The Prevalence of Common Cardiovascular Diseases among 17-Year-Old Israeli Conscripts

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Adolescents  Cardiovascular disease  Mitral valve prolapse  Congenital valvular heart disease  Screening  Syncope

Abstract

Background: There are only few reports on the prevalence of common cardiovascular disorders among adolescents. The previous studies focused on specific diseases, and screened relatively small samples. Objective: The aim of this study was to define the prevalence of different common cardiovascular disorders among 17-year-old Israeli conscripts. A comparison between the morbidity patterns of female and male adolescents was also performed. Design: All 17-years-old Israeli nationals are obliged by law to appear at the Israel Defense Forces Recruiting Office for medical examination except for orthodox religious and Arabic adolescents. Cardiology specialists evaluated and classified nominees with suspected cardiovascular disorders. Results: The most prevalent diagnoses were valvular heart disease (590/100,000), syncope (440/100,000), and mitral valve prolapse (340/100,000). The most prominent differences between female and male adolescents were noted in the prevalence of: congenital valvular heart disease, syncope, history of hypertension, supraventricular tachycardia with pre-excitation, myocarditis and pericarditis, and bradycardia and conduction disorders. Conclusions: The most prevalent cardiac disorders among 17-year-old Israelis were congenital valvular heart disease, syncope and mitral valve prolapse. Some significant differences were noted between the morbidity patterns among male and female adolescents. The higher prevalence of congenital valvular heart disease compared to non-valvular heart disease is surprising. The prevalence of hypertension among Israeli adolescents in the last 15 years remained stable.

Introduction

The majority of adolescents appear to be in good health, when traditional health status measures such as disease patterns and healthcare utilization are examined [1]. In the past few decades, two major developments can be recognized. The first is the considerable improvement in treatment and survival of patients with congenital heart disease. Around 80–85% of patients born with congenital heart disease now survive to adulthood (age 16 years) [2]. The second is the significant increase in the prevalence of obesity among children and adolescents. Obesity in adolescents is associated with psychosocial...
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Material and Methods

Source of Data

All 17-year-old Israeli nationals are obliged by law to appear at the IDF Recruiting Office for medical examination. This obligation does not include the Arabic adolescents, the orthodox religious who are exempted from military service and female conscripts who prefer to volunteer for national service.

Medical Surveillance

Military physicians performed the medical examinations in the Recruiting Office. Medical history was obtained from the family physicians of most conscripts. During the examination, the subjects were asked to note specifically any diagnosis of medical conditions they had ever received in the past. A trained cardiologist evaluated conscripts suspected of having a cardiac disease for a second examination. This examination included further detailed history, physical examination, and radiological and laboratory tests as needed, including echocardiography with Doppler, electrocardiogram (ECG), Holter monitoring and a stress test.

Disease Categories

Valvular Heart Disease Diagnosed by Echocardiography or Cardiac Catheterization. This category comprised mitral, aortic, pulmonic, and tricuspid stenosis or regurgitation. Minimal or trivial mitral or tricuspid regurgitation was not included. Aortic or pulmonic stenosis was diagnosed in the presence of supravalvular, subvalvular or valvular stricture. The pressure gradients across stenotic valves were evaluated by Doppler or during cardiac catheterization.

Non-Valvular Congenital Heart Disease Diagnosed by Echocardiography or Cardiac Catheterization and after Consultation with a Cardiologist. This category comprised ventricular septal defect (VSD), atrial septal defects, patent ductus arteriosus, dextrocardia, anomalies of the pulmonary veins, coarctation of the aorta, tetralogy of Fallot, transposition of great vessels and coronary fistula.

Mitral Valve Prolapse: Diagnosed by Echocardiogram. The significant clinical symptoms were chest pain, palpitations and diaphoresis. Other relevant criteria were a history of syncope, a history of sudden death of a first-degree relative and the presence of supraventricular or ventricular tachycardia.

Rheumatic Fever. Patients with a history of this diagnosis in the past with or without permanent valvular damage were included in this category.

Infective Endocarditis. Patients with a history of this diagnosis in the past comprised this category excluding patients with permanent valvular damage.

Myocarditis or Pericarditis. The diagnosis was based on clinical symptoms, echocardiography, Holter monitoring, ECG, and serum inflammatory markers such as the erythrocyte sedimentation rate.

Coronary Artery Disease (CAD). CAD was diagnosed based on a proven history of myocardial infarction, a suspicion of CAD based on clinical symptoms, a positive stress test, ECG findings, a coronary angiogram or other radiological tests.

Ventricular Tachycardia (VT). This category included ventricular premature beats, idiopathic benign VT, right ventricular outflow tract VT, fascicular VT, VT with a cardiac organic origin and VT with the presence of congenital long QT syndrome. The diagnosis was based on Holter ECG, echocardiography, stress and late potential tests after a cardiologist consultation.

Supraventricular Tachycardia without Pre-Excitation. This category included atrial premature beats without organic cardiac disease, narrow complex tachycardia and paroxysmal atrial fibrillation. The evaluation included thyroid function, blood pressure measurements, echocardiography and Holter monitoring.

Supraventricular Tachycardia with Pre-Excitation Syndrome. This category included conditions in which an aberrant conductive pathway causes pre-excitation and arrhythmias. The most common is the Wolff-Parkinson-White syndrome. The evaluation included electrophysiological studies, Holter monitoring and stress tests.

Bradyarrhythmias and Conduction Disturbances. This category included the different AV blocks, right and left bundle branch blocks, bi-fascicular and tri-fascicular blocks, arrhythmogenic right ventricular dysplasia, and the need for a permanent pacemaker. The evaluation consisted of stress test, Holter monitoring and cardiologist consultation.

Syncope. This category included vasovagal syncope and a syncope with a neurologic or cardiogenic origin. A recurrent syncope was diagnosed after three or more events, and a neurologist or psychiatric consultation as needed.

Hypertension. Hypertension was defined as a systolic blood pressure value above 140 mm Hg or a diastolic blood pressure above 90 mm Hg. The measurement was performed at rest, with a compatible cuff which covers 80% of the arm circumference and two thirds of its length. The determining value was the average of ten measurements performed during 2 months, no more frequently than twice a week.

Statistical Analysis

All data were recorded on a computer and analyzed later. These data were used in order to describe the prevalence of common cardiovascular disorders in a specific population comprising 17-year-old consecutive conscripts. A t test was performed in order to compare the prevalence of the disorders between male and female conscripts with 95% confidence intervals (CI) for the differences between the two means, respectively.

Results

Our survey included 94,805 records of medical encounters of 17-year-old adolescents [36,511 (38.5%) females and 58,295 (61.5%) males]. Table 1 presents the prevalence of the different cardiovascular disorders in
both genders. The most prevalent diagnoses were valvular heart disease (590/100,000), syncope (440/100,000) and mitral valve prolapse (340/100,000). We noted significant differences between male and female adolescents in some of the diagnoses: valvular heart disease (p < 0.001), syncope (p < 0.001), hypertension (p < 0.001), bradycardia and conductive disorders (p < 0.001), supraventricular tachycardia with pre-excitation (p = 0.014) and myocarditis and pericarditis (p = 0.004). These results are also presented in Table 1.

### Discussion

The IDF Registry Medical Database was used in order to describe the current cardiologic morbidity patterns among Israeli adolescents. Our survey included 94,805 records of medical encounters of 17-year-old adolescents, 36,511 (38.5%) females and 58,295 (61.5%) males. The percentage of female adolescents was lower, because women can also volunteer for national service and be exempted from military service.

The most prevalent cardiac disorders were congenital valvular heart disease, syncope and mitral valve prolapse. The number of children with congenital heart disease surviving beyond adolescence is rapidly increasing [5]. The incidence of congenital heart disease among live-born children ranges between 0.6 and 1%, and about 75–80% survive to adolescence. The most common conditions at birth in descending order are VSD, atrial septal defect and aortic and pulmonary stenoses [2, 6–10]. It is interesting to note that in this study, the prevalence of valvular heart disease was significantly higher than the prevalence of non-valvular heart disease. Some of this difference can be explained by the higher rates of surgical repair and spontaneous closure of VSD and atrial septal defects compared to the usual conservative follow-up performed on mild valvular diseases. But still, these results are interesting [11, 12].

The prevalence and female: male ratios of mitral valve prolapse [13–15] and syncope [16–18] are quite similar to previous reports on adolescents. There are only few reports on the prevalence among adolescents of the following conditions: cardiac arrhythmias, rheumatic heart disease, inflammatory heart diseases, cardiomyopathies and coronary heart disease [19–24]. It was impossible to compare these reports to the current study, because of the different clinical definitions and the size of the populations examined.

We noted the recent reports on increasing prevalence of obesity among children and adolescents, and the correlation between childhood obesity and essential hypertension [3, 4, 25, 26]. In 1989, Shohat et al. [26] studied the prevalence of hypertension among 93,303 Israeli military recruits, and their findings were almost identical to ours. It would be interesting to check if the prevalence of...

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Prevalence/100,000</th>
<th>Male/100,000</th>
<th>Female/100,000</th>
<th>95% confidence interval</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valvular heart disease</td>
<td>590</td>
<td>674</td>
<td>452</td>
<td>1.26–1.77</td>
<td>&lt;0.001</td>
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<td>Syncope</td>
<td>440</td>
<td>334.5</td>
<td>600</td>
<td>0.47–0.66</td>
<td>&lt;0.001</td>
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<tr>
<td>Mitral valve prolapse</td>
<td>340</td>
<td>346.5</td>
<td>340</td>
<td>0.83–1.25</td>
<td>0.860</td>
</tr>
<tr>
<td>Non-valvular heart disease</td>
<td>330</td>
<td>322.5</td>
<td>345</td>
<td>0.76–1.15</td>
<td>0.527</td>
</tr>
<tr>
<td>Hypertension</td>
<td>320</td>
<td>473</td>
<td>79</td>
<td>4.09–8.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SVT without pre-excitation</td>
<td>160</td>
<td>160</td>
<td>172.5</td>
<td>0.69–1.25</td>
<td>0.624</td>
</tr>
<tr>
<td>Bradycardia &amp; conduction disorders</td>
<td>100</td>
<td>132</td>
<td>47</td>
<td>1.68–4.80</td>
<td>&lt;0.001</td>
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<tr>
<td>VT</td>
<td>90</td>
<td>96</td>
<td>88</td>
<td>0.71–1.69</td>
<td>0.679</td>
</tr>
<tr>
<td>SVT with pre-excitation</td>
<td>70</td>
<td>87.5</td>
<td>44</td>
<td>1.14–3.50</td>
<td>0.014</td>
</tr>
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<td>Rheumatic fever</td>
<td>70</td>
<td>74</td>
<td>63</td>
<td>0.71–1.94</td>
<td>0.541</td>
</tr>
<tr>
<td>Myocarditis &amp; pericarditis</td>
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<td>50</td>
<td>14</td>
<td>1.41–9.38</td>
<td>0.004</td>
</tr>
<tr>
<td>Cardiomyopathy &amp; CHF</td>
<td>30</td>
<td>34</td>
<td>25</td>
<td>0.63–3.06</td>
<td>0.408</td>
</tr>
<tr>
<td>CAD</td>
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<td>7</td>
<td>5.5</td>
<td>0.23–6.84</td>
<td>0.794</td>
</tr>
<tr>
<td>Infective endocarditis</td>
<td>0.2</td>
<td>0</td>
<td>0.55</td>
<td>0.00–11.9</td>
<td>0.206</td>
</tr>
</tbody>
</table>

SVT = Supraventricular tachycardia; CHF = congestive heart failure.
hypertension among Israeli adolescents remained stable despite the increased prevalence of obesity. In all previous reports like in this study a male predominance was noted [25–27]. In addition, we found a very low prevalence of coronary artery disease among 17-year-old adolescents. These data were not examined in the past. Unfortunately, we could not examine the correlation between high body mass index and the diagnosis of coronary artery disease in this study.

Conclusions

The most prevalent cardiac disorders among 17-year-old Israeli adolescents were congenital valvular heart disease, syncope and mitral valve prolapse. Some significant differences were noted between the morbidity patterns among male and female adolescents. The higher prevalence of congenital valvular heart disease compared to non-valvular heart disease is unusual. The prevalence of hypertension among Israeli adolescents in the last 15 years remained stable.

References

1 Irwin CE, Burg SJ, Uhler Cart C: America's Adolescents: Where have we been, where are we going? J Adolesc Health 2002; 31:91–121.