

## Referral Patterns to a Pediatric Tertiary Cardiac Unit

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**Background:** New referrals to tertiary cardiac centers have and continue to increase despite the static prevalence of congenital heart disease.

**Objective:** To evaluate the referral patterns to a pediatric tertiary cardiac unit.

**Setting:** Cardiac Center, Bahrain Defense Force Hospital, Bahrain.

**Design:** A Retrospective Study.

**Method:** Two thousand three hundred eight patients were referred to a specialist pediatric cardiology unit over a ten-year period. Six-hundred seventy-five were excluded as they had known or previously diagnosed cardiac disease; therefore, the study sample is 1,633.

**Result:** One thousand six-hundred thirty-three patients were reviewed; the mean age was 3 years. The main reasons for referral were cardiac murmurs, chest pains, palpitations or syncope attacks. Six hundred and eighty-seven (42%) murmurs were innocent. One hundred fifty-four (9.4%) murmurs were pathological, only 33 (2%) required intervention. One hundred and twenty-five (7.6%) of children referred with chest pain; 121 had non-cardiac chest pains and 4 were of cardiac origin. Palpitations were seldom significant. No child with syncope was of cardiac origin.

**Conclusion:** One thousand five hundred fifty-one (95%) referrals had normal hearts. Heart murmurs are seldom pathological and rarely require any intervention. Chest pains, palpitations and syncope attacks in children without previously diagnosed heart disease are rarely of cardiac origin. Continued education and training of primary care physicians improve the skills in the clinical assessment and limit unnecessary referrals. Programs in performing basic echocardiogram could be initiated and monitored within a supported network.

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Congenital Birth Defects (CBD) are the leading causes of infant mortality in developed countries. Congenital Heart Defects (CHD) form the major proportion of the CBD. It is estimated that they contribute almost one-half of the deaths due to CBD, both as isolated lesions and as part of other multiple CBD<sup>1</sup>. This prevalence of CHD however, remains static despite modern techniques and technology to improve the evaluation of these cases<sup>2</sup>.

New referrals to tertiary cardiac centers had and continued to increase dramatically despite the static prevalence of CHD<sup>3</sup>. Reports reveal that between 25% to 100% of referrals have normal hearts<sup>3,4,5</sup>. The continued increase in referrals is due to numerous factors, which include primary care physician's reluctance to diagnose normality without echocardiography and parental demands of echocardiography to confirm normality. This results in extensive usage of societal and personal resources. The cost involved to society is immense and continue to rise.

No study was performed on the referral patterns to a tertiary pediatric cardiac unit in the Kingdom of Bahrain.

The aim of this study was to evaluate the referral patterns to a pediatric tertiary cardiac unit.

### METHOD

Patients referred to a specialist pediatric cardiology unit from May 2002 to April 2012 were reviewed, and all relevant information was analyzed.

Two thousand three-hundred eight patients were referred. Six-hundred seventy-five (29%) of the referred patients were excluded from the study because they had known or previously diagnosed cardiac disease and were referred for either further intervention (surgery or catheterization) or medical management. A total of 1,633 patients were reviewed.

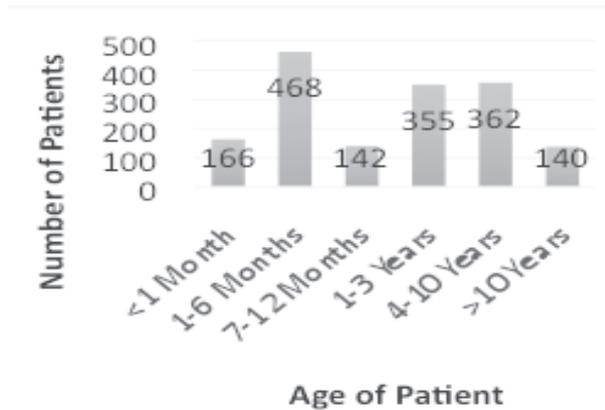
The paired t-test was performed to compare grouped data using IBM SPSS Statistics 19.

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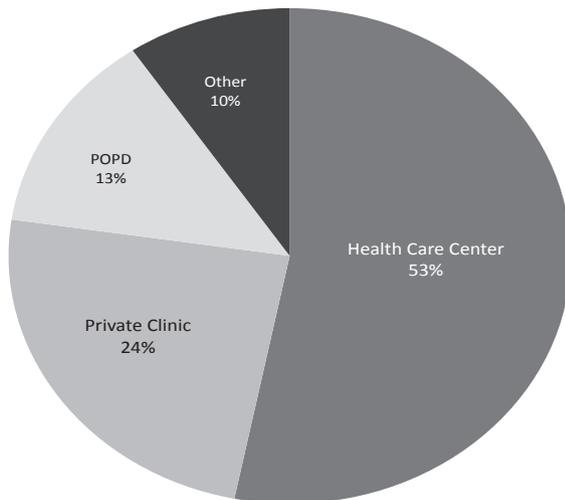
**RESULT**

One thousand six-hundred thirty-three patients were reviewed. Eight hundred ninety-eight (55%) were males; the mean age was three years, see figure 1. One thousand twelve (62%) were Bahrainis, and 621 (38%) were non-Bahrainis.



**Figure 1: Age at Referral (Total = 1,633)**

Eight hundred sixty-eight (53%) patients were referred from Local Health Centers or General Practitioner Clinics (LHC/GP), 395 (24.2%) from private specialist clinics, 216 (13.2%) from pediatric outpatient department (POPD) and 154 (9%) from other centers, see figures 2 and 3.



Health Care Center	868
Private Clinic	395
POPD	216
Other	154
<b>Total</b>	<b>1633</b>

**Figure 2: Referral Areas (Total = 1,633)**

The four most common reasons for referral were cardiac murmur, chest pains, palpitations or syncope attacks, see table 1.

**Table 1: Reasons for Referral (N 1633)**

Reason for Referral	HC/GP		Private Clinic		POPD		Other		Total
	Total	Normal	Total	Normal	Total	Normal	Total	Normal	
Murmur	667	561 (84%)	136	93 (68%)	9	8 (89%)	25	21 (84%)	837
Atypical Chest Pain	83	80 (96%)	17	17 (100%)	8	8 (100%)	21	16 (94%)	125
Palpitations	23	20 (87%)	11	10 (91%)	10	9 (90%)	6	6 (100%)	50
Syncope	9	9 (100%)	3	3 (100%)	-	-	-	-	12
<b>Total</b>	<b>782</b>	<b>670 (86%)</b>	<b>167</b>	<b>123 (74%)</b>	<b>27</b>	<b>25 (93%)</b>	<b>48</b>	<b>43 (90%)</b>	<b>1024</b>

**HC:** Health Center **GP:** General Practitioner clinic  
**POPD:** Pediatric Outpatient Department

Eight hundred thirty-seven (51.2%) patients referred with heart murmurs; 683 (41.8%) were innocent, more from LHC/GP clinics, POPD and other centers than those referred by the private specialist clinics (P value <0.05). Hundred fifty-four (9.4%) were confirmed as pathological. Thirty-three (2%) patients with heart murmurs required any intervention or treatment; Atrial Septal Defects (ASD) was the most prevalent, see table 2.

**Table 2: Pathological Heart Murmurs Requiring Intervention**

Intervention	Pathology	Total	
<b>Surgery</b>	BAV	1	
	DORV	1	
	DTGA	1	
	AS	1	
	ASD	8	
	AV Block	1	
	AVSD	2	
	Coarctation	1	
	Other	1	
	PDA	3	
	Sub AS	1	
	VSD	2	
	<b>Catheterization</b>	PS	1
		AS	1
ASD		4	
PDA		3	
Pulmonary Hypertension		1	

**BAV:** Bicuspid Aortic Valve  
**DORV:** Double Outlet Right Ventricle  
**ASD:** Atrial Septal Defect  
**AS:** Aortic Stenosis  
**PDA:** Patent Ductus Arteriosus  
**AV Block:** Atrio Ventricular Block  
**Sub AS:** Sub Aortic Stenosis  
**VSD:** Ventricular Septal Defect  
**AVSD:** Atrio Ventricular Septal Defect  
**DTGA:** Dextro Transposition of the Great Arteries

The second reason for referral was chest pains, see table 1. One hundred twenty-five (7.7%) children were referred; 121 (7.4%) were non-cardiac in origin. Four had cardiac origin, 2 (0.1%) had bicuspid aortic valves without significant aortic stenosis, one (0.06%) had mild mitral valve prolapse, and 1 (0.06%) had innocent premature ventricular contractions (PVCs).

Fifty (3%) children were referred with palpitations, 45 (2.8%) were classified as normal after investigation, see table 1. Three (0.2%) had minor rhythm disturbances (premature atrial/ventricular contractions (PACs/PVCs)). One (0.06%) had systemic hypertension that required further investigation and treatment and 1 (0.06%) was diagnosed with a sinus venosus type of ASD that required surgical closure and correction.

Twelve (0.7%) children were referred with syncope attacks, see table 1. None was classified as being of cardiac origin with vasovagal attacks being the most common cause.

Other reasons for referral included suspected abnormal rhythm detected on clinical examination or ECG, screening for family history with CHD or other genetic anomalies.

## DISCUSSION

Demands on pediatric cardiology unit continue to increase with reports of >50% increase in the workloads every five years<sup>4</sup>. This increase has a significant impact on clinical care, teaching and research activities. No study has been performed in The Kingdom of Bahrain on the referral patterns to a tertiary cardiac unit.

This study is comparable with other studies in developed and developing countries, which showed between 25% to 100% of referrals have normal hearts, which is similar to other studies<sup>3-6</sup>. The majority of children referred from primary health care providers were asymptomatic with normal hearts as confirmed by echocardiography<sup>3,4</sup>. The small geographic size of The Kingdom of Bahrain makes it easy and rapid access to a tertiary cardiac unit.

This study is the first being performed in The Kingdom of Bahrain, which confirms that 95% of children referred from health centers and general practitioners had normal hearts. Only 33 (2%) required intervention out of 154 (9.4%) found to have pathological lesions. This is approximately the same findings as published elsewhere<sup>6</sup>.

## CONCLUSION

**Most of the referrals are from primary care physicians and most of these referrals have normal hearts. Heart murmurs are the main reason for a referral from these centers, and are seldom pathological and rarely require any form of intervention. Chest pains, palpitations and syncope attacks in children without previously diagnosed heart disease are also rarely from cardiac origin.**

**Continued education and training of primary care physicians to improve the skills in children with heart murmurs, chest pains, palpitations and syncope attacks is needed to limit the continued escalation in unnecessary referrals.**

**Programs in performing basic echocardiogram combined with the clinical assessment detailed above by the primary care physicians could then be initiated and monitored within a supported network.**

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