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Pattern of Congenital Heart Disease with its outcome among 100 Newborns admitted in a Tertiary Care Hospital in Dhaka, Bangladesh

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ABSTRACT

Background: *Congenital heart disease is one of the most common congenital problems of neonates which can contribute to infant mortality and morbidity. The goal of this study is to identify the different patterns of congenital heart diseases with its outcome among neonates attending a tertiary care hospital in Dhaka.*

Methods: *This prospective observational study was conducted over a period of 1 year from March 2020 to February 2021, among the neonates admitted to the Neonatal Intensive Care Unit of Central Hospital Limited. Neonates with structural congenital heart disease, diagnosed by routine echocardiography were included in this study. Pattern of the lesions was observed and analyzed. Patients were followed up to neonatal period to see the outcome.*

Results: *A total of 100 neonates were diagnosed with congenital heart disease during the study period and majority of them were acyanotic (98%) and combined lesions such as PDA with ASD (37.7%) followed by PDA only (36.7%). Males were predominant (60%). The majority of neonates were pre-term (79%) with low birth weight (38%). Consanguinity was present in 5% of cases. Resuscitation was required mostly among the combined type of CHD cases. Treatment was required in 67% of cases with a complete resolution of the defect in 89% of cases. Overall mortality was 7% mostly due to combined cardiac lesions.*

Conclusion: *Regarding the type of congenital heart defect, acyanotic defect was more common than cyanotic with patent ductus arteriosus alone or in combination were the commonest lesion.*

Keywords
Congenital, Heart disease, Neonates, Echocardiography, Bangladesh.

Introduction
Congenital heart disease (CHD) is one of the commonest congenital lesions in children [1]. These are defects in the structure of the heart or intrathoracic great vessels present at birth and are actually or potentially of functional significance [2]. It constitutes one-third of all congenital birth defects in children. It is estimated that every year 1.35 million neonates are born with congenital heart disease. Asia reported the highest CHD birth prevalence, with 9.3 per 1,000 live births (95% CI: 8.9 to 9.7) [3]. There are also sporadic data available from Bangladeshi centers, where the incidence of CHD ranges from 7.8 to 25 in every 1000 babies [4,5].

The CHDs are multifactorial defects. Most of the cases are due to sporadic genetic mutation and associated chromosomal abnormalities [6]. Established risk factors include: advanced maternal and paternal age, consanguinity, maternal diabetes, TORCH infection, nutritional deficiency, Systemic Lupus Erythematosus (SLE), maternal drug exposure etc. [7]. There are many types of congenital heart disease and they sometimes occur in combination. According to the pathophysiology and affected structure, CHD is categorized into trivial, moderate, and severe lesions or acyanotic versus cyanotic defects [8].

These defects can manifest at birth or soon after birth. However, often the clinical features are not specific in newborns. Moreover, they remain asymptomatic in many cases. Unless cyanosis, congenital heart defects can be missed during a routine examination. Screening with Echocardiography is an easy and simple way nowadays to identify those conditions earlier.

CHD not only contributes to significant morbidity and mortality but also causes tremendous psychological stress and economic burden to the whole family. Over the decades, there is an improvement in treatment strategy including medical and surgical parts for CHD, which leads to increased survival of children into adolescence and adulthood [9]. If the defect is recognized at earlier stage, long-term complications will be lesser and the outcome is better. Neonatal period is the best time for that. As there are limited studies on this topic from Bangladesh, we aimed to identify the pattern of different congenital heart diseases among newborns admitted in a tertiary care hospital, which will support the existing evidence and will guide us to formulate preventive strategy in national level.

Methodology
This prospective observational study was conducted in the Neonatal Intensive Care Unit (NICU) of Central Hospital Limited, a tertiary level private hospital for children in Dhaka city, over a period of 1 year from March 2020 to February 2021. The 25 bedded NICU of the study hospital is well equipped with all modern technological supports and has 24 hours echocardiography facility.

During the study period, all newborns admitted in the NICU, were underwent Echocardiography as a part of routine screening. Those who had congenital heart diseases confirmed by Echocardiography and whose parents gave consent, were enrolled in the study. Detail history of the study subjects including antenatal, natal and postnatal period was collected from the parents. Relevant examination findings and investigations were noted accordingly. Patients received standard care as per unit protocol. For cardiac management, opinion from cardiologist was taken and treated consequently. After initial diagnosis, all cases were followed up prospectively by echocardiography to see the outcome of the heart diseases during neonatal period.

Two-dimensional echocardiogram with Doppler vascular assessment was performed in all enrolled patients within first one week of life. To ensure validity, all studies were performed and reviewed by the same cardiologist of Assistant Professor rank and same Echocardiography machine during the study period. The diagnosis of any heart defect was obtained as documented in the medical records by the cardiologist at the time of evaluation.

Data were entered into an excel spreadsheet. Statistical analyses were performed using IBM SPSS Statistics Software (version 21). Data were presented as frequency distributions for categorical variables and mean ± standard error of the mean for continuous variables.

Results
A total of 100 neonates were diagnosed with congenital heart disease. Among them more than two third were preterm neonates and mostly born by LUCS (83%). Thirty-eight percent had low birth weight. Male were affected more (60%). Most of the mothers belonged to 18-30 years of age group and majority of them were homemakers (76%). Consanguinity was present in 5% cases (Table-1 and Table-2).

Table 1: Baseline Characteristics of the Study Population.

Variable	Cong. Heart disease, n (100)	Percentage (%)
Gestational age category (weeks)		
<28	0	0
28-32	17	**17**
>32-34	28	**28**
>34-<37	34	**34**
≥37	21	21
Birth weight (g)		
<1000	0	0
1000-<1500	28	28
1500-<2500	38	**38**
2500-4000	32	32
>4000	2	2
Sex Male	60	**60**
Female	40	40

Table 2: Antenatal, Natal and Post-Natal Features of the Studied Neonates.

Variable	Cong. Heart disease, n (100)	Percentage (%)
Mother's age		
18-30	52	52
>30-45	48	48
Maternal Education		
Less than high school	19	19
High school	38	38
Degree or Equivalent	43	43
Socio economic condition		
Low	6	6
Middle	9	9
High	85	85
Working Mother		
Yes	24	24
No	76	76
Parity		
Primi	36	36
Multi	64	64
Previous Sib Death with Birth Defect (among 64)		
Yes	6	9.3
No	58	91
Consanguinity of Parents		
Yes	5	5
No	95	95
Mode of Delivery		
NVD	15	15
LUCS	85	85

Table 3: Pattern of Congenital Heart Diseases among Studied Neonates.

Name of congenital heart disease, total 100	Number, n (100)	Percentage (%)
Acyanotic Heart Disease	98	98
PDA	36	**36.7**
VSD	8	8.2
ASD	4	4
PDA with ASD	37	**37.7**
PDA with VSD	5	5
VSD with ASD	8	8
Cyanotic Heart Disease	2	2
Ebstein anomaly	1	1
TOF	1	1

Table 4: Clinical Profile of the Studied Neonates.

Clinical Profile and Outcome	PDA 36, n (%)	VSD 8, n (%)	ASD 4, n (%)	PDA with ASD 37, n (%)	PDA with VSD 5, n (%)	VSD with ASD 8, n (%)	TOF, 1, n (%)	Ebstein anomaly,1, n (%)
APGAR at 5th Min								
0-3	0	0	0	**3 (8)**	0	0	0	0
4-6	**4 (11)**	0	0	**4 (11)**	**1(20)**	**1 (13)**	1 (100)	0
>7	11(31)	3 (38)	3 (75)	11(30)	2(40)	0	0	0
No Information	21 (58.3)	5 (62)	1 (25)	19(51.3)	2 (40)	7(87)	0	1(100)
Resuscitation Requirement								
Yes	**4 (11.1)**	0	0	**7 (19)**	**1 (20)**	**1 (13)**	**1 (100)**	0
No	32 (88.8)	8 (100)	4 (100)	30 (81)	4 (80)	7 (87)	0	1(100)
Symptomatic								
Yes	**25 (69.4)**	4 (50)	1 (25)	**25 (68)**	**4 (80)**	**6 (75)**	**1 (100)**	**1(100)**
No	11 (31)	4 (50)	3 (75)	12 (32.4)	1 (20)	2 (25)	0	0
Treatment Required								
Yes	**25(69.4)**	4 (50)	**1 (25)**	**25 (68)**	4(80)	6(75)	1 (100)	1(100)
No	11 (31)	4 (50)	3 (75)	12 (32.4)	1 (20)	2(25)	0	0

Table 5: Outcome of the Studied Neonates.

Outcome Variable	PDA 36, n (%)	VSD 8, n (%)	ASD 4, n (%)	PDA with ASD 37, n (%)	PDA with VSD 5, n (%)	VSD with ASD 8, n (%)	TOF, 1, n (%)	Ebstein anomaly,1, n (%)
Resolved								
Yes	34 (94)	8 (100)	4 (100)	30 (81)	5 (100)	8(100)	0	0
No	2 (5.5)	0	0	7 (19)	0	0	1 (100)	1(100)
Survivor								
Yes	35 (97.2)	8 (100)	4 (100)	33 (89)	5(100)	8(100)	0	0
No	1(2.8)	0	0	4 (11)	0	0	1 (100)	1(100)

In Table 3, different types of congenital heart diseases were categorized into acyanotic and cyanotic variety, among which acyanotic was prevalent (98%) with a predominance of combined defect PDA with ASD (37.7%) followed by PDA only (36.7%).

Table-4 shows the clinical profile of these patients. Neonates having PDA with ASD were found depressed after birth as documented by APGAR score (moderate depression 4 case and severe depression 3 case). Patients were symptomatic in most of the cases. Treatment was required in 67% (n=67) patients.

In table-5, outcome of the patients was observed. In majority of cases (89%), defects resolved. Seven percent patients died due to TOF, Ebstein anomaly, PDA with ASD and 1 case with PDA.

Discussion

In this study, among the total 100 neonates with congenital heart disease, majority were born preterm (79%). It is evidenced that, neonates with congenital heart disease have greater risk of being premature and low birth weight [4,10]. There is a risk of 2-3 folds increase in chance of prematurity and small for gestation. Our study finding also matches with this result.

Male found to be affected more in our study which is consistent with other study findings [11,12]. It is also stated in previous studies that male have more CHD in South Asian regions due to genetic substrate as well as cultural factors; where male babies get more attention than female child [13].

Advanced maternal age is known to be a risk factor for CHD in children in different ethnicities. The maternal age of neonates with CHD was observed between 18-30 years age range in this study. Abqari et al. have found that the odds of having CHD was 2.509 (95% confidence interval, CI, 1.278-4.926) with mother's age between 20-30 years and 2.868 (95% CI, 1.255-6.555) in mothers > 30 years of age respectively [7]. Therefore, it is obvious that CHD can occur both in advanced maternal age and earlier to that. Contrarily, another study done by Hashim T et al. have found no association between maternal age and CHD.

This study noted that, 5% neonates had consanguineous parents, which is not negligible. In a case-control study conducted in Lebanon, found that infants born to first cousin marriages had a 1.8 times higher risk of having a CHD diagnosed at birth compared to those born to unrelated parents (95% CI: 1.1-3.1) [13]. Other studies have shared similar findings [14]. We also found that, majority of mothers were multiparous and among them9.3% had previous affected child with CHD. This finding is slightly higher than other study findings (3.5-4.5% recurrence risk). Small sample size could be a cause behind this [15].

In this study, the pattern of congenital heart diseases was similar to the previously documented data. The commonest CHD diagnosed were PDA with ASD (37.7%) followed by PDA only (36.7%), VSD (8.2%), VSD with ASD (8%) and PDA with VSD (5%). This is similar to the findings in other low resource countries [16-18]. However, VSD was not predominant in our report like others, might be because we enrolled only neonates where presentation of VSD is less common in neonatal period. Most of the studies have been done among infants and older children [4]. Some of the previous studies have excluded PDA in premature babies where it appears usually within first 72 hours of life. Meanwhile in this study, we have included all types of cardiac defects within the neonatal period.

In the current analysis, it was observed that, neonates with single or combined heart defects were depressed at birth and required resuscitation. APGAR score is used to determine the level of asphyxia and to predict baby's outcome. It is evidenced that, low APGAR score in babies with congenital heart disease is a predictor of hospital mortality. Moreover, complex and or combined CHDs require extensive resuscitation at birth which is obvious from our findings as well [19]. Treatment was required in 92% patients and most of them (88%) resolved defects. Mortality was 8% and mostly among neonates with combined cardiac defects.

Conclusion

Congenital heart disease is not uncommon in neonate population. In this study, Patent ductus arteriosus alone (36.7%) or in combination with other defects are mostly encountered congenital cardiac lesions. Timely screening and initiation of treatment resulted in complete recovery in most of the cases.

Limitation

Limitations of this prospective study includes the study was conducted in a single center. Furthermore, follow up was performed only up to neonatal period.

Recommendation

Routine echocardiography is essential for early diagnosis of CHD among neonates. Besides private hospitals like ours, this need to

be made available in Government hospitals for determination of the full extent of the problem.

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