

# A Review of Cardiovascular Health At The Environment of The School

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**Abstract-** The review of the scientific literature was the purpose of the article on the importance of interventions that can be made within in the environment of the school. School interventions were programs that were aimed at reducing the impact of risk factors for cardiovascular diseases. These factors were the hypertension, the elevated levels of LDL-C and triglycerides, the low HDL-C levels, the obesity and the physical inactivity. It is known that these factors begin affect at the teens age, but the results are visible in adulthood. Several interventions have thrived and have been used by researchers in schools. The results were related to the duration of the intervention program, the age, the sex of the participants, as well as the content of the same intervention program. Many research results showed an improvement in the expected results, while in others there were no significant differences. Additional studies are needed to improve intervention programs in schools, which are aimed at reducing risk factors for cardiovascular diseases.

**Index Terms-** Blood pressure, exercise, diet, lipids profile, obesity, prevention, school, lifestyle.

## I. BACKGROUND AND DOCUMENTATION OF CARDIOVASCULAR HEALTH IN SCHOOLS

There is plenty of evidence for the importance of primary prevention of cardiovascular diseases (CVD), which is known that starts from childhood. The need for informing the general public, with the aim of improving, promoting health and reducing the risk of CVD is considered authoritative. Autopsy studies done on children and young people, after unexpected deaths [1], [2], [3], demonstrating the significant positive correlation that exists between the established risk factors and of atherosclerotic lesions in the aorta and the coronary arteries of children and young people. Data from the Bogalusa Heart Study ([1], [2] and Pathobiological Determinants of Atherosclerosis study in Youth [1], [2], [3] connect their modifiable risk factors, such as lipids, systolic blood pressure, diastolic blood pressure and obesity with the development and progression of the atherosclerotic process. Recent data from the Bogalusa Heart Study and the study of Finland [4] reaffirm the relationship between risk factors in childhood and adolescence and atherosclerosis during adulthood. Additional timeless surveys demonstrate the relationship between risk factors and cardiovascular diseases from childhood to adulthood of person [5], [6].

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Epidemiological studies, among which include the "Third National Nutrition Examination Survey (NHANES III), give important data about the prevalence of risk factors for the development of CVD and associate this trend with behaviors in health related issues [7], [8], [9], [10], [11]. These data are useful for informing people and the formulation of the strategy to be followed for the improvement of public health. Also supports the need for greater and more effective approach to the population on issues related to the cardiovascular health of children and young people. A particularly disturbing trend in NHANES III and other national studies was the dramatic increase of obesity in children and young people ([8]. Data (1999 – 2000) from NHANES III study demonstrate that the 15.5% of those aged 6 to 9 years and the 10.4% of those aged 2 to 5 years old are overweight (BMI  $25 > \text{kg/m}^2$ ) [9]. This trend is particularly disconcerting, because obesity is associated with the main factors of CVD, including hypertension and high lipid levels [10], [12], [13]. Results of many clinical studies documenting the rise in obesity in children and adolescents, especially among the minority's youth [12], [13].

Moreover, national studies show that the food consumption and physical activity for the majority of children and young people does not agree with the recent recommendations of experts. Fat consumption has decreased over the past two decades by 36.3% to 34%, as a percentage of total energy intakes from food. Nevertheless the intake of saturated fat was increased from 12% to 16% of the total energy intake [14]. At the same time, according to NHANES data there is the trend of obesity in particular in young from minorities, where there is a significantly higher intake of saturated fat [14], [7].

The dietary guidelines for Americans recommended that they are used as a standard for the percentage of energy intake of total fat and saturated fat. A content analysis of nutrition at school ages proves that the total fat and saturated fat contained in children's meals exceed recommended levels given by these dietary guidelines [33] (U. S Department of Agriculture 1992). In addition, according to 2001 data from the survey "Youth Risk Behavior Surveillance" (YRBS), it turns out that almost 80% of children who are in school do not consume the recommended servings of fruits and vegetables daily [15].

Data of the physical activity from the same survey show that the percentage of students who exercised daily declined from 41.6% in 1991 to 29.1% in 1991. Students reported, only about one-third exercised for 20 minutes or longer during the course of physical education. Moreover the participation in sports for recreation and entertainment decreased substantially from the ages of 9 and 12 years. This type of change is more intense and conspicuous among girls. For example in 2001 the YRBS study concluded that the

participation rate of girls in exercises with high intensity was 67% at ages 9 years and 45% at ages 12 years [15]. Similar data from the longitudinal study "National Heart, Lung and Blood Institute" (NHLBI) Growth and Health Study shows a sharp decrease of physical activity during adolescence, between boys and girls [16].

Also at the age of 18 and 19 years old, 56% of girls reported no physical activity was related to sports or recreation. Notable factors that can predict the reduction of physical activity is the low educational level of parents and a high BMI [16]. Overall the indicators available underline the need for the individual and the comprehensive approach of the population, with the aim of primary prevention of CVD, which starts from childhood. The guidelines of the American Heart Association (AHA) for improving cardiovascular health [17] describe a comprehensive list of goals, objectives and strategies that can be approximated by the general population. One third of the programme's objectives "Health Year 2010" can be influenced significantly by the health programs that may be carried out within the school, by assigning a strategic role in school so they can achieve these goals [18]. The school can give too many chances and many stimuli, so misinformed one new about the type of diet you should have, which is a risk factor for the prevention of DSA. School programs can be considered like a unique opportunity, because they give the possibility of an effective intervention in all the above mentioned risk factors, such as lipids, blood pressure and obesity.

## II. PROGRAMS THAT PROMOTE EXERCISE AND PROPER DIET

The majority of programs that promote exercise and healthy eating are at the school environment and most of them focus on young [19], [20], [21], but some of them also are focus on adolescents. Many of these are complex programs, which aim to reduce cardiovascular risk factors through behavioral change and exercise and sometimes include smoking [21]. Generally has proven that theory classes are not effective in health behavior change [22], [23]. But programs that include behavioral change approaches, have a higher success rate in achieving the goals they have set.

### A. *Intervention Programs aimed at reducing lipids*

A centralized, random, well organized and controlled clinical trial (DISK), designed to examine the efficacy and safety of interventions in nutrition, in order to reduce LDL-C in adolescents young people with elevated LDL-C. The people that were in the intervention group were taught to follow a diet, which constituted the "National Cholesterol Education Program" program Step II Diet and which was addressed in children with a family history of premature cardiovascular disease [24].

Recently in another research [24] after 3 years of intervention, the average LDL-C was found significantly decreased in the intervention group compared with the control group. Compared intervention group children with those of control group had significantly lower intake of total fat (28.6% vs. 33.0%), saturated fat (10.2% versus 12.3%), and cholesterol (95.0 versus 112.9 mg/dl). Diet DISK was

found to be safe, based on non-diversity of intervention and control groups in terms of height and weight.

Furthermore found that there was a significant difference in reducing LDL-C and in other studies, such as in research [29] in which the LDL-C was reduced by 11.7 mg/dL in control group, compared to 15.4 mg/dL in the intervention group. In this survey, it was examined in detail the relationship between the intake of total fat, saturated fat and cholesterol with LDL levels – C within 3 years. Other factors such as BMI and measurement of adipose tissue, sex and maturity, may influence the effect of the diet to reduce LDL-C.

## III. NON-SCHOOL PROGRAMMES

Although the majority of programmes promoting exercise and good nutrition among young, school-based, are also quite significant modification of healthy behaviors with programs that take place outside of school. Teenagers consume multiple meals and snacks every day outside of school and practiced in a wide variety of exercises and outside the classrooms [25]. Furthermore, it is quite important that these programs equip teens with positive elements of healthy behaviors, which carry into adulthood, and after the end of programmes made either in school or in after-school environment [25], [22]. However, the current knowledge about the programs is acceptable where after-school environment-based, as are the family and the society, are extremely scarce.

In a long time program that was implemented within and outside of school, namely "The Minnesota Heart Health Program Class of 1989" studied the changes of the behavior of individuals, as to the exercise and diet [26]. The main parts of the program were applied initially to the second class of the high school, but also a second intervention was in high school. The program contained theory of physical education in high school and courses of the healthy eating in the first class of Lyceum. The intervention had significant results, especially among adolescent girls. Nevertheless, the experimental design did not provide enough data to allow an assessment of whether the external intervention has added something important to healthy adolescent behavior above and beyond the school intervention.

## IV. CONCLUSION FOR PROGRAMS THAT PROMOTE EXERCISE AND NUTRITION

In conclusion, some complex programs that was made within the schools and is designed to promote cardiovascular health through changes in the school environment, through various approaches to change behavior through education, have shown encouraging results. The research "The Child and Adolescent Trial for Cardiovascular Health" (CATCH), for example, was a program in the school environment that showed long-term positive effects on exercise and diet.

The valuation of the CATCH survey, which was a large and complex scale randomized research based on school curricula, were successful. However more research is needed to determine the appropriate amount and intensity of exercise but also the kind of nutrition programs for teenagers. It must also be an evaluation of the programs that run outside the

school premises and is based on the effect of family and society.

#### V. THE PROMOTION OF CARDIOVASCULAR HEALTH IN SCHOOLS

Since the late 1970s it was conducted a variety of interventions aimed at promoting health in schools. Many of these interventions contained only at topics with health knowledge related to the heart, while in some others intervened to other risk factors of cardiovascular diseases, with a more comprehensive approach. Many of the early studies considered that they belonged to the first generation of studies, which were primarily teaching interventions and focusing on the positive impact of providing knowledge on health issues, or on issues of conduct and attitudes. Since the mid of 1980s research that was based on the school environment, focused and in theoretical interventions from behaviors, but also were valued and measured a number of factors that were considered responsible for the occurrence of cardiovascular disease [27].

The results of this second generation of surveys were reviewed, analyzed and were synthesized from them [27], demonstrate the core of these interventions in schools to improve risk factors for CVD at children and young people. Also documented surveys for the third generation, in which the research was extrapolated beyond the classroom with interventions, focused on the wider school environment and included the nutrition and physical activity programs, which could be extended to other hours after school hours.

Example of the third generation of interventions is the CATCH research, done in schools [28], [29], [30], [31], [32]. More specifically, the CATCH was the largest, randomized, controlled research designed to evaluate and assess the effects of interventions in the school and in the family, to risk factors for the development of CCA diseases in school children. In this survey included 96 schools, of which 56 were in the intervention group and 40 in the control group from four different geographical areas, which was California, Louisiana, Minnesota and Texas. The sample at the beginning of the survey included students who belonged to many nationalities. The CATCH intervention included, among other things, the curriculum that was taught in the classroom, various nutrition and physical exercise. Also it was examined the impact of the family. The primary objective of the intervention was in school was to reduce the fat content of foods offered in the school and the quantity of medium intensity exercise during the course of physical therapy. At the individual level for each student, the primary objective was to reduce the levels of cholesterol, the recall in memory of quantity food's consumed and physical activity, while secondary objectives were other physiological and social parameters [28], [29], [30], [31].

The results demonstrate that the CATCH intervention was able to modify the percentage of fat at the foods that ate the students in school, to increase the physical activity of medium intensity and to improve the quality of nutrition [28]. In particular, the percentage of total fat in school decreased significantly more in the intervention schools from 38.7 to 31.9%, while in the control schools by 38.9 to 36.2%. Similar during the CATCH intervention decreased the total saturated fat in school meals menu from 14.8% to 10.8%, while in the

control schools decreased from 15.1% to 13.7%.

Another effect of the intervention of CATCH was a significant increase in the proportion of medium intensity physical activity during the physical exercise in the school from 37% to 52% of students, students in the intervention schools to demonstrate greater physical activity compared to control schools. No differences were observed between schools of the intervention and control in total cholesterol or other physiological measurements [28].

#### VI. REVIEW OF RELEVANT RESEARCHES

In the majority of the interventional studies the key variables that tested were obesity (body weight, body mass index), blood pressure (systolic, diastolic), the reduction of lipids (cholesterol, triglycerides, HDL-C, LDL-C), the diet quality and physical and physical activity. There are studies that assess the risk factors for cardiovascular disease. The studies were implemented various intervention programs in different contexts, with different durations.

In a survey [34], which was last for one school year in order to assess a school program that to improve the physical activity for 540 students, who were selected randomly. The intervention group (n = 297) performed physical activity lessons that included physical education classes and daily activities during breaks. It was measured the risk for developing cardiovascular diseases such as Body Mass Index (BMI), blood pressure, blood glucose, cholesterol, triglyceride levels, LDL-C and HDL-C. The results showed that there was an increase aerobic capacity, increase in physical activity at medium intensity at school exercises and during the rest of the day. Therefore an appropriate intervention program could increase physical activity and reduce obesity in children.

In a study [35] it was evaluated an intrusive program that lasted 12 months and addressed to 498 students aged 8-10 years in the public schools of Mexico City. The purpose of the intervention program was to increase physical activity and to reduce sedentary life of the students. According to the results of the intervention, it was proved that the program positively changed the physical activity and significantly reduced the time in sedentary activities. Finally there was a significant increase in physical activity with medium intensity exercise among students in the intervention group but not in the control group.

In a pilot study [36] it was studied the improvement of modifiable risk factors to students of 5th grade of elementary school. Specifically the study was aimed to improve the knowledge of the participants, the modification of behaviors and attitudes about nutrition and physical activity, the heart health, and finally to increase the number of students who met the officially recommended levels of physical activity and diet. The duration of the intervention program was a school year. The intervention included lessons properly designed to promote heart health, proper nutrition and increased physical activity. Attended physical education teachers helped by undergraduates. The researchers conclude that it is possible and feasible, the development and use of such methods with multifactorial interventions at school level to improve the modifiable risk factors for cardiovascular diseases

According to the authors [37] in this study it was reviewed the changes was made to students, in order to reduce the risk

factors for cardiovascular disease. According to the results, students improved their knowledge of the cardiovascular system and risk factors for health. Cholesterol levels remained stable. A small percentage of young girls moved from the category with high content of fat in the body, to the category with lower fat levels, while 21% of the experimental group reduced the consumption of fats. Participating students showed a slight decrease in blood pressure. The authors reported that cardiovascular diseases are the result of many factors and a program that was lasting only for one year, for only 30 minutes a week is not enough to achieve the targets for the prevention of cardiovascular disease.

In a systematic review and meta-analysis [38] it was evaluated the effectiveness of educational interventions on body mass index. Among 18 studies that met the criteria involved a total of 18 141 primary school students. The duration of the interventions ranged from six months to three years. The meta-analysis showed that BMI did not improve during the interventions. Also there were not any other changes in body composition, although there were beneficial effects on the health of students.

In another pilot study [39] it was examined the effectiveness of an educational intervention in children aged 11-14 years. This was intended to prevent and reduce the modifiable risk factors for cardiovascular diseases. There was intervention group in which increased physical activity for two hours a week, for a total of 18 weeks. The intervention took place in the school. It was measured the body composition, the skinfolds, the blood pressure and the physical fitness of students. Questionnaires were used to assess physical activity and nutrition. Finally it was tested the blood lipid levels. The researchers conclude that it is possible, in terms of cost, the implementation of appropriate strategies to reduce risk factors for cardiovascular diseases in people.

Also in another study [40], an interventionist program was applied to students aged 6-13 years during two school years. It was involved a total of 2494 students from five schools, four of which were involved in the intervention group and one in the control group. The intrusive program included training courses on nutrition, physical activity, the way of living, modified school meals and information about proper nutrition staff canteen and students' parents. They measured demographic and anthropometric factors and blood pressure. The results showed a reduction in blood pressure in girls and reducing weight and body mass index also girls. Scholars emphasize in conclusion that school interventions show promising results for improving health in particular girls.

In an intervention [41], the aim was the increasing of physical activity in schools, according to an intervention program that was implemented and in which it was involved 515 pupils aged 9-11 years. The duration of the intervention was 16 months. The results showed that there was an increase in physical activity only boys in the intervention group, which is an important fact because the current trend is the reduction of physical activity and exercise.

## VII. CONCLUSION

Conclusively it is possible after the appropriate interventions inside the school environment but also and outside it with appropriate programs the risk factors for cardiovascular diseases can reduce in young students and teenagers.

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