

CONGENITAL HEART DISEASE IN CHILDREN WITH ACCIDENTALLY DISCOVERED MURMUR

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Abstract

Murmur is an auditory vibration resulting from turbulent blood flow within the cardiovascular system. Once a murmur is detected, a complete and systematic clinical assessment to identify the aetiology of the murmur should be done. Patients with non-critical congenital heart diseases may be completely asymptomatic or have murmur as their sole clinical manifestation. To determine the frequency of congenital heart diseases in patients who had murmur discovered accidentally and to find out any possible predicting factor for early diagnosis. A case-control study was conducted on 40 patients with murmur discovered accidentally during cardiac examination of the patients admitting the ER regardless their symptoms compared with another 40 patients (selected randomly) but had no murmur. The study was conducted at the Child's Central Teaching Hospital over a period of 5 months from the 1st of September, 2019 till the 7th of February, 2020. Neonates and patients known to have CHD were excluded from the study. It has been found that 32 (80%) patients who had murmurs discovered accidentally had congenital heart diseases and 8 patients (20%) had no congenital heart diseases (innocent murmur). Atrial septal defect was the commonest CHD discovered [13 out of the 32 patients (40.63%)], followed by Patent Foramen Ovale, Patent Ductus Arteriosus, Pulmonary valve Stenosis, and Mitral Regurgitation [15.6, 15.6, 6.3 and 3.1% respectively. the mean age of patients who had murmur was 6.7 months \pm 12.21 months (SD), While the mean age of patients in whom no murmur was detected was a bit higher [11.8 months \pm 26.88 (SD). The females with CHD were more than males, with male to female ratio of 1:1.3 vs. 1.66:1. But neither the difference in mean age nor gender difference was statistically significant. There was significant association between the family history of congenital heart diseases and the presence of congenital heart diseases, highest percentage of CHD was found in patients who had positive family history [7 out of 9 patients (77.8%) compared with 25 out of 63 (38%)] (P= 0.03144). Other clinical presentation, weight, mother age, medical illness, the residency had no significant correlation with the presence of CHD. Accidental discovery of murmur may indicate the presence of CHD especially in ages less than 6 months, females and presence of positive family history of CHD.

Keywords: murmur, congenital heart disease.

BACKGROUND

The Heart murmur is the most common reason for referral to the paediatric cardiologist. ⁽¹⁾ It is an auditory vibration which is resulting from turbulent blood flow within the cardiovascular system with varying intensity, frequency, quality, configuration, location, and duration. Once a murmur is detected, a complete and systematic clinical assessment to identify the aetiology of the murmur should be done. ⁽²⁾ Patients with non-critical congenital heart diseases may be completely

asymptomatic or have murmur as their sole clinical manifestation. There are 3 main types of murmur; systolic, diastolic, and innocent murmur. ⁽³⁾

Systolic ejection murmurs are caused by the outflow obstruction, start a short time after a well-heard 1st heart sound, increase in intensity, peak, and then decrease in intensity; they are usually end before the 2nd heart sound. ⁽⁴⁾ They are classified according to their timing and duration into two categories; the mid-systolic ejection, and pansystolic (holosystolic) category. Systolic ejection murmurs can be heard in patients with aortic stenosis, pulmonic stenosis, and hypertrophic cardiomyopathy as obstruction to outflow occurs. Pansystolic murmurs result from retrograde flow from a high-pressure chamber to a low-pressure chamber. Common conditions that associated with pansystolic murmurs include ventricular septal defect, mitral insufficiency, and tricuspid insufficiency. ⁽⁵⁾

Diastolic murmurs are usually pathological and it has two types: Early (decrecendo) murmur which occurs due to aortic or pulmonary regurgitation, and mid-diastolic murmur which occurs due to increased blood flow or stenosis of the mitral or tricuspid valve. ⁽⁶⁾

Innocent murmur: By definition an innocent murmur is not associated with heart disease; however, it is an extremely common finding, reason for referral and some clarification is needed. ⁽⁷⁾ Most murmurs found in infants and children originate through normal flow patterns with no structural or anatomic abnormalities of the heart or vessels and are referred to as innocent or physiological. ⁽⁸⁾

AIM OF STUDY

To determine the frequency of congenital heart diseases in patients who had murmur discovered accidentally and to find out any possible predicting factors for early diagnosis of these diseases.

PATIENTS AND METHOD

A single center, case control study was conducted on Children who were admitted to the emergency department at Child's Central Teaching Hospital in Baghdad during a period of five months, from the 1st of September, 2019 till the 7th of February, 2020. Heart examination was done for most of the patients who were attending the emergency department regardless of their complaints that bring them to the hospital and excluding the patients who were known cases of CHD and the neonates. From those patients who were discovered to have a murmur, a Careful history and detailed examination was taken.

History includes age, gender, residency, symptoms that bring the patient to the ER and if they had a previous admission, age of the mother at that time when she delivered the baby, any medical illness during pregnancy, mode of delivery, and consanguinity. Clinical examination includes concentration on the heart for the presence of murmur, and measurement of weight and plotting it on weight for age centiles. Echocardiography studies were performed using ECHO device Philips CX50 Ultrasound Machine (Philips Healthcare, USA, and Model 2012) with the S5-1 transducer. All cases examined in supine and left lateral recumbent position and the examination was done by pediatric cardiologist at the Child's Central Teaching Hospital.

In order to find out possible predicting factors for the early diagnosis of these patients with CHD,

another group of patients (control group) were randomly selected from those who were attending the ER for any reason (but not having CHD) and no murmur, their number was equal to the number of murmur cases discovered at the same setting. For those control group, a similar interrogation regarding history & clinical examination was done.

The data analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean, standard deviation and ranges. Categorical data presented by frequencies and percentages. Independent t-test (two tailed) was used to compare the continuous variables accordingly. Chi square test was used to assess the association between categorical variable and certain information. A level of P – value less than 0.05 was considered significant.

RESULTS

Forty patients were found to have murmur. All of the cases group had a systolic type of murmur, another 40 patients with no murmur were selected and information were taken from them as a control group. In this study it has been found that 32 cases (80%) out of the 40 murmurs patient had CHD by ECHO examination and 8 cases (20%) considered (innocent) as no CHD has been found. The distribution of studied patients in murmur group by Echo findings is shown in table (1).

Table (1): The Distribution of patients with CHD in murmur group by Echo finding

Type of CHD	No. of patients	Percentage
ASD	13	40.625
PFO	5	15.625
PDA	5	15.625
PS	2	6.25
MR	1	3.125
ASD/ PFO	1	3.125
ASD II /MR/VSD	1	3.125
LVH /RVH /Small ASD	1	3.125
VSD/ ASD	1	3.125
DTGA/ PFO /VSD	1	3.125
PDA/ PS /DTGA	1	3.125
TOTAL	32	100%

The age of patients in whom murmur were detected was ranging from one month to 15 years with a mean of 6.7 months and standard deviation (SD) of ± 12.21 months. The highest proportion of patients in case groups was aged < 6 months (82.5%). There was no significant difference in age between those who got CHD and normal heart, as well as with control group. table (2,3).

Table (2): Age distribution of case group in correlation with ECHO findings.

Age (Month)	Echo Finding		Total (%) n= 40	P - Value
	CHD (%) n= 32	Normal (%) n= 8		
< 6	26 (81.2)	7 (87.5)	33 (82.5)	0.656
6 - 12	3 (9.4)	0 (0)	3 (7.5)	
> 12	3 (9.4)	1 (12.5)	4 (10.0)	

Table (3): Age distribution of cases with CHD and control group.

Age (Month)	Study Group		Total (%) n= 72	P- Value
	CHD (%) n= 32	Control (%) n= 40		
< 6	26 (81.2)	27 (67.5)	53 (73.6)	0.416528
6 - 12	3 (9.4)	6 (15)	9 (12.5)	
> 12	3 (9.4)	7 (17.5)	10 (13.9)	

Regarding gender, proportion of females was higher than males in cases with CHD as compared with no CHD group (85.7 vs. 73.7%), [the male to female ratio is 1:1.3 vs. 1.66:1]. This increased proportion was also seen when comparing the cases with CHD and control group (54.54 vs. 35.9% with a male to female ratio of 1:1.3, 1.6:1 respectively). But both of them found to be statically not significant as shown in table (4) and (5).

Table (4): Gender distribution of case group in correlation with ECHO findings.

Gender	Echo Finding		Total (%) n= 40	P - Value
	CHD (%) n= 32	Normal (%) n= 8		
Male	14 (73.7)	5 (26.3)	19 (47.5)	0.342
Female	18 (85.7)	3 (14.3)	21 (52.5)	

Table (5): Gender distribution of cases with CHD and control group.

Gender	Study Group		Total (%) n= 72	P- Value
	CHD (%) n= 32	Control (%) n= 40		
Male	14 (35.9)	25 (64.1)	39 (54.1)	0.11259
Female	18 (54.54)	15 (45.45)	33 (45.8)	

The clinical information of murmur group with/without CHD also was studied as well as with control group; they were shown in table (6).

Table (6): The association between clinical information between murmur groups and the CHD group with the control group

	Echo		Total (%) n= 40	P- Value	CHD and control		Total (%) CHD and control n= 72	P- Value
	CHD (%) n= 32	Normal (%) n= 8			CHD (%) n= 32	Control (%) n= 40		
Presentation								
SOB	17 (53.1)	7 (87.5)	24 (60)	0.318	17 (53.1)	30 (75)	47(65.3)	0.343
GE	7 (9.7)	0 (0.0)	7 (17.5)		7(21.9)	8(20)	15(20.8)	
Fit	4 (12.5)	0 (0.0)	4 (10.0)		4(12.5)	0(0.0)	4(5.6)	
Lethargy	2 (6.3)	0 (0.0)	2 (5.0)		2(6.3)	0(0.0)	2(2.8)	
Fever	1 (3.1)	1(12.5)	2 (5.0)		1(3.1)	1(2.5)	2(2.8)	
UTI	1 (3.1)	0 (0.0)	1 (2.5)		1(3.1)	1(2.5)	2(2.8)	
	(100)	(100)	(100)		(100)	(100)	(100)	
Weight centile								

Above 3 rd	28 (87.5)	5 (62.5)	33 (82.5)	0.096	28 (87.5)	26 (65)	54 (75)	0.055
Below 3 rd	4 (12.5)	3 (37.5)	7 (17.5)		4 (12.5)	14 (35)	28 (25)	
	(100)	(100)	(100)		(100)	(100)	(100)	
Medical Illness During Pregnancy								
Positive	7 (21.8)	2 (25)	9 (22.5)	0.85	7 (21.8)	8(20)	15(20.8)	0.845
Negative	25 (78.2)	6 (75)	31(77.5)		25 (78.2)	32(80)	57(79.2)	
	(100)	(100)	(100)		(100)	(100)	(100)	
Mode of Delivery								
NVD	19 (59.4)	2 (25)	21(52.5)	0.082	19 (59.4)	27(67.5)	46 (63.9)	0.475
CS	13 (40.6)	6 (75)	19(47.5)		13 (40.6)	13(32.5)	26 (36.1)	
	(100)	(100)	(100)		(100)	(100)	(100)	
Previous Admission								
Positive	9 (28.1)	3 (37.5)	12 (30.0)	0.605	9 (28.1)	12(30)	21 (29.1)	0.861
Negative	23 (71.9)	5 (62.5)	28(70.0)		23 (71.9)	28(70)	51 (70.9)	
	(100)	(100)	(100)		(100)	(100)	(100)	

The associations between Echo finding and general characteristics in murmur groups was shown on table (7) which also shows the comparison between patients with CHD and control group regarding the same characteristics. It has been found that the highest percentage of CHD was found in patients who had positive family history (77.8%) with a significant association (P= 0.03144).

Table (7): Association between Echo finding and general characteristics in murmur group and those with CHD with control group

	Echo Finding		Total (%) n= 40	P- Value	CHD (%) n= 32	Control (%) n= 40	Total (%) CHD and control n= 72	P- Value
	CHD (%) n= 32	Normal (%) n= 8						
Mother age (Year)								
< 20	6 (85.7)	1 (14.3)	7 (17.5)	0.714	6 (40)	9 (60)	15 (20.8)	0.735
20 - 30	19 (76.0)	6 (24.0)	25 (62.5)		19(43.18)	25 (56.8)	44 (61.1)	
> 30	7 (87.5)	1 (12.5)	8 (20.0)		7 (61.9)	6 (39.1)	13 (18.1)	
Family History								
Positive	7 (77.8)	2 (22.2)	9 (22.5)	0.85	7 (77.8)	2 (22.2)	9 (12.5)	0.03144
Negative	25 (80.6)	6 (19.4)	31 (77.5)		25 (39.7)	38 (60.3)	63 (87.5)	
Residence								
Rural	10 (71.4)	4 (28.6)	14 (35.0)	0.32	10 (71.4)	8 (36.4)	18 (27.5)	0.273
Urban	22 (84.6)	4 (15.4)	26 (65.0)		22 (84.6)	32 (55.2)	54 (72.5)	
Consanguinity								
Positive	16 (69.6)	7 (30.4)	23 (57.5)	0.055	16 (69.6)	22 (48.9)	38 (52.8)	0.6728
Negative	16 (94.1)	1 (5.9)	17 (42.5)		16 (94.1)	18 (51.4)	34 (47.2)	

DISCUSSION

In this study 80% of cases with murmur had a CHD and the remaining 20% had innocent murmur, which is approximately similar to Ainsworth SB et al ⁽⁹⁾ who found that if a murmur is heard, there is a 54% chance of there being an underlying cardiac malformation, but they include neonates in their study; but differs from Edin Begic, Zigo Begic et al ⁽¹⁰⁾ in which patients who discovered to have systolic murmurs accidentally, most of them had innocent murmur, because most of them were in age group from 3 to 10 years.

An extended neonatal murmur research done by Ainsworth SB et al ⁽⁹⁾ showed that there are 32 cases of CHD over the first year of life for patient who had no discovered murmur on the neonatal period. Still the commonest CHD found was VSD. Actually it's difficult to find the cause of this difference since both studies have the same primary aim which was searching for murmur, but in Ainsworth et al ⁽⁹⁾ study nothing had been mentioned if their patient were symptomatic or not. This difference is related to the age of our studied group, since they were selected samples (patient who were admitted to the ER for a disease) not the general population, their ages were mostly below one year. So the screening actually was done for those aged less than one-year old and not represented all age groups.

In this study the commonest type of congenital heart disease was atrial septal defect which is similar to result found by Fatema et al ⁽¹¹⁾ and this study was a screening of CHD among live birth in Bangladesh hospital and it was done by examination of all newborns with suspected CHD unlike our study which exclude the neonatal age group, and the ASD was the commonest finding since ASD is a common finding in newborns, most of which closes spontaneously by 2 years of age, but differs from L Shamima et al ⁽¹²⁾ who found that VSD was the commonest CHD.

The patients' age was almost similar in cases and control group (below one year), this explained on the fact that it was a selected sample in a period of respiratory season where younger patient need admission while older age group usually didn't. Yasmeen et al ⁽¹³⁾ also found same age group, the reason was their patients were symptomatic and most symptomatic CHD presented in the first year of life.

Regarding the gender, most of the CHD were found in females (male to female ratio 1:1.3) although its statistically not significant, the females were more with CHD rather than control group and even innocent murmur that is because the commonest CHD discovered was ASD which is more common in female, a result also mentioned by L Shamima et al ⁽¹²⁾ who stated that females were more frequently noted in ASD, PDA, and COA. But it is different from Yasmeen Memon et al ⁽¹³⁾ who showed that males were more than female in CHD and the VSD was the commonest type discovered.

Regarding weight, this study shows no significant difference between the cases and control, while F. Chowdhury et al ⁽¹⁴⁾ found a decrease in the weight of patients whether having cyanotic or acyanotic CHD. This reduction in weight is multifactorial and could be related to the increment in the metabolic rate because those patient were in heart failure in addition to the poor oral intake and other causes, so the cause of this difference is that their patients were symptomatic and their mean age were 28 months which is higher than the mean of this study.

For the medical illness during pregnancy, there is no significant relation with the CHD in murmur group, unlike Kathy J. Jenkins et al ⁽¹⁵⁾ who shows that there was significant association between maternal pre-gestational and, less consistently, with gestational diabetes and the presence of CHD. This might be because of small sample size in our study.

We put in our consideration the age of the mothers thinking that a young mothers had poor experience in the caring of the child. Most of the patients' mother age was between the 20 and 30 years and had no significant difference between the cases and control groups, and that because the age group of fertility is between 20 and 30 yrs, like Kate E best and Judith Rankin⁽¹⁶⁾ who showed no effect of the mother age when chromosomal and extra cardiac anomalies were excluded, but the same study showed that the frequency of infants with CHD increased in mothers aged less than 20 yrs. when they had extra cardiac anomalies, also with advanced maternal age when their infants had a chromosomal anomalies.

Regarding the family history, there is significant relation between the CHD and the presence of family history of CHD which is similar to results found by Taksande AM, Vilhekar K et al ⁽¹⁷⁾ and this is because the CHD had increased its rate of occurrence in the next generation by having a child with CHD confers a 2% risk in a subsequent pregnancy. While the mothers who had a CHD has 6% risk of having an affected offspring while an affected father has a 2% risk. ⁽¹⁸⁾

Regarding the residency, mode of delivery, previous admission, and consanguinity, there was no significant difference between the cases and control groups which indicate that those types of CHD which were asymptomatic that nothing in their past history attract attention for their occurrence.

CONCLUSIONS

1. The frequency of CHD in accidentally discovered murmur was 80% in infant aged less than 1 yr.
2. ASD was the commonest type of asymptomatic CHD discovered in this study.
3. The CHD in accidentally discovered murmur was more in females than males.
4. The presence of family history was significant predicting factor for those who had murmur discovered accidentally and they had CHD, and it seems to be there is no significant relation with the clinical presentation, effect on the weight, and no correlation with the age of the mother, the mode of delivery, medical illness during pregnancy, and previous admission to the hospital.

LIMITATIONS OF THE STUDY

1. Small study sample may not reflect the actual population.
2. The heart examination was done by one pediatrician, which may reflect subjective errors about the nature of the examination required to detect the presence of murmur.
3. Single center study.

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