Epidemiology of Congenital Heart Diseases among Children in a Tertiary Level Hospital in Dhaka, Bangladesh

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Abstract: *Background: Congenital Heart Disease (CHD) is the most common congenital problem in children. Congenital heart disease (CHD) is associated with multiple risk factors, consanguinity may be one such significant factor. The role of consanguinity in the etiology of CHD is supported by inbreeding studies, which demonstrate an autosomal recessive pattern of inheritance of some congenital heart defects. Objective: This study was conducted to observe the disease pattern and factors of Congenital Heart diseases among children admitted in Dhaka Shishu Hospital. Methods: This descriptive cross - sectional study was carried out at Dhaka Shishu (Children) Hospital in Dhaka City from August, 2020 to January 2021. Chromosomal test done by the patient party from outside of data collection site. Results: Among 113 children female were 44 (38.9%) and male were 69 (61.1%). The age group of participated children ≤3 years of age were 23.9% (27), 4 - 6 years of age were 26.5% (30), 7 - 9 years of age were 23.9% (27), and above 10 years of age were 25.7% (29). Among all children, 13 % (15) were 5 - 10 kg, 16% (18) were 11 - 15 kg, 29% (33) were 15 - 20 kg and 42% (47) were above 20 kg respectively. Among 113 children 49 were in malnutrition, 27 in moderate nutrition and 37 were in normal; 55.75% (63) had family history of heart diseases from parents, 31.86% (36) from grandparents and 12.39% (14) from no history. Among 113 children VSD 43 (38.05%) was the most common acyanotic CHD in children followed by ASD 27 (23.89%), PDA 19 (16.81%), TOF 12 (10.62%), PVS 7 (6.19%), COA 3 (2.65%0 and TGA was 2 (1.77%). Chromosomal abnormalities were 33%, Genetic abnormalities were 27%, gestational diabetes were 19%, consagnuity were 15%, maternal rubella infection 4% and hypothyroidism were 2%. Conclusion: With the advancement of diagnostic facility and neonatal care, early detection of CHD is possible and treatment can be started at an earlier age.*

Keywords: Heart Diseases, Hypothyroidism

1. Introduction

Congenital heart disease (CHD) is the most common congenital problem accounting for nearly 25% of all congenital malformations and is the most common type of heart disease among children1. It may present in different ages from birth to adolescent. Most cases are asymptomatic and discovered during routine neonatal checkup. As it is the most common amongst major birth defect, place a significant economic burden and psychological impact on the affected families and treatment is costly, it is very important to find out its pattern among children. In the western countries pattern of CHD is well documented, but has not been studied nationwide in Bangladesh as in other western and neighboring countries. It is not a static condition, changes takes place throughout patient's life (Hussain*et al*, 1992). Over the past 30 years there has been an increasing awareness regarding the importance of early referral of newborn with heart disease to special centers. Continuous advances in technology and training in pediatric cardiology and pediatrics have improved long term outcome and promised better quality of life. CHD if left untreated is an important cause of morbidity and mortality in children, therefore early detection and proper intervention is most important. But in Bangladesh there is still lack of awareness regarding health problems and lack of diagnostic facilities which make the detection of CHD difficult. The purpose of this study was to present and compare the experience regarding pattern of CHD in children during past and present in Dhaka Shishu Hospital, which is the largest paediatric teaching hospital providing care to the children from all over Bangladesh having 533 beds along with a well - equipped Pediatric Cardiology Unit. (Bloomfield *et al*, 2010). It is very important to find out pattern of CHD among children for proper management. In the western countries pattern of CHD is well documented, but it has not been studied nationwide in Bangladesh. Another study found ASD (39.9%) as commonest CHD followed by VSD (28.4%) TOF (28.6%) and PDA (5.2%). Begum et alfound ASD as the commonest CHD in neonate. Hussain et al found VSD (52.8%) ASD (11.1%) TOF (22.2%) and PDA (8.3%) as the common CHD (Rahman *et al*, 1992).

2. Material and Methods

Methodology
This study was carried out to observe the pattern and find out factors of Congenital Heart diseases among children admitted in a tertiary level hospital.

Study Design: Descriptive Cross - sectional study was conducted.

Study Period: The study was conducted during the period of one year. A work schedule was prepared including all the tasks in a sequence. The first four months were applied for literature review and strategy finalization. The subsequent months were passed for questionnaire development,

pretesting, data collection, compilation and analysis, report writing, printing and submission of thesis. Literature review was simultaneously going on till final report was submitted. This study was conducted from August, 2020 to January, 2021.

Study population: Children who were admitted at Dhaka Shishu Hospital, Dhaka of which a total of 113 patients were included in the study with maintaining selection criteria.

Study Place: The study was carried out in Dhaka Shishu Hospital, Sher - E - Bangla Nagar, Dhaka.

Sample Size: Sample size was determined by using the following formula
$n = z^2pq/d^2$
Where, n = the desired sample size
 z = at 95% confidence level usual value is 1.96
 p = Prevalence of factors related to CHD, p = 12% (0.12)
q = 1 - 0.12
 =0.88
d =Absolute precision, 5 % (0.05)
So, $n = (1.96)^2$ x 0.12 x 0.88/ $(0.05)^2$ = 163

Calculated sample size was 163.

During the study period 113 patients were included in this study.

Sampling Technique: Purposive sampling (Non randomized) according to considering the selection criteria.

Data Collection Procedure: Face to face Interview and checklist filled up from hospital record information with a pre - tested structured questionnaire.

Selection Criteria:

Inclusion Criteria:
- Age less than 12 years
- Hospital admitted children
- Confirm diagnosed CHD

Exclusion Criteria:
- Age more than 12 Years
- Children from Out patient department
- Children from ventilator or life support
- Guardian and or children who not willing participation in this study

Data analysis
Data was collected, compiled and tabulated according to key variables. The analysis of different variable was done according to standard statistical analysis by using SPSS version 19.

Ethical issue

- In this study, all participants are treated equally, secretly and with respect.
- The study was conducted with the permission of proper authority of hospital.
- A verbal and written consent was obtained from all the participants.
- The aim and possible benefits of the study was explained to the children who participated in this study. The study was conducted only for learning purpose.
- Ethical Clearance was taken from IRB of Dhaka Shishu (Children) Hospital.

3. Results

Distribution of the children by gender
Figure 1 show that, among the children, Among 113 children female were 44 (38.9%) and male 69 (61.1%)
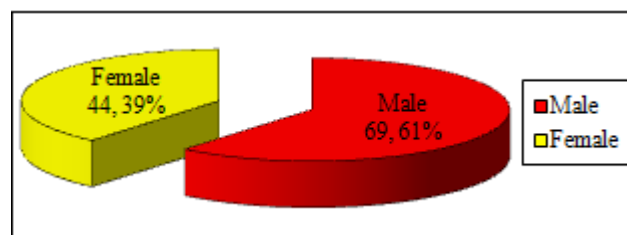

Figure 1: Distribution of the children by gender

Table 1 shows that among 113 children, ≤3 years of age were 23.9% (27), 4 - 6 years of age were 26.5% (30), 7 - 9 years of age were 23.9% (27), and above 10 years of age were 25.7% (29).

Table 1: Distribution of children according to age, n=113

Age (in years)	Number (n)	Percentage (%)	Mean	Standard Deviation (SD)
≤3	27	23.9		
4 - 6	30	26.5		
7 - 9	27	23.9	2.83	1.209
Above 10	29	25.7		
Total	n = 113	100%		

Table 2 shows that among all children, 13 % (15) were 5 - 10 kg, 16% (18) were 11 - 15 kg, 29% (33) were 15 - 20 kg and 42% (47) were above 20 kg respectively.

Table 2: Distribution of the children according to body weight

Weight (in Kg)	Number (n)	Percentage (%)
5 - 10kg	15	13%
11 - 15kg	18	16%
15 - 20kg	33	29%
Above 20 kg	47	42%
Total	**113**	**100%**

Figure: 2 Shows that among all children 49 were in malnutrition, 27 in moderate nutrition and 37 were in normal.
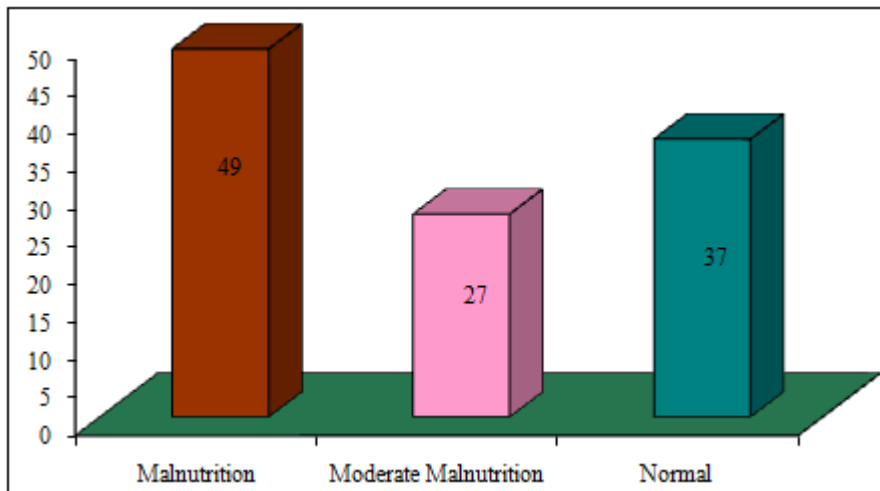
Figure 2: Nutritional Status of the children

Figure 3 Shows that among 113 children 55.75% (63) had family history of heart diseases from parents, 31.86% (36) from grandparents and 12.39% (14) from no history.
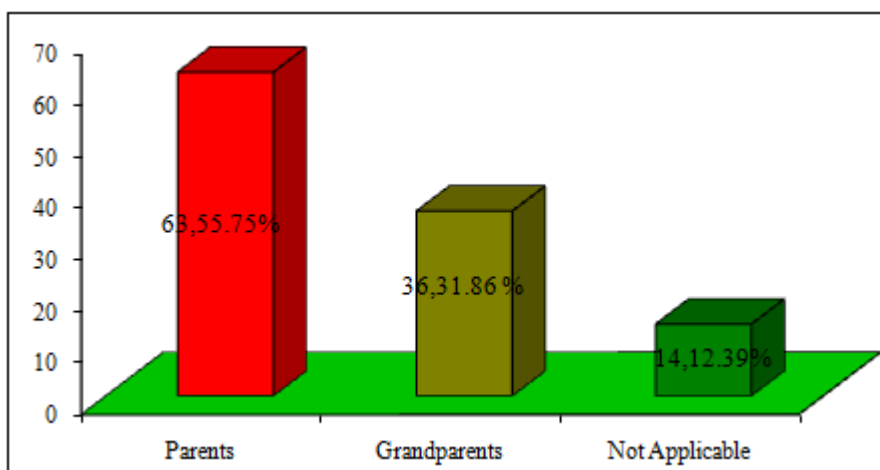

Figure 3: Distribution of the children by their family history

Table - 3 shows that total 113 children were diagnosed as CHD during the study period. VSD 43 (38.05%) was the most common acyanotic CHD in children followed by ASD 27 (23.89%), PDA 19 (16.81%), TOF 12 (10.62%), PVS 7 (6.19%), COA 3 (2.65%0 and TGA was 2 (1.77%).

Table 3: Distribution of children according to pattern of congenital heart diseases, n=113

Pattern of Congenital heart diseases	Number (n)	Percentage (%)
VSD	43	38.05
ASD	27	23.89
PDA	19	16.81
TOF	12	10.62
Pulmonary valve stenosis	7	6.19
COA	3	2.65
TGA	2	1.77
	113	100

Fig 4 Shows that among all children the following factors were related to CHD; Chromosomal abnormalities were 33%, Genetic abnormalities were 27%, gestational diabetes were 19%, consagnuity were 15%, maternal rubella infection 4% and hypothyroidism were 2%.
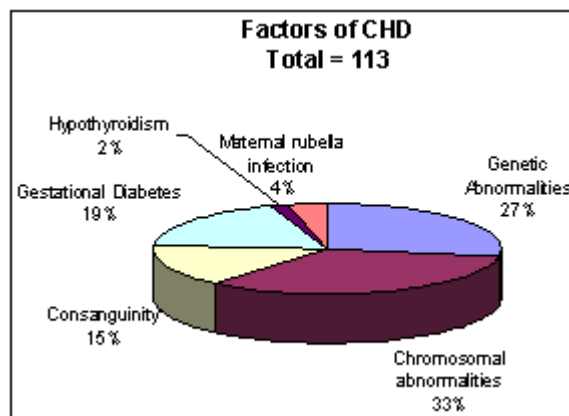
Figure 4: Distribution of children according to factors of congenital heart diseases.

4. Discussion

Congenital heart disease is the most common congenital malformation. Many infants require corrective or palliative surgery and frequent hospitalization during 1st year of life. Early detection, timely referral to proper center and adequate

management is most important for long term outcome and better quality of life.

Most of the studies regarding pattern of CHD were hospital based so estimation of magnitude of the CHD was not possible. My study is also a hospital based study in Dhaka.

The present study reveals that among 113 children ≤3 years of age were 23.9% (27), 4 - 6 years of age were 26.5% (30), 7 - 9 years of age were 23.9% (27), and above 10 years of age were 25.7% (29).

This is inconsistent with some previous studies conducted in Dhaka Shishu Hospital on Pattern of congenital heart disease among children in 1992 (Hussain et al, 1992 and Cameron et al, 1995)

The present study shows that among all children, 13% (15) were 5 - 10 kg, 16% (18) were 11 - 15 kg, 29% (33) were 15 - 20 kg and 42% (47) were above 20 kg respectively.

Similar studies conducted in previous and reveals present study result also (Fatema*et al*, 2017 and Khalil *et al*, 1994).

In this studyamong all children 49 were in malnutrition, 27 in moderate nutrition and 37 were in normal, a similar study conducted in previous and showed that malnutrition another commonest characteristics among CHD children (Jackson *et al,* 1980)

In this study VSD 43 (38.05%) was the most common acyanotic CHD in children followed by ASD 27 (23.89%), PDA 19 (16.81%), TOF 12 (10.62%), PVS 7 (6.19%), COA 3 (2.65%0 and TGA was 2 (1.77%). Similar study shown that VSD was the most commonest pattern of CHD in children (Fatema*et al*, 2017). A significant proportion of VSD close spontaneously before adulthood and some untreated patients with large VSD die in childhood from heart failure. On the other hand ASD patients may remain asymptomatic in childhood and are diagnosed for the first time when they are adult. The study subject of Fatema et al were all newborn and many small sized VSD and most of the child with TOF may not manifest by that time. However, all these studies found TOF as the commonest acyanotic congenital heart diseases. This finding is quite similar to the current study.

Present study shows that Shows that among all children the following factors were related to CHD; Chromosomal abnormalities were 33%, Genetic abnormalities were 27%, gestational diabetes were 19%, consagnuity were 15%, maternal rubella infection 4% and hypothyroidism were 2%. A study carried out in Bangladesh (Mollah *et al* 2002) showed that there was no association between CHD and factors such as consanguinity and maternal diabetes. The difference in results observed in our study and the one carried out previously on the same population may be accounted for by the different study design that we employed, namely case - control compared to the descriptive study design used earlier.

This particular study design allowed us to compare the rates of consanguinity and multiple risk factors in CHD patients with those in controls in a short time period. It was less cumbersome financially and could be carried out by the limited number of students present in our team. However, there were a number of limitations in our study design. These included limitation in recall of the parents while giving information about exposure to risk factors when the phone calls were made, or during history - taking at the time of admission. A limitation of case - control study designs which also applies to my study is that the absolute risk of any individual factor cannot be indicated.

5. Conclusion

Majority of CHD in children up to 12 years of age are acyanotic. VSD was the commonest acyanotic CHD followed by ASD and PDA whereas TOF was the commonest cyanotic lesion. About 25% of children were diagnosed during neonatal period but maximum number were diagnosed during infancy (55%). Majority of the patients were male. Result analysis that, Parental consanguinity, family history of CHD, genetic abnormalities are independent risk factors for CHD.

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