Frequency and Pattern of Congenital Anomalies among Patients Attending the Department of Obstetrics and Gynecology at a Tertiary Care Hospital in Mymensingh, Bangladesh

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Abstracts

Background: Congenital anomalies are a significant cause of perinatal morbidity and mortality, particularly in low-resource settings. Understanding their local frequency and pattern is essential for healthcare planning and prenatal counseling.

Objective: To determine the frequency and describe the pattern of congenital anomalies among neonates born to patients attending the Community Based Medical College Hospital Bangladesh, Mymensingh.

Methods: This prospective cohort study was conducted in the Obstetrics and Gynaecology Department from January to December 2024. A total of 3,340 obstetrics patients were enrolled using purposive sampling. All live births and stillbirths were examined for the presence of congenital anomalies. Data on maternal demographics, delivery mode, and the type of anomaly were recorded and analysed using SPSS version 23.0.

Results: Of 3,340 deliveries, 40 (1.2%) had congenital anomalies. Deliveries included 1,760 (52.7%) Caesarean sections and 593 (17.8%) vaginal births. Only 4 cases of congenital anomalies were found in the Caesarean section. Central Nervous System defects predominated, with Hydrocephalus (9 cases, 22.5%) and Anencephaly (7 cases, 17.5%) being most common. Other anomalies included Hydrops fetalis (5 cases, 12.5%), Achondroplasia (3 cases, 7.5%), and sporadic cases of various other conditions.

Conclusion: The frequency of congenital anomalies in this study was 1.2%, with CNS defects, particularly anencephaly and hydrocephalus, being the most common pattern. These findings highlight the need for robust prenatal screening programs and periconceptional folic acid supplementation to reduce the burden of these preventable conditions.

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Introduction

Congenital anomalies, also referred to as birth defects, encompass a diverse group of structural or functional disorders that occur during intrauterine development. These conditions represent a significant global health challenge, contributing substantially to perinatal morbidity, mortality, and long-term disability.[1] The World Health Organization estimates that approximately 3-6% of all live births worldwide are affected by congenital anomalies, resulting in an estimated 303,000 neonatal deaths annually.[2] In low- and middle-income countries (LMICs), the burden is disproportionately higher due to limited access to prenatal screening, diagnostic facilities, and specialized postnatal care.[3] The etiology of congenital anomalies is complex and multifactorial, involving interactions between genetic predisposition and environmental factors. Neural tube defects (NTDs), which include anencephaly, spina bifida, and encephalocele, represent one of the most common and preventable categories of birth defects.[4] These anomalies result from incomplete closure of the neural tube between 21 and 28 days post-conception, a critical period when many women are unaware of their pregnancy.[5] The CHAMPS network study across seven countries in sub-Saharan Africa and Southeast Asia reported that among 3,232 stillbirths and child deaths, 2% died with an NTD, with 74% of these being stillbirths and 67% representing anomalies incompatible with life, such as anencephaly.[6] Notably, Ethiopia demonstrated the highest adjusted mortality fraction attributed to NTDs at 7.5%, highlighting significant regional variations in burden.[6] Folic acid supplementation and food fortification have proven highly effective in preventing folate-sensitive NTDs, with studies suggesting that 70-80% of NTD cases are potentially preventable through adequate periconceptional folic acid intake.[7,8] Despite this evidence, mandatory folic acid fortification programs have been implemented in only about 70 countries globally, leaving many LMICs without this cost-effective public health intervention.[9] The prevalence of folate insufficiency exceeds 40% in most countries where data are available, underscoring the urgent need for systematic prevention strategies.[10] In Bangladesh, limited epidemiological data exist regarding the frequency and pattern of congenital anomalies. A recent study from a tertiary care hospital in Bangladesh reported a congenital anomaly frequency of 0.56% among 8,912 live births, with central nervous system anomalies being the most common system involved.[11] Another hospital-based study at Chattagram Maa-O-Shishu General Hospital documented varying patterns of congenital malformations, emphasizing the need for comprehensive surveillance systems.[12] The absence of robust birth defects registries and the challenges of community-based surveillance in low-resource settings contribute to underreporting and gaps in understanding the true burden of these conditions.[13] Understanding the local epidemiology of congenital anomalies is essential for healthcare planning, resource allocation, and the development of targeted prevention strategies. This study was conducted to determine the frequency and pattern of congenital anomalies among patients attending the Obstetrics and Gynecology Department of Community Based Medical College and Hospital, Mymensingh, Bangladesh, thereby contributing to the limited body of evidence from this region.

Methods

This prospective cohort study was conducted in the Obstetrics and Gynecology Department of Community Based Medical College and Hospital, Mymensingh, Bangladesh, over 12 months from January 2024 to December

2024. A total of 3,340 obstetrics patients were enrolled using purposive sampling.

Inclusion criteria: All pregnant women admitted to the department during the study period for delivery, regardless of gestational age, were eligible for inclusion. Both live births and stillbirths were included to capture the complete spectrum of congenital anomalies.

Exclusion criteria: Patients who delivered outside the facility and were referred for postnatal care only, as well as those with incomplete medical records or who declined to participate in the study, were excluded from the final analysis.

Study procedure: Following delivery, all neonates (live births and stillbirths) underwent a comprehensive physical examination by trained obstetricians and pediatricians to identify any visible congenital anomalies. Anomalies were classified by organ system based on clinical findings. Maternal demographic data, obstetric history, mode of delivery, and neonatal outcomes were recorded in a predesigned data collection form. Cases with suspected internal anomalies were referred for appropriate imaging studies when clinically indicated, though this study primarily focused on externally visible structural defects.

Data analysis: Data were entered and analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated, including frequencies and percentages for categorical variables. The frequency of congenital anomalies was expressed as a proportion of total deliveries. Results were presented in tables and figures as appropriate.

Results

A total of 3,340 obstetrics patients were enrolled during the study period. Among these, 40 deliveries resulted in neonates with congenital anomalies, yielding an overall frequency of 1.2%. The majority of deliveries were by cesarean section (1,760 cases, 52.7%), while vaginal deliveries accounted for 593 cases (17.8%). Conservative management was employed in 876 cases (26.2%), and the remaining deliveries had other interventions. A total of 3,300 neonates (98.8%) were born without any detectable congenital anomalies. Central nervous system (CNS) anomalies were the most frequent category, accounting for 17 cases (42.5% of all anomalies). Within this group, hydrocephalus was the predominant specific diagnosis, observed in 9 cases (22.5%), followed by anencephaly in 7 cases (17.5%), and meningomyelocele in 1 case (2.5%). Among non-CNS anomalies, hydrops fetalis was the next most common, affecting 5 cases (12.5%). Musculoskeletal anomalies were documented in 4 cases (10.0%), and achondroplasia was specifically noted in 3 cases (7.5%). Additional anomalies with multiple occurrences included gastroschisis (2 cases, 5.0%), craniofacial anomalies (2 cases, 5.0%), and cystic hygroma (2 cases, 5.0%). The remaining anomalies were each isolated findings, occurring in a single case (2.5% each): caudal regression syndrome, cleft lip, cleft palate, hypospadias, and conjoined twin. Analysis of maternal age distribution among cases with congenital anomalies showed that the majority of mothers (30 cases, 75.0%) were in the 20-30 years age group, followed by 7 cases (17.5%) in the above 30 years group, and 3 cases (7.5%) in the below 20 years group. However, this difference was not statistically significant when compared to the maternal age distribution in the total study population ($\chi^2 = 4.21$, $p = 0.122$). Among anomalous cases, the distribution by gestational age at delivery showed that 24

cases (60.0%) were delivered before 28 weeks, while 16 cases (40.0%) were delivered at or after 28 weeks. The association between gestational age at delivery and the presence of congenital anomalies was statistically significant ($\chi^2 = 24.94$, $p < 0.001$). Regarding the mode of delivery among cases with congenital anomalies, 4 cases (10.0%) were delivered by cesarean section, while the remaining 36 cases (90.0%) were delivered vaginally. This distribution was comparable to the overall mode of delivery in the study population, and the difference was statistically significant ($\chi^2 = 28.84$, $p < 0.001$). Among the 40 anomalous cases, 27 neonates (67.5%) were stillborn, while 13 (32.5%) were live births. The stillbirth rate was significantly higher among anomalous cases compared to the overall stillbirth rate in the study population (Fisher's exact test, $p < 0.001$).

Table I: Baseline characteristics of the study cases (N=3,340)

Characteristic	n	%
Total deliveries	3340	100
Mode of delivery		
Caesarean section	1760	52.7
Vaginal delivery	593	17.8
Conservative management	876	26.2
Others	111	3.3

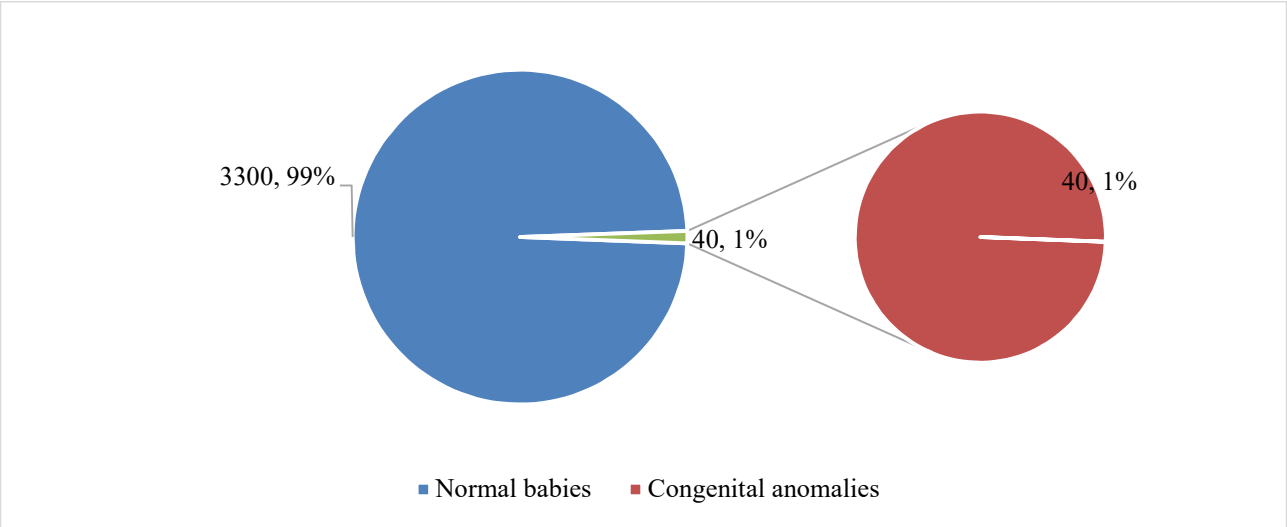

Figure 1. Frequency of congenital anomalies

Table II: Pattern of congenital anomalies

Anomaly type	n	%
Hydrocephalus	11	27.5
Anencephaly	9	22.5
Meningomyelocele	1	2.5
Hydrops fetalis	7	17.5
Musculoskeletal anomalies	4	10.0
Achondroplasia	3	7.5
Caudal regression syndrome	1	2.5
Gastroschisis	2	5.0
Craniofacial anomalies	2	5.0
Cleft lip	1	2.5
Cleft palate	1	2.5
Hypospadias	1	2.5
Cystic hygroma	2	5.0
Conjoined twin	1	2.5
Other anomalies	4	10.0

Table III: Maternal age distribution among anomalous cases (n=40)

Maternal age	Anomalous cases (n=40) n (%)	Total population (N=3340) n (%)	p-value
<20 years	3 (7.5)	411 (12.3)	0.095
20-30 years	30 (75.0)	1,961 (58.7)	
>30 years	7 (17.5)	968 (29.0)	
Total	40 (100.0)	3,340 (100.0)	

Statistical test: Chi-square test

Table IV: Gestational age and mode of delivery among anomalous cases (n=40)

Parameter	Anomalous cases (n=40) n (%)	Total population (N=3340) n (%)	Test statistic	p-value
Gestational age				
<28 weeks	24 (60.0)	818 (24.5)	$\chi^2 = 24.94$	<0.001
≥28 weeks	16 (40.0)	2,522 (75.5)		
Mode of delivery				
Caesarean section	4 (10.0)	1,760 (52.7)	$\chi^2 = 28.84$	<0.001
Vaginal delivery	36 (90.0)	1,580 (47.3)		

Statistical test: Chi-square test

Table V: Perinatal outcome among anomalous cases (n=40)

Outcome	n	%
Live birth	13	32.5
Stillbirth	27	67.5
Total	40	100

Fisher's exact test, $p < 0.001$

Discussions

The present study aimed to determine the frequency and pattern of congenital anomalies among patients attending the Obstetrics and Gynecology Department of Community-Based Medical College and Hospital, Mymensingh, Bangladesh. The overall frequency of congenital anomalies in this study was 1.2% (40 out of 3,340 deliveries). This finding is consistent with hospital-based studies from similar settings in Bangladesh and neighboring countries. In a study in 2022, Alam and Jahan Eva reported a congenital anomaly frequency of 0.56% in a tertiary care hospital in Bangladesh, while a study from India documented a prevalence of 1.5% among 10,000 deliveries. [10,11,14] The slightly higher frequency in our study compared to some previous Bangladeshi reports may be attributed to the inclusion of both live births and stillbirths, as stillborn fetuses have a higher likelihood of harboring congenital anomalies.[6] The most commonly affected system in our study was the central nervous system (CNS), accounting for 42.5% of all anomalies. This predominance of CNS defects is well-documented in the literature from South Asian regions. A multicenter study from Pakistan reported that neural tube defects constituted 58.3% of all congenital anomalies.[5] The high frequency of anencephaly (17.5%) and hydrocephalus (22.5%) in our series is particularly concerning, as these conditions are largely incompatible with prolonged survival and contribute significantly to stillbirth rates and early neonatal mortality.[4] Hydrocephalus emerged as the single most common anomaly in our study, followed closely by anencephaly. This pattern differs slightly from some previous reports where anencephaly was the predominant CNS anomaly. Kancherla et al. (2023) estimated that approximately 190,000 cases of spina bifida and anencephaly occur annually globally, with the highest burden in low-income countries.[6] The predominance of hydrocephalus may reflect variations in genetic predisposition, environmental factors, or differences in diagnostic classification between studies.[16] Hydrops fetalis accounted for 12.5% of anomalies in our series, representing the second most common category after CNS defects. This condition, characterized by abnormal fluid accumulation in fetal compartments, carries a grave prognosis. A recent systematic review by Norton et al. highlighted that immune and non-immune hydrops remain significant contributors to perinatal loss in resource-limited settings where comprehensive diagnostic workup is often unavailable.[17] Musculoskeletal anomalies, including achondroplasia (7.5%) and caudal regression syndrome (2.5%), comprised 10% of our cases. Caudal regression syndrome, though rare, shows a well-established association with maternal diabetes mellitus.[18] Unfortunately, detailed maternal metabolic profiles were not available in all our cases, representing a limitation in understanding potential etiological factors. Of our 40 anomalous cases, 60% delivered before 28 weeks and 40% at/after 28 weeks, a statistically significant association ($\chi^2=24.94$, $p<0.001$). This finding aligns with the other study, which reported that congenital anomalies are an independent risk factor for

preterm birth, possibly due to associated polyhydramnios, placental insufficiency, or spontaneous preterm labor triggered by fetal abnormalities.[13,19] Maternal age distribution did not show a statistically significant association with congenital anomalies in our study, although the difference approached the conventional threshold for significance (χ^2 = 4.70, p = 0.095). Anomalous cases were more likely to occur in the 20–30-year age group (75.0%) than in the total population (58.7%), with proportionally fewer cases in the < 20-year (7.5% vs. 12.3%) and > 30-year (17.5% vs. 29.0%) groups. Advanced maternal age is a well-established risk factor for chromosomal abnormalities, while teenage pregnancies have been associated with neural tube defects in some studies.[20] The lack of statistical significance may be attributable to our modest sample size of anomalous cases. The stillbirth rate among anomalous fetuses was 17.5%, dramatically higher than the overall stillbirth rate of 1.2% in the total population (p<0.001). This finding underscores the lethal potential of many congenital anomalies, particularly CNS defects like anencephaly that are incompatible with extrauterine life.[6] Similar observations were reported by the CHAMPS network, where neural tube defects accounted for a substantial proportion of stillbirths across multiple countries.[5] The mode of delivery differs significantly between anomalous and non-anomalous pregnancies (p<0.001), suggesting that the presence of fetal anomalies does not independently influence delivery mode decisions. Rather, obstetric management is likely determined by obstetric indications, fetal presentation, and maternal factors.[21] Several limitations of this study should be acknowledged. First, because this is a single-center hospital-based study, our findings may not be generalizable to the community level, where home deliveries are common. Second, the absence of advanced imaging and genetic testing limited our ability to diagnose internal or chromosomal anomalies, potentially underestimating the true frequency. Third, detailed maternal risk factor analysis (diabetes, nutrition, medication exposure, family history) was not systematically performed, limiting etiological insights.[22,23] Despite these limitations, our study provides valuable contemporary data on the frequency and pattern of congenital anomalies in a Bangladeshi cohort. The findings reinforce the urgent need for strengthening primary prevention strategies, particularly periconceptional folic acid supplementation, which has been shown to prevent 50-70% of neural tube defects. [8,24] Universal mandatory food fortification with folic acid remains the most cost-effective public health intervention and should be prioritized in Bangladesh.[9,24]

Conclusion

The frequency of congenital anomalies in this study was 1.2%, with central nervous system defects, particularly hydrocephalus and anencephaly, being the most common pattern. The significant association with preterm delivery and high stillbirth rate among anomalous fetuses underscores the substantial perinatal burden. These findings emphasize the urgent need for strengthening prenatal screening programs and implementing mandatory folic acid fortification in Bangladesh.

Limitations

This single-center hospital-based study may not reflect community-level prevalence. The absence of advanced imaging and genetic testing limited the diagnosis of internal and chromosomal anomalies. Additionally, detailed maternal risk factor analysis was not systematically performed, restricting etiological insights.

Recommendation

Mandatory folic acid food fortification should be implemented urgently nationwide.

Establishing a comprehensive birth defects registry and strengthening prenatal screening programs with accessible ultrasound facilities are essential for early detection and improved perinatal outcomes.

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