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Impact of Bony Pelvis Type on Mode of Delivery in Reproductive Age Females of District Rahim Yar Khan: A Cross-Sectional Analysis

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ABSTRACT

Background: Among the bony elements of human body, the pelvis always gained importance due to its intricate structure as well as due to its important functional role in childbirth and locomotion.[1] X-ray pelvimetry is being used to determine the type of bony pelvis and its predictive role in mode of delivery in the females. Pelvises can be classified as Gynecoid, android, anthropoid, and platypelloid pelvis. Gynecoid type favors normal birth process but rest of the types hinders natural birth variably depending on their bony morphology, which leads to poor delivery outcomes and need of C-section.

Objective: To Assess the impact of different bony pelvic types on the mode of delivery among reproductive-age females in District Rahim Yar Khan using X-ray pelvimetry.

Study Design: Cross sectional study

Study Setting: Department of Gynecology & Obstetrics and Department of Radiology, Sheikh Zayed Hospital ,Rahim Yar Khan from May 2024 to October 2024.

Methods: The subjects for this study were recruited from the Department of Gynecology & Obstetrics, sheikh Zayed hospital, Rahim Yar Khan. The females who were admitted in Gynae ward and labor room for spontaneous vaginal delivery and caesarian section were sent to the radiology department for x-ray pelvimetry. X-ray pelvimetry was done in erect posture in both AP and lateral views. On the basis of which type of pelvis was determined. Later on association of type of bony pelvis with mode of delivery, was observed. Statistical analysis was performed using the Chi-square test; a p-value <0.05 was considered significant.

Results: Data was collected among 384 postpartum females, mean. The majority of 146 (38.0%) had gynecoid pelvis and was most compatible with vaginal delivery, followed by, android pelvis 96 (25.0%), anthropoid pelvis 84 (22.0%) and platypelloid pelvis 58(15.0percent).

Conclusion: Pelvic Morphology, as classified by X-ray pelvimetry, Significantly impacts delivery mode. Pelvic type

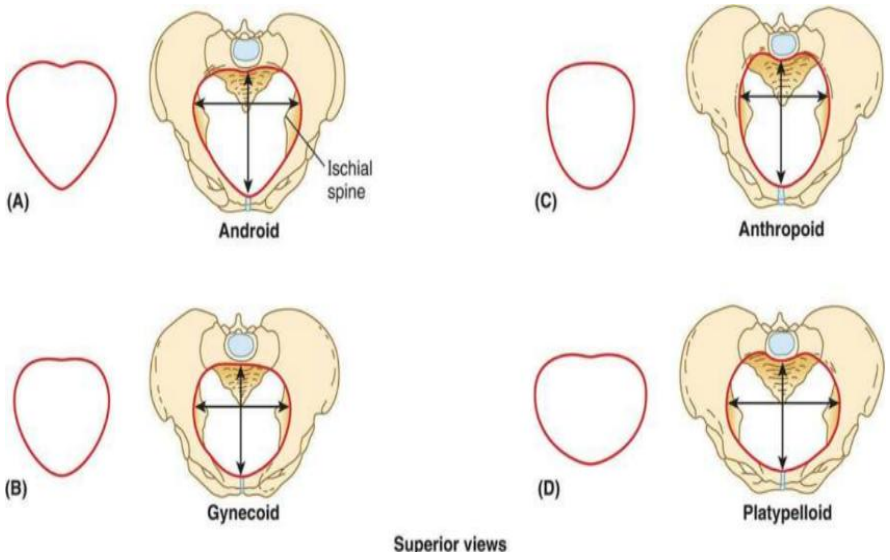
assessment may aid obstetricians in predicting delivery outcomes and planning labor management..

Keywords: *Bony pelvis, mode of delivery, pelvic morphology, cesarean section, X-ray pelvimetry*

1. INTRODUCTION

The pelvis serves many of the indispensable functions of human skeleton.[1,2] The key function of bony pelvis includes encasement of pelvic organs, weight bearing and acting as a strong support for muscles of gluteal and thigh regions.[3] The female pelvis catches the attention of many researchers due to its crucial role in the process of parturition.[4]

Caldwell and Moloy (1933) classified the bony pelvis into four types: gynecoid, android, anthropoid, and platypelloid. Each type has distinct characteristics that can influence the labor and delivery process. The gynecoid pelvis, is the most suitable type for vaginal delivery because it is round and spacious. The android pelvis is heart-shaped and narrower, often associated with longer and more difficult labor. The anthropoid pelvis is oval and generally permits vaginal delivery, while the platypelloid pelvis, being flat, poses significant challenges for childbirth. [5,6,7]



In obstetric practice, the pelvimetry constitutes the measurements of various dimensions of the pelvic regions, including AP diameters and transverse diameters of pelvic inlet, mid cavity and pelvic outlet. This is done to ascertain its adequacy for the passage of an average sized fetus.[20] Pelvimetry is helpful for obstetricians for predicting potential delivery challenges. Prior knowledge regarding individual's pelvic measurements, can help health provider to vigilantly plan about mode of delivery thus reducing chances of maternal and neonatal complications. In low resource settings like District Rahim Yar Khan, objective pelvic measurements serve as fundamental tools in enhancing clinical outcomes. ([8,9]).

The obstetrician must know the diameters of the pelvis while deciding about the mode of delivery.[10] Five diameters of the pelvis must be known by the obstetrician for healthy delivery. For Pelvic inlet, transverse and obstetrical conjugate are significant. While for pelvic outlet, transverse diameter, interspinous diameter and AP diameter are important. The information regarding the normal measurement of fetal skull i.e biparietal diameter is also crucial.(11,12)

When normal vaginal delivery is not possible, the surgical procedure done for child birth is caesarean section (CS). Although caesarean section is life saving for both the mother and the fetus, there are always possibilities of risks.[13]. A cesarean section should be performed only when the risks of complications for the mother and the fetus are significant.

Rationale: X-ray pelvimetry provides an objective classification of pelvic morphology, allowing clinicians to assess delivery feasibility in advance. In resource-limited regions like South Punjab, accurate assessment can reduce maternal and fetal complications associated with obstructed labor.

Objective: The objective of this study was to determine the frequency of pelvic types using X-ray pelvimetry and to analyze the relationship between types of bony pelvis and mode of delivery.

Research Gap: The current data lacks focused research on types of bony pelvis and its relation to delivery outcomes, specifically in District Rahim Yar Khan. Most of the current data is non South Asian which is different due to inherent

variations in genetics, anthropometry, nutritional status and socioeconomic status, ([14,15]). Thus there exist a regional research gap, which needs to be addressed for clinical practices in South Punjab.

2. MATERIALS AND METHODS

This cross sectional research was conducted at Department of Gynaecology /Obstetrics in collaboration with Department of Radiology, Sheikh Zayed hospital, Rahim Yar Khan, from May 2024 to October 2024 ,after the approval of ethical review board vide letter No. FRB/BMS/03/017/2024 dated 27-03-2024.The data was collected from 384 Healthy and Postpartum females at a single point in time during hospital stay. The target population consisted of reproductive age females who underwent spontaneous vaginal delivery or cesarian section. To ensure unbiased representation across relevant sub groups, this research opted for a stratified random sampling method and structured questionaires were used as data collection tools. The participants were grouped based on age, height, weight, BMI and parity.[16].The pregnant females, or females having co morbidities , history of any bony deformity, history of pelvic trauma or having weight more than 85 kgs were excluded. Written consent was taken from subjects meeting the inclusion criteria. Confidentiality and privacy of participants was strictly maintained. Subjects were sent to the Radiology department of Sheikh Zayed hospital, escorted with "aya G" (female helper) and ward boy on a wheelchair carrying a request form for x-ray pelvimetery in both AP and Lateral views in erect posture. The x-ray machine CGR 750 MA (milli amperes) was used and I personally identified landmarks of the subject on the monitor attached . The x-rays were printed by FUJI CR system printer. The AP view was taken to assess the transverse diameters of the inlet, midpelvis and pelvic outlet. The lateral view was important for measuring AP diameters of pelvic inlet, midcavity and pelvic outlet. All measurements were taken in cms. The types of the pelvises were then determined from the the obtained data. The collected data was entered in computer software SPSS version 25.0.To assess demographic characteristics of the participants, a descriptive analysis was done. Inferential statistics, such as chi-square test was employed to determine the association between types of bony pelvis and modes of delivery. Statistical value of <0.05 was taken as significant. To ensure data accuracy, data entry was doublechecked and any inconsistencies present in data were addressed. Reliability was assessed through test-retest procedures for measurements and inter-rater reliability for X-ray pelvimetry. Findings were presented using tables, graphs and charts to facilitate clear communication of the results

Figure : X-ray Machine (CGR 750 MA)

Table 1: Demographic Information of Females

Variable	Mean ± SD	Range
Age (years)	26.7±4.5	18–35
Height (cm)	150.2±3.1	145–155
Weight (kg)	67.4±8.5	50–85
BMI	24.1±3.2	18.5–29.9
Parity (number of children)	2.1±1.3	0–5

BMI = Body Mass Index; SD = Standard Deviation

Table depicts that among 384 postpartum females, mean age was 26.7±4.5 (range 18-35 years), mean height was 150.2±3.1 cm (range 145-155), mean weight was 67.4±8.5 kg (range 50-85) and mean BMI was 24.1±3.2 (range 18.5-29.9) while mean parity was 2.1±1.3 (range 0-5).

Table 2: Frequency Distribution of Females according to Pelvic Types

Pelvic Type	Frequency (n)	Percentage (%)
Gynecoid	146	38.0
Android	96	25.0
Anthropoid	84	22.0
Platypelloid	58	15.0
Total	384	100.0

Table exhibits that among 384 females, majority 146 (38.0%) had gynecoid pelvis, followed by, android pelvis 96 (25.0%), anthropoid pelvis 84 (22.0%) and platypelloid pelvis 58 (15.0%). Among these females, majority had gynecoid pelvis which is considered most favorable type for vaginal delivery.

Table 3: Frequency Distribution of Females according to Mode of Delivery

Mode of Delivery	Frequency (n)	Percentage (%)
Vaginal delivery	238	62.0
Cesarean section	146	38.0
Total	384	100.0

Table demonstrates that among 384 females, mainstream 238 (62.0%) experienced vaginal delivery while 146 (38.0%) experienced cesarean section. These findings are consistent with the pelvic type distribution, with a higher incidence of vaginal delivery associated with the gynecoid pelvis.

Mode of Delivery by Pelvic Type with 95% Confidence Intervals

Exact p-value from Chi-square test: 7.58e-11

Pelvic Type	Vaginal Deliveries (n)	Vaginal Delivery (%)	95% CI (Vaginal)	Cesarean Sections (n)	Cesarean Section (%)	95% CI (C-Section)
Gynecoid	119	81.51	74.43% - 86.97%	27	18.49	13.03% - 25.57%
Android	38	39.58	30.38% - 49.58%	58	60.42	50.42% - 69.62%
Anthropoid	54	64.29	53.62% - 73.7%	30	35.71	26.3% - 46.38%
Platypelloid	27	46.55	34.33% - 59.2%	31	53.45	40.8% - 65.67%

The p-value obtained from the Chi-square test of independence is 0.000000000076.

Therefore, statistically the results are highly significant, demonstrating a strong association between the type of pelvis and the likelihood of vaginal versus cesarean delivery. This strengthens the conclusion that pelvic morphology influences the mode of childbirth.

3. DISCUSSION

The pelvis is an anatomically complex and functionally significant bone. It plays a key role in both human locomotion and obstetrics. Due to its crucial role in obstetrics, the pelvis is considered one of the most sexually dimorphic bony elements.

The bony pelvis has essential functions, such as transferring force and weight, providing muscle attachment, and offering protection. The outer surface of the pelvis stabilizes several strong muscles, including the thigh and gluteal muscles. Additionally, the pelvis is vital during childbirth as the baby must pass through the birth canal. The bony pelvis plays a critical role in childbirth, affecting the labor process and determining whether a woman can deliver vaginally or requires a cesarean section. This study was carried out to know the relationship between types of bony pelvis and its effect on mode of delivery in females of reproductive age in District Rahim Yar Khan.

To acquire appropriate outcomes, a group of 384 postpartum women was included in the study and found that majority of the women were in their good reproductive age group as the mean age was 26.7±4.5 years. The findings of our study are comparable with a study undertaken by Munabi and teammates (2016) who reported that mean age of the women was 25.52 ± 5.74 years which is considered peak reproductive period for a woman.[17] Another study conducted by Softa and fellows (2022) exhibited almost similar scenario that mean age of the females was 24.7 ± 4.6 years.[18] But the results of a study carried out by Salk and comrades (2016) showed different scenario that most of the women belonged to elderly age group as the mean age of the women was 49.9 ± 9.8 years.[19]

In medical literature, there are numerous classifications of pelvis as per its shape. Generally, pelvis types can be commonly classified as gynecoid, android, anthropoid and platypelloid. The vaginal delivery can significantly be difficult, delayed or even impossible if shape of pelvis is not according to fetus size. It was found during study that most of the females (38.0%) in our study had gynecoid pelvis, followed by, android pelvis (25.0%), anthropoid pelvis (22.0%) and platypelloid pelvis (15.0%). Among these females, majority had gynecoid pelvis which is considered most favorable type for vaginal delivery. Understanding the distribution of these pelvic types is crucial for tailoring obstetric care to optimize maternal and fetal health.[20]

During study the relationship between pelvis type and mode of delivery was analyzed using a chi-square test. Study showed a significant association between pelvis type and mode of delivery ($p < 0.01$). Specifically, women with a gynecoid pelvis were more likely to have a vaginal delivery while those with an android pelvis had a higher likelihood of requiring a cesarean section. The android pelvis, characterized by a narrower and more heart-shaped structure, often presents challenges during labor, such as a higher risk of obstructed labor, making vaginal delivery more difficult and increasing the probability of surgical intervention. .[21]

The findings of our study showed a significant association between the types of bony pelvis and mode of delivery, with female having gynecoid pelvis being more likely to have vaginal deliveries.

4. CONCLUSION

The type of bony pelvis is a significant factor predicting mode of delivery. Routine assessment of pelvic morphology using Xray pelvimetry, can reduce emergency cesarean rates by allowing early detection of obstetric risk and better planning for delivery...

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