Original Research Article

A Study to Identify the Risk Factors of Coronary Artery Disease among Adolescents at Selected Adolescent Clinic in Kolkata, West Bengal

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ABSTRACT

Coronary artery disease can be prevented if high risk factors are identified in adolescent and modified. To implement effective preventive measures, the magnitude of the problem should be known. The objective of the study was to identify the risk factors of coronary artery disease in adolescents and its relationship with other factors. Based on health Belief model, descriptive survey design was chosen. Semi structured interview for background information and structured interview for assessing risk factor related information was performed. Body weight and blood pressure was measured and BMI was calculated and analysed in terms of both descriptive and inferential statistics.

72% of adolescents were at moderate risk for developing coronary artery disease and 16% were at higher risk.57% of adolescent had family history of hypertension or coronary artery disease. No significant association was found between the risk factor of the adolescents and selected demographic variables except their age. The study revealed that adolescents had risk factor for future development of coronary artery disease. It signifies the need for creating health awareness among adolescents studying at school, housing complex and in the community. The present study has severe implications for nursing practice, nursing education, nursing administration, nursing research.

Key words: Coronary artery disease, Adolescent, Obesity, Hypertension, Smoking, Physical activity

INTRODUCTION

Adolescence is a period of transition for growth and development, a very tender period of life where a person is in between childhood and adulthood. Most important goals of preventive cardiology are to identify and develop interventions to lower those indicators of coronary artery disease risk during childhood and adolescence that are predictive of subsequent development of CAD in adult life. . In the past five decades, considerable evidence has been accumulated to support the argument that the atherosclerosis may begin early in life and can progress to advanced stage of young adulthood. Post mortem examination of American and Finnish school children revealed fatty streaks and intimae thickening in youth. In a large analysis of 4737 subjects aged 10 to 39; coronary fatty streaks were found to develop beginning at the age group 10 to 14. [1] Parental and family influences, peers, educators and media all play role in shaping a adolescents' health beliefs and lifestyle behaviors that are often carried into adulthood. [2] The multicenter Pathobiological Determinates of Atherosclerosis in Youth (PDAY) study evaluated coronary arteries, aorta, blood and other specimens from approximately 3000 individuals 15 to 34 years old who died of external cause. [3] Investigators correlated the extent of atherosclerosis in the right and the left anterior descending coronary

arteries with serum lipid, glycosylated haemoglobin level, history of smoking and indices of adiposity. Each of these factors was independently associated with the extent of atherosclerosis noted. A parenteral history of CAD as well as a grand father history of high choresterol or CAD corelates with the high incidence of CAD risk factors among children. [4] It is established that atherosclerosis begins in childhood and adolescence and the cardiovascular risk in earlier can be tracked into adulthood CVD. [5] Research into adolescent cardiovascular risk factor provides evidence that the devlopment of possible large scale intervention may hold great promise if conducted before life style choice are entrenched. Adolescence is an important target stage for research on the identification and modification of risk factors. Nutritional intake,physical activity or inactivy, smoking, attitude and behaviour begin in childhood. Research on adolescents is valuable at this stage of life span devlopment to identify CAD risk factors and prevalence, so that individuals and societies can make decision about where to put their health promotion and risk reduction effort based on the evidence. [5] Many CVD risk factorsare adopted by adolescents without awarness of their present and long term impact on h5ealth or the potential devlopment of the heart disease. "Prevention is better than cure". In any preventive programme, the level of magnitude of the problem is to be defined.

So studies are needed to identify risk factors and to find out its prevalence. It is hoped that this information will serve as a resources to policy makers who shape policies and programme to reduce CVD risk. This information will also help the clinicians who deal with adolescents in the assessment and management of CVD risk factors.It will also help health educators to formulate strategies in the primordial prevention of coronary artery disease. Many studies have been conducted on several aspects of CAD. But none was found specifically related with identification of

risk factors of CAD among adolescents. The researcher has observed during her working periods that the prevalence of risk factors of CAD is high among adolescents. They frequently have faulty dietary habit, are used to smoke and remain phyysically inactive. They are sometimes obese and show other habits which are deleterious to cardiac health.

Therefore the present study was undertaken to assess the risk factors of coronary artery disease present among the adolescents and to examine its association with selective variables like socio economic status,parental education, habitation (rural and urban), food habits etc.

METHODOLOGY
Descriptive survey approach and descriptive survey research design was adopted in this study to identify the risk factors of coronary artery disease and also to find out the association between risk factors and selected demographic variables.

Variables of the study

Research Variables	Demographic Variables
Tobacco smoking	Age
Alcohol consumption	sex
Heredity	habitation,
Dietary habits	education
Physical activity	occupation of adolescents
Obesity	type of family
BMI	monthly family income
Ratio of waist to hip circumference	number of family member
Blood pressure	Education of father and mother.

The study was done at Calcutta Medical College Hospital, 88, College Street, Kolkata 700073 West Bengal, India and data was collected from 30.12.2013 to 18.01.2014

Sample size
One hundred adolescents (100) were selected for the study.

Criteria for sample selection
Adolescent aged between 10-19 years
Adolescents attending adolescent clinic at Calcutta Medical College and Hospital, Kolkata

Adolescents available during study period
Adolescents willing to participate in the study

Sampling technique

In this present study, non probability convenient sampling was adopted as the researcher wanted to include adolescents from selected adolescent clinic. Adolescent were selected on the basis of their attendance in the selected adolescent clinic.

Data collection tool and techniques

Based on objective of the study, four different tools were prepared. One semi structured interview schedule was prepared to obtain demographic data related to risk factor of coronary artery disease among adolescents. Second and third tool was the structured interview schedule for assessing risk factors of coronary artery disease among adolescents. Fourth tool was utilized to measure the bio physical parameter of risk factor of CAD among the adolescents. Data collection tools and techniques utilized for the present study is presented in table 1.

Table 1: Data collection tools and techniques

Variables to be measured	Types of tool	Technique for data collection
Age ,sex, habitation ,education and occupation of adolescents, type of family, monthly family income, number of family member, reason for attending clinic, education of father and mother.	Semi structured interview scheduled	Interview
Risk factors for CAD Tobacco smoking, alcohol consumption. Heredity. dietary habits, physical activity	Structured interview scheduled	Interview
BMI, Ratio of waist hip circumference	Standardized weighing machine and stadiometer for measuring weight and height.	Physical measurement of weight and height Measurement of waist and hip circumference
Blood pressure	Digital blood pressure(CH 432)	Measurement of Blood Pressure

The investigator constructed the tools considering the factors under study and review of research and non–research literature. Teacher's opinion and formal discussion with peer group helped in the development of the tool. In order to ascertain the appropriateness of the items in the interview schedule, experts were consulted. The investigator's personal knowledge and experience in the field also were taken into consideration.

Risk status score: It was decide that after collection of data the adolescents would be categorized according to their risk status for CAD. It refers to the score given to the adolescents from cumulative score of individual risk factors depending on the presence or absence of the risk factors among them. The decision regarding scoring was taken after discussion with the experts. It was done according to the score developed by the Pathological Determinates of Atherosclerosis in Youth (PDAY) study(US National Library of Medicine,

Clinical Trials.gov Idenyifier: NCT00005679). [6,7] According to the cumulative score, categorization of the adolescents would be done as the following:
Low: <Mean±1 SD (<34.81)
Moderate: Mean±1 SD (34.81-51.81)
High: >Mean±1 SD (>51.81)

RESULT

In the present study analysis and interpretation of the findings were based on data collected through semi structured interview scheduled and biophysical measurements related to the risk factor of coronary artery disease among 100 adolescents. Analysis was done according to the objectives of the study. Both descriptive and inferential statistics were used to analyze the data. Results of analysis of obtained data were organized by statistical method, so that the summarized results could be visualized in scientific way.

Table 2: Frequency and percentage distribution of the adolescents according to age, sex and marital status n=100

Variable	Frequency	Percentage (%)
Age (in years)		
10-14	69	69
15-19	31	31
Sex		
Male	57	57
Females	43	43
Marital status		
Unmarried	94	94
Married	06	6

Data presented in table 2 showed that 69 (69%) adolescents belonged to the age group of 10-14 years and only31 (31%) adolescents belonged to 15-19 years.

Data also showed that the adolescents were distributed more in male (57%) and less in female group (43%).

Ninety four (94%) adolescents participated in the present study were unmarried and only six (6%) adolescent girls were married.

Table 3: Frequency and percentage distribution of the adolescents according to the type of family, family income, and number of family members n=100

Variable	Frequency	Percentage (%)
Type of family		
Single	80	80
Joint	20	20
Family income (monthly)		
Up to 500	49	49
5001-10,000	47	47
10,001-20,000	04	04
Number of family members		
3-6	79	79
7-10	20	20
11-14	01	01

Data presented in table 3 explained that 80 (80%) of the adolescents belonged to single family and20 (20%) adolescents belonged to joint family. Data also projected that the family income of 47(47%) adolescents ranged from 5001-1000 per month, 49 (49%) adolescents' family income was upto 5000 per month and only 4(4%) respondents had the family income above 10001-2000 per month.

Table 4: Frequency and percentage distribution of the adolescents according to their risk status of coronary artery disease n=100

Risk status of coronary artery disease	Frequency	Percentage
Low risk (<34.81)(<M±1SD)	13	13
Moderate risk (34.81-51.81) (M± 1 SD)	72	72
High risk (>51.81 51.81 above) >M+ 1SD	15	15

Data presented in table4 indicated that most of the adolescents [72 (72%)] had moderate risk for developing coronary artery disease in future, 13(13%)] were running with low risk and 15(15%)] adolescents were at high risk.

Table 5: Range, Mean, Median, and SD of risk status score of coronary artery disease of the adolescents (N100)

Variable	Range	Mean	Median	SD
Risk status score of coronary artery disease	21--59	43.31	44	8.5

Minimum possible score: 08
Maximum possible score: 87

Data presented in table 5 indicated that the risk status score of coronary artery disease of the adolescents of the present study ranged from 21-59, mean was 43.31 with a standard deviation of 8.5, and median was 44.

Table 6: Frequency and percentage distribution of the adolescents according to the history of hypertension/CAD in the family. n=100

Heredity	Frequency	Percentage
No close relative with hypertension /coronary artery disease	37	37
One close relative who developed hypertension / CAD after 60 years	46	46
Two close relative who developed hypertension / CAD after 60 years	11	11
One close relative who developed hypertension / CAD before 60 years	05	05
Two close relative who developed hypertension / CAD before 60 years	01	01

[Close relative's means-grandparents, parents, brothers, and sisters]

Data presented in table 6 regarding history of hypertension /CAD showed that majority57 (57%) of adolescents had close relative who developed hypertension /CAD after 60 years, (06%) had close relative who had developed hypertension /CAD.

Table 7: Frequency and percentage distribution of the adolescents according to their dietary habits of salt intake n=100

Dietary habits	Frequency	Percentage
Take salt free diet	01	01
Do not add extra salt in diet	57	57
Takes extra salt in diet	40	40
Takes extra salt and pickles in the diet	02	02

Data presented in table 7 showed that among the adolescents, 40% had the habit of adding extra salt in diet and 2% used to have both salt and pickles in their diet, 57% did not take extra salt and 1% used to take salt free diet.

Table 8: Frequency and percentage distribution of the adolescents according to their dietary habits other than salt n=100

Dietary habits	Frequency	Percentage
Strict vegetarian do not take saturated fat	13	13
Vegetarian & take unsaturated fats	12	12
Vegetarian & take saturated fats	03	03
Both vegetarian & Non vegetarian and like to take unsaturated fats	17	17
Both vegetarian & Non vegetarian and like to take saturated fats	37	37
Non vegetarian & take only unsaturated fats	17	17
Non vegetarian & take plenty of saturated fats	01	01

Data presented in table 8 showed that 28% of adolescents were vegetarian and among them 3% took saturated fats. Seventeen percent of adolescents were both vegetarian non vegetarian and liked to take unsaturated fats,37% were both vegetarian and non vegetarian and like to take saturated fats, and out of 18% of non vegetarian,1% took plenty of saturated fat and 17% took unsaturated fats.

Table 9: Frequency and percentage distribution of the adolescents according to the physical activity they perform (N100)

Physical activity	Frequency	Percentage
High physical activity (low risk for CAD)	nil	------
Moderate physical activity (moderate risk for CAD)	08	08
Low physical activity (High risk for CAD	92	92

Data presented in table 9 showed that almost all the respondents used to perform low physical activity (92%) and only 8 (8%) of the adolescents used to perform moderate physical activity. According to the tool, adolescents performing low physical activity were at higher risk of developing CAD. No adolescent of the present study performed high physical activity.

Table 10: Frequency and percentage distribution of the adolescents according to their habit of tobacco smoking (N=100)

Tobacco Smoking	Frequency	Percentage
Never smoke	85	85
Use to smoke but left now	10	10
Smoke <5 cigarettes daily	05	05
Smoke 5-10 cigarettes daily	nil	----
Smoke 10-20 cigarettes daily	nil	---
Smoke 10-20 cigarettes daily	nil	---

Data presented in table 10 showed that 85% adolescents of the present study had never smoked, 10% left smoking now

and the rest 5 adolescents used to smoke less than 5 cigarettes daily.

Table 11: Frequency and percentage distribution of the adolescents according to their habit of alcohol consumption (N100)

Alcohol consumption	Frequency	Percentage
Never taken alcohol	86	86
Takes once in a month	11	11
Takes once a week	03	03
Takes once a day	nil	----
Takes more than once a day	nil	------

Data presented in table 11 showed that among the adolescents participated in the present study, 86% never consumed alcohol in their lives, 11% used to consume once in a month and 3% were habituated to have alcohol once a week.

Table 12: Frequency and percentage distribution of the adolescents according to their (N100)

BMI	Frequency	Percentage
<18.50 (Underweight)	72	72
18.50 to 24.99 (normal)	25	25
25.00 to 24.99(overweight)	01	01
30.00 to 34.99(obesity)	02	02
35.00 to 39.99(morbid obesity)	nil	----
≥ 40(extreme obesity)	nil	---

Data presented in table 12 showed that only 3% of the adolescents were at risk of developing CAD on the basis of their BMI.

Table 13: Frequency and percentage distribution of the female adolescents according to their waist hip ratio(n 43)

Waist hip(W/H) ratio	Frequency	Percentage
≤ 0.8(normal in female)	**14**	**32.6**
> 0.8 (risk of CAD in female	**29**	**67.4**

According to the standard W/H ratio ≤ 0.8is considered as normal among female and > 8 indicates risk for CAD.

Data presented in table 13 showed that67.4% female adolescents of the present study were at risk of developing CAD according to their waist/hip ratio.

Table 14: Frequency and percentage distribution of the male adolescents according to their waist hip ratio (N 57)

Waist hip ratio (W/H)	Frequency	Percentage
≤1(normal in male)	**50**	**87.7**
> 1 (risk of CAD in male)	**07**	**12.3**

According to the standard, W/H ratio ≤ 0.1 is considered as normal among male and > 1 indicates risk for CAD.

Data presented in table 14 showed that 12.3 % male adolescents of the present study were at risk of developing CAD according to their waist/hip ratio.

Table 15: Frequency and percentage distribution of the adolescents according to their mean systolic blood pressures (measured on two consecutive occasions on the day of data collection .(N 100)

Mean systolic blood pressure (Mm/Hg)	Frequency	Percentage
67.5-100	24	24
101-120	63	63
121-146.5	13	13

Data presented in Table 15 explained that mean systolic blood pressure of 24 (24%) adolescents were within the range of 67.5- 100 mm/Hg, 63(63%) adolescents were within 101-120 mm/Hg, and 13 (13%) were within 121-146.5.mm/Hg.

Table 16: Frequency and percentage distribution of the adolescents according to their mean diastolic blood pressures (measured on two consecutive occasions on the day of data collection) n=100

Mean diastolic blood pressure (Mm/Hg)	Frequency	Percentage
53-80	80	80
81-104.5	20	20

Data presented in table16 explained that mean diastolic blood pressure of 80(80%) adolescents were within range of 53-80 mm/Hg, and 20(20%) adolescents were within range of 81-104.5mm/Hg.

Table 17: correlation coefficient and its significance existing between age of the adolescents and their risk status for coronary artery disease

Variable	r-value	t-value
Age and risk status of CAD	0.36	3.82

T(98) 3.39 P<0.001

Data presented in table 17 revealed that the correlation coefficient computed between age and risk status of the adolescents of coronary artery disease was 0.36 which was statistically significant as evident from respective "t' value.

So the risk status of the adolescents of the present study for CAD was dependent on their age.

Table 18: Chi-square test of association between sex of the adolescents and their risk status for coronary artery disease (N 100)

Sex	Risk status score of CAD			
	< Median	≥ Median	Total	Chi- square value
Male	25	32	57	0.22
Female	21	22	43	
Totals	46	54	100	

X^2 (df1) = 3.84, P,>.0.05

Data presented in table18 showed that 25 male adolescents scored below median and 32 scored at and above median of total risk status score of CAD. Similarly, 21 female adolescents scored below median and 22 scored at or above median as far as their total risk status score of CAD were concerned.

Chi-square value computed to determine the association between sex and risk status of the adolescents was not statistically significant at 0.05 level.

So it could be concluded that the risk status of the respondents of the present study for developing coronary artery disease was not dependent on their sex.

Data presented in table19 showed that among 84 adolescents who lived in rural area, 24 scored below median and 44 scored at and above median of total risk status score of CAD. Similarly, among 16

adolescents who lived in urban area, 6 scored below median and 10 scored at or above median as far as their total risk status score of CAD were concerned.

Table 19: Chi-square test of association between risk status of coronary artery disease of adolescents and their habitation n=100

Habitation	Risk status score of CAD			
	<Median	≥ Median	Total	Chi- square value
Rural	40	44	84	
Urban	06	10	16	
Total	46	54	100	0.55

X^2 (df1) =3.84, P>0.05.

Chi-square value computed to determine the association between habitation and risk status of the adolescents was not statistically significant at 0.05 level. So it could be concluded that the risk status of the respondents of the present study for developing coronary artery disease was not dependent on their habitation.

Table 20: Chi-square test of association between type of family of adolescents and their risk status of coronary artery disease (N100)

Type of family	Risk status score of CAD			
	<Median	≥ Median	Total	Chi- square value
Single	36	44	80	0.16
Joint	10	10	20	
Total	46	54	100	

X^2(df 1) = 3.84, P>0.05

Data presented in table20 explained that among 80 adolescents belonging to the single family, 36 scored below median and 44 scored at and above median of total risk status score of CAD. Similarly, among 20 adolescents belonging to joint family, 10 scored below median and 10 scored at or above median as far as their total risk status score of CAD were concerned.

Chi-square value computed to determine the association between type of family and risk status of the adolescents was not statistically significant at 0.05 level. So it could be concluded that the risk status of the respondents of the present study for developing coronary artery disease was not dependent on their type of family.

Table 21: Chi-square test of association between monthly family income of the adolescents and their risk status of coronary artery disease (N100)

Family income	Risk status score of CAD			
	<Median	≥ Median	Total	Chi- square value
Up to 5000	24	25	49	0.08
>50000	22	29	51	
Total	46	54	100	

X^2(df1)= 3.84, P>0.05

Data presented in table 21 explained that 24 adolescents with family income up to 5000 per month and 22 adolescents with family income of more than 5000 per month scored below median and 25 adolescents with family income up to 5000 per month and 29 adolescents with family income of more than 5000 per month scored at or above median of their total risk status score of CAD.

Chi-square value computed to determine the association between monthly family income of the adolescents and their risk status of coronary artery disease was as not statistically significant at 0.05 level.

So it could be concluded that the risk status of the respondents of the present study for developing coronary artery disease was not dependent on their family income.

DISCUSSION
Findings related to sample characteristics
Most of the adolescents (69%) were between the age group of 10 -14 years.
Majority57%) of the adolescents were male.
Only (6%) adolescents were married and all of them were female.
Majority of the adolescents (84%) lived in rural area.
Maximum adolescents had completed up to secondary level.
Majority of the adolescents were student.
Majority of adolescents belonged to the single family.
Majority of the adolescents (49%) had their monthly family income up to Rs5000/-
Only (1%) adolescent had more than11 family members whereas majority of them (79%) had 3-6 family members.

Findings related to risk level of the adolescents for coronary artery disease

Majority (72%) of the adolescents were at moderate level of risk for developing coronary artery disease (CAD) in future.

13% were of with low risk and 15% was at high risk for CAD.

Findings related to relationship between risk factors of coronary artery disease and selected demographic variables

Correlation coefficients ('r' and 't') computed between risk status of the adolescents for development of coronary artery disease and their age was found to be statistically significant at 0.05 level.

Chi square values were computed between risk status score of the adolescents for CAD and selected demographic factors to examine their associations. The result indicated that there was no statistically significant association between risk status of adolescents and their sex, habitation, type of family, and monthly family income.

Discussion related to other studies

The result obtained by the investigators in this present study had been discussed with the major findings of other related studies.

According to the present study 72% adolescents are underweight (BMI<18.50), 25% have normal BMI (18.50-24.99) and 2 adolescents are obese (30.00-34.99). This finding is supported by the study of **Shetty Rani (2010)** which had also found 76% underweight adolescents, 20% with normal BMI and 2 adolescents were obese. [8]

The present study is also consistent with the study findings of **Akhil Kant et al.(2006)** which found low physical activity, experimentation with alcohol and smoking, and hypertension in the school children. [9] In the present study 15% adolescents smoke, 14% consume alcohol, 92% perform low physical activity. According to New US Guidelines for hypertension in children and adolescents, 13% and 20% adolescents are categorized as pre hypertensive and hypertensive as per their systolic (>120 mm of Hg) and diastolic (>80 mm of Hg) blood pressure respectively.

CONCLUSIONS

In the present study majority of the adolescents in the adolescent clinic were at moderate level of risk for developing CAD. Presence of most of the risk factors had been identified among them by the investigator but no statistical association could be found between risk factors of CAD and other selected demographic variables. Only statistically significant relationship was present between risk status score of CAD and age of adolescents one of the reasons might be the small sample size. From the distribution of risk factors in the present study it was evident that there is a need for them to modify their behavior and lifestyles and take preventive action for preventing CAD in adolescents in the future. This signifies the crying need for organizing health awareness programs and regular school health program me to make them aware and promote a healthy lifestyle. This also highlights the risk of the adolescents to the need of the hour today is to educate the community, regarding prevention of CAD. Every nurse should make it her mission to teach families specially mothers and children regarding life style modification so that future epidemic of CAD can be prevented.

Implications of the study

The present study revealed that the adolescents were at risk of developing CAD in future if they would not modify their unfavorable lifestyle. It signifies the need for creating health awareness among adolescents studying in school, and in the community. The present study has implications for nursing practice, nursing education, nursing administration, and nursing research.

Nursing practice: Nursing personnel serving in the hospital and in the community provides care to the individual and group irrespective of age, sex, caste and religion. Nurses also play the role to identify the health problem of the adolescents and provide health awareness; motivate them to adopt healthy life style in order to prevent

the risk of developing CAD in the future. This wills also reduce the morbidity and mortality rate of non communicable diseases. Adolescents as well as parents' participation in health activities should be encouraged.

Nursing education: Nursing students learning at different levels should have enough knowledge and experience in providing health care regarding preventive and promotive health services of different diseases. Nursing curriculum adopted by nursing institution should emphasize the different aspects of health care delivery so that every nursing student is made aware and able to carry on different methods of preventive health strategies.

Nursing administration: As an administrator, the nurse should plan and organize continuing nursing educational program for nursing personnel and motivate them in conducting health awareness program beneficial to the adolescents in the community. Such planning requires efficient team work, enough resources to conduct the programs. Nurses with their expert knowledge on CAD can be changing agent for the society and can influence health policies and also take part in formulating healthy public policy. School health component of primary health care could be utilized more to identify the students who are at risk so that preventive strategies are planned. The students can be brought under the services of primordial prevention also.

Nursing research: Nursing research has tremendous scope to identify these types of risk factors and ways of behavior modifications of the adolescents at home as well as in the school. Research should be done on preparing better method of health teaching, focusing on interest, quality and cost effectiveness.

Limitations of the study
• The study was confined to a small sample size (100) and conducted in one adolescent clinic, so the scope of generalization of the finding was limited.

• Collections of data about dietary behavior, physical activity, and use of tobacco smoking, alcohol consumption were dependent on self reports of the respondents only

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