Jaraković M, et al. High School Students and Cardiovascular Disease

Introduction

Cardiovascular diseases (CVD) are one of the leading causes of mortality and morbidity worldwide. The atherosclerotic process in the aorta starts in childhood, while atherosclerotic changes of coronary heart vessels start in adolescence. The aim of the study was to evaluate the knowledge of the students attending all four grades of grammar school about the risk factors for cardiovascular disease, with special attention to the risk factors that can be influenced by modification of life-style.

Material and Methods

Data from the entrance and exit tests were collected from 197 students attending a grammar school in Novi Sad. Chi-square test and Student T-test or Mann-Whitney U test were used to examine the statistical difference between categorized variables and the continuous variables, respectively.

Results

The difference between the number of correct answers for all the students on the entrance test and exit test was statistically significant (p<0.0005) and the overall knowledge level after lectures was increased by 29.4%. The lowest level of knowledge on the entrance tests was noted among the students of the third grade of grammar school and after the lectures, the student's knowledge level was increased by 82.3% (p<0.0005).

Conclusion

Children and adolescents from Vojvodina and Serbia should be well informed about the cardiovascular disease risk factors and their prevention with special attention paid to the risk factors that can be influenced by changing lifestyle habits.

Key words: Cardiovascular Diseases; Risk Factors; Adolescent; Students; Life Style; Risk Reduction Behavior; Health Knowledge, Attitudes, Practice

THE LEVEL OF GRAMMAR SCHOOL STUDENTS' KNOWLEDGE ON CARDIOVASCULAR DISEASE RISK FACTORS

NIVO ZNANJA UČENIKA GIMNAZIJE O FAKTORIMA RIZIKA ZA KARDIOVASKULARNE BOLESTI

Milana JARAKOVIĆ, Bojan MIHAJLOVIĆ, Snežana ČEMERLIĆ, Filip ADIĆ, Miroslava SLADOJEVIĆ and Bogoljub MIHAJLOVIĆ

Summary

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Sažetak

Uvod. Kardiovaskularne bolesti predstavljaju jedan od vodećih uzroka mortaliteta i morbiditeta širom sveta. Aterosklerotski proces na aorti počinje u detinjstvu, dok aterosklerotske promene korarnih krvnih sudova počinju u adolescenciji. Cilj studije je bila evaluacija znanja učenika od prvog do četvrtog razreda gimnazije o faktorima rizika za kardiovaskularne bolesti, sa posebnim osvrtom na faktore na koje se može uticati promenom stila života. Materijal i metode. Prikupljeni su podaci sa ulaznih i izlaznih testova za 197 učenika od prvog do četvrtog razreda jedne novosadske gimnazije. Za ispitivanje razlika između kategorisanih varijabli korišćen je χ2 test, a između kontinuiranih Studentov T test ili Mann-Whitney U test. Rezultati. Prema broju tačnih odgovora svih učenika na izlaznom u odnosu na ulazni test dokazana je statistički značajna razlika (p<0,0005) i ukupno nivo znanja nakon edukacije podignut je za 29,4%. Među učenicima trećeg razreda gimnazije zapažen je najniži nivo znanja na ulaznim testovima, a nakon učinjenih predavanja, postignuto je najveće ukupno poboljšanje nivoa znanja od 82,3% (p<0,0005). Zaključak. Deca i omladina koja žive u Vojvodini treba da budu dobro informisana o faktorima rizika za nestanak kardiovaskularnih bolesti i njihovoj prevenciji, pre svih o faktorima rizika na koje se može uticati promenom stila života.

Ključne reči: Kardiovaskularna oboljenja; Faktori rizika; Adolescent; Students; Životni stil; Smanjenje rizičnog ponašanja; Znanje o zdravljaku stavovi, praksa

Original study

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Introduction

Cardiovascular diseases (CVD) are one of the leading causes of mortality and morbidity worldwide. In 2001, approximately one third of all mortality causes in the world were attributable to CVDs and they are predicted to become the leading cause of death in developed countries. In the United States of America (USA), CVD accounts for 35.2% of mortality in comparison with 48% in Europe [1]. According to the data of the Institute for Public Health of Vojvodina from 2011, the number of patients in Vojvodina with a registered diagnosis of CVD in Departments of General Medicine, Occupational Health and Inpatient Institutions was greater than 500 000 [2].

Although the average age of patients suffering from CVD has been increasing in recent years, even a greater number of young people get ill from CVD [3–7].

Coronary heart disease (CHD) develops slowly, insensibly and without any symptoms over the years, so that it is often diagnosed at an advanced stage.

The development of a CHD depends on the presence of risk factors that can be divided into two...
groups. The first group consists of the risk factors that cannot be influenced and they include age, gender and inheritance. Particularly significant is the other group, which includes the risk factors that can be influenced by changing habits and lifestyle. These factors are: hypertension, diabetes, obesity, high serum lipoprotein level, alcohol, smoking, physical inactivity and stress. Risk factors for CVD can be individual, but they are mostly combined. The probability of developing a CVD tends to be greater with a higher number of associated risk factors.

Epidemiological studies conducted so far have shown that there is a high level of correlation between morbidity and mortality of CVD in adulthood and early atherosclerotic changes and the presence of risk factors among children and youth.

McGill and McMahen have proved in their studies that atherosclerosis is a “pediatric problem”. The atherosclerotic process starts in the aorta in childhood, while atheroclerotic changes of coronary heart vessels start in adolescence. It has also been proved that these changes appear earlier in the populations where the morbidity rate of CHD is higher. The changes on coronary heart vessels are reversible until the twenties [8–10].

Wissler has shown in his multicenter study, published in 1991, that risk factors contribute to the faster progression of the CHD, especially if they are cumulated. The cumulated effect of risk factors increases the risk of CHD as early as fifteen years of age. It has also been confirmed that most of the factors that are present in childhood have tendency to persist during adulthood, that being called a persistent phenomenon [11].

According to the data of the Institute for Public Health of Vojvodina from 2011, every eighth child in Vojvodina is overweight and every twentieth child is obese. It has been observed that 24.7% of those aged 15–19 do not have regular breakfast. In their free time, only 28.7% of the respondents have some daily sports activities. Most of them go to sleep late and thus, they have insufficient number of sleep hours during the night. In addition, 20% of those aged 15–19 smoke periodically or every day and only one out of five wants to quit that habit [2, 12–15].

These results point to the fact that it is necessary to stop the development of bad habits among children and adolescents and start the primary prevention of risk factors for CVD before the age of fifteen.

The aim of the study was to evaluate the knowledge of the students from 1st to 4th grade of grammar school about the risk factors for CVD, with special attention paid to the risk factors that can be influenced by changing life-style.

### Material and Methods

During 2013, a pilot study was conducted in a grammar school in Novi Sad. More than 200 students from the 1st to the 4th grade were included in the study. All the students completed entrance tests consisting of 20 questions, and the results were used to determine the level of knowledge pertaining to the risk factors for the development of CVD. After the entrance tests, lectures were given by medical doctors, with special attention paid to the risk factors for the development of CVD which can be influenced by changing the lifestyle. After the lectures, the same students completed the exit test containing the same set of questions as the entrance tests. By analyzing the results of the exit tests, it was concluded that the knowledge of the students from the 1st to 4th grade of grammar school was at the lowest level regarding the risk factors for CVD that can be influenced, primarily obesity, high serum lipoprotein levels, alcohol, smoking and physical inactivity.

Based on the results of the conducted pilot study, the same study was conducted in the same grammar school in Novi Sad in 2014, this time including 197 students from the 1st to the 4th grade.

The data were analyzed statistically by the following standard descriptive methods: mean value, standard deviation, absolute and relative incidence. Chi-square test and Student T-test or Mann-Whitney U test were used to examine the statistical difference between categorized variables, and the continuous variables, respectively.

For all the tests, the level of statistical significance was analyzed and a p-value lower than 0.05 was considered statistically significant. All the data were collected in the specially created database and statistical analyses were performed using SPSS software. The results are shown in tables with a text comment.

### Results

The difference between the number of correct answers for all the students on the entrance test and exit test was statistically significant (p=0.0005). The average students’ knowledge level was 37.1% before the lectures and 48% after them. The overall knowledge level was increased by 29.4% (Table 1). The students attending the 1st grade of grammar school showed the highest level of knowledge before the educational lectures were given (48.2%), as well as the highest level of knowledge after the lectures (52.6%), thus their knowledge level was increased by 9.1% (p=0.024). Among the students of the 2nd grade, the level of knowledge was 35.4% and the percent of its increase after the lectures was only 8.5%, thus being the lowest one.

When comparing number of the correct answers between the grades, there was a statistically significant difference (p<0.0005) between the number of correct answers on the exit test compared with the number of correct answers on the entrance test.
among the students of 3rd and 4th grade. The lowest level of knowledge on the entrance tests was noted among the 3rd grade students (28.3%). After the lectures, the students’ knowledge level was 51.6%, so that the knowledge level among the 3rd grade students was increased by 82.3%, which was the highest increase in knowledge among all the respondents. The 4th grade students answered correctly to 36.8% of all the asked questions on the entrance test, while 50.1% of them gave the correct answers to the same questions on the exit test, which led to the 36.1% increase in the knowledge level (Table 1).

As for the risk factors that can be influenced, the students showed the highest level of knowledge on the entrance test related to the questions connected with eating habits (55%) (Table 2). The highest number of the correct answers on the exit test was also connected to the eating habits (70%), which led to the overall improvement in the knowledge level of 27.3%, that being statistically highly significant (p<0.0005). In addition, the students showed a high knowledge level related to the questions concerning obesity. On the entrance test, 50% of examined students gave the correct answer about this risk factor. On the exit test, 62% of the examined students gave the correct answer regarding obesity, which led to the overall improvement in knowledge level by 24%, that also being statistically highly significant (p<0.0005). As for cigarette smoking habit, the students’ knowledge level on the entrance test was 32.5%, while on the exit test, the level of knowledge was 52.5%, that meaning that the knowledge was increased by 61.5% (p<0.0005). When the students were asked about everyday physical activity, 35% of them gave the correct answer on the entrance test, while 42.5% gave the correct answer on the exit test, which led to the 21.4% improvement in the knowledge level (p=0.007). Regarding the students’ knowledge about elevated serum lipid level, high blood pressure and diabetes, there was no improvement in the level of knowledge on the exit test compared with the entrance test (Table 2).

On the entrance test, 32.5% of the students answered correctly the questions concerning the change of lifestyle in order to lower the risk of CVD. During the lectures, special attention was paid to the significance of everyday life habits in the primary prevention of CVD. On the exit test, 42.5% of the students gave the correct answer, which made the overall improvement of the knowledge level of 30.7% (p=0.059) (Table 2).

Table 1. Level of overall student’s knowledge on the entrance and exit test

<table>
<thead>
<tr>
<th>Tests/Testovi</th>
<th>Entrance test (%)</th>
<th>Exit test (%)</th>
<th>P-value</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>37.1</td>
<td>48.0</td>
<td>&lt; 0.0005</td>
<td>29.4</td>
</tr>
<tr>
<td>Physical activity</td>
<td>48.2</td>
<td>52.6</td>
<td>0.024</td>
<td>9.1</td>
</tr>
<tr>
<td>Smoking/Pušenje</td>
<td>35.4</td>
<td>38.4</td>
<td>0.236</td>
<td>8.5</td>
</tr>
<tr>
<td>Eating habits/Ishrana</td>
<td>28.3</td>
<td>51.6</td>
<td>&lt; 0.0005</td>
<td>82.3</td>
</tr>
<tr>
<td>Diabetes</td>
<td>36.8</td>
<td>50.1</td>
<td>&lt; 0.0005</td>
<td>36.1</td>
</tr>
</tbody>
</table>

Table 2. Student’s level of knowledge for the individual risk factors for cardiovascular disease

<table>
<thead>
<tr>
<th>Tests/Testovi</th>
<th>Entrance test (%)</th>
<th>Exit test (%)</th>
<th>P-value</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>50.0</td>
<td>62.0</td>
<td>&lt; 0.0005</td>
<td>24</td>
</tr>
<tr>
<td>Physical activity</td>
<td>35.0</td>
<td>42.5</td>
<td>0.007</td>
<td>21.4</td>
</tr>
<tr>
<td>Smoking/Pušenje</td>
<td>32.5</td>
<td>52.5</td>
<td>&lt; 0.0005</td>
<td>61.5</td>
</tr>
<tr>
<td>Eating habits/Ishrana</td>
<td>55.0</td>
<td>70.0</td>
<td>&lt; 0.0005</td>
<td>27.3</td>
</tr>
<tr>
<td>Diabetes</td>
<td>14.2</td>
<td>19.0</td>
<td>0.275</td>
<td>33.8</td>
</tr>
<tr>
<td>Hypertension/Hipertenzija</td>
<td>36.0</td>
<td>21.3</td>
<td>0.003</td>
<td>- 40</td>
</tr>
<tr>
<td>Serum lipid levels/Nivo masnoća u krv</td>
<td>38.1</td>
<td>36.2</td>
<td>0.792</td>
<td>- 5</td>
</tr>
<tr>
<td>Life style/Stil života</td>
<td>32.5</td>
<td>42.5</td>
<td>0.059</td>
<td>30.7</td>
</tr>
<tr>
<td>Total/UKupno</td>
<td>42.1</td>
<td>47.4</td>
<td>&lt; 0.0005</td>
<td>12.6</td>
</tr>
</tbody>
</table>
Discussion

According to the contemporary recommendations regarding the CVD, special attention should be paid to the prevention of risk factors development (primordial prevention), as well as to the prevention of future CVD by effective management of identified risk factors (primary prevention) [16].

No multi-decade, population-based, longitudinal studies have been conducted that would link absolute levels of risk factors in childhood to incident clinical cardiovascular events in adult life. Moreover, no randomized clinical trials have demonstrated that reduction of risk factor levels in childhood prevents cardiovascular events in adult life. Such studies are difficult to undertake because large sample sizes are needed, and multi-decade follow-up period is necessary. In addition, costs of long-term interventions and monitoring would be rather high. Large cohort studies are possible and much is expected from the National Children's Study that started in 2011 in the USA that will examine the effect of environment and genetics on the growth, development and health of children across the USA. The study will follow the cohort from before birth until 21 years of age and it is expected to contribute to better understanding of the role played by various factors on health and disease [3].

Histopathological studies have shown that both the presence and extent of atherosclerotic lesions at autopsy after unexpected death of children and young adults correlate positively and significantly with the established risk factors, namely low density lipoprotein cholesterol, triglycerides, systolic and diastolic blood pressure, body mass index, and cigarette smoking habit. Multiple epidemiological studies have demonstrated a disturbing increase in the prevalence of obesity beginning in childhood, with at least 22% of 6- to 17-year-old subjects diagnosed as overweight. This is a cause for particular concern because of the strong association between obesity and hypertension, dyslipidemia, and type II diabetes mellitus beginning in childhood [17].

The Bogalusa study findings indicate that the number of cardiovascular risk factors increases, the amount of pathological evidence for atherosclerosis in the aorta and coronary arteries beginning in early childhood. Electron beam computed tomography of coronary artery calcium and increased carotid artery intima-media thickness, an ultrasound measure of carotid artery atherosclerosis, have been evaluated in 29- to 39-year-old subjects monitored from the age of 4 years. Significant risk predictors for coronary artery calcium were obesity and elevated blood pressure in childhood and increased body mass index and dyslipidemia in young adults [18].

According to the results of our study, it was concluded that the knowledge of the students attending the chosen grammar school in Novi Sad was the least about CVD risk factors that could be influenced by changing the lifestyle, including obesity, unhealthy pattern of eating, high blood serum lipid-protein level, physical inactivity, smoking, alcohol use and stress. As a result, it has been concluded that it is necessary to repeat lectures and analysis of the entrance and exit tests among students of the same grammar school.

The study conducted among grammar school students by comparing the results from the tests done before and after the lectures showed a statistically significant increase in the students' knowledge about CVD risk factors. Particularly good results were achieved by the 3rd grade students of this grammar school, who showed the lowest knowledge level on the entrance test, but a very high level of knowledge about the CVD risk factors, especially those factors that can be influenced by the change of the lifestyle on the exit test with the increase in the overall knowledge level by more than 80% (p<0.0005).

The change of the lifestyle among children and youth by reducing or eliminating risk factors that can be influenced would include the following: an overall healthy eating pattern, reduced intake of salt, alcohol and fatty substances, appropriate body weight, desirable lipid profile, desirable blood pressure, control of fasting plasma glucose level, no new initiation of cigarette smoking, no exposure to environmental tobacco smoke, complete cessation for those who smoke, being physically active every day, reduced sedentary time (television watching, computer, video games, or time on the phone), avoidance of stressful situations whenever possible.

The study included a relatively small number of participants from a single high school in Novi Sad. Further research should obtain results and conclusions that could be extrapolated to wider population.

Conclusion

By analyzing the results of the performed study, we came to the conclusion that healthy lifestyle should be popularized among children and adolescents not only from Novi Sad, but also from Vojvodina and Serbia. Children and youth should be well informed about the cardiovascular disease risk factors. Lectures on the prevention of risk factors development, as well as the prevention of future cardiovascular disease by effective management of identified risk factors should be given. Special attention should be paid to the risk factors that can be influenced by changing the lifestyle habits. That could be a way to have healthier adult population and the morbidity and mortality from cardiovascular diseases would be lowered.
References


