Corresponding Author
Nisha Yadav,
Department of Obstetrics and Gynaecology, Gajara Raja Medical College, Gwalior, Madhya Pradesh, India
nishamy20@gmail.com

Author Designation
[1,3,4]Resident Doctor
[2]Professor

Evaluation of Maternal Demographic and Anthropometric Parameters for Prediction of Cephalopelvic Disproportion in Primigravida

[1]Nisha Yadav, [2]Yashodhara Gaur, [3]Anita Meena and [4]Jagrati Gupta
[1-4]Department of Obstetrics and Gynaecology, Gajara Raja Medical College, Gwalior, Madhya Pradesh, India

ABSTRACT
Cephalopelvic disproportion (CPD) related obstructed labour requires delivery by cesarean section. Maternal anthropometric parameters as risk factors for CPD have always been a matter of interest and concern for obstetricians. This study aims at showing the relationship between cesarean section indications with maternal socio-demographic and anthropometric parameters among primigravida. A cross-sectional study was made among 190 Primigravida with singleton pregnancy at term and vertex presentation. Concerned anthropometric parameters were height, weight and six pelvic distances of pregnant women were measured and correlate with the mode of delivery. Majority of the cases (91.6%) were 21-25 years of age group, most of them (80.0%) were residing at urban resident. Majority of the women (89.5%) were belong to >145 cm height and most of them (78.4%) cases were normal BMI. Maternal anthropometric parameters like height, Bisacromial Diameter, Intercristal Diameter, Intertrochanteric Diameter and foot length were significantly associated with the CPD in primigravida (p<0.05). 45.3% cases were delivered as LSCS. There was statistically significant association seen between the Height and BMI (P<0.05). Maternal height and other anthropometric measurements are primarily helpful in determining the cephalo-pelvic disproportion primiparous women

INTRODUCTION

Cephalopelvic disproportion is one of the common obstetric complications[1]. Cephalopelvic disproportion (CPD) occurs in a pregnancy where there is mismatch in size between the fetal head and the maternal pelvis, resulting in difficulty of the fetus to pass safely through the pelvis for mechanical reasons[2]. Cephalopelvic disproportion may lead to severe complications in mother and child when it not diagnosed and managed timely[1]. It is developed either by maternal or fetal causes. The fetal causes include increased fetal weight, hydrocephalous, malposition and maternal causes include short height or small pelvis, metabolic bone diseases, previous fracture. Women of small height (<1.60m) with comparatively a large baby in their pelvis are more likely to develop CPD especially in their first pregnancy[3]. Therefore, it is necessary to predict cephalopelvic disproportion as early as possible to avoid such serious complications. However, maternal height in isolation has limited value for predicting Cephalopelvic disproportion (CPD) risk[4] and combining anthropometric measurements may increase the likelihood of predicting Cephalopelvic disproportion (CPD)[5]. Since anthropometry and stature of women of different ethnic origins vary, it is important to identify the most sensitive predictors of Cephalopelvic disproportion (CPD) for a particular population. Maternal death remains a major health problem in some developing region of world such as sub-Saharan Africa and South Asia and among these 20-30% is attributable to complications of cephalopelvic disproportion[6]. The cephalopelvic disproportion can be predicted to some extent by maternal anthropometric measurement, by combining these measurements with clinical estimates of fetal weight, it defines predictive value to a relatively modest degree[7]. The rate of developing cephalopelvic disproportion is still higher in short stature parturient even after control of birth weight, parity, type of attendance in antenatal care unit[8].

Aims of this Study: The primary aim of this research is to determine the relationship between cephalopelvic disproportion with maternal socio-demographic and anthropometric parameters among primigravida.

MATERIALS AND METHODS

This prospective observational Study was conducted in the Department of Obstetrics and Gynaecology, Kamla Raja Hospital and J.A. Group of Hospitals, Gwalior, M.P. study duration was 2 years from November 2020-august 2022.

Inclusion Criteria:
- Women aged 20-30 years

- Primigravida after 37 week of gestation and at time of labor
- Singleton pregnancy, live fetus and Cephalic presentation
- Women who provided consent for the study

Exclusion Criteria:
- Women age >30 or <18 years
- Women with other than Cephalic presentation
- Multigravida, Twin pregnancy, intrauterine fetal demise or any congenital anomalies
- Pregnancy associated complications like GDM, preeclampsia, eclampsia or APH
- Elective caesarean section and C.S. for reasons other than CPD
- Women who not willing for the study

Detailed history and examination has been taken from all the participants according to proforma. Socio demographic characteristics of the mother such as age, residence, occupation and level of education were recorded.

Maternal anthropometric measurements are taken by external pelvimetry such as, bis-acromial, inter-crestal, inter-trochanteric diameters, and height, foot length, vertical and transverse diameters of the Michaelis rhomboid, symphysio-fundal height and abdominal girth were measured by measuring tape for each woman at or beyond 37 wk before labour. Effective fetal weight is calculated and record it for every women.

Statistical Analysis: Data were entered and analyzed using SPSS version 22. Mean and the standard deviation were calculated for continuous variable. Frequency and proportions were calculated for categorical variables. $P < 0.05$ were considered statistical significant.

RESULTS AND DISCUSSIONS

A total of 190 primi women were enrolled and analysed in this study. Majority of the (91.6%) cases belong to 21-25 years of age group with mean age was 22.92±1.39 years. Most of the cases (96.3%) were unbooked and 80.0% cases were belonging to urban residents.

Table 1: Socio-Demographic Characteristics of Study Participants.

Socio-demographic variables		Frequency	Percentage
Age Group (in years)	≤20	8	4.2%
	21-25	174	91.6%
	26-30	8	4.2%
Mean±SD		22.92±1.395	
Booked / Unbooked cases	Booked	7	3.7%
	Unbooked	183	96.3%
Residential area	Rural	38	20%
	Urban	152	80%

Among maternal anthropometric measurements majority of the women (89.5%) were belong to >145

cm height and most of them 78.4%) cases were belong to normal BMI. Bisacromial Diameter in maximum cases (53.2%) had 32.1-34 cm, there were 60.5% cases were belong to Intercristal Diameter ranges from 27.1-29.0 cm, there were 40.5% cases were belong to Intertrochanteric Diameter ranges from 28.1-30.0 cm and 61.6% cases were belong to ≤23 cm foot length. All the maternal anthropometric parameters significantly associated with the CPD in pregnant women (p<0.05)

**Table 2: Maternal Anthropometric Parameters among Study Participants.**

Anthropometric parameters		Frequency	Percentage
BMI (kg/m2)	Normal Weight	149	78.4%
	Overweight	32	16.8%
	Obese	4	2.1%
	Underweight	5	2.6%
Mean±SD		23.24±2.49281	
Height (cm)	≤145 cm	20	10.5%
	>145 cm	170	89.5%
Bisacromial Diameter (cm)	30-32 cm	88	46.3%
	32.1-34 cm	101	53.2%
	>34 cm	1	0.5%
Intercristal Diameter (cm)	25-27	73	38.4%
	27.1- 29	115	60.5%
	>29	2	1.1%
Inter-trochanteric Diameter (cm)	26.0-28	65	34.2%
	28.1-30	77	40.5%
	30.1-32	48	25.3%
Foot Length (cm)	≤23	117	61.6%
	>23	73	38.4%

Linear regression analysis of the independent variables reveal that Bisacromial Diameter (cm) was the biggest predictor to CPD. Coeffcient of determination R2=0.906 (90.6%), F=1777.89, p=0.000. The next predictor was Intercristal Diameter, Coeffcient of determination R2=0.694 (69.4%), F=421.11, p=0.000, followed by Foot Length 69.2%, Intercristal Diameter 58.6%, Abdominal Girth 3.7%, EFW by Johnsons Formula (gm) 2.7% and symphysio fundal Height 2.5%. EFW by Johnsons Formula (gm) did make significant impact on mode of delivery.

**Table 3: Regression Analysis of the Anthropometric Variable among Study Subjects.**

Independent Variable	R2	Mean Square	F	p-value
Height	0.180	8.35	40.782	0.000
Bisacromial Diameter (cm)	0.906	41.54	1777.89	0.000
Intercristal Diameter (cm)	0.694	32.23	421.11	0.000
Intertrochantric Diameter (cm)	0.586	27.58	266.09	0.000
Foot length (cm)	0.692	31.70	412.58	0.000
Symphysiofundal Height (cm)	0.025	1.18	4.86	0.029
Abdominal Girth (cm)	0.037	1.75	7.29	0.008
EFW by Johnsons Formula (gm)	0.027	1.26	5.19	0.024
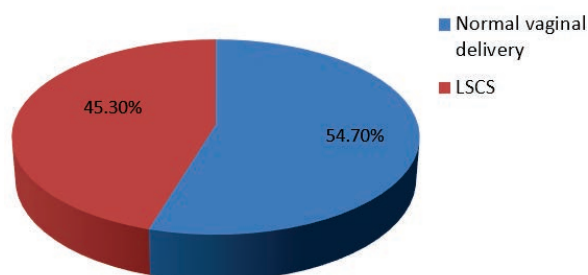
Graph 1: Distribution of Cases According Mode of Delivery

Out of total cases, there were 54.7% cases were delivered as normal delivery and 45.3% cases were delivered as LSCS.

There was statistically significant association seen between the Height and BMI (P<0.05).
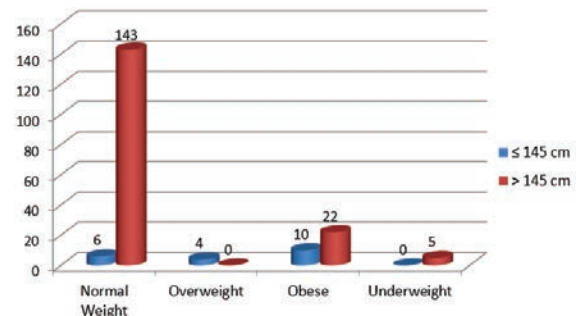
Graph 2: Association of Height in Relation to BMI among Study Subjects

Cephalopelvic disproportion is defined as, the anatomical disproportion between fetal head and maternal pelvis. It is developed either by maternal or fetal causes. Cephalopelvic disproportion complicates 2-15% of pregnancies and is associated with significant maternal and fetal complications Risk of obstructed labor and caesarean section are higher in women with short stature due to cephalo-pelvic disproportion. In the health centers which are not equipped to perform a caesarean section, accurate prediction of women at risk for CPD is difficult[9].

Maternal age is among several factors used to screen pregnant women for potential risk of labor complications. According to this study the mean value of maternal age 22.9±1.3 years, in agreement with study done by Solomon[10].

A study conducted by Phupong[11] observed that women of younger age experienced more obstetric complications than older women. The age range of 18 to 30 years and height from 135 cm to 165 cm indicates that the sample of women broadly covers groups of women of reproductive age, on the one hand and height on the other, as both variables, among others, are used to evaluate and determine obstetric risk[12].

In our study women were shorter in disproportion group. When 10th percentile values (<142cm) were used risk of cephalopelvic disproportion was 4 times and up-28% women with cephalopelvic disproportion could be detected using this parameter alone (sensitivity 28%). These findings were consistent with findings of Bansal[13] and Deepika[14]. Women with higher BMIs and pre pregnancy weight gain are at high risk for cephalopelvic disproportion in the current study, similar results shown by Young[15] and S Roshan[16].

Foot length as a constant factor for CPD, in present study most of the women of foot length <18cm

delivered by caesarean section, consistent observation detected by Awonuga[17] and Kakoma[18].

In our study 10th percentile cutoff intertrochanteric diameter has sensitivity 39% and specificity 86% with PPV 29.09% for predicting contracted pelvis which is comparable to study conducted by Rozenholc[19].

Bis-acromial diameter did show significant association with CPD in this study, in agreement with the P Rishi[20], disagreement with the Benjamin[21], did not show any significant association between Bis-acromial diameter and CPD. In the present study, LSCS was required in 45.3% of the pregnant women, accordance with the Duran[22].

The current study shows combination of mothers' height with the other anthropometric measurements show better prediction compared to mothers' height alone. This study is consistent with the study conducted by Rahele[10].

CONCLUSION

A measurement of maternal height, foot length, bisacromial diameter, maternal weight and Michaelis transverse diameter is a simple method to detect primiparous women at risk for cephalo-pelvic disproportion. Combination of height with other anthropometric measurements play crucial role in increment of CPD predictive value. Maternal Height, Foot Length, Intertrochanteric diameter, Bis-acromial diameter and Michaelis transverse diameter are the most significant factors to predict the cephalo-pelvic disproportion in pregnant women.

REFERENCES

1. Toh, A.R., K. Srisupundit and T. Tongsong, 2012. Short stature as an independent risk factor for cephalopelvic disproportion in a country of relatively small-sized mothers. Arch. Gynecol. Obstet., 285: 1513-1516.

2. Ronsmans, C. and W.J. Graham, 2006. Maternal mortality: Who, when, where and why. Lancet., 368: 1189-1200.

3. Biase, N.D., S. Balducci, C. Lencioni, A. Bertolotto and A. Tumminia et al., 2019. Review of general suggestions on physical activity to prevent and treat gestational and pre-existing diabetes during pregnancy and in postpartum. Nutr., Metab. Cardi Dis., 29: 115-126.

4. Melah, G., A. El-Nafaty , A. Massa and B. Audu, 2003. Obstructed labour: A public health problem in gombe, gombe state, Nigeria. J. Obstet. Gynaecology, 23: 369-373.

5. Neilson, J., T. Lavender, S. Quenby and S. Wray, 2003. Obstructed labour. Br. Med. Bull., 67: 191-204.

6. Benjamin, S.J., A.B. Daniel, A. Kamath and V. Ramkumar, 2012. Anthropometric measurements as predictors of cephalopelvic disproportion. Acta Obst Gyne Scand., 91: 122-127.

7. Grev, J., M. Berg and R. Soll, 2018. Maternal probiotic supplementation for prevention of morbidity and mortality in preterm infants. Coch Datab Syst. Rev., Vol. 12, No. 12 .10.1002/14651858.cd012519.pub2.

8. Kozuki, N., J. Katz, A.C. Lee, J.P. Vogel and M.F. Silveira et al., 2015. Short maternal stature increases risk of small-for-gestational-age and preterm births in low-and middle-income countries: Individual participant data meta-analysis and population attributable fraction. J. Nutr., 145: 2542-2550.

9. Munabi, I.G., S.A. Luboga, L. Luboobi and F. Mirembe, 2016. Association between maternal pelvis height and intrapartum foetal head moulding in Ugandan mothers with spontaneous vertex deliveries. Hindawi Limited, Obstet. Gynecol. Int., 2016: 1-7.

10. Solomon, D., A. Dirar and F. Getachew, 2018. Age, anthropometric measurements and mode of delivery among primigravidae women at addis ababa governmental hospitals, Ethiopia. J. Women's Health Care, Vol. 7 .10.4172/2167-0420.1000418.

11. Phupong V, Suebnukarn K 2007. 1. Obstetric outcomes in nulliparous young adolescents. Asian J Trop Med Pub Health., 38: 141-145.

12. Alijahan, R., M. Kordi, M. Poorjavad and S. Ebrahimzadeh, 2014. 1. Diagnostic accuracy of maternal anthropometric measurements as predictors for dystocia in nulliparous women. Iran. J. Nurs. Midwifery Res., 19: 11-18.

13. Bansal, S., K. Guleria and N. Agarwal, 2011. Evaluation of sacral rhomboid dimensions to predict contracted pelvis: A pilot study of Indian primigravidae. J. Obstet. Gynecol. India, 61: 523-527.

14. Deepika, N., A. Kumar and C. Shivagami, 2019. 1. Study of anthropometric measurements to predict contracted pelvis. Int J Clin Obstet Gynaecol., 3: 7-11.

15. Young, T.K. and B. Woodmansee, 2002. Factors that are associated with cesarean delivery in a large private practice: The importance of prepregnancy body mass index and weight gain. Am. J. Obstet. Gynecol., 187: 312-318.

16. Samiya, R., P. Maryam, N. Roohi and A. Swhakeel, 2021. Association between Height of the Patients and Cephalopelvic Disproportion in Primigravidas. J Liaquat Uni Med Health Sci., Vol. 0.

17. Awonuga, A.O., Z. Merhi, M.T. Awonuga, T.A. Samuels, J. Waller and D. Pring, 2007. Anthropometric measurements in the diagnosis of pelvic size: An analysis of maternal height and shoe size and computed tomography pelvimetric data. Arch. Gynecol. Obstet., 276: 523-528.

18. Kakoma, J.B., 2016. Cesarean section indications and anthropometric parameters in rwandan nulliparae: Preliminary results from a longitudinal survey. Pan Afr. Med. J., Vol. 24 .10.11604 /pamj.2016.24.310.9603.

19. Rozenholc, A.T., S.N. Ako, R.J. Leke and M. Boulvain, 2007. 1. The diagnostic accuracy of external pelvimetry & maternal height to predict dystocia in nulliparous women: a study in Cameroon. Br J Obstet Gynaecol., 114: 630-635.

20. Prisha, R., P. Abhiruchi, J. Ameet and P. Garima, 2023. Validation of Sacral Rhomboid Diameters and Maternal Height in Antenatal Prediction of Contracted Pelvis in Primigravida. Int J Anat Res., 11: 8721-8728.

21. Pons, D.C., B. Wilder, B.M. Hunegnaw, S. Haneuse, F.G. Goddard, D. Bekele and G.J. Chan, 2023. Development of risk prediction models for preterm delivery in a rural setting in Ethiopia. J. Global Health, Vol. 13 .10.7189/jogh.13.04051.

22. Rahele, A., K. Mosoumeh, P. Munira and E. Saeed, 2014. 1. Diagnostic accuracy of maternal anthropometric measurements as predictors for dystocia In nulliparous women. Iran jou nur mid rese., Vol. 19, No. 4.