Assessment of the physical growth and development in children with congenital heart diseases: A descriptive study

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Abstract—*Congenital heart diseases (CHD) are the anatomical abnormalities present at the birth resulting in abnormal cardiac function. Children with congenital heart diseases may grow or develop more slowly than other children. The present study was conducted with the objectives to assess the physical growth and development of children with CHD. A descriptive study was undertaken on 103 children with CHD attending/admitted in selected units of Advanced Cardiac Centre and Advanced Pediatric Centre PGIMER Chandigarh by Interview of parents and observation of children. Questionnaire contained four parts socio-demographic profile of Parents, Clinical profile of children, WHO growth charts and Vineland Social Maturity Scale. This study observed that most of children were toddlers (62.5%) and male child (62.5%).Most of children(91.3%) were diagnosed less than three years of age and most of children(41.3%) found suffering from ventricular septal defect (VSD). According to WHO 'z' scoring 31.7% of children were found severely stunted, 53.8% were found severely underweight. And 37.5% children were severely wasted and 55.8% children had below average intelligence. The present study concluded that some of children had growth retardation (i.e. severely stunted, severely underweight and severely wasted) and developmental delay (below average intelligence). It was also seen that there was no association of socio-demographic characteristics with their growth pattern.*

Keywords: Congenital heart diseases (CHD), Physical Growth, Development.

I. INTRODUCTION

Congenital heart diseases (CHD) are structural anomalies present at birth with incidence of 5 to 8 per 1000 live births.[1]Children with CHD are undernourished which affect their height and weight during their developmental period. Also they have delayed development milestones. Normal growth and development indicate good health in children and only growth is important parameter to assess their health status.[2] CHD often either have hypoxemia or pulmonary over circulation (shunting) concomitant danger for growth and development.

After birth, in children with congenital heart diseases weight is afflicted to a greater extent than height; however liner growth is also hindered in later ages.[3] Studies conducted on children with CHD experience simultaneously decreases in growth trajectory across weight, length and head circumference this decrease suggested a role for altered regulation in children with CHD.[4]

Studies also found that children with congenital heart diseases were having significant delay in growth and development of language and gross motor skills.[5]

It was noticed that the growth and development of children varied in those who were suffering from congenital heart disease as compared to the normal children of same age group. Nurses are in significant position to decrease the growth retardation and developmental delay in children with congenital heart diseases by providing appropriate training and practices to parents.[6] Moreover they can provide early and necessary interventions to improve the physical growth and development of children. Understanding of this aspect, it is very important to assess the growth and development pattern of children suffering from congenital heart diseases in order to help parents and care givers to provide quality care to children with congenital heart diseases.

II. METHODOLOGY

A Descriptive study was conducted to on 103 children (birth-12years) suffering from congenital heart diseases attending/admitted in selected units of Advanced Cardiac Centre and Advanced Pediatrics Centre PGIMER, Chandigarh.

For the study purpose, children of age group at birth to 12 years with congenital heart diseases without surgical intervention attending /admitted in selected units of Advanced Cardiac Centre and Advance Pediatric Centre, PGIMER, Chandigarh from 18th April 2017 to 29th April 2017 (2 weeks period) were taken. Among these children, children having other congenital anomaly were excluded. Total enumeration of eligible children during that period was 103 children.

The ethical clearance was taken from Institute ethics committee NINE, PGIMER, Chandigarh, permission from department of Cardiology was taken and Informed written consent was taken from parents of children (birth-12 years).

The socio-demographic data of parents and children were taken. The clinical parameters of children are assessed at cardiology OPD, PGIMER. It included physical examination of children & anthropometric assessment and milestones of children according to age. The WHO growth charts included separate charts for boys and girls and different charts for different parameters like Weight for age, Height for age, BMI for age were used. The Vineland Social Maturity Scale was used to measure of Social age and Social Quotient.

The data were analyzed using descriptive and inferential statics. Descriptive analysis included percentage and mean with SD. Inferential statistics included t-test.

III. RESULTS

In the socio-demographic profile of children with CHD (N=103) the mean age. Majority of children (66.3%) belonged to Hindu religion. Majority (62.5%) belonged to joint family and 53.8% belonged to rural population. Majority (88.5%) was living in their own house and as per socio-economic status 34.6% and 35.6% belonged to upper lower class and lower class respectively.

Age of children is ranging from 5weeks to 12years with mean age of 3.09 years with standard deviation 3.04 years. There was male predominance i.e. 62.5% of the children were male and 36.5% were female. Regarding birth order, 44.2% of the children were the second child of the parents. Out of 103 children, 25 (24%) were going to school and 14.4% of the children had good performance in school as per the parents. (Table 1)

When history of consanguineous marriage was asked to parents it was found in 6.7% and history of congenital heart diseases in family was found in 2.9%. (Figure 1 & 2)

Table 1
Socio-demographic profile of children with CHD (N=103)

S. No.	Variables		Frequency (%)
1	**Age in years**	<3 3-6 6-9 9-12	65 (62.5) 27 (26) 5 (4.8) 6 (5.8)
2	**Sex**	Male Female	65 (62.5) 38 (36.5)
3	**Birth order**	1st child 2nd child 3rd child 4th child	41 (39.4) 46 (44.2) 11 (10.6) 5 (4.8)
4	**Performance (school) School going (N=25)**	Excellent Good Poor	8(7.7) 15(14.4) 1(1)

Figure 1

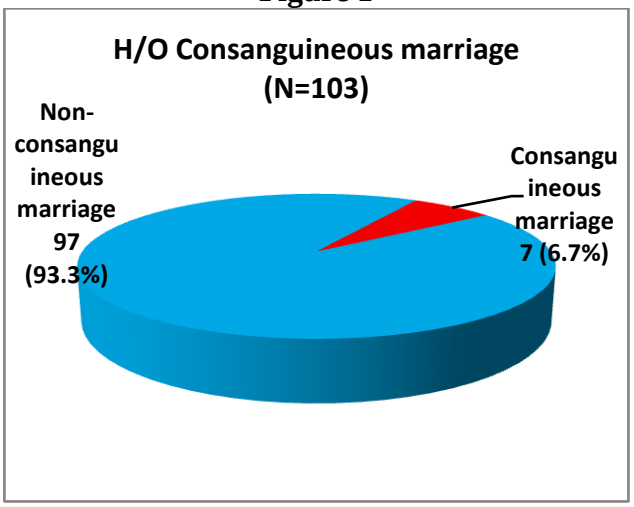


Figure 2

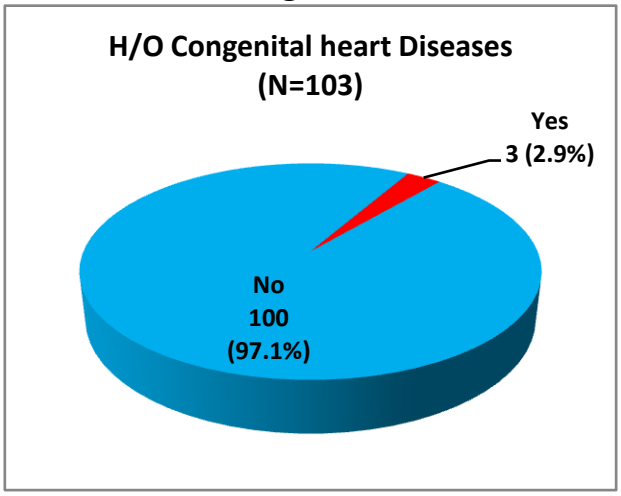


Figure 3

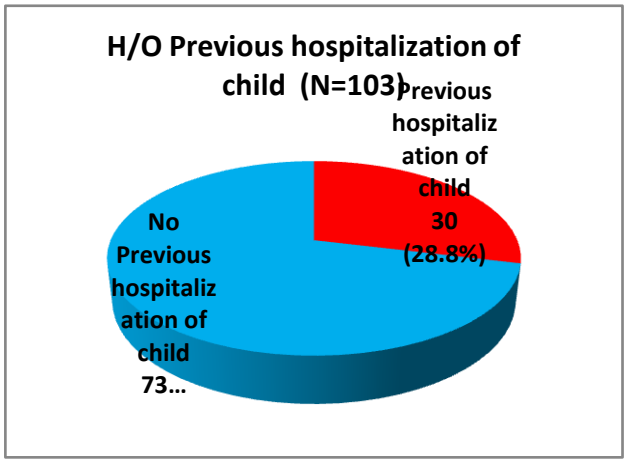
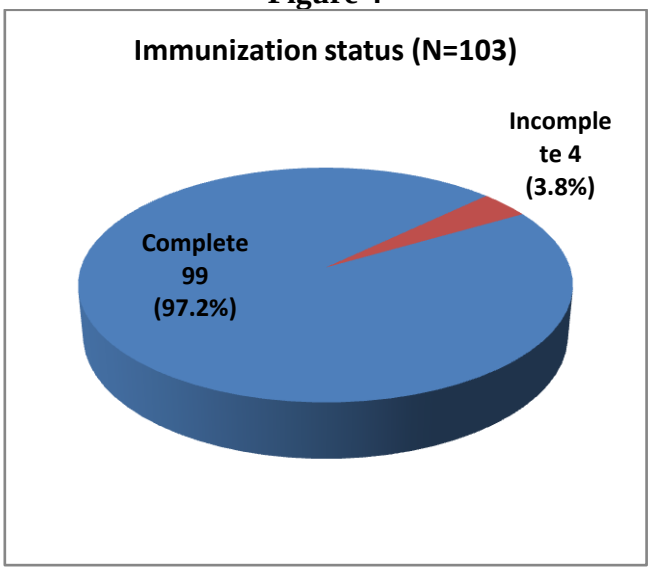


Figure 4



Birth weight of children ranges from 1.25 Kg to 3.7 Kg with the mean birth weight of 2.50 Kg with SD of 0.052 kg. Majority (43%) of children had birth weight between 2.1-2.5kg.

Regarding the CHD, 41.3% of children were found to have ventricular septal defect (VSD). Majority (70.2%) of children were found with acyanotic type of congenital heart diseases. Only 28.8% of children had previous history of hospitalization. 95.2% children had completed their immunization up to the age. Majority (87.5%) of children had left to right shunt as per Echocardiography. (Table 2)

Table 2
Clinical profile of children with CHD (N=103)

S. No.	Variables		Frequency (%)
1	**Birth weight(kg)**	1-1.5 1.6-2 2.1-2.5 2.6-3 3.1-3.5 3.6-4	7 (6.7) 16 (15.4) 45 (43.3) 24 (23.1) 10 (9.6) 1 (1)
2	**Medical Diagnosis**	PDA TOF VSD ASD ASD,VSD,TA,TOF	15(14.4) 16(15.4) 43(41.3) 17(16.3) 12(11.8)
3	**Type of CHD**	Cyanotic Acyanotic	30 (28.8) 73 (70.2)
4	**Echocardiography**	Left to right shunt Right to left shunt	91 (87.5) 12 (11.5)

Growth parameters as per WHO growth charts showed that 42.2% children were stunted as per Height for age and 53.8% children were severely underweight as per Weight for age. Regarding BMI (body mass index) 37.5% children were found severely wasted. The social developmental status of children showed that 55.8% children had below average intelligence. (Table 3)

Table 3
Growth parameters and social developmental status (N=103)

S. No.	Variables		Frequency (%)
1	**Height for age**	Normal Tall Stunted Severely stunted	50 (48.1) 6(5.8) 14(13.5) 33(31.7)
2	**Weight for age**	Normal Underweight Severely underweight	25(24) 21(20.2) 56(53.8)
3	**BMI for age**	Normal Obese Wasted Severely wasted Risk	35(33.7) 1(1) 20(19.2) 39(37.5) 8(7.7)
4	**Social developmental** (Vineland social maturity scale)	Above average Average Below average	16 (15.3) 28 (26.9) 58 (55.8)

In comparison analysis among the cyanotic and acyanotic with growth parameters the t-test showed there was no statistically significant difference in cyanotic and acyanotic with height, weight and BMI. (Table 4)

Table 4
Comparison of Type of CHD with growth parameter

S. No	Growth parameters	Cyanotic (N=30) Mean(SD)	Acyanotic (N=73) Mean(SD)	t, df (p value)
1	**Height(cm)**	82.78 (19.21)	83.0 (22.26)	0.037,63 (0.97)
2	**Weight (kg)**	10.19 (4.44)	9.95 (5.43)	0.169,63 (0.87)
3	**BMI(kg/m^2)**	13.04 (2.60)	13.97 (2.95)	1.195,63 (0.24)

In comparison analysis of type of CHD, socio-economic status and social development with growth parameters there was no statistically significant difference. (Table 5)

Table 5
Comparison of Type of CHD, socio-economic status and social development with growth parameters

S. No.	Growth parameters	Type of CHD t, df (p value)	Socio-economic status t, df (p value)	Social development t, df (p value)
1	**Height(cm)**	1.835,4 (0.13)	0.627,3 (0.59)	1.043,81 (0.48)
2	**Weight (kg)**	2.045,4 (0.09)	0.701,3 (0.55)	0.674,81 (0.89)
3	**BMI(kg/m^2)**	0.656,4 (0.62)	0.905,3 (0.442)	8.471,81 (0.62)

IV. DISCUSSION

In the Congenital heart diseases are the structural abnormalities which are present at birth. These defects affect the cardiac functions and result in growth and development delay. Delay in the growth and development of the children are due to clinical features like left to right shunt, heart failure and pulmonary hypertension.

The present study results showed that majority of children were (62.5%) males and (36.5%) were females and most of them came from the rural areas with (35.6%) belonged to lower socio-economic class. The study results were similar in comparison to previous studies.[7]This present study found that most of children suffering from ventricular septal defects which was also similar to present study which found that majority children suffered from ventricular septal defect.

The study conducted in the Dhaka[8] reported that majority of children (38%) were suffering from acyanotic congenital heart disease and 16% children from cyanotic. The present study also revealed the almost similar observations that majority of (70.2%) children had acyanotic type of congenital heart defects. This study conducted in Dhaka also showed that severe stunting was more common than wasting and there was delay in growth and development.[8] The present study found severe wasting was more common than severe stunting. The present study also found no significant difference in relation to weight for age and height for age WHO Z scoring whereas a similar study conducted in Cralova[9] compared the weight for age and height for age with the WHO Z scoring and identified a significant difference $p<0.01$) between average of height for age Z scores and weight for age z score between the children who were born prematurily.[9]

The study conducted in Iraq[10] reported that there was no association of socio-economic status with growth pattern. They also revealed no significant association of child's age with growth parameters. But the present study also found that there was no significant association of socio-economic status and children's age with growth pattern. The study reported a significant association between years of diagnosis with BMI (body mass index) of children similarly current study found no association of years of diagnosis with growth parameters. The study conducted in Iraq also revealed association of residential area with growth parameters whereas this, current study did not find any association of residential area with growth parameters.[10]

A study conducted in Chennai[11] to find out the levels of social development in children with congenital heart defects.[11]Theyreported that 72% were with average intelligence, 14% below average intelligence and2% were above average intelligence whereas the present study reported that 55.8% were below average intelligence, 26.9% were average and 15.3% were above average intelligence.

V. CONCLUSION

The present study concluded that most of children with congenital heart diseases were below three years of age, male, from rural areas, living in lower socio-economic class ,had ventricular septal defect. Some of children had growth retardation (i.e. severely stunted, severely underweight and severely wasted) and developmental delay (below average intelligence).It was also seen that there was no association of socio-demographic characteristics with their growth pattern. It is recommended to be aware of the risks, prevention and diagnosis of congenital heart diseases so that early and necessary intervention could be incorporated to improve the outcome of disease.

Limitations

The study was conducted on small sample size due to boundaries of short period of data collection. The possible risk factors like pulmonary hypertension, presence of congestive heart failure and parental height were not assessed. The study was limited to children suffering with congenital heart defects between age group (Birth-12yr)

Future directions

The future studies can be conducted to large scale to explore more factors influencing the growth and development and also in post- operative children with congenital heart defects. The similar studies can be conducted to provide educational programs for identifications of risk factors and prevention of congenital birth defects.

CONFLICT OF INTEREST

None declared till now.

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