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The Association between Heart Murmurs and Pre-Existing Heart Diseases amongst Children in the United Arab Emirates between January 2019 and May 2019: A Case-Control Study

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Abstract

Objective: To determine whether heart diseases are a risk factor for the development of heart murmurs in a tertiary care hospital in Dubai emirate, United Arab Emirates.

Methods: A case control study. Data from 183 age and gender matching pairs of cases and control attending at a cardiology clinic in Dubai between January 2019 and May 2019 were analyzed. Cases were children with presenting heart murmurs, and controls were those with no heart murmurs. Sociodemographic variables obtained were age, gender and nationality. Major risk factor assessed was the previous diagnosis of heart diseases, and the outcome variable was the presenting diagnosis of heart murmurs.

Results: Overall, 26.4% of all cases with heart murmurs have a previous diagnosis of a heart disease and are of an Emirati origin (all p's ≤ 0.05). Children with previously diagnosed heart diseases are 9 times at a higher risk of developing heart murmurs (Odds ratio, 9.42 [95% Confidence interval, 5.22 to 17.02]). Interestingly, being of an Emirati origin increases the risk of having heart murmurs (Odds ratio, 1.87 [95% Confidence interval, 1.10 to 3.16]).

Conclusion: The finding that a large proportion of children cases with heart murmurs is explained by a pervious heart diseases and being of an Emirati origin. These findings may improve the quality of care to children with heart murmurs in the United Arab Emirates.

Keywords: *Heart Murmurs; Heart Diseases; Children; United Arab Emirates*

Introduction

Heart diseases are disorders of the heart and blood vessels and include coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions [1]. And heart murmur is a blowing, whooshing, or rasping sound heard during a heartbeat [2]. Heart murmurs are common in asymptomatic, otherwise healthy children [3].

Heart murmurs in children are usually discovered during clinical visits by pediatricians through auscultation, and the child is then referred to a pediatric cardiologist for further examinations. Globally, most of the cases referred are of innocent murmurs. The prevalence of such innocent murmurs during routine random auscultation is estimated at 30% [4]. However, congenital heart disease may also occur in the presence or absence of a heart murmur. The incidence of congenital heart diseases varies between four and 50 per 1,000 live births [3]. It is extremely important to identify the origin of the murmur, whether it is innocent or resulting from a heart disease, to improve the quality of life of the patient. As the paediatrician is usually the first physician to see a child with heart murmur, thus he should be able to distinguish between innocent and pathologic heart murmurs [5].

We are unaware of any studies in the United Arab Emirates that report the risk of developing heart murmurs in children with heart diseases and this lack of knowledge illustrates a need for research. Therefore, this study was conducted to fill the literature gaps and provide results from the United Arab Emirates.

Objective of the Study

The main objective of this study is to determine whether heart diaseases are a risk factor of heart murmurs at a tertiary care hospital in the United Arab Emirates.

Methods

Study design

This study is reported according to the STROBE guidelines [6]. It is a case-control study, which was performed to evaluate the risk of developing heart diseases in children attending a cardiology clinic between January 2019 and May 2019.

Study setting

Data were collected from the cardiology clinic of a tertiary care hospital located in Dubai emirate, United Arab Emirates. Data was extracted from the electronic medical record of the hospital. The extraction took place between 3 April 2019 and 4 September 2019.

Participants

Cases of children with heart murmurs, who presented at the Cardiology clinic of the hospital. All patients, who are younger than 18 years, presenting to the clinic between January 2019 and May 2019 were eligible for the study. Children with a diagnosis of heart murmurs were selected as cases, and those patients with no presenting or previous diagnosis of heart murmurs as controls. One control with no presenting heart murmur was selected from the same clinic was matched for age and gender with each case.

Sample size calculation was not applicable for that it's a time frame sample.

Study variables

Sociodemographic variables such as nationality, age and gender were obtained for the purpose of further evaluation (Table 1). The main analyses focused on heart murmurs as the outcome of the study along with heart diseases as the exposure. Age and gender are matched for both groups, to eliminate some of the possible confounding factors.

Most of the variables are qualitative, including: heart murmurs, heart diseases, gender and nationality.

The only quantitative variable obtained was the age of patients. The variable was collected and grouped according to the age in months for both the case and control groups during the analysis (Table 1).

Data sources/measurement

The variables of interest, which include the previous diagnosis of heart diseases and presenting heart murmurs, were found on the electronic medical record of the hospital. As the patient presents to the attending doctor, the history of each visit including data related to these variables are recorded on the system. They are mainly gathered and reported as binary data in the form of yes/no, depending on whether a diagnosis of heart murmur or heart disease was made or not.

An ethical approval was obtained from the hospital to gain access and use the patient's data from the medical record, but informed consents were not eligible as there was no communication with patients required. After selecting the patients with outcome of interest, they were deidentified and encrypted to ensure patients' privacy. The data was saved on a password secured excel sheet and accessed by the main researcher only.

Statistical analysis

Data was extracted in a Microsoft Excel sheet and then statistically analysed using statistical package for social sciences (SPSS) software [7]. Frequencies and cross-tabulations between the cases, controls and potential risk factors were obtained using this package. Conditional logistic regression was used to demonstrate the effects of the potential risk factors. The alpha value of $p \leq 0.05$ was chosen to determine statistical significance.

Study bias

Selection bias has occurred with the selection of controls, as they were recruited from the same cardiology clinic. This bias was considered carefully when selecting the participants, as the control group were only eligible if there was no previous or current diagnosis of heart murmurs. Also, control group was selected from those patients who were referred to the clinic for other medical conditions.

Results

Participants

A total of 426 cases and 217 controls were obtained from the records, who are potentially eligible for the study. Of the 643 identified, only 183 cases and controls were definitely eligible and matching (Table 1).

Descriptive data

Study participants from both groups ranged from 1 to 108 months of age. Of the 183 matching cases and controls, 95 pairs are males and 88 are females. Cases are more likely than controls to be of an Emirati origin. More than 90% of the cases were positive for exposure, while only 51% of the controls were (Table 1).

Variables	Cases (%)	Controls (%)
All (n= 366)	183	183
Gender		
Male	95 (51.91%)	95 (51.91%)
Female	88 (48.08%)	88 (48.08%)
Age Categories (months)		
0 to 12	40 (21.85%)	40 (21.85%)
12 to 24	33 (18.03%)	33 (18.03%)
24 to 36	15 (8.19%)	15 (8.19%)
36 to 60	25 (13.66%)	25 (13.66%)
60 to 144	64 (34.97%)	64 (34.97%)
> 144	6 (3.27%)	6 (3.27%)
Nationality		
Emirati	120 (65.57%)	146 (79.78%)
Non-Emirati	63 (34.42%)	37 (20.22%)
Heart disease		
Yes	166 (90.71%)	94 (51.36%)
No	17 (9.29%)	89 (48.63%)

Table 1: *Demographic data of the participants.*

Outcome data

Overall, 26.4% of all cases are explained by the previous diagnosis of heart diseases and nationality adjusted over age and gender. Those cases who were diagnosed with heart diseases earlier had a significantly higher risk of developing heart murmurs compared to the control group (Table 2). Development of heart murmurs has also shown a positive correlation with nationality as it was higher in Emirati cases (Table 2).

Risk Factor	Odds Ratio (95% Confidence interval)	P. Value
Gender	0.869 (0.547 - 1.382)	0.554
Nationality	1.866 (1.104 -3.155)	0.02
Heart Disease	9.425 (5.220 - 17.017)	0.001

Table 2: *Odds ratio of risk and confounding factors.*

Overall statistics of the analysis tests has a significant value of .000 (p value ≤ 0.05), which indicates the fitness of the analytical models.

Discussion

Summary of major findings

This is the first study in the United Arab Emirates reporting the risk of developing heart murmurs in children with previously diagnosed heart diseases. The study has documented that heart diseases are a major risk factor. Nationality also imposes a risk of developing heart murmurs.

Comparison with previous studies

This study reported that heart diseases are a major risk factor for the development of heart murmurs, while a study that was conducted in the United States of America reported that the prevalence of murmurs in that population is coupled with the low occurrence of congenital heart disease [8]. However, several other studies conducted in New Zealand and United Kingdom have reported results similar to that of this study by illustrating the significance of heart diseases in future diagnosis of heart murmurs. The studies conducted imply that there is a large proportion of patients with significant structural and congenital heart diseases, who present to the clinics with murmurs [9,10]. A cross sectional study that was conducted on school children included other variables not taken into account in this study, suggested that structural heart diseases could be a risk factor depending on the age of the patient and the grade of the murmur [11]. A study conducted on neonates also reported that heart murmurs are mostly due to heart diseases [12]. And a retrospective study conducted in the United States of America reported that the prevalence of valvular abnormalities in patients who were referred with the diagnosis of murmur for echocardiographic examination was less than 50% in an older group of patients, hence, heart diseases seem to be a risk factor across different age groups [13].

Implications for public health practitioners and clinicians

There are a number of clinical implications from these study findings. Although the study was limited by the lack of data and all the possible confounders were not identified, the majority of cases presented earlier with heart diseases illustrating the need of early clinical diagnosis of heart diseases in younger patients. An attentive paediatrician should identify a presenting murmur and whether there is an underlying heart disease as early as possible to decrease the morbidity and mortality rate among those with significant risk factors.

A proper diagnostic system like a reliable clinical assessment based on the disappearance of a heart murmur while standing would rule out pathologic heart murmurs in children aged 2 years and older, would be cost efficient and an enhancement to the quality of care in the region [14].

Strengths, Limitations, and Generalisability

To our knowledge, this is study was the first in the region, and specifically United Arab Emirates which indicates a significant strength of the study. Also, participants from variety of age groups and nationalities were enrolled to assess some of the potential confounders.

This study has several limitations, including: (1) data were collected from a single tertiary care hospital in one emirate, thus, limiting the generalisability of the study findings to other tertiary care hospitals in the United Arab Emirates and the region; (2) other potential confounding factors such as co-morbidities, age at birth and quality of care were not included partially due to unavailability of data.

Areas for Future Research

This study was limited by the lack of data, hence did not fulfil all the gaps in literature. Future studies are left with exploring other potential risk factors associated with heart murmurs in the region, as those conducted in Israel aimed to define and to classify the causes of a murmur in a new-born with an otherwise normal examination [15]. As previously reported heart diseases are a risk factor for heart murmurs, and generally Atrial Septal Defect (ASD) and Ventricular Septal Defect (VSD) are two common heart diseases found in children causing murmurs during systole [16]. But the most common heart diseases in the United Arab Emirates and the region are not yet reported, highlighting the need for a research in this field.

A prospective study reports that if a murmur is heard there is a 54% chance of there being an underlying cardiac malformation [16]. However as this is a case control study design, the prevalence and incidence of heart murmurs could not be identified from the available data, future papers could estimate these values in the region, to furthermore improve the quality of care to the paediatric group of patients.

The reasons behind the increased risk of developing heart murmurs in Emirati children are unknown, future papers could investigate the possible risk factors like consanguinity and genetic factors in the United Arab Emirates.

Conclusion

Heart diseases seem to be a considerable risk factor of heart murmurs in the paediatric group of patients in the United Arab Emirates, based on this study. Also, those children of Emirati origin appear to be at a higher risk of developing heart murmurs in comparison to patients of other origins.

Bibliography

1. Cardiovascular diseases (CVDs). World Health Organization (2019).
2. Murmurs H. “Heart murmurs”. MedlinePlus Medical Encyclopedia (2019).
3. Biancaniello T. “Innocent Murmurs”. *Circulation* 111.3 (2005).
4. Cardiac Murmurs in Children: Predictive Value of Cardiac Markers - Full Text View - Clinical Trials (2019). “
5. ME K. “Assessment of heart murmurs in childhood”. PubMed - NCBI [Internet] (2019).
6. Strobe-statement.org (2019).
7. DP A. “Evaluation of children with heart murmurs (2019).

8. Khushu A., *et al.* "Outcome of children referred with heart murmurs referred from general practice to a paediatrician with expertise in cardiology". *Cardiology in the Young* 25.1 (2014): 123-127.

9. Kueh S., *et al.* "The not so innocent heart murmur: a 5-year experience". *Internal Medicine Journal* 47.2 (2017): 199-205.

10. Kang G., *et al.* "Prevalence and clinical significance of cardiac murmurs in schoolchildren". *Archives of Disease in Childhood* 100.11 (2015): 1028-1031.

11. Du Z., *et al.* "Clinical and echocardiographic evaluation of neonates with heart murmurs". *Acta Paediatrica* 86.7 (1997): 752-756.

12. Movahed M and Ebrahimi R. "The Prevalence of Valvular Abnormalities in Patients Who Were Referred for Echocardiographic Examination With a Primary Diagnosis of "Heart Murmur". *Echocardiography* 24.5 (2007): 447-451.

13. Lefort B., *et al.* "Auscultation While Standing: A Basic and Reliable Method to Rule Out a Pathologic Heart Murmur in Children". *The Annals of Family Medicine* 15.6 (2017): 523-528.

14. Rein A., *et al.* "Significance of a Cardiac Murmur as the Sole Clinical Sign in the Newborn". *Clinical Pediatrics* 39.9 (2000): 511-520.

15. Leung T., *et al.* "Analysing paediatric heart murmurs with discriminant analysis. Proceedings of the 20th Annual International Conference of the IEEE Engineering in Medicine and Biology Society Vol20 Biomedical Engineering towards the Year 2000 and Beyond (Cat No98CH36286) 20 (2000).

16. Ainsworth S., *et al.* "Prevalence and clinical significance of cardiac murmurs in neonates". *Archives of Disease in Childhood - Fetal and Neonatal Edition* 80.1 (1999): F43-F45.

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