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Outcome of congenital heart diseases in Egyptian children: Is there gender disparity?

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KEYWORDS

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Abstract The purpose of this work is to evaluate the effect of sex on the outcome of congenital heart diseases (CHDs) in children. The frequency of occurrence of each outcome within the disease is also detected.

Methods: 312 patients (171 males and 141 females) with CHDs aged less than 12 years were included in this study. For them complete history taking, physical examination, chest X-ray, electrocardiography and echocardiography were done. The following aspects were recorded: mortality, surgical repair, development of pulmonary hypertension, diagnosis of heart failure, hospitalization due to chest infection and growth parameters (weight and height).

Results: Of 312 patients the most frequent two diagnoses were atrial septal defect (28.8%), and ventricular septal defect (28.2%). Death occurred in 4.8% of patients with no significant gender difference. 11.9% of patients were treated surgically with no sex disparity. 23.1% developed heart failure and 34.9% of the patients developed pulmonary hypertension with no significant sex difference. 35.6% and 34.6% of the patients were below 10th percentile for weight for age and height for age, respectively with no sex difference. Hospitalization due to chest infection occurred in 42.9% of the patients; females had significantly higher risk than males.

Conclusion: Females are more vulnerable to hospitalization due to chest infection than males in children with congenital heart diseases while as regards mortality, access to surgery, occurrence of heart failure, development of pulmonary hypertension and affection of growth, no significant gender differences were detected.

Abbreviations: ASD, atrial septal defect; AV canal, atrioventricular canal; CHDs, congenital heart diseases; ECG, electrocardiogram; HF, heart failure; IGF-1, insulin growth factor 1; MVP, mitral valve prolapse; PDA, patent ductus arteriorus; PH, pulmonary hypertension; SPSS, Statistical Package For Social Science; TOF, tetralogy of fallot; TAPVR, total anomalous pulmonary venous drainage; TGA, transposition of the great arteries; VPS, valvular pulmonary stenosis; VSD, ventricular septal defect.

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Introduction

Congenital heart diseases (CHDs) are responsible for the largest proportion (30–50%) of mortality caused by birth defects in pediatric age.[1] Surgical repair of cardiac defect alters the prognosis of CHDs.[2] Genetic factors in regulation of the cardiovascular system and predisposition to heart failure have been evidenced recently.[3] Pulmonary arterial hypertension affects the course of CHDs, morbidity and mortality in many children.[4] Prolonged hospitalization due to respiratory tract infections is more common in these patients.[5] There is obvious retardation of growth parameters among those children.[6] Many factors contribute to the affection of growth among these children as hypoxia and defective perfusion to the growing tissues, hyper metabolic state due to increased metabolic rate and also malnutrition due to decreased appetite.[7] Sex differences in the outcome of CHDs among adults are evidenced by Verheugt et al.,[8] but there is a lack in researches that explain if there is an impact of gender on the prognosis and outcome of CHDs in pediatric age groups.

Material and methods

It is a prospective, cross sectional descriptive study. The study was conducted in El Fayoum University hospital (pediatric cardiology clinic and inpatient). The study enrolled 312 CHD patients, 171 males and 141 females. The diagnosis was confirmed by echocardiography using Vivid 3 ultrasound machine made in Norway with a 5S MHz transducer phase array scanner. The protocol for the research project has been approved by the regional Ethics Committee. The work had been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. The parents gave informed consent, they understood and signed it.

Inclusion criteria

Patients with CHDs aged $\leqslant$12 years.

Exclusion criteria

Patients with associated extracardiac malformations or genetic disorders, children with isolated cardiac arrhythmias, cardiomyopathy, acquired heart disease, isolated dextrocardia, cardiac tumors and mitral valve displacement with leaflet prolapse of less than 2 mm beyond the long axis annular plane without leaflet thickening were excluded from the study.

Complete medical records were available for all patients, who had been followed in the pediatric cardiology clinic of the El-Fayoum University Hospital, Fayoum governorate, Egypt.

All cases were classified according to the anatomical diagnosis. The participants had the following distribution of pathologies: Atrial septal defect (ASD); ventricular septal defect (VSD), patent ductus arteriorus PDA), tetralogy of fallot (TOF), valvular pulmonary stenosis (VPS), transposition of the great arteries (TGA), atrioventricular canal (AV canal); combined ASD and VSD, total anomalous pulmonary venous drainage (TAPVR), mitral valve prolapse (MVP) and other anomalies which included together in one item due to low frequency of them in our study population.

Work for the study started on April 2012 and ended on August 2013. The following outcomes were studied in our search, mortality, surgical repair, occurrence of heart failure, development of pulmonary hypertension, hospitalization due to chest infection and lastly affection of growth. Informed consent was taken by one of the parents of each patient.

Detailed medical history and physical examination were done with special emphasis on.

- History of any surgical cardiac procedure and the presence of surgical scar.
- Symptoms and signs of HF, PH and chest infection. Chest infection with respiratory distress (grade 2, 3 or 4) or oxygen saturations of less than 90% is considered an indication for hospitalization.[9]
- Assessment of growth by anthropometric measurements was represented by weight and length or height. Measured weight and height were plotted on Egyptian growth Charts to detect weight for age and height (length) for age percentiles for each patient. Less than 10th percentile for weight or height was considered a cutoff point for poor growth according to Program for Women, Infants, and Children (WIC).[10]

The patients were subjected to:

- Chest X-ray and ECG.
- Echocardiographic evaluation of systolic pulmonary arterial pressure was estimated on the basis of tricuspid regurgitation jet velocity measurements and/or simplified Bernolli equation. Tricuspid regurgitation is often visualized in the apical or subcostal views. The most recently recorded pulmonary arterial pressure value was used. Pulmonary arterial hypertension was defined as a systolic pulmonary pressure >35 mm Hg.[11] For moderate sedation, 50 mg/kg of chloral hydrate was given to the patients prior to echocardiography, if the child did not respond within 30 min after the first dose; another half dose of the drug as the second dose was given.[12]

Patients with suspicion of chest infection by clinical examination were subjected to laboratory tests (complete blood count, C-reactive protein and sputum culture & sensitivity) and chest X-ray to confirm the diagnosis.

Statistical analysis (calculation)

Collected data were computerized and analyzed using Statistical Package for Social Science (SPSS) version 16. Descriptive statistics were used to describe variables; percent and proportion for qualitative variables. Highly variable data where co-efficient of variation (ratio of the standard deviation to the mean) is more than 20% were presented by median and range. Comparison between male and female groups was done for qualitative variables using chi-Square test & fisher exact test when expected cell count was less than 5, independent *t*-test and Mann–Whitney test for quantitative variables. *P*-values with significance of less than 0.05 were considered statistically significant.