Original research article

To study the magnitude of cardio metabolic abnormalities and metabolic syndrome in adolescent population of primary health centre

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 Abstract
Background: The cardio-metabolic abnormalities are the cardio-metabolic risk factors including abdominal obesity, hypertension, dyslipidemia, hyperglycemia. The presence of overweight and cardio metabolic abnormalities are more common in higher socioeconomic group which is related with difference in lifestyle.
Aim: To study the magnitude of cardio metabolic abnormalities and metabolic syndrome in adolescent population of Primary Health Centre.
Material and Methods: A cross sectional study was carried out in rural area of Primary Health Centre. All adolescent in the age group of 10-19 years of Primary Health Centre, were included in study.
Considering prevalence of one or more cardio-metabolic abnormality to be 67.7% among adolescents [5], sample size of 369 was required at α-error=5%, non-response rate 10%.
Results: In present study, we found overall prevalence of metabolic syndrome was 9.9%. In the present study, the metabolic syndrome was not found to be significantly associated with physical activity among those with moderate to light physical activity. However, the prevalence of metabolic syndrome did not differ significantly (p≥0.05).
Conclusion: Therefore, we conclude that there is definitely alarming situation as per prevalence of cardio metabolic abnormalities and metabolic syndrome are concerned, even in rural communities.
Keywords: Abnormalities and metabolic, magnitude, cardio metabolic, health centre

Introduction
The cardio-metabolic abnormalities are the cardio-metabolic risk factors including abdominal obesity, hypertension, dyslipidemia, hyperglycemia. The constellations of these risk factors are responsible for metabolic syndrome. The metabolic syndrome has been called by several other names, including syndrome X [1], insulin resistance syndrome, dysmetabolic syndrome X, Reavan syndrome, and metabolic cardiovascular syndrome [2]. The pathogenesis of the syndrome is complex and so far incompletely understood, but obesity, sedentary lifestyle, dietary and genetic factor are known to contribute its development[1].The final products of this syndrome which affect the cardiovascular system are the endothelial dysfunction, atherosclerosis and coronary artery disease [3].

Material and Methods
Study design and study population
A cross sectional study was carried out in rural area of Primary Health Centre. All adolescent in the age group of 10-19 years of Primary Health Centre, were included in study. The subjects who were not willing to remain fasting or were not willing to participate in the study were excluded.

Sample size and their selection
Considering prevalence of one or more cardio-metabolic abnormality to be 67.7% among adolescents [5], sample size of 369 was required at α-error = 5%, non-response rate 10%. The subjects were selected by using simple random sampling. The sampling frame available with department of Community Medicine was used for drawing the sample.

Data collection

The study was commenced after obtaining clearance from the Institutional Human Ethical Committee. The subjects were selected after obtaining written informed consent from them. Detailed history was taken including past and present status of health of parent, occupation, education, dietary intake and addiction of subjects etc. Using pre-designed proforma anthropometric measurement, and laboratory investigation like fasting blood glucose level, lipid panel compromising total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein, and very low density lipoprotein were noted in the pretested proforma.

Statistical Analysis

For this purpose, EPI- INFO software version 6.04 & Health Watch Pro version 3.1 software was used. Chi square test was applied to test the significance of difference between two group and p value < 0.05 considered as significant.

Results

A cross-sectional study was carried in rural area of Primary Health Centre, adjacent to medical college, with adolescent population of 3042.

Table 1: Association of age with cardio metabolic abnormalities and metabolic syndrome

Age group (in year)	Total (n)	M.S n(%)	HBP n(%)	WC n(%)	BMI n(%)	HDLc n(%)	HTG n(%)	IFG n(%)
<15	159	17(10.7)	37(23.3)	3(1.9)	9(5.7)	86(54.1)	47(29.6)	20(12.6)
≥ 15	246	23(9.3)	62(25.2)	6(2.4)	13(5.3)	150(61.0)	66(26.8)	36(14.6)
Total	405	40(9.9)	99(24.4)	9(2.2)	22(5.4)	236(58.3)	113(27.9)	56(13.8)
p- Value	--	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05

[n=Number of subjects, M.S-metabolic syndrome, HBP-High blood pressure, WC-waist circumference for obesity, BMI-body mass index for overweight, HDLc-high density lipoprotein cholesterol (≤40mg/dl), HTG- high triglyceride, IFG-impaired fasting glucose]
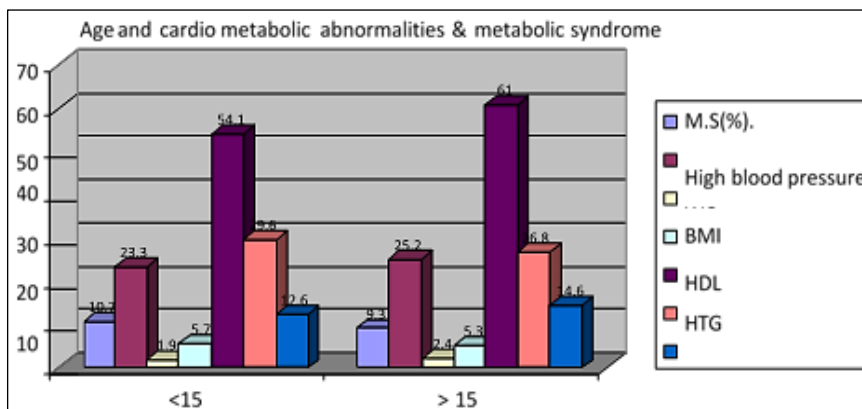

Fig 1: Association of age with cardio metabolic abnormalities and metabolic syndrome

Table 2: Association of sex with cardio metabolic abnormalities and metabolic syndrome

Sex	Total(n)	M.S n(%)	HBP n(%)	WC n(%)	BMI n(%)	HDLc n(%)	HTG n(%)	IFG n(%)
Male	182	14(7.7)	43(23.6)	3(1.6)	14(7.7)	103(56.6)	47(25.8)	27(14.8)
Female	223	26(11.7)	56(25.1)	6(2.7)	8(3.6)	133(59.6)	66(29.6)	29(13.0)
Total	405	40(9.9)	99(24.4)	9(2.2)	22(5.4)	236(58.3)	113(27.9)	56(13.8)
p-Value	--	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05	≥0.05

[n=Number of subjects, M.S-metabolic syndrome, HBP-High blood pressure, WC-waist circumference for obesity, BMI-body mass index for overweight, HDLc-high density lipoprotein cholesterol (≤40mg/dl), HTG- high triglyceride, IFG-impaired fasting glucose]
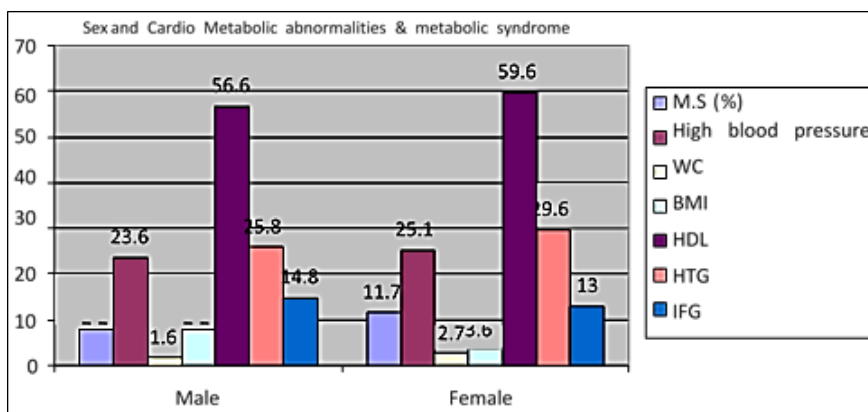
Fig 2: Association of sex with cardio metabolic abnormalities and metabolic syndrome

Table 3: Association of cardio metabolic abnormalities & metabolic syndrome with physical activity

Physical activity	Total (n)	M.S n(%)	HBP n(%)	WC n(%)	BMI n(%)	HDLc n(%)	HTG n(%)	IFG n(%)
Light	291	25(8.6)	69(23.7)	9(3.1)	16(5.5)	161(55.3)	76(26.1)	35(12.0)
Moderate	114	15(13.2)	30(26.3)	0	6(5.3)	75(65.8)	37(32.5)	21(18.4)
Total	405	40(9.9)	99(24.4)	9(2.2)	22(5.4)	236(58.3)	113(27.9)	56(13.8)
_p_-Value	--	$\geq$0.05	$\geq$0.05	--	$\geq$0.05	$\geq$0.05	$\geq$0.05	$\geq$0.05

[n=Number of subjects, M.S-metabolic syndrome, HBP-High blood pressure, WC-waist circumference for obesity, BMI-body mass index for overweight, HDLc-high density lipoprotein cholesterol ($\leq$40mg/dl), HTG-high triglyceride, IFG-impaired fasting glucose]

Metabolic syndrome in study population
In study population, we found 9.9% prevalence of metabolic syndrome.

Table 18: Distribution of metabolic syndrome

Metabolic syndrome	Number of subjects	Percentage
Present	40	9.9
Absent	365	90.1
Total	405	100

Discussion
The cardio-metabolic abnormalities are the cardio metabolic risk factors including abdominal obesity, glucose intolerance (insulin resistance), dyslipidemia (low HDL cholesterol, elevated triglyceride and LDL) and hypertension. According to the National Cholesterol Education Program (NCEP, ATP III), person having three or more cardio metabolic risk factors are considered as having the metabolic syndrome [170].

Cook _et al_. [16] also reported 4.2% of prevalence of metabolic syndrome in adolescents 12-19 years of age group and it increased to 6.4% in the NHANES study during 1999-2000. A prevalence of 3.6% was reported by investigators from the Bogalusa heart study in young adolescents of 8-17 years of age [178]. A comparatively higher prevalence of metabolic syndrome reported in our study can be attributed to difference in study setting and population. It can also be due to difference in definition used for metabolic syndrome.

In present study, we found overall prevalence of metabolic syndrome was 9.9%. The overall prevalence of metabolic syndrome in a study by Singh _et al_. in adolescents aged between 12-17 years from India was 4.2% [111]. In Turkey, prevalence of metabolic syndrome was reported to be 2.2% among adolescents. A study by Esmaillzadeh _et al_., in the capital city of Iran reported a prevalence of 10.1% for the metabolic syndrome in adolescents aged 10-19 years (10.3% in boys and 9.9% in girls) [116]. The prevalence of the metabolic syndrome among Korean adolescents, was found 5.5% in 12-13 years of age group.

In the present study, the metabolic syndrome was not found to be significantly associated with physical activity among those with moderate to light physical activity. However, the prevalence of metabolic syndrome did not differ significantly (p$\geq$0.05). In contrast, the study by Nguyen _et al_. found that the prevalence of metabolic syndrome was higher in subject with lowest physical activity as compared to vigorous to moderate physical activity [181].

Conclusion
Therefore, we conclude that there is definitely alarming situation as per prevalence of cardio metabolic

abnormalities and metabolic syndrome are concerned, even in rural communities. The early identification of cardio metabolic risk factors can help with an attempt to prevent or delay metabolic syndrome, diabetes and cardiovascular disease.

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