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ORIGINAL ARTICLE

Prevalence and clinical significance of heart murmurs detected in routine neonatal examination

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Abstract *Objective:* To determine the prevalence and clinical impact of murmurs detected during routine physical examination in neonates.

Methods: In a 4 years retrospective study, 6333 healthy newborn babies were screened for the presence of a heart murmur during routine neonatal physical examination. Prematures or those who were admitted to neonatal intensive care unit or any neonate with a risk factor that is known to be associated with increased incidence of congenital heart disease were excluded from the study. All those with murmurs underwent echocardiography examination and color Doppler study.

Results: Murmurs were detected in 87 neonate (1.37%) of whom 37 (42.5%) had a structural cardiac malformation. Ventricular septal defect (62%) was the most common diagnosis, followed by atrial septal defect, pulmonary stenosis and patent ductus arteriosus.

Conclusion: The prevalence of heart murmur was 13.7 per 1000 neonate. If a murmur is heard there is a (42.5%) chance of their being underlying structural defects. Therefore, detection of a murmur should prompt early referral for investigation and diagnosis or appropriate family reassurance.

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1. Introduction

Heart murmurs are the most common reason for referral to the pediatric cardiologist. In children, approximately 50–70% of these murmurs are clinically insignificant (Newburger et al., 1983; Rajakumar et al., 1999). The reported prevalence of heart murmurs in neonates varies from 0.6% to 77.4%. Most of this reports come from early studies, predating echocardiography and interventional cardiology which has improved the accuracy of diagnosis of congenital heart disease (Richard et al., 1955; Benson et al., 1961; Ainsworth et al., 1999). About half of these murmurs in the neonates are due to an underlying cardiovascular malformation (Wren et al., 1999). The incidence of congenital heart disease (CHD) varies from about 4/1000 to 50/1000 live births (Hoffman and Kaplan, 2002). This wide

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variation is primarily due to variations in the ability to detect trivial lesions, notably small muscular ventricular septal defects (VSD) that usually close in infancy (Roguin et al., 1995).

This retrospective study is conducted to determine the prevalence and significance of murmur detected during routine neonatal examination.

2. Patients and methods

All neonates born in King Fahd Hospital of the University at Al-Khobar, Eastern Province of Saudi Arabia between January 2005 and December 2008 were screened for the presence of cardiac murmur. The clinical examination was carried out by pediatric residents within 24 h of delivery. Pediatric residents had received standard training in neonatal examination as a part of their residency training program. All those who were admitted in Nursery Intensive Care Unit (NICU) or prematures (<37 weeks of gestational age), or any neonate with a risk factor that is known to be associated with increased incidence of congenital heart disease were excluded from analysis as their examination was not routine. All those with murmurs underwent echocardiography examination which permitted accurate anatomical diagnosis.

3. Results

During the study period, 7386 were live born at the hospital. Of these 1053 were admitted in neonatal intensive care unit (Fig. 1). Total of 6333 healthy newborn babies were screened for the presence of a murmur during routine neonatal examination.

Murmurs were detected in (87) babies (1.37%). Echocardiography and Doppler study confirmed a cardiac malformation in 37 (42.5%), 24 had an insignificant structural heart lesion, i.e., physiological variant that would account for a murmur such as (patent foramen ovale, small patent ductus arteriosus, mild peripheral pulmonary stenosis) and 20 had structurally normal hearts. Ventricular septal defect was diagnosed in 23 babies, atrial septal defect in 5, patent ductus arteriosus in 3,

Table 1 Type of congenital heart disease.

Lesion	Number
Ventricular septal defect	23
Atrial septal defect	5
Patent ductus arteriosus	3
Pulmonary stenosis	3
Pulmonary atresia	1
Aortic stenosis	1
Hypertrophic cardiomyopathy	1
Totals	37

pulmonary stenosis in 3, and pulmonary atresia, aortic stenosis, hypertrophic cardiomyopathy one each (Table 1).

4. Discussion

Detection of a cardiac murmur on physical examination may be a clue to the presence of an underlying heart disease particularly in asymptomatic children. Auscultation is, therefore, an integral part of a standard neonatal physical examination (Hall, 1996).

The prevalence of murmur was 13.7 per 1000 of normal neonates during the period of study. The reported prevalence of heart murmur in neonate varies from 6/1000 to 770/1000. This variations may be due to the examiner's skills and experience, the timing and frequency of examination, the conditions under which examination takes place and the size of population studied (Ainsworth et al., 1999).

In this study 42.5% of babies with heart murmur had structural cardiac malformation. Most importantly, 5.4% of neonates required early cardiac intervention before they became symptomatic. This fact shows the importance of early detection and, therefore, early referral for a comprehensive cardiology assessment (Silove, 1994).

The birth prevalence (total live birth) of congenital heart disease diagnosed in neonates in this study was 13.2 per 1000

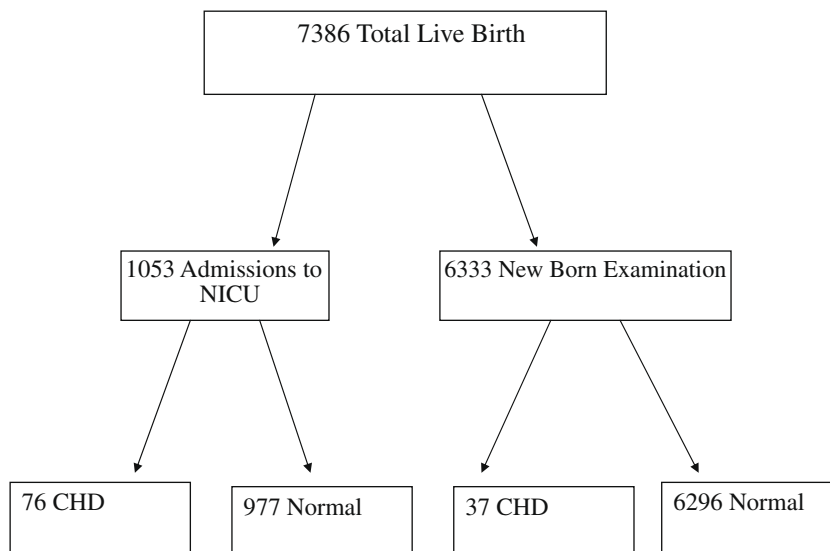


Figure 1 Flow diagram showing total live birth and number of congenital heart disease.

life births. Although similar to several recent studies (Bansal and Jain, 2005; Rivera et al., 2007), this figure is higher than in most early studies (Mitchell et al., 1971; Ferecz et al., 1985). This may be explained by the high prevalence of small muscular ventricular septal defects detected by easy available echocardiogram.

Ventricular septal defect was diagnosed in 23 babies (62%). Most of these defects were small and in the muscular portion of the interventricular septum. Several studies using echo-Doppler cardiogram has shown a high prevalence of muscular ventricular septal defects in neonates (Roguin et al., 1995; Hiraishi et al., 1992; Wren et al., 2000). Most of these patients are asymptomatic and majority of these defects were small and close spontaneously.

In conclusion, this study has shown that a prevalence of murmurs of 13.7 per 1000 babies undergoing routine neonatal examination. Forty-three per cent of murmurs were due to underlying cardiac malformation.

About 5% of these malformation were serious enough that required early cardiac intervention. Babies with murmurs should be referred for early cardiology evaluation which will result either in a definitive diagnosis of congenital heart disease or in authoritative reassurance of normal cardiac anatomy and function.

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