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Original Research Article

Prevalence and Classification of Congenital Uterine Anomalies in Women Undergoing Caesarean Section: A Study from GMCH, Purnea, Bihar

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Abstract:

Background: Congenital uterine anomalies (CUAs) result from maldevelopment, incomplete fusion, or resorption failure of the Müllerian ducts during fetal life. These anomalies often go undiagnosed until pregnancy complications arise, including recurrent pregnancy loss, preterm labor, or abnormal presentations. Caesarean section provides an opportunity for incidental detection of uterine malformations. With rising caesarean rates, intraoperative identification of CUAs becomes increasingly feasible. This study aims to estimate the prevalence and classify the types of congenital uterine anomalies identified intraoperatively in women undergoing caesarean section.

Methods: This hospital-based cross-sectional observational study was conducted at the Department of Obstetrics and Gynaecology, Government Medical College and Hospital, Purnea, Bihar, over a 15-month period from October 2023 to December 2024. A total of 950 women who underwent lower segment caesarean section (LSCS) for various obstetric indications were enrolled. Intraoperative evaluation of the uterus was carried out immediately after fetal delivery and before uterine closure to identify any gross congenital uterine anomalies. Detected anomalies were classified according to the American Society for Reproductive Medicine (ASRM) classification system. Clinical characteristics, obstetric outcomes, and associations were analyzed.

Results: Among the 950 caesarean deliveries evaluated, 33 cases (3.5%) were found to have congenital uterine anomalies. The most commonly detected anomaly was arcuate uterus (36.4%), followed by septate uterus (27.3%), bicornuate uterus (21.2%), and unicornuate uterus (9.1%). A single case of didelphys uterus (3.0%) was observed. The majority of these anomalies were undiagnosed prior to surgery and detected incidentally during intraoperative inspection. Anomalies were more common in primigravida women and in those with malpresentation, intrauterine growth restriction (IUGR), or previous first-trimester loss. Among the women with CUAs, 45.5% had abnormal fetal presentations and 27.3% had a history of early pregnancy loss.

Conclusion: The prevalence of congenital uterine anomalies detected during caesarean section in this study was 3.5%, aligning with global estimates. Arcuate and septate uterus were the most frequently observed types. Routine intraoperative inspection during caesarean section offers a valuable opportunity to detect undiagnosed uterine anomalies, which may have reproductive implications. Early diagnosis can guide appropriate counseling and future fertility management strategies.

Keywords: Congenital uterine anomaly, Caesarean section, Arcuate uterus, Septate uterus, Müllerian malformation, Intraoperative diagnosis

Introduction

Congenital uterine anomalies (CUAs), also known as Müllerian anomalies, are structural malformations of the uterus resulting from developmental disturbances in the embryological fusion or canalization of the paired Müllerian ducts [1]. These anomalies can present as subtle indentations in the uterine fundus or as complete duplications of the uterine cavity and cervix, depending on the timing and type of developmental error. Although the exact prevalence in the general population remains uncertain due to asymptomatic cases, it is estimated that approximately 3–4% of women have some form of uterine anomaly, with higher prevalence noted among women experiencing infertility or recurrent pregnancy loss [2].

The clinical significance of CUAs lies in their association with various adverse reproductive and obstetric outcomes. These include spontaneous

abortion, preterm labor, malpresentation, intrauterine growth restriction, and complications during labor and delivery [3]. However, many uterine anomalies remain undetected until pregnancy complications arise or until incidental findings are made during imaging or surgery. In this context, caesarean section provides a unique opportunity for direct visualization and assessment of the uterine contour and morphology, particularly in cases where anomalies may have gone undiagnosed in antenatal evaluation [4].

Historically, the detection of CUAs has relied on imaging modalities such as two-dimensional ultrasonography, hysterosalpingography (HSG), hysteroscopy, and more recently, three-dimensional ultrasonography and MRI [5]. However, in low-resource settings, such evaluations are not always routinely performed unless there is a history of infertility or pregnancy loss. As the rate of caesarean sections continues to rise across India, including in public sector hospitals in Bihar, intraoperative examination offers a practical and underutilized method to identify anomalies in women undergoing delivery [6].

Various classification systems have been proposed to categorize CUAs, with the American Society for Reproductive Medicine (ASRM) system being widely used. It includes categories such as septate, arcuate, bicornuate, unicornuate, and didelphys uteri based on morphological and embryological characteristics. Accurate identification and classification of these anomalies are essential for predicting reproductive risk and planning individualized management in subsequent pregnancies [7].

Despite the clinical importance of these anomalies, there is limited data on their prevalence and type from rural tertiary care centers in eastern India. In particular, Bihar remains underrepresented in such research, and most cases of CUAs go unreported unless they are symptomatic [8]. Therefore, the present study was undertaken to assess the prevalence and categorize the types of congenital uterine anomalies observed intraoperatively in women undergoing caesarean sections at Government Medical College and Hospital (GMCH), Purnea, Bihar. The study also aimed to analyze their associations with clinical presentations and obstetric outcomes.

Methodology

This hospital-based cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at Government Medical College and Hospital (GMCH), Purnea, Bihar, over a period of 15 months from October 2023 to December 2024. The primary objective of the study was to estimate the prevalence and classify congenital uterine anomalies (CUAs) detected intraoperatively in women undergoing caesarean section. The study also aimed to evaluate the associated clinical features and obstetric outcomes in these patients.

The study population included all women aged 18 years and above who underwent lower segment caesarean section (LSCS) for any obstetric indication during the study period. Based on institutional delivery load and inclusion estimates, a sample size of 950 women was included. Women with known acquired uterine pathologies such as fibroids or synechiae, previous uterine surgery for Mullerian anomalies, and those with incomplete surgical exposure due to intraoperative complications or adhesions were excluded to avoid misclassification and diagnostic errors.

Each patient included in the study was evaluated intraoperatively immediately after fetal delivery and prior to uterine closure. The anterior surface and fundus of the uterus were carefully inspected through the surgical incision to detect any gross congenital uterine anomaly. If an anomaly was suspected, the uterine contour, symmetry, and intercornual distance were carefully observed. The attending senior obstetrician confirmed each finding. Detected anomalies were classified according to the American Society for Reproductive Medicine (ASRM) classification, which includes arcuate, septate, bicornuate, unicornuate, and didelphys uteri, among others. Data regarding maternal age, gravidity, parity, indication for caesarean section, history of previous pregnancy loss, malpresentation, and intrauterine growth restriction (IUGR) were collected from patient records and case sheets. Additional obstetric parameters such as gestational age, birth weight, fetal presentation, and neonatal outcome were recorded. Any anomaly detected was photographed and documented in the operative record. In cases where diagnosis remained uncertain intraoperatively, follow-up imaging or hysteroscopy was advised postnatally for confirmation.

All data were compiled and analyzed using Microsoft Excel and SPSS version 25.0. Categorical variables such as type of anomaly, parity, and presence of complications were expressed as frequencies and percentages. Continuous variables like maternal age and gestational age were presented as mean ± standard deviation. Chi-square test was used to compare categorical variables, and one-way ANOVA was applied where necessary. A p-value of less than 0.05 was considered statistically significant.

Ethical clearance was obtained from the Institutional Ethics Committee of GMCH, Purnea. Written informed consent was obtained from all participants prior to surgery, and confidentiality of patient records was maintained throughout the study.

Results

Out of the 950 women who underwent caesarean section during the study period, 33 cases (3.5%) were identified with congenital uterine anomalies based on intraoperative inspection. The age of the study population ranged from 18 to 39 years with a mean of 26.4 ± 4.5 years. The majority of anomalies were diagnosed in primigravida women, with a higher frequency among those with fetal malpresentation and previous early pregnancy losses. The most common anomalies identified were arcuate uterus (36.4%) and septate uterus (27.3%), followed by bicornuate (21.2%), unicornuate (9.1%), and didelphys uterus (3.0%). The majority of cases were incidentally detected during surgery. The findings below summarize the clinico-pathological profiles and obstetric correlations of the study participants.

Table 1: Age-wise Distribution of Study Participants (n = 950)

Age Group (years)	Frequency (F)	Percentage (%)
≤20	122	12.8%
21–25	356	37.5%
26–30	298	31.4%
31–35	136	14.3%
>35	38	4.0%
Total	**950**	**100.0%**

Table 2: Gravidity Status of Participants

Gravidity	Frequency (F)	Percentage (%)
Primigravida	424	44.6%
Multigravida	526	55.4%
Total	**950**	**100.0%**

Table 3: Prevalence of Congenital Uterine Anomalies

Uterine Anomaly Detected	Frequency (F)	Percentage (%)
Yes	33	3.5%
No	917	96.5%
Total	**950**	**100.0%**

Table 4: Types of Congenital Uterine Anomalies (n = 33)

Type of Anomaly	Frequency (F)	Percentage (%)
Arcuate uterus	12	36.4%
Septate uterus	9	27.3%
Bicornuate uterus	7	21.2%
Unicornuate uterus	3	9.1%
Didelphys uterus	1	3.0%

Table 5: Gravidity Distribution Among Women with CUAs (n = 33)

Gravidity	Frequency (F)	Percentage (%)
Primigravida	21	63.6%
Multigravida	12	36.4%

Table 6: Fetal Presentation and CUAs (n = 950)

Presentation	With CUA F (%)	Without CUA F (%)	p-value
Cephalic	18 (54.5%)	761 (83.0%)	
Breech	10 (30.3%)	97 (10.6%)	
Transverse	5 (15.2%)	59 (6.4%)	<0.001

Table 7: Obstetric Complications in Women with CUAs

Complication	Frequency (F)	Percentage (%)
Malpresentation	15	45.5%
IUGR	6	18.2%
Previous miscarriage	9	27.3%

Preterm labor (<37 wks)	4	12.1%

Table 8: Birth Weight Comparison

Group	Mean Birth Weight (g) ± SD	p-value
With CUAs (n = 33)	2498 ± 326	
Without CUAs (n = 917)	2721 ± 340	0.02

Table 9: Preoperative vs Intraoperative Detection (n = 33)

Timing of Diagnosis	Frequency (F)	Percentage (%)
Incidental during CS	28	84.8%
Previously known	5	15.2%

Table 10: Gestational Age at Delivery

Gestational Age (wks)	With CUA F (%)	Without CUA F (%)
<37 weeks	7 (21.2%)	104 (11.3%)
≥37 weeks	26 (78.8%)	813 (88.7%)

Table 11: NICU Admission Rates

Group	NICU Admission F (%)	p-value
With CUAs (n=33)	11 (33.3%)	
Without CUAs	126 (13.7%)	0.004

Table 12: Fetal Malpresentation by Anomaly Type

Anomaly Type	Malpresentation F (%)	Total Cases
Arcuate uterus	3 (25.0%)	12
Septate uterus	4 (44.4%)	9
Bicornuate uterus	5 (71.4%)	7
Unicornuate uterus	2 (66.7%)	3
Didelphys uterus	1 (100.0%)	1

Discussion

This study offers a detailed analysis of the prevalence and classification of congenital uterine anomalies (CUAs) identified during caesarean sections and emphasizes the clinical significance of these incidental intraoperative findings. With an overall incidence of 3.5%, the findings fall squarely within the expected range reported globally for uterine malformations identified during surgical delivery [9]. The relatively high number of undiagnosed anomalies highlights how caesarean section serves not only as a delivery mode but also as an unintentional screening opportunity for Müllerian abnormalities, particularly in regions where pre-conceptional or antenatal uterine imaging is limited [10]. Arcuate and septate uteri emerged as the most commonly observed anomalies in this study, together accounting for nearly two-thirds of all cases. These are often the most challenging to differentiate clinically and radiologically without detailed imaging or hysteroscopic evaluation. Their identification during surgery, although not comprehensive, provides a practical indication of potential anatomical variations that may predispose to obstetric complications. Bicornuate and unicornuate uteri were less frequently encountered but carried a higher rate of fetal malpresentation and intrauterine growth restriction. This pattern reinforces the association of lateral fusion defects with mechanical disturbances in fetal positioning and uterine capacity [11].

A notable finding was the higher prevalence of CUAs among primigravida women and those with abnormal fetal presentation. This association suggests that some congenital anomalies may first come to attention only at the time of the index pregnancy and surgical delivery. Furthermore, a significant proportion of women with uterine anomalies had a past history of first-trimester pregnancy loss or recurrent miscarriage, underscoring the known link between uterine structural anomalies and adverse reproductive outcomes. Despite these reproductive risks, the majority of anomalies were not diagnosed prior to surgery, reflecting a gap in routine antenatal evaluation, especially in low-resource settings [12].

The statistical association between congenital anomalies and neonatal complications such as low birth weight and increased NICU admission further underlines their clinical relevance. In this study, neonates born to mothers with uterine anomalies had lower average birth weights and a significantly higher NICU admission rate compared to those born

to women with normal uterine morphology. This pattern indicates a potential impact on placental efficiency or uterine space, affecting intrauterine fetal development. Although many of these pregnancies progressed to term, the observed rates of preterm labor, fetal growth restriction, and malpresentation reaffirm the need for vigilant antenatal surveillance in women known or suspected to have Müllerian anomalies [13,14].

Importantly, the majority of anomalies were diagnosed intraoperatively and not during the antenatal period, suggesting that caesarean section provides a unique window for early detection. As antenatal sonography often prioritizes fetal and placental parameters, focused uterine evaluation may be missed unless there's a clinical indication. In such contexts, encouraging intraoperative inspection and documentation of uterine shape during LSCS can help detect and classify anomalies that may be crucial for managing future pregnancies or counseling women with recurrent losses or infertility [15].

This study emphasizes that systematic intraoperative assessment during caesarean section has significant diagnostic value and can aid in timely referral, imaging, or surgical correction postnatally in indicated cases. For centers like GMCH, Purnea, where a large volume of deliveries take place and access to advanced imaging may be limited, this approach can contribute meaningfully to improving reproductive health outcomes by flagging high-risk uterine anomalies at an early stage.

Conclusion

This study highlights that congenital uterine anomalies were identified in 3.5% of women undergoing caesarean section, aligning with internationally reported prevalence rates. The most common anomalies encountered were arcuate and septate uterus, followed by bicornuate and unicornuate forms. Most of these cases were incidentally discovered during surgery, reinforcing the diagnostic value of routine intraoperative uterine inspection. The presence of uterine anomalies was significantly associated with obstetric complications such as fetal malpresentation, intrauterine growth restriction, and history of early pregnancy loss.

The findings underscore the importance of heightened intraoperative vigilance in detecting congenital uterine malformations, especially in resource-limited settings where access to advanced pre-conceptional imaging is restricted. Identifying these anomalies at the time of caesarean section offers a critical opportunity to counsel women regarding the implications for future pregnancies and the need for further gynecological evaluation or corrective procedures where applicable.

Integrating intraoperative screening for uterine morphology as a standard part of caesarean protocol may serve as a cost-effective approach to improving reproductive health outcomes. Moreover, early recognition and classification of these anomalies can inform tailored obstetric care in subsequent pregnancies, potentially reducing the risk of adverse perinatal outcomes and improving maternal-fetal prognosis in women with congenital uterine abnormalities.

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