%) measured 22.94 cm. The remaining 18 (13%) had a foot length above 22.94 cm.

Table 3: Frequency and percentage distribution of gravid women according to their Bis Acromion Diameter

BIS ACR (CM)	Frequency	Percentage
Below 37.9	60	44%
37.9	39	29%
Above 37.9	36	27%
Total	135	100%

P value: 0.2804

A little less than half of the gravid women 60, (44%) measured below 37.9 cm, 39 (29%) measured 37.9 cm and 36 (27%) 0f the gravid women measured above 37.9 cm.

Table 4: Frequency and percentage distribution of gravid women according to their Inter Trochanteric Diameter

INT. TRO (cm)	Frequency	Percentage
Below 41.74	53	39%
41.74	20	15%
Above 41.74	62	46%
Total	135	100%

P value: 0.121

Out of 135 gravid women, 62(46%) of them measured above 41.74 cm, 53(39%) of them measured below 41.74 cm and the remaining 20, (15%) measured
41.74 cm.

Table 5: Frequency and percentage distribution of gravid women according to their Michaelis Rhomboid Transverse Diameter

MI RH TR (cm)	Frequency	Percentage
Below 25.47	21	15%
25.47	28	21%
Above 25.47	86	64%
Total	135	100%

P value: < 0.0001

Out of 135 gravid women, 86 (64%) of them measured above 25.47 cm, 28 (21%) of them measured 25.47 cm and the remaining 28 (21%) measured below 25.47 cm.

Table 6: Frequency and percentage distribution of gravid women according to their Michaelis Rhomboid Vertical Diameter

MI RH VER (cm)	Frequency	Percentage
Below 6.08	40	30%
6.08	71	52%
Above 6.08	24	18%
Total	135	100%

P value: 0.0183

Out of 135 gravid women, 40 (30%) of them measured below 6.08 cm, 71(52%) of them measured 6.08 cm and the remaining 24, (18%) measured above 6.08 cm.

Table 7: Frequency and percentage distribution of gravid women according to their Symphysis Fundal Height

SFH (cm)	Frequency	Percentage
Below 34	34	25%
34	63	47%
Above 34	38	28%
Total	135	100%

P value: 0.1363

Out of 135 gravid women, 34 (25%) of them measured below 34 cm, 63 (47%) measured 34 cm and the remaining 38(28%) measured above 34 cm.

Table 8: Frequency and percentage distribution of gravid women according to their Abdominal Girth

AG (cm)	Frequency	Percentage
Below 97. 35	60	44%
97.35	5	4%
Above 97.35	70	52%
Total	135	100%

P value: 0.378

A little less than half of the gravid women 60, (44%) measured below 97.35 cm, 5(4%) measured 97.35 cm and 70 (52%) 0f the gravid women measured above 97.35 cm.

Table 9: Frequency and percentage distribution of gravid women according to their Estimated Fetal Weight

EFW (kg)	Frequency	Percentage
Below 2.7	38	28%
2.7	11	8%
Above 2.7	86	64%
Total	135	100%

P value: < 0.0001

In more than half of the gravid women 86, (64%) of the fetuses weighed above 2.7 kg, 11(8%) weighed 2.7 kg and 38 (28%) of the fetuses weighed below 2.7 kg.

Table 10: Frequency and percentage distribution of gravid women according to their Fetal Scan Weight

SCAN WT (kg)	Frequency	Percentage
Below 2.8	37	28%
2.8	15	11%
Above 2.8	83	61%
Total	135	100%

P value: 0.0007

In more than half of the gravid women 83, (61%) of the fetuses weighed above 2.8kg, 15(11%) weighed 2.8 kg and 37(28%) of the fetuses weighed below 2.8 kg.

Table 11: Frequency and percentage distribution of gravid women according to their Actual Fetal Weight

ACT. FETAL WT (kg)	Frequency	Percentage
Below 2.8	28	20%
2.8	13	10%
Above 2.8	94	70%
Total	135	100%

P value: < 0.0001

A little less than three quarters 94, (70%) of the newborns weighed above 2.8 kg, 13(10%) weighed 2.8 kg and 28 (20%) of the newborns weighed below 2.8 kg.

Table 12: Frequency and percentage distribution of gravid women according to Pelvimetry N=135

PELVIMETRY	Frequency	Percentage
Adequate	104	77%
Inadequate	31	23%
Total	135	100%

P value: < 0.0001

A little more than three quarters 104, (77%) of the gravid women had an adequate pelvis and the remaining 31 (23%) were reported as inadequate.

Table 13: Logistic Regression of the factors significant in diagnosis of CPD

Parameters	B	Sig.	Odds Ratio	95% C.I. for EXP(B)	
				Lower	Upper
BMI	0.35	0.05	1.43	.99	2.06
Foot length	-3.03	<.0001	.06	.01	.16
Michaelis rhomboid transverse diameter	.07	.19	1.07	.68	1.69
Actual fetal weight	2.17	0.03	8.79	1.11	69.29
Pelvimetry	-.52	.56	0.59	.10	3.47

Logistic regression was performed to assess the independent factors associated with caesarean delivery after adjusting independent variables for age of the mother, BMI of the mother, foot length, Michaelis Rhomboid Transverse diameter, actual weight of the baby and pelvimetry. It was found that foot length, and actual weight of the baby were significant risk factors associated with caesarean delivery. Mother's with increased foot length were less likely (OR: 0.06) of being in the LSCS group. Increased BMI in the mother increases the risk of caesarean delivery due to CPD (OR: 1.4). The odds ratio of a mother being in the LSCS group (OR: 8.9) increases when the actual weight of the baby increases.

Discussion

In a study done by HUBERT *et al.* [5], bis acromion diameter showed a positive predictive value for CPD. This study however did not show any statistical significance for the above mentioned parameter as the diameters turned out to be comparatively similar (37.9 cm in vaginal delivery and 37.6 in caesarean delivery) in both the groups of women who delivered either vaginally or by caesarean delivery.

Based on multivariate analysis, one of the risk factor for CPD in the study population of BENJAMIN *et al.* [6] that turned out to be statistically significant was an inter trochanteric diameter of < than 30 cm. This study did not show any positive correlation with regard to this parameter and the reason being a smaller sample size of 135 in comparison to the other study where the sample size was 249 primigravidae.

Another promising positive predictor of CPD is the Michaelis Rhomboid – transverse and vertical diameter. The transverse diameter of Michaelis Rhomboid is a statistically significant parameter with a p value of < 0.001 in this study. Several comparable studies done by HUBERT B *et al.* [5] and RAHELLE *et al.* [7] have also proven the same parameter to be significant. The Michaelis Rhomboid area moves outwards during the second stage of labor and as it moves back, it also pushes the wings of the ilea out, increasing the diameter of the pelvis.

KHUNPRADIT S *et al.* [8] and WANCHAI *et al.* [9] have reported that SFH measurement greater than 35 cm and 33 cm respectively can be strong predictors for caesarean delivery due to CPD. This study showed no correlation between SFH and risk of caesarean delivery. The SFH differed in cut off points which may be due to the different population, sample size and individual technique employed to measure fundal height. No comparative studies were found in relation to abdominal girth. Abdominal girth as an individual parameter did not turn out to be a significant predictor of CPD. The measurements of both

abdominal girth and SFH are easy, safe and harmless, and without expensive equipment or expertise.

Traditional obstetrical services relied heavily on pelvimetry in the conduct of delivery in order to decide if vaginal delivery was possible. Clinical pelvimetry, which is inexpensive, has been shown to be a reliable method of assessing the pelvic capacity, and is of predictive value for the fetal outcome in primigravidae. The caesarean delivery rate among parturients who had adequate pelvis at antenatal pelvimetry was 58% and normal vaginal delivery rate was 92% in comparison to parturients with inadequate pelvis (8% - vaginal delivery and 42% - caesarean delivery) which was statistically proven to be significant with a p value of < 0.001. Parturients who had spontaneously gone into labor had a higher chance of normal vaginal delivery in comparison to caesarean delivery (44 v/s 34) which was also proven to be statistically significant with a p value of 0.0452. The findings in this study suggest that antenatal pelvimetry has a predictive value for CPD. The practice should, therefore, be encouraged in all primigravidae especially those in the rural set up where adequate fetal monitoring facilities are not widely available.

In an editorial published in the BJOG, Hall[10] reviewed attempts to improve fetal weight estimation by ultrasound technology, and concluded that clinical assessment was as good as scanning and that a simple tape measure and clinical expertise, will serve as well as an ultrasound estimated fetal weight in detecting the big baby. A number of factors may affect the accuracy of fetal weight estimation. It has been shown that fetal weight estimation, by whatever method, diminishes in accuracy as birth weight increases. This study has shown that the fetal weight parameter be it by estimated fetal weight by using the Johnson's formula or ultrasound weight or the actual weight of the neonate is statically a significant parameter in predicting CPD. The mean difference with regard to estimated fetal weight and ultrasound weight was found to be ± 200 grams both among the study and control group.

As mentioned earlier, the calculation of this parameter is not precisely definite because of involvement of factors such as macrosomia, fetal growth restriction, poly/ oligohydramnios, maternal obesity etc.

Combining some maternal measurements with estimates of fetal weight, increase modestly the predictive value of CPD. This is more likely to be greater if the estimates of fetal weight is close to the actual birth weight. This study has directly correlated the increased risk of caesarean delivery with a big baby (p value < 0.001) – birth weight of 3.2 kg and above when compared to 2.8 kg babies delivered vaginally. Similar statistical analysis is shown by BENJAMIN *et al.* [6] and WANCHAI *et al.* [9].

The second objective of my study was to develop a risk score to assess CPD.

KHUNPRADIT S *et al.* [8] performed a case-control study to develop a simple risk scoring scheme for the prediction of cesarean delivery due to cephalopelvic disproportion (CPD) in Lamphun Hospital, Thailand. In this study 116 pregnant women had cesarean delivery due to CPD and 307 pregnant women delivered vaginally.

A risk scoring scheme was developed from five obstetric predictors: maternal age, height, parity, pregnancy weight gain and symphysis-fundal height. Item scores ranged from 0 up to 3.5 and the total score from 0 -14.5. The likelihood of cesarean delivery due to CPD in pregnant women with low risk (scores below 5), moderate risk (scores 5-9.5) and high risk (scores 10 and over) were 0.09, 0.86 and 10.11 respectively. The risk of cesarean delivery due to CPD could be forecasted by a simple scoring scheme using five predictors that correctly identified women with low, moderate and high risk.

After analyzing the data compiled in this study we have developed a risk assessment score. The statically significant predictors like height, BMI, foot length, transverse diameter of Michaelis Rhomboid, pelvimetry and fetal weight can be involved in assessing a primigravida for presence or absence of CPD.

Conclusion

- Maternal anthropometric measurements continue to be a simple tool in predicting the risk of caesarean delivery due to CPD and if rightly done saves an obstetrician from stress involved emergencies.
- A careful assessment with adequate obstetric skills of pelvimetry can prevent maternal morbidity and mortality because of obstructed labor.

Early detection of CPD in a rural set up enables an obstetrician to refer a patient on time to a tertiary care, sparing stress and added agony in a woman who is already in labor.

References

1. Chauhan S, Cowan B, Magann E, Bradford T, Roberts W, Morrison J. Intrapartum Detection of a Macrosomic Fetus: Clinical Versus 8 Sonographic Models. The Australian and New Zealand Journal of Obstetrics and Gynaecology 1995;35(3):266-270.
2. Eckhart Johannes Buchmann. Head descent, moulding and other intrapartum clinical findings in the prediction of cephalopelvic disproportion. Johannesburg 2007.
3. Young TK, Woodmansee B. Factors that are associated with cesarean delivery in a large private practice: the importance of pre pregnancy body mass index and weight gain. Am J Obstet Gynecol 2002;187(2):312-8. Discussion 318-20.
4. Papungkorn Surapanthapisit, Wiboolphan Thitadilok. Risk Factors of Caesarean Section due to Cephalopelvic Disproportion. J Med Assoc Thai 2006;89(4):S105-11.
5. Hubert B. Liselele, Michel Boulvain, Kalala C. Tshibangu and Sylvain Meuris. Maternal height and external pelvimetry to predict cephalopelvic disproportion in nulliparous African women: a cohort study. BJOG: An International Journal of Obstetrics & Gynaecology 2000;107(8):947-952.
6. Benjamin S, Daniel A, Kamath A, Ramkumar V. Anthropometric measurements as predictors of cephalopelvic disproportion. Acta Obstetricia et Gynecological Scandinavica 2011;91(1):122-127.
7. Alijahan R, Kordi M, Poorjavad M, Saeed Ebrahimzadeh Diagnostic accuracy of maternal anthropometric measurements as predictors for dystocia in nulliparous women. Iranian Journal of Nursing and Midwifery Res 2014;19(1):11-18.
8. Khunpradit S, Patumanond J, Tawichasri C. Development of risk scoring scheme for prediction of cesarean delivery due to cephalopelvic disproportion in Lamphun Hospital, Thailand. J Obstet Gynaecol Res 2007;33(4):445-451.
9. Wanchai Wianwiset MD, Risk factors of caesarean delivery due to CPD in nulliparous women at Sisaket hospital, Thai journal of OBG 2011;19:158-164.
10. Hall M. Guessing the weight of the baby. BJOG: An International Journal of Obstetrics and Gynaecology 1996;103(8):734-736.