

CORRELATION OF MAGNETIC RESONANCE IMAGING-BASED OBSTETRIC CONJUGATE DIAMETER AND MODE OF DELIVERY AMONG PRIMIPARA WOMEN IN NORTH-EAST INDIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Of all the Magnetic Resonance Imaging (MRI) pelvimetry measurements, Obstetric Conjugate Diameter (OCD) is most reliable because of its strong positive correlation with successful vaginal delivery. This study attempts to find an optimal cut off point of OCD for prediction of vaginal delivery. **Materials and Methods:** This was a cross-sectional observational study carried out in JNIMS Imphal, Manipur, India. After applying inclusion and exclusion criteria a total of 152 women were included in the study. They were divided into two subgroups: Vaginal delivery group of 100 participants and Caesarean delivery group of 52 participants. MRI pelvimetry was performed. Obstetric conjugate diameter and mode of delivery was evaluated statistically. **Result:** Caesarean section rate increased as OCD decreased. amongst 54 women with $OCD \geq 12$ cm, vaginal delivery was done in 81% of women. Amongst those 108 women with $OCD 11$ to < 12 , vaginal delivery was achieved in 61% of women. In those with $OCD < 11$ cm, vaginal delivery was done in 37%. Mean of OCDs between the CS and vaginal delivery was statistically significant (t static 5.078, $p < 0.0001$, 95% CI 0.4099-0.9321). **Conclusion:** If OCD is more than or equal to 12 cm, chances of vaginal delivery is very high. Opportunistic measurement of OCD in reproductive age group women can be adopted in Radiodiagnostic department.

INTRODUCTION

Identification of women who will be able to deliver vaginally is one of the greatest challenges in contemporary Obstetric practice. Fetopelvic disproportion is one of the main reasons for failure of vaginal delivery and leading to delivery by caesarean section.

Magnetic Resonance Imaging (MRI) pelvimetry was introduced by Stark et al in 1985. With MRI pelvimetry, error of pelvimetry can be reduced to approximately 1%.^[1] Despite its accuracy for assessing the maternal pelvis and safety from radiation exposure, its higher cost has been a limiting factor for use in pregnant women especially in the developing nations. Another problem is that MRI pelvimetry is not routinely used in antenatal work-up. Very few studies are found in the literature.

Objective: Of all the dimensions, we chose the Obstetric Conjugate Diameter (OCD) to determine its correlation with the mode of delivery.

MATERIALS AND METHODS

This was a cross-sectional observational study carried out in Radiodiagnosis Department of Jawaharlal Nehru Institute of Medical Sciences (JNIMS) Imphal, Manipur, India. The study period was conducted during the period of November 2023 - August 2024. All adult married female patients referred to Radiology Department for MRI abdomen/pelvis were the study participants. Only primipara term vertex deliveries were included in the study. If delivered by CS, only those cases with cranio-pelvic disproportion were included. Exclusion criteria were preterm deliveries, CS for fetal distress, scared uterus, ante-partum hemorrhage, medical or surgical comorbid conditions present or not willing to give informed consent for the study. Those with claustrophobia, pacemakers and other metallic splinters were also excluded. For sampling convenient sampling method was used.

MRI pelvimetry was performed with 3T Philips system. Obstetric conjugate diameter was taken in

mid-sagittal section from the sacral promontory to the nearest point on symphysis pubis which is about one cm below the upper border on the inner surface of symphysis pubis. Data were collected using a pre-tested questionnaire. The participants were grouped into two groups based upon their pregnancy outcome in the last pregnancy viz. (a) vaginal delivery group and (b) Caesarean delivery group. Based on the obstetric conjugate diameter they were again divided into three groups. Based on the OCD, the participants were again sub-grouped into three (a) less than 11 cm (b) less than 12 cm and (c) 12 cm or more.

Student's t test was applied to establish the correlation between the mean OCDs and the pregnancy outcome in the last delivery. Chi square test was also used to establish association between the three OCD groups and the mode of delivery. A p value of < 0.05 was taken as statistically significant. Approval for the study was obtained from the Institutional Ethics Committee, JNIMS.

RESULTS

Completed data sets could be obtained from 152 eligible women. Their mean (SD) age was 36.9 (6.096) years. A total of 100 women (66%) had vaginal delivery (VD) in the last pregnancy whereas, the remaining 52 had CS (34%).

Of all the 100 women who had vaginal deliveries, 14 (14%) had an OCD of less than 11 cm, 42 (42%) had OCD of less than 12 cm and 44 (44%) had OCD of 12 cm or more. Among the women who had CS in the last delivery, 24 (46%) had an OCD of less than 11 cm, 18 (35%) had OCD of less than 12 cm and 10 (19%) had OCD of 12 cm or more. [Table 1]

The mean (SD) of the OCD among those who had VD was found to be 11.75 (0.073) and the same for the CS group was found to be 11.08 (0.118). When T test was applied to these two groups of means, it was statistically significant (T statistics-5.078 CI: 0.4099 to 0.9321; $p < 0.0001$) implying that, there was a significant correlation OCD and mode of delivery. [Table 2]

Table 1: Distribution of study participants by mode of delivery and OCD

OCD in cm	VD (n=100)	CS (n=52)	Total (%)
< 11	14	24	38 (25)
11 to <12	42	18	60 (39.5)
≥12	44	10	54 (35.5)

Table 2: Correlation between different OCDs and mode of deliveries

OCD in cm	VD (%)	CS (&)	Test
< 11	14 (36.8)	24 (63.2)	Chi static 20.528, $p = 0.000035$
11 to <12	42 (70.0)	18 (30.0)	
≥12	44 (81.0)	10 (19.0)	
Mean (SD)	11.75 (0.073)	11.079 (0.118)	T statistic-5.078 CI: 0.4099 to 0.9321; $p < 0.0001$

Chi square test also showed a significant difference in the proportions between OCDs and the mode of delivery (Chi static 20.528, $p = 0.000035$). When the OCD was 12 cm or more, the CS rate was 19% only. It increased 30% if OCD was 11-<12 cm and it went up to 63% when OCD was below 11 cm. [Table 2]

DISCUSSION

In the present study, the means (SD) of OCD in the vaginal delivery and CS groups were found to be 11.75 (0.073) cm and 11.079 (0.118) cm respectively. This is comparable with study findings made by Sporri et al [11.8 (0.7) cm],^[2] although Ryuichi S et al, Mahmoud ND et al and Thomas MK et al obtained higher OCDs ranging from 12.17 to 13.1 cm in vaginal delivery group and 11.29-12.4 cm in the CS group.^[3-5] This difference may be because of regional difference in race and ethnicity.

Thomas MK et al observed that, a few millimeters difference in pelvimetry measurements can have a significant impact on mode of delivery. However, which measurement or diameter has the most significant impact and most reliable is not clear. Yet, they opined that, in MRI pelvimetry, inter-observer error and intra-observer error may creep up except

while measuring OCD.^[5] Our study finds that, OCD can be a reliable indicator in predicting the mode of delivery. This finding gain supports the significant correlation between OCD and mode of delivery as found by Ryuichi S and Mohammad HD.^[3,4] Zaretsky MV et al also found that, of all the pelvimetry measurement, OCD is the most reliable measurement because of its strong positive correlation with successful vaginal delivery.^[6]

Huerta-Enochian GS et al in 2006, observed that, the hormonal environment of pregnancy increases the ligament laxity.^[7] However, some studies observed no pelvimetric differences between pregnant and non-pregnant women nor any correlation between pelvimetric profile and parity.^[8]

The optimal cut off point of OCD in the prediction of vaginal delivery was 11.95cm as found by Mohamod et al 2013. They further reported a sensitivity and specificity to predict vaginal delivery of 80% and 78.5% respectively.^[4] Klempt AS et al also considered an OCD of 12 cm as sufficient pelvic inlet for trial of labor.^[9]

The value of OCD was significantly lesser in the caesarean section group compared with the vaginal delivery group [11.079 (0.118) cm vs 11.75 (0.073)].

Our finding is consistent with other workers' findings.^[5,10]

Some of the important diameters of the pelvis are in sagittal section true obstetric conjugate at pelvic inlet and sagittal outlet, in transverse section interspinous diameter and inter-tuberous diameter and oblique diameters. Clinical measurement of antero-posterior diameter of inlet is most difficult because in normal situations or unless frank CPD is present as sacral promontory cannot be reached during clinical pelvimetry. Accurate measurement of OCD and its correlation will be of immense help in planning delivery.

It was difficult to identify the threshold above which a women will deliver vaginally because multiple factors are involved when predicting mode of delivery e.g. fetal distress, poor uterine contractions, rotation of the head etc.

A Strength of the current study was that, there was no chance for interobserver bias as the measurements are simple and specific. Having said this, the study was not done in pregnant women and the sample size was relatively small, which may limit generalizability of the current study findings.

CONCLUSION

Although MRI pelvimetry is not an absolute prerequisite, MRI pelvimetry especially OCD can provide crucial information for determining route of delivery. When in doubt especially laboring women MRI pelvimetry will be of help. Future direction of study is to do three- dimensional study of the pelvis and the fetal head and their correlation in the mechanism of labor. The take home message which can be derived from the present study is that, If OCD is more than or equal to 12 cm chances of vaginal

delivery is very high and opportunistic measurement of OCD in reproductive age-group women can be adopted in Radiodiagnostic department.

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