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THE PREVALENCE OF LIFESTYLE RELATED CARDIOVASCULAR RISK FACTORS AMONG SCHOOL-GOING FEMALE ADOLESCENTS IN KSA IN A FAMILY MEDICINE CLINIC

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Abstract:

Background*: In KSA the prevalence of non-communicable diseases and related lifestyle behaviors are pervasive. Adolescent population at the transition of childhood and adulthood start to pick lifestyle related risk factors for cardiovascular diseases. The present study was undertaken to estimate the prevalence of lifestyle related risk factors and its socio-demographic correlates among school going adolescent girls in KSA .****Methods:****A cross-sectional study was conducted during 2018 on a sample of students selected from 6 public schools using a multistage stratified random sampling technique. to entire school peers, an cooperation was held and anthropometric parameters including blood pressure readings were chosen. Fasting glucose and total cholesterol levels on a capillary blood sample were measured using Accoutered for a subsample of students.****Results:****Of the 120 female students selected, 35% of adolescent females, the overall mean age was 15.3 ± 2.7 years. After age adjustment, about 12% of the students were found overweight. In addition, 3.6% and 7% of the students were found to have systolic and diastolic hypertension, respectively, with no statistically significant difference between females. Among the selected female students, 1% of females had hypercholesterolemia (p=0.04). Hyperglycemia was found in 0.2% of females. Students in the 9th to 12th grades, 1% of females were current cigarette smokers.****Conclusion****: Appropriate strategies should be adopted involving school authorities; social media as well as parents to control those identified risk factors for reduction of the chance of CVD among today's adolescent school students.*

Key words: *Female Adolescents, CVD, Comorbidities, Prevalence*

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INTRODUCTION:

Cardiovascular diseases (CVD) account for a major proportion of all deaths during adulthood in both developed and developing countries [1]. The major risk factors in adulthood appear to be determined by patterns of behavior established in childhood and adolescence. Preventing the development of such behavior in childhood is easier than the attempt to reverse the situation and reduce the resulting risk of atherosclerosis in adulthood [2], that's why schools have to be unique in their attitude.

Data on the prevalence of CVD risk factors among children and adolescents in Saudi Arabia is scarce. To our knowledge, only one report[3] from Saudi Arabia dealt with the prevalence of these risk factors in children. The sample in that study was confined to only one primary school where neither girls nor adolescents were considered. It is the aim of this study to describe the prevalence of CVD risk factors among male and female school children of various ages and at different educational levels and to discuss the potential for future intervention.

MATERIAL AND METHODS:

Study design

To achieve the objectives of this study a cross-sectional or prevalence study design was followed.

Sample selection and study subjects

A multi-stage stratified random sampling technique with proportional allocation (involving three major stages) was used to choose the required number of schools in KSA at each educational level and the required number of students from the selected schools according to their study grade. The sample size was determined by means of one of the conventional equations with a 90% power, $\alpha = 0.05$ and an estimated prevalence for any CVD risk factor of at least 5%. In order to handle any missing data, as large a sample size as possible was aimed for. Therefore, a total number of 120 students were selected from 22 public schools at the three educational levels (primary, intermediate and secondary) during 2018.

Methods of data and specimen collection

Medical students trained on interviewing skills, anthropometric measurements, blood pressure measurement, and blood testing using the Accutrend® GC meter were recruited and divided into task groups to conduct the study under the direct supervision of the authors.

All students were interviewed using a structured questionnaire which included information on sociodemograhic factors, physical activity and family history. For students in the third grade intermediate and first, second and third grades secondary, additional information on smoking habits were also obtained using a separate self-administered questionnaire. The following measurements were also taken on all students: weight using Seca® (model 777) personal scale to the nearest 0.1 kg and height using a standard measuring tape to the nearest 0.1 cm, both without shoes and lightly clothed from which body mass index (BMI) (weight in kg/height [2] in meters) was calculated; triceps, skinfold thickness using Slim Guide®skinfold caliper; and blood pressure using Baumanometer® desk model. In addition, blood sugar has to be sampled and standardized in an expected solution. sample were measured for a random subsample of the students using Accutrend® GC, Boehringer Mannheim.

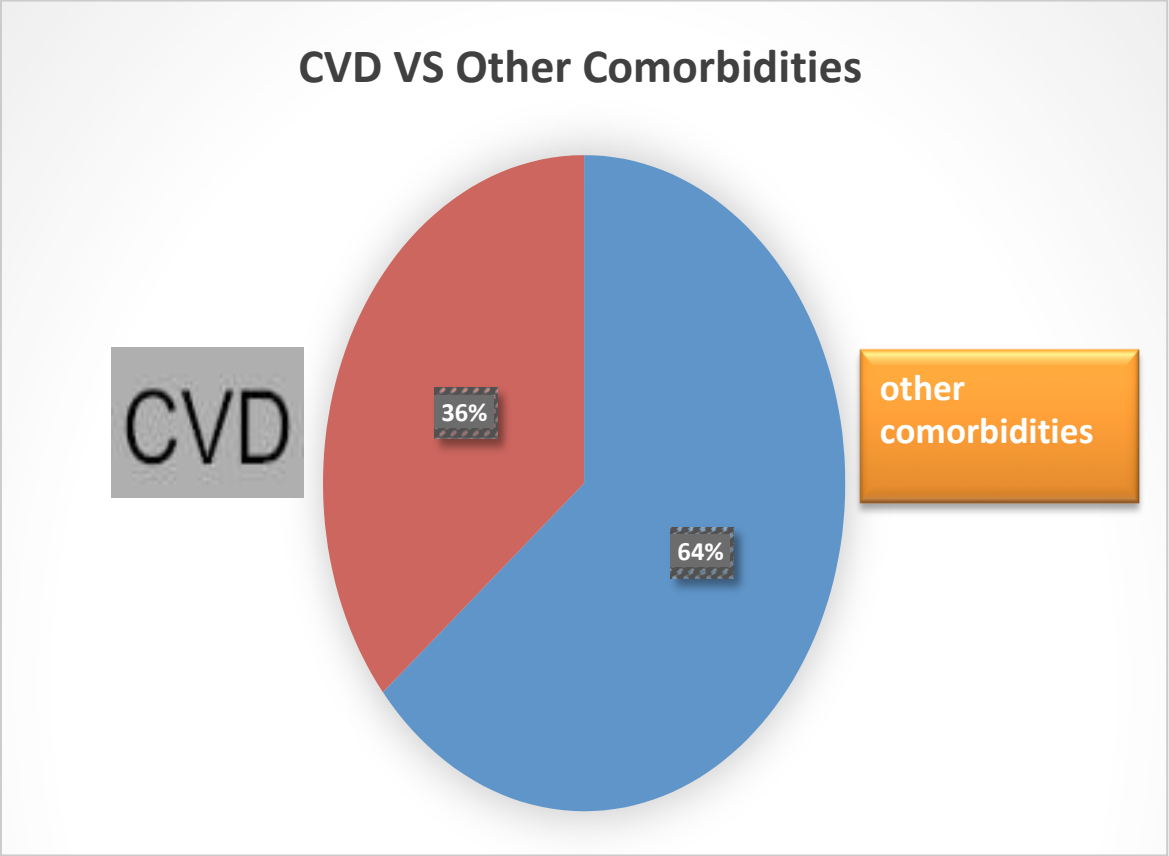
Throughout the study, scales were calibrated at the beginning of each session and each time they were moved. Similarly, different meters were constantly checked for accuracy of reading according to the manufacturer's protocol.

After adjusting for age, cut-off points for BMI and skinfold thickness to determine obese and overweight students, respectively, were based on a published reference data for obesity [4]. Similarly, cut-off points to determine those with systolic or diastolic hypertension were based on the criteria for arterial hypertension outlined by the WHO[5] and the third JNC classification of blood pressure [6] after adjusting for age. For the age groups 6 - <10, 10-<14, and 14-18 years, systolic/diastolic hypertension was defined as blood pressure readings of >=120/80, >=125/85, and >=135/90 mmHg respectively. Physical activity was assessed through only the performance of regular physical exercise based on the total number of hours per week and then categorized accordingly. Hyperglycemia was defined as a fasting glucose level of > 120 mg/dl and hypercholesterolemia was defined as a fasting total cholesterol level of >=200 mg/dl. The criteria used follow known scientifically acceptable cut-off points for children of the same age range as the study population.[7].

Data management and statistical analysis

Data were entered in a database file and scrutinized for outliers and influential points. The search was using SPSS system to enhance our search. Descriptive statistics, chi-square test and t-test were used as appropriate. The analyses of BMI, skinfold

thickness and blood pressure were adjusted for age. Level of significance was set to be <0.04 throughout the analysis.



type	(Yes)	(No)
Cardiovascular	18%	82%
Other Comorbities	35%	65%

RESULTS:

A total of 120 girls were studied. The Mean age for females it was 15.6 ± 2.5 years. The majority of the girls were in age groups 13-15 years and 16-18 years (34.3% and 40.0% respectively). About 67% of the girls were Saudis and 33.2% were non-Saudis.

Mean values and standard deviations of weight, height, BMI and triceps skinfold thickness, of female students are shown in table. On the average, females between the age of 10 and 14 years had a higher weight. But at 15 years of age, the picture was reversed with weighing more. Females were also taller between the age of 10 and 13 years but this was reversed at 14 years. With minor exceptions, mean values of both BMI and skinfold thickness for female students were higher of all ages. Overall mean BMI adjusted for age was 21.0 ± 5.7. Mean BMI was significantly lower in females (20.6 ± 5.6 vs 21.9 ± 5.8, $p < 0.001$). Overall, 23.5% of the students were obese (26.4% females were obese, $p<0.005$). This was confirmed by results of skinfold thickness adjusted for age where 12% of the students were found to be overweight.

Age (years)	No.	Weight (kg)	Height (cm)	BMI* (kg/m²)	SKF† (mm)
9	22	27.8 (7.5)	131.9 (6.6)	15.6 (3.2)	9.1 (2.7)
10	144	30.5 (8.8)	134.7 (8.5)	16.2 (4.2)	10.2 (5.0)
11	147	34.3 (9.5)	139.3 (7.3)	17.0 (3.9)	11.4 (6.6)
12	195	38.1 (11.2)	144.1 (10.2)	17.7 (4.2)	11.7 (5.5)
13	290	41.9 (13.7)	147.8 (10.3)	18.4 (5.0)	11.6 (6.2)
14	360	49.8 (15.1)	156.2 (9.7)	19.8 (5.2)	11.9 (6.0)
15	313	54.2 (15.1)	162.7 (9.2)	19.8 (4.9)	11.5 (6.1)
16	357	58.0 (14.8)	165.5 (9.4)	20.8 (5.5)	11.3 (6.2)
17	407	63.9 (16.6)	168.7 (10.1)	22.2 (6.7)	12.2 (7.0)
18	350	64.9 (15.7)	169.8 (9.0)	22.1 (5.6)	12.2 (7.0)
19	160	64.9 (15.2)	172.2 (6.7)	21.2 (4.6)	11.3 (5.9)
20	83	66.7 (16.2)	171.6 (6.2)	22.1 (5.2)	12.2 (7.0)

*BMI = Body Mass Index †SKF = Triceps skinfold thickness

Overall mean systolic blood pressure was 114.8 ± 12.7 mmHg and mean diastolic blood pressure was 74.4 ± 10.0 mmHg and there were consistent increments with age for both. After adjusting for age, females were of higher mean systolic blood pressure. Analysis among various age groups showed that in the first two groups, females had significantly higher systolic and diastolic blood pressure.

After adjusting for age, 3.6% of the students were found to have systolic hypertension while 7% of them were found to have diastolic hypertension. More Females significantly had systolic hypertension ($p<0.0001$). However, no statistically significant difference was found between readings of diastolic hypertension.

Overall, 64.8% of the students reported that they perform physical exercise for at least half an hour per week on a regular basis. However, this was more evident among female (78.8% vs 30.5%, $p<0.001$).

DISCUSSION:

We have compared both males and females in the discussion section as written below.

Compelling evidence exists that the atherosclerotic process begins in childhood and progresses slowly into adulthood, when it frequently leads to coronary heart disease (CHD) [8]. In addition, cardiovascular risk factors found in children are potentially predictive of adult CHD[9]. Therefore, identification and modification of CVD risk factors in children together with early development and maintenance of healthy lifestyles are advocated as important precursors to the reduction of adult onset of cardiovascular disease [10].

Obesity is a well-known predisposing factor for CVD especially through its role in the development of other risk factors like diabetes mellitus, hypertension and high blood cholesterol level. BMI, as measure of obesity, increased in our sample with age in both sexes and was found to be higher for females than males, which is consistent with results from previous studies done in Saudi Arabia [3,11,12] and elsewhere [1].

The proportion of obese students (23.5%) in our sample, although considerably high, is not different from what has been reported previously.[3,13] However, a greater proportion of females (26.4%) than males (23.3%) were found obese, which is, again, consistent with the finding of Al- Sekait et al[13] (31.8% of females vs 27.1% of males). This has been further confirmed in our study by the measurement of triceps skinfold thickness indicating a greater fat deposition among females. In fact, these sex-related differences could be explained by lack of physical activity among females in our Saudi society as compared to male students, a situation which was confirmed in this study. This, in turn, calls for the urgent inclusion of physical activity programs in the curriculum of female schools in an appropriate way that does not conflict with the Saudi culture, in addition to dietary intervention for all students.

Recent studies [14-17] have shown that levels of blood pressure and serum cholesterol in childhood are predictive of levels during adulthood. Apart from diastolic blood pressure (DBP) for females in the age group 10 to <14 years, both male and female students exhibited consistent increase in systolic blood pressure (SBP) and DBP with age which conforms to a previous report.[3] Moreover, for students <14 year-old, females had both higher mean SBP and DBP than males which is the opposite of what held for students of 14 years and

above. This could be partly explained by the fact that blood pressure level is influenced by various factors including physiological and emotional state of the child, which could vary between males and females.

The proportion of hypertensive students in the present study was higher than that reported from a similar study in Japan (1%) [18] or that found in another study done in Saudi Arabia (0-4%) [3] but similar to some other studies[19–21] done elsewhere. Many factors could explain these variations including genetic, environmental, dietary pattern, technical and methodological issues.

The mean values of total cholesterol reported in this study are generally lower than those levels reported previously from Saudi Arabia [3] and several other studies on European and American children [10,20,22,24], but similar to some other studies done elsewhere [25,26]. Although national dietary pattern might partly explain these differences, the comparison of these values between different studies could be affected by various technical and methodological considerations [27].

The finding in our study that female students have higher total cholesterol levels as compared to males confirms to a similar study from USA.[10] This might indirectly confirm the general trend in our study that females have higher BMI and skinfold thickness than males.

Measuring blood cholesterol levels in children and adolescents is important. This is supported by numerous indications including the aggregation in children (as in adults) of elevated cholesterol levels with other CVD risk factors, tracking of high cholesterol levels (and of other risk factors) from childhood to adolescence and early adulthood, and the association of risk factors in children with a parental history of cardiovascular disease [28]. However, advocating screening programs in children and adolescents is a controversial issue that should be determined on the basis of its cost effectiveness and other technical criteria as well as the availability of effective preventive measures.

Interestingly, the 2.3% of school students with hypercholesterolemia reported in our study was much lower than that reported by Al-Hazzaa (22.9%) [3] in his study from Riyadh or that reported by Wynder et al [29] in the study from 15 countries, but similar to others [18,29].

The adverse effects of tobacco smoking are now well known. Prevalence rates vary considerably among children and young people by age, sex and country. The percentages of current smokers among either male (6.9%) or female (0.5%) secondary school students in this study were less than that reported by a study[30] from the Riyadh region conducted among secondary health institutes (17.5% for males and 8% for females), and much less for male secondary school students compared to that (24.8%) reported from Cairo, Egypt [31]. However, much higher percentages were reported from developed countries like England [32] where 33.3% and 29.9% of male and female secondary school students, respectively, were current smokers. Inspite of these low percentages in our sample, effective measures to prevent smoking among school students should be implemented and schools should have a greater role in health education.

Studies among children have shown that children's smoking rates and nutrition habits can be influenced and their serum cholesterol levels can be modified [33,34]. In fact, the promotion of lifestyles that are likely to result in optimum levels of CVD risk factors in youth is the basis for early prevention of CVD and promotion of health [33]. Thus, the inclusion of cardiovascular health education in general educational studies of children should be a major objective of the future [35]. However, it should be clear that an integrated school policy which calls for the promotion in schools of healthy heart implies not only health education lessons in the classroom but also a healthy workplace for teachers and a healthy school environment complemented with parents' involvement since most of the curricula used in successful interventions were aimed at parents as well as children [1,36].

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