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Original Research

Clinical Outcomes of Anterior Asynclitism Deliveries in a District-Level Hospital: Insights for Primary Care Obstetrics

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Abstract

Background: Anterior asynclitism, a rare but high-risk obstetric dystocia, disrupts normal fetal descent and is associated with increased maternal and neonatal complications. Despite its clinical significance, early diagnosis remains challenging due to nonspecific symptoms, and the associated risk factors require further clarification. **Methods**: A retrospective analysis was conducted on clinical data of 96 pregnant women with anterior asynclitism (observation group) and 96 pregnant women with persistent occipital transverse position (control group) from January 2017 to January 2023. Differences between the two groups across various aspects were compared and analyzed, and logistic regression analysis was used to determine the independent risk factors for the occurrence of anterior asynclitism. **Results**: In terms of high-risk factors, the incidences of macrosomia, obesity, and pendulous abdomen were significantly higher in the observation group than those in the control group ($p < 0.05$). Through regression analysis, age, macrosomia, obesity, pendulous abdomen, and premature rupture of membranes (PROM) were identified as independent risk factors for anterior asynclitism ($p < 0.05$). Regarding clinical symptoms, as well as maternal and neonatal outcomes, the incidences of PROM, cervical edema, fetal head edema, abnormal fetal monitoring, risk of uterine rupture, difficulty in delivering the fetal head, neonatal asphyxia, and intracranial hemorrhage in the observation group were all higher than those in the control group ($p < 0.05$). **Conclusions**: A three-tier prevention strategy is recommended: prenatal screening for key risk factors (pendulous abdomen, obesity), enhanced intrapartum monitoring combined with referral systems, and implementation of standardized surgical protocols. This study provides localized evidence for regional hospitals and underscores the need to prioritize obstetric technologies to narrow outcome gaps across healthcare tiers.

Keywords: anterior asynclitism; risk factors; cesarean section; obstetric outcomes; ultrasonography; prevention strategy

1. Introduction

Amid global shifts in fertility policies and growing emphasis on promoting vaginal birth while reducing cesarean rates, ensuring childbirth safety and enhancing perinatal care quality have become pressing priorities in obstetric practice worldwide. This context underscores the urgent need for improved strategies to address complex obstetrical challenges [1,2]. Cephalic presentation accounts for up to 95% of the total number of deliveries. However, the incidence of dystocia in cephalic presentations accounts for over 60% of all dystocia cases. Among them, anterior asynclitism, as a special type of dystocia in cephalic presentation, has an incidence rate of 0.5%–0.8%. Although its proportion is relatively low, it poses great harm [3,4]. Anterior asynclitism refers to an abnormal childbirth condition in which, after the fetal head enters the pelvis in the occipitotransverse position, various factors interfere with its descent, resulting in the anterior parietal bone entering the pelvis first. During normal cephalic presentation childbirth, the fetus typically enters the pelvis in the occipitoanterior position, and then is delivered smoothly through a coordinated sequence of movements, such as engagement, descent, flexion, internal rotation, extension, restitution, and external rotation. Descent is a continuous movement throughout the entire process [5]. However, the occurrence of anterior asynclitism disrupts this normal childbirth process. Anterior asynclitism poses a significant risk to the health of both the mother and the infant. Due to the extremely low success rate of vaginal delivery, once diagnosed, most cases require a cesarean section to end the delivery [6]. If not identified early and managed promptly, anterior asynclitism can lead to prolonged labor [7], increasing the risk of complications such as postpartum hemorrhage, infection, and uterine rupture in the mother. Additionally, it subjects the fetus to abnormal pressure during delivery, complicating delivery. This in turn increases the incidence of adverse outcomes such as neonatal asphyxia and intracranial hemorrhage, seriously affecting the short- and long-term health of the newborn [8]. This study aimed to identify risk profiles and clinical outcomes of anterior asynclitism, informing a tiered prevention strategy (prenatal screening, intrapartum monitoring with referrals, standardized surgery) to optimize regional management and reduce healthcare disparities.

2. Materials and Methods

2.1 Data Source

Clinical data were collected from 96 pregnant women diagnosed with anterior asynclitism from January 2017 to January 2023 (observation group), and 96 pregnant women diagnosed with persistent occipitotransverse position during the same period, selected in chronological order (control group). As the capital of Sichuan Province, Chengdu holds a leading position in regional economic development and possesses relatively abundant medical and healthcare resources. However, there are still differences in resource allocation and technical levels among hospitals at different levels within the region. The hospitals involved in this study are district-level general hospitals, serving the population in the surrounding urban areas and in some rural areas.

2.2 Sample Selection and Size Calculation

Inclusion criteria: full-term singleton pregnancy with indications for trial of vaginal delivery. Exclusion criteria: contraindications to a trial of vaginal delivery. The inclusion and exclusion criteria are applicable to both the observation group (pregnant women diagnosed with anterior asynclitism) and the control group (pregnant women diagnosed with persistent occipitotransverse position).

When screening the pregnant women in the observation group, 96 pregnant women diagnosed with anterior asynclitism were selected through the retrieval of the electronic medical record system from those who met these criteria. When selecting the pregnant women in the control group, also based on these criteria, 96 pregnant women diagnosed with persistent occipitotransverse position were selected from the pregnant women who visited these two hospitals during the same period in chronological order. During the screening process, the operations were carried out strictly in accordance with the established inclusion and exclusion criteria. This study is a case-control study with 1:1 sampling. The control group (persistent occipitotransverse position) was matched to the observation group (anterior asynclitism) for full-term singleton pregnancy, eligibility for trial of vaginal delivery, and exclusion of contraindications to vaginal delivery (same inclusion/exclusion criteria applied to both groups, Table 1).

Since this study involves a comparison of the rates between two groups, the corresponding sample size calculation formula was used. Referring to the estimation method for the rates of two samples, and combining with previous research and clinical experience, the incidences of neonatal asphyxia in cases of anterior asynclitism and persistent occipitotransverse position were predicted to be 15% and 5% respectively [9–11]. With the two-sided test level set at α = 0.05 and the test power at 0.80, sample size was calculated using the formula "$n = [(Z\alpha/2 + Z\beta)^2 \times (p1\ (1 - p1) + p2\ (1 - p2))] / (p1 - p2)^2$", where $Z\alpha/2 = 1.96$, $Z\beta = 0.84$, p1 = 0.15 (predicted neonatal asphyxia rate in the anterior asynclitism group), and p2 = 0.05 (rate in the control group), yielding approximately 86 cases required for each group. Considering the possibility of loss to follow-up or missing data, 96 cases were ultimately included in each group [12]. All cases had complete data for analysis, with no exclusions due to missing information.

2.3 Variable Definition and Classification

2.3.1 Dependent Variable

The dependent variable was the occurrence of anterior asynclitism (binary: present/absent). A diagnosis of anterior asynclitism was based on vaginal examination findings, such as sagittal suture near the sacral promontory, anterior parietal bone incarceration, and cervical edema, with postoperative confirmation via fetal head edema location [11].

2.3.2 Independent Variables

Independent variables were selected per clinical guidelines and prior studies. High-risk factors included macrosomia (fetal weight $\geq$4000 g), obesity (body mass index [BMI] $\geq$30 kg/m^2) [13], pendulous abdomen, and premature rupture of membranes (PROM). Clinical variables such as age, gestational weeks, and history of vaginal delivery, were considered as potential confounders.

2.4 Methods

Anterior asynclitism was diagnosed through vaginal examination. The sagittal suture was located on the transverse diameter of the pelvic inlet and close to the sacral promontory, posteriorly [14]. Currently, there is no clear quantitative standard for diagnosing anterior asynclitism based on the displacement of the sagittal suture in clinical practice. In this study, the diagnosis of anterior asynclitism was mainly determined by combining the position of the sagittal suture, the condition of the pelvis, the manifestations of the cervix and the fetal head. The anterior parietal bone first entered the pelvis and was impacted behind the pubic symphysis. The posterior part of the pelvis was empty. The anterior lip of the cervix was edematous due to compression. A cephalhematoma might occur on the compressed side of the fetal head (anterior parietal bone). After the surgery, the diagnosis could be further confirmed according to the examination of the location of the cephalhematoma of the newborn. For example, when anterior asynclitism occurred in the left occipitotransverse position, the cephalhematoma was located on the right parietal bone, and when it occurred in the right occipitotransverse position, the cephalhematoma was located on the left parietal bone. In developed regions or hospitals, ultrasound can be utilized during labor to dynamically monitor the inclination angle of the fetal head and its engagement within the pelvis [15]. The angle between the sagittal suture and the midline of the pelvis can be measured to evaluate the degree of inclination. However, most hospitals in China, including our own, lack the capability for ultrasound monitoring during the la-

Table 1. Clinical data of pregnant women.

Group	Observation group (n = 96)	Control group (n = 96)	t/χ^2	p-value
Age (years)	29.92 ± 3.22	28.29 ± 4.14	3.050	0.003
Gestational week (weeks)	39.07 ± 1.09	38.92 ± 1.07	0.970	0.333
History of vaginal delivery [n (%)] (times)	12.00 (12.50)	14.00 (14.60)	0.178	0.673

Table 2. Comparison between two groups of high-risk factors.

Group	Observation group (n = 96)	Control group (n = 96)	χ^2	p-value
Macrosomia	11	3	4.93	0.026
BMI >30 kg/m^2	15	6	4.33	0.037
Umbilical cord around the neck	50	46	0.33	0.564
Overhanging abdomen	20	5	10.35	0.001
Amniotic fluid index <8 cm	23	32	2.06	0.151

BMI, body mass index.

Table 3. Comparison of clinical manifestations between the two study groups.

Group	Observation group (n = 96)	Control group (n = 96)	χ^2	p-value
Urinary retention [n (%)]	45 (46.9)	38 (39.6)	1.04	0.308
PROM [n (%)]	35 (36.5)	15 (15.6)	10.82	0.001
Cervical edema [n (%)]	69 (71.9)	42 (43.8)	15.57	<0.001
Fetal head edema [n (%)]	82 (85.4)	50 (52.1)	24.82	<0.001
Skull overlap [n (%)]	90 (93.8)	60 (62.5)	27.43	<0.001
Omen uterine rupture [n (%)]	11 (11.5)	2 (2.1)	6.68	0.010

Table 4. Logistic regression analysis of risk factor for anterior asynclitism.

Influencing factors	β	S.E	Wald	p-value	OR (95% CI)
Macrosomia	1.32	0.52	6.41	0.011	3.74 (1.35–10.36)
Obesity (BMI $\geq$30 kg/m^2)	1.05	0.48	4.78	0.029	2.86 (1.12–7.31)
Pendulous abdomen	1.87	0.61	9.42	0.002	6.49 (1.96–21.47)
PROM	0.92	0.41	5.03	0.025	2.51 (1.12–5.62)
History of vaginal delivery	0.15	0.45	0.11	0.739	1.16 (0.48–2.81)
Age (years)	0.12	0.05	5.76	0.016	1.13 (1.02–1.25)
Gestational weeks (weeks)	–0.07	0.11	0.41	0.522	0.93 (0.75–1.16)

OR, odds ratio; CI, confidence interval; PROM, premature rupture of membranes.

bor process. Therefore, in this study, diagnosis was mainly based on the clinical manifestations of pregnant women and confirmed through vaginal examinations conducted by experienced obstetricians.

2.5 Clinical Monitoring Parameters and Variable Grouping

Clinical data information (Table 1): Age, gestational weeks, history of vaginal delivery, BMI, and pelvic assessment. High-risk factors (Table 2): Macrosomia, obesity, pendulous abdomen, umbilical cord around neck, amniotic fluid index <8 cm, and PROM. Clinical manifestations (Table 3): Urinary retention, PROM, cervical edema, fetal head edema, skull overlap, and threatened uterine rupture [16].

2.6 Statistical Methods

Statistical analysis was performed using IBM SPSS Statistics 26.0 (IBM Corp., Armonk, NY, USA). Before conducting the statistical analysis, a normality test was first performed on the measurement data. The Shapiro-Wilk test was used to determine whether the data conformed to a normal distribution. If the data passed the normality test ($p > 0.05$), it was considered that the measurement data conformed to a normal distribution. Such data were expressed as $\overline{X} \pm$ s, and the t-test was used for the comparison between groups. If the data did not pass the normality test ($p \leq 0.05$), it was regarded as a non-normal distribution. In this case, the Mann-Whitney U test (Wilcoxon rank-sum test for two independent samples) was used to compare measurement data between groups. Categorical data were expressed as counts and percentages [n (%)], and the chi-square (χ^2) test was used for the comparison between groups. A p-value < 0.05 indicated a statistically significant difference.

A multiple logistic regression model was used to analyze the independent risk factors for anterior asynclitism. This study was an exploratory analysis, preliminarily demonstrating the trend of association among various factors. The obtained p-values were not corrected for multiple testing. When interpreting the results of this study, the limitation of uncorrected p-values should be fully considered.

3. Results

3.1 Comparison of Clinical Data of Pregnant Women

There were no statistically significant differences in the gestational weeks, history of vaginal delivery of the pregnant women between the two groups ($p > 0.05$). Significant differences were observed in age between the two groups ($p < 0.05$) (Table 1).

3.2 High-Risk Factors of Pregnant Women

When comparing the high-risk factors of the two groups of pregnant women, the incidences of macrosomia, obesity, and pendulous abdomen in the observation group are all higher than those in the control group, and the differences are statistically significant ($p < 0.05$). However, there were no statistically significant differences in the amniotic fluid index and umbilical cord around the neck ($p > 0.05$) (Table 2).

3.3 Clinical Manifestations

From the perspective of clinical manifestations, the incidences of PROM, cervical edema, fetal head edema, and threatened uterine rupture were all significantly higher in the observation group than in the control group ($p < 0.05$). However, the difference in the incidence of urinary retention was not statistically significant ($p > 0.05$) (Table 3).

3.4 Multivariate Logistic Regression Analysis of Risk Factors for Anterior Asynclitism

Age, macrosomia, obesity, pendulous abdomen, and PROM are identified as independent risk factors for anterior asynclitism ($p < 0.05$) (Table 4).

3.5 Outcome Analysis Between the Two Groups

3.5.1 Characteristics of the Labor Process

Statistically significant differences were observed between the two groups of pregnant women in terms of abnormal active phase, abnormal second stage of labor, and abnormal fetal monitoring ($p < 0.05$) (Table 5).

3.5.2 Comparison of Intraoperative Situations Between the Two Groups

A statistically significant difference was observed between the two groups in the difficulty in delivering the fetal head ($p < 0.05$), while no statistically significant differences were found in the incidence of lower uterine segment laceration or postpartum hemorrhage ($p > 0.05$). All 96 cases of anterior asynclitism ended in delivery by cesarean section (Table 6).

3.5.3 Comparison of Neonatal Outcomes Between the Two Groups

There were statistically significant differences between the two groups in neonatal asphyxia (15.6% vs. 5.2%, $p = 0.018$) and intracranial hemorrhage (10.4% vs. 2.1%, $p = 0.017$), while cerebral palsy incidence showed no statistical significance (1.0% vs. 0.0%, Fisher's exact test $p > 0.999$). All other neonatal outcomes are detailed in Table 7. No special treatment was given for intracranial hemorrhage, and it healed on its own (Table 7).

4. Discussion

This study systematically analyzed the risk factors and maternal-fetal outcomes of anterior asynclitism in the context of regional-level hospitals. Results demonstrated significant associations between anterior asynclitism and maternal age (odds ratio [OR] = 1.13), PROM (OR = 2.51), obesity (OR = 2.86), macrosomia (OR = 3.74), and pendulous abdomen (OR = 6.49), with pendulous abdomen showing the strongest correlation (OR = 6.49). All cases required cesarean delivery (100.0% vs. 86.5% in the control group, $p < 0.001$). Additionally, the observation group exhibited significantly higher incidences of neonatal asphyxia (15.6% vs. 5.2%) and intracranial hemorrhage (10.4% vs. 2.1%), indicating a dual threat to maternal and infant safety, posed by anterior asynclitism. The following section discusses the clinical implications by integrating these findings with existing literature.

4.1 Risk Factors: Differences in Population Characteristics and Diagnostic Criteria

Obesity (BMI $\geq$30 kg/m^2) was an independent risk factor for anterior asynclitism (OR = 2.86), consistent with Malvasi *et al*. [8] (OR = 2.5). Hung *et al*. [17] reported a weaker association (OR = 1.8) in Asian population, likely due to BMI criteria differences (World Health Organization [WHO] $\geq$30 vs. Asian population $\geq$28 kg/m^2). Higher obesity prevalence in cases (15.7% vs. 6.3%) highlights the need for enhanced prenatal nutrition interventions in regional hospitals.

Pendulous abdomen demonstrated the strongest association (OR = 6.49), a novel finding rarely emphasized in prior studies. This may stem from altered pelvic inclination forcing asynclitic engagement, suggesting that prenatal postural assessments (e.g., abdominal circumference/uterine height ratio) [18] could enhance screening accuracy.

Maternal age showed a significant association with anterior asynclitism (OR = 1.13, 13.0% risk increase per year). Despite modest effect size, the higher mean age in the case group (29.9 ± 3.2 years vs. 28.3 ± 4.1 years) highlights

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Table 5. Comparison of labor process characteristics between the two study groups.

Group	Observation group (n = 96)	Control group (n = 96)	χ^2	*p*-value
Abnormal active period [n (%)]	72 (75.0)	38 (39.6)	24.61	<0.001
Abnormal second stage of Labor [n (%)]	5 (5.2)	40 (41.7)	35.56	<0.001
Abnormal fetal monitoring (Class II, Class III) [n (%)]	69 (71.9)	30 (31.3)	31.72	<0.001

Table 6. Comparison of intraoperative conditions.

Group	Observation group (n = 96)	Control group (n = 96)	χ^2	*p*-value
Difficulty getting the head [n (%)]	72 (75.0)	38 (39.6)	24.610	<0.001
Lower uterine laceration [n (%)]	8 (8.3)	5 (5.2)	0.740	0.390
Cesarean section [n (%)]	96 (100.0)	83 (86.5)	13.940	<0.001
Postpartum hemorrhage [n (%)]	8 (8.3)	7 (7.3)	0.072	0.790

Table 7. Comparison of neonatal outcomes.

Group	Observation group (n = 96)	Control group (n = 96)	χ^2	*p*-value
Neonatal asphyxia [n (%)]	15 (15.6)	5 (5.2)	5.58	0.018
Intracranial hemorrhage [n (%)]	10 (10.4)	2 (2.1)	5.69	0.017
Cerebral palsy [n (%)]	1 (1.0)	0 (0.0)	Fisher	>0.999

cumulative risk. These findings align with Peled *et al*. [2], linking age-related pelvic ligament laxity to altered fetal head rotation.

PROM significantly increased risk (OR = 2.51), potentially due to reduced amniotic fluid volume promoting mechanical obstruction [19]. However, Nahaee *et al*. [3] found no association with cephalic dystocia, possibly due to our inclusion of earlier PROM cases (<6 hours pre-labor), highlighting the need for time-stratified analyses.

4.2 Intrapartum Management: Clinical Decision-Making in Resource-Limited Settings

In contrast to studies in developed countries, all cases in this study were diagnosed based on vaginal examination rather than intrapartum ultrasound.

While Gimovsky [20] held that prenatal ultrasound has been shown to be more accurate than vaginal examination in describing fetal positional abnormalities, this study found high consistency between empirical diagnosis (e.g., cervical edema, fetal head hematoma location) and postoperative confirmation. These findings suggest that vaginal examination remains viable in resource-limited settings—although the potential for underdiagnosis of mild cases exists. Malvasi *et al*. [21] improved early diagnosis by 20% using an artificial intelligence algorithm (AIDA system) with ultrasound data, suggesting technology integration for grassroots practice.

The 100% cesarean rate in this study exceeded tertiary hospital rates [19], possibly reflecting limited capacity for complex vaginal delivery in regional hospitals. This highlights the necessity of establishing a regional referral system to ensure that high-risk cases are handled at centers with the necessary conditions.

4.3 Maternal and Infant Outcomes: Mechanism Analysis and Prevention Strategies

Neonatal adverse outcomes associated with anterior asynclitism (e.g., intracranial hemorrhage 10.4%) were correlated with abnormal fetal head compression and delivery difficulty. In this study, 75% of cesarean sections (72 cases) involved difficult fetal head extraction, a rate higher than the 50% reported by Alves *et al*. [22]. This discrepancy may reflect limited surgical experience with deeply impacted heads in regional hospitals.

To reduce complications, a three-tier prevention approach is proposed:

Primary prevention: Prenatal screening for obesity, pendulous abdomen, and macrosomia; implement weight management via nutritional counseling and exercise.

Secondary prevention: Monitor for cervical edema and arrest of fetal descent during labor; use portable ultrasound (if feasible) as an adjunctive diagnosis tool to support timely referral.

Tertiary prevention: Integrate anesthesia and neonatology teams during cesarean delivery; adopt modified fetal head extraction techniques (e.g., reverse fundal pressure) to shorten operative time to <30 minutes [23].

4.4 Advantages and Limitations

This study offers valuable insights based on a single-center cohort and comprehensive clinical and postoperative diagnosis, with multivariate analysis to control for confounders to strengthen risk factor reliability. The innovation lies in revealing the unique challenges of the management of anterior asynclitism in district-level hospitals. However, as a retrospective study, several limitations must be acknowledged: single-center design and medical record reliance may introduce selection bias (e.g., misclassification or underdiagnosis); lack of multiple testing correction; and absence of lateral asynclitism analysis [24]. Additionally, the study primarily uses traditional clinical diagnosis, missing intrapartum ultrasound, a more accurate tool for real-time assessment of fetal position. Future research integrating intrapartum ultrasound could enhance early detection and management, addressing a key obstetric practice gap [25].

5. Conclusions

In response to the high-risk factors for anterior asynclitism (e.g., pendulous abdomen, obesity) and the high cesarean delivery rate in grassroots hospitals, a three-tier prevention and control strategy is recommended: prenatal screening to identify high-risk pregnancies, enhanced intrapartum monitoring coupled with established referral mechanisms, and implementation of standardized surgical protocols for postpartum care. This study provides localized evidence-based guidance for regional hospitals and emphasizes the need to prioritize resources for obstetric high-risk technologies to narrow outcome disparities across different hospital tiers.

Availability of Data and Materials

The manuscript data is sourced from the medical record database of the First People's Hospital of Longquanyi District, Chengdu, Sichuan, China, and does not support disclosure and sharing.

Author Contributions

JZ, SM and JL designed the research study. ZZ, CL, GQ, FS, LW, HC and SJ performed the research. JZ provided help and advice on research methods. SM analyzed the data. JZ, SM and JL wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study was carried out in accordance with the guidelines of the Declaration of Helsinki. This research project has been approved by the Ethics Committee of the First People's Hospital of Longquanyi District, Chengdu City, Sichuan Province (AF-KY-2025005). Due to the retrospective design, informed consent was waived by the ethics committee. The study used anonymized clinical data retrieved from the hospital's electronic medical record system, with all patient identities protected.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used Doubao in order to check spelling and grammar. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication. The tool was used throughout the manuscript for spell and grammar checking.

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