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RESEARCH ARTICLE

RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND METABOLIC SYNDROME IN POPULATION WITH SEDENTARY JOB PROFILE

[1*]Dr. Kamble Harshada, [2]Dr. Kowale A.N. and [3]Dr. Shah Swati

[1]M.D. Physiology, Assistant Professor, Dept. of Physiology, B. J. Govt. Medical College, Pune, Maharashtra
[2]M.D. Physiology, Professor and H.O.D., Dept. of Physiology, B.J. Govt. Medical College, Pune, Maharashtra
[3]M.D. Physiology, Associate Professor, Dept. of Physiology, B. J. Govt.Medical College, Pune, Maharashtra

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ABSTRACT

Background: In recent years lifestyle related diseases are increasing globally, one such condition is Metabolic syndrome. Low physical activity levels being one of the major causative factor. Information Technology professionals because of their sedentary job profile and erratic schedule can be considered to be at risk of Metabolic syndrome. Hencethe study was carried out to study the correlation between physical activity levels and Metabolic syndrome components. **Method:** A cross sectional study was conducted considering 150 males in the age group 25–50 yrs. of Information Technology sector as subjects. Waist circumference, blood pressure, fasting blood glucose levels, Serum Triglycerides, Serum HDL levels were correlated with leisure time physical activity levels, assessed by a standard self-reported questionnaire, Godin Shephard Leisure-time physical activity questionnaire. **Results:** We observed that all other components of Metabolic syndrome, except for Serum HDL levels, had a statistically significant negative correlation with physical activity levels. **Conclusion:** Low physical activity levels have a detrimental effect on Metabolic syndrome components. These results can be of help to create awareness among the population with sedentary job profiles and also the general population. Importance of physical activity and lifestyle modifications for prevention of Metabolic syndrome and its consequences can be explained to I.T. professionals.

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INTRODUCTION

Metabolic syndrome, characterized by central obesity, dyslipidemia, hyperglycaemia and hypertension is currently a major global public health challenge because it involves a serious risk of cardiovascular disease and type 2 diabetes mellitus (Alberti, 2005; Harmonizing metabolic syndrome, 2009). It is a common metabolic disorder as a result of combination of sedentary lifestyle, unhealthy diet and genetic predisposition (Eckel, 2005). This syndrome is characterized by abnormal components like obesity, high blood pressure, impaired fasting glucose, raised triglycerides level and reduced levels of high density lipoprotein cholesterol (HDL-C). According to National Cholesterol Education Program Adult Treatment Panel (NCEP, 2001) (NCEP ATP-III), if 3 or more of the components are present the person is diagnosed to have Metabolic syndrome.

Corresponding author: **Dr. KambleHarshada,**
M.D. Physiology, Assistant Professor, Dept. of Physiology, B. J. Govt. Medical College, Pune, Maharashtra.

The metabolic syndrome and its components are closely associated with lifestyle factors, including low physical activity (PA) levels (Carroll, 2004). A general trend towards a more sedentary society with the emergence of modern electronic equipment and computers, more time spent in sedentary activities as television viewing as well as reduced physical activity at work and at leisure may be the major causative components in this development (Hu et al., 2001; Laaksonen et al., 2002). The underlying pathophysiology of metabolic syndrome is unclear, but both insulin resistance and abdominal obesity are considered main causative factors (Laaksonen, 2004; Alberti, 2006). Prevalence of metabolic syndrome is high among Asians including Indians. Reported prevalence of metabolic syndrome in some regions of the country ranges from 23.2 to 41.1 per cent (Deepa, 2007). Professionals working in Information Technology sector, a part of the general population, can be assumed to be at risk because of their sedentary job profile, job stress, erratic food habits and lifestyle modernization and also only a few studies are carried out considering this population group. So these professionals were taken into consideration for study purpose.

The study was carried out to find out whether there is any correlation between physical activity and components of metabolic syndrome and occurrence of metabolic syndrome in this population group. It also provides an opportunity to create awareness and for prevention through physical activity and dietary changes.

MATERIALS AND METHODS

This study was a cross sectional study. A synopsis of the study protocol was approved by Institutional Ethics Committee. The study was conducted in the Department Of Physiology. One hundred and fifty male subjects in the age group 25 to 50 years, selected randomly from Information Technology (IT) companies in Pune were the study group. Known case of hypothyroidism, hyperthyroidism, severely disabled, persons with debilitating disease and chronic illness were excluded. All the subjects were informed in detail about the purpose and procedures of the study and a written, informed consent was taken prior. The Anthropometric parameters i.e. weight in kgs, height in meters, waist circumference in cms, pulse manually, Blood pressure (B.P.) by mercury sphygmomanometer were recorded. B.M.I. was calculated. Blood samples were collected with all aseptic precautions and Biochemical parameters i.e. Fasting Blood glucose levels, Serum Triglycerides, Serum High Density Lipoprotein cholesterol were estimated. A standard questionnaire, Godin Shephard Leisure-time physical activity, [11] assessing self-reported leisure-time physical activity was used to evaluate physical activity.A score of<14 units indicates an insufficient level of activity with low health benefits; 14–23 indicates moderate activity with some health benefits; ≥24 indicates sufficient activity with substantial health benefits. Accordingly, we categorised 84 as insuffuiciently active, 47 as moderately active and 19 as active subjects.

RESULTS AND DISCUSSION

There exists a close association between Metabolic syndrome and its components with low physical activity (Carroll, 2004). Time spent at sedentary occupations has been increasing and may be expected to have an adverse effect on total physical activity (Mackie, 2006). Low levels of physical activity contribute to overweight and obesity and studies exist to show that obesity is a major risk factor for metabolic syndrome (Haskell et al., 2007). We undertook the present study to evaluate the metabolic syndrome components or risk factors, to assess the correlation between the physical activity and these components and to create awareness healthy lifestyle modifications among I.T. professionals. Table 1 shows mean values of demographic profile of the subjects in the three groups.

The difference in mean values of age was statistically non-significant in subjects of the three groups so the subjects were comparable whereas the difference in mean values of BMI was statistically highly significant among the three groups. Table 2 shows mean values of the metabolic syndrome components in insufficiently active, moderately active and active groups. Table 3 and scatter diagrams shows the correlation of physical activity score with components of metabolic syndrome. Correlation was done by taking physical activity score as independent variable and metabolic syndrome components as dependent variable. The result shows that there is statistically significant negative correlation between physical activity score and waist circumference systolic blood pressure, diastolic blood pressure, serum triglyceride, and fasting plasma glucose. While we observed that there is positive correlation between physical activity score and serum HDL-C.

Parameter	Insufficiently active n = 84 (Mean ± SD)	Moderately active n = 47 (Mean ± SD)	Active n = 19 (Mean ± SD)	p- value
Age (years)	32.85 ± 3.48	33.80 ± 4.16	32.36 ± 4.09	> 0.05
Body mass Index (BMI) (kg/m^2)	24.08 ± 2.47	23.01 ± 2.37	21.36 ± 1.40	< 0.001**

Non-significant at p>0.05 Highly significant at p < 0.001**

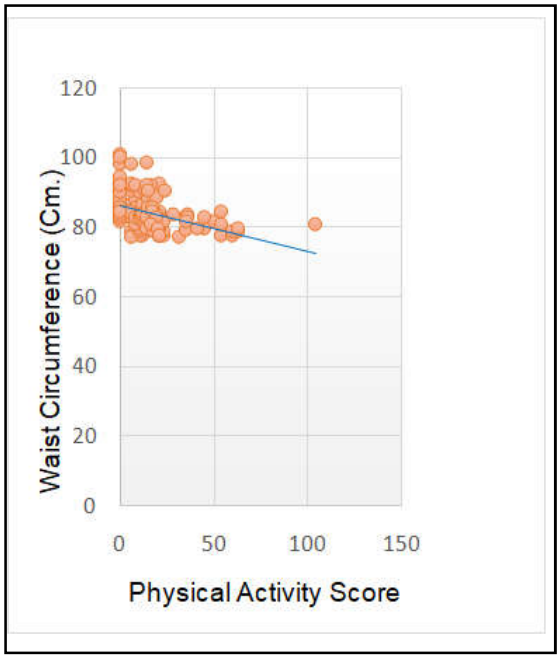
Table No. 2. Mean values of metabolic syndrome components in the 3 groups

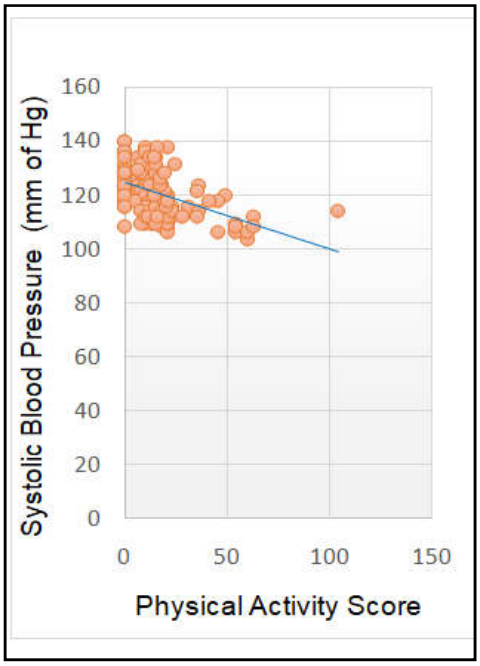
Parameter	Insufficiently Active n = 84 (Mean ± SD)	Moderately Active n = 47 (Mean ± SD)	Active n =19 (Mean ± SD)
Waist circumference [WC] (cm)	85.41 ± 5.18	83.08 ± 4.88	81.39 ± 3.23
Systolic Blood Pressure [SBP] (mm of Hg)	123.38 ± 7.72	118.97 ± 8.18	113.78 ± 7.26
Diastolic Blood Pressure [DBP] (mm of Hg)	78.95 ± 8.32	75.40 ± 7.11	72.21 ± 6.06
Serum Triglycerides [Sr.TG] (mg/dL)	151.30 ± 22.41	142.31 ± 17.49	132.89 ± 15.28
High Density Lipoprotein cholesterol [HDL-C] (mg/dL)	41.31 ± 4.88	44.04 ± 6.09	47.36 ± 7.92
Fasting plasma glucose (FPG) (mg/dL)	93.63 ± 6.84	90.21 ± 6.60	88.05 ± 6.53

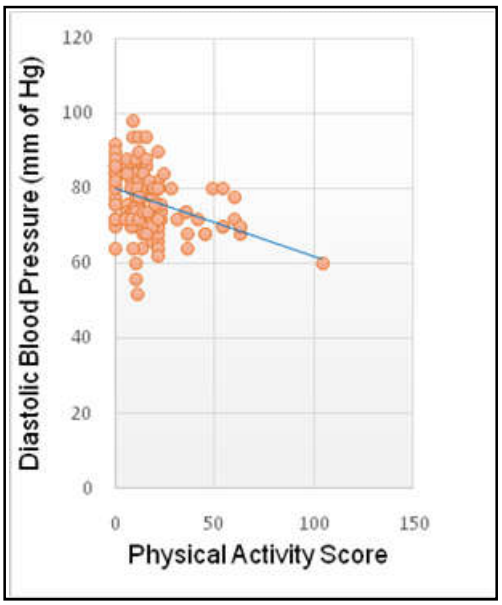
Table No. 3. Correlation between Physical activity score and components of MetabolicSyndrome:

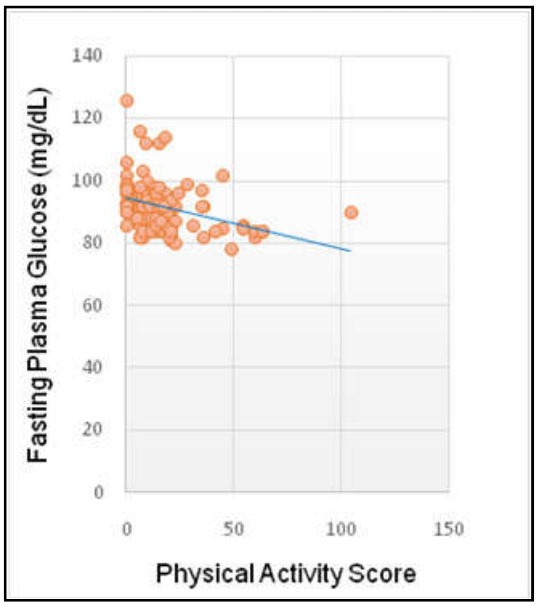
	Dependent variable	Pearson's Correlation Coefficient 'r'	p value
Physical Activity Score	Waist circumference	-0.39	< 0.001**
	Systolic blood pressure	-0.44	< 0.001**
	Diastolic blood pressure	-0.34	< 0.001**
	Serum triglycerides	-0.43	< 0.001**
	Serum HDL-C	0.44	< 0.001**
	Fasting blood sugar	-0.35	< 0.001**

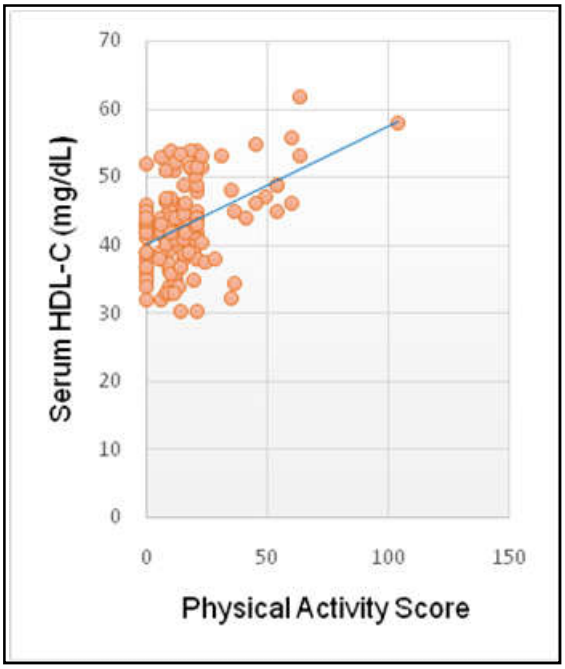
Highly significant at p < 0.001**


Waist Circumference (Cm.)
120
100
80
60
40
20
0
0
50
100
150
Physical Activity Score


Systolic Blood Pressure (mm of Hg)
160
140
120
100
80
60
40
20
0
0
50
100
150
Physical Activity Score


Diastolic Blood Pressure (mm of Hg)
120
100
80
60
40
20
0
0
50
100
150
Physical Activity Score


Fasting Plasma Glucose (mg/dL)
140
120
100
80
60
40
20
0
0
50
100
150
Physical Activity Score


Serum HDL-C (mg/dL)
70
60
50
40
30
20
10
0
0
50
100
150
Physical Activity Score

When we studied correlation of physical activity score with body mass index, we found that physical activity score was significantly negatively correlated with body mass index. In our study we also observed that body mass index was significantly positively correlated with waist circumference, systolic blood pressure, diastolic blood pressure, serum triglyceride and serum fasting plasma glucose and significantly negatively correlated with serum HDL-C. Forrest KY et al in their study reported that physical activity was inversely correlated with BMI, waist hip ratio, blood pressures, HDL-cholesterol and triglycerides in men (Forrest, 2001).

Sofi F et al in their study also concluded that leisure time physical activity was inversely related to BMI, diastolic blood pressure and triglycerides and directly correlated with HDL cholesterol (Sofi et al., 2007). The probable explanation to this can be given as Non resting energy expenditure primarily in the form of physical activity (about 30%) is one of the components of total energy expenditure. Increased physical activity has been associated with reduction in fat mass (Grundy, 2005). Regular physical activity contributes to weight maintenance and weight reduction.

The probable reason for negative correlation between physical activity and blood pressures can be postulated according to some theories as medium term and long term physical activity would alter the insulin level with consequent reduction in the retention of renal sodium and basal sympathetic tone. It also suggests a reduction in the level of catecholamines and the release of vasodilator substances in the circulation by skeletal muscle (American college of sports medicine, 1993). Increased free fatty acid levels are associated with resistance to insulin mediated glucose uptake and metabolism in muscle and an increase in glucose production and release by the liver.

Physical training improves skeletal muscle insulin sensitivity and reduces insulin resistance (van Loon, 2005). Thus physical activity aids to maintain normal fasting plasma glucose levels. The postulated reason for negative correlation of physical activity with serum triglycerides may be the activation of lipoprotein lipase, the enzyme responsible for catabolism of serum triglyceride. Chronic training may also lead to decreased production of very low density lipoprotein (VLDL) and to activation of the enzyme lecithin-cholesterol acyltransferase (LCAT) involved in transfer of unesterified cholesterol from cells to nascent HDL (van Loon, 2005).

Conclusion

To conclude, metabolic syndrome involves risk for development of cardiovascular diseases and type 2 diabetes mellitus. Low physical activity is associated with increased risk of developing metabolic syndrome. So regular physical activity and lifestyle modifications may be beneficial in avoiding the risk of metabolic syndrome and its consequences.

Limitations and Scope

The limitations of study were dietary habits, genetic factors, determination of body composition of the study group, which can also affect the results, should have been considered. The scope of the study can further be expanded considering these factors. IT professionals can be guided about the risk factors of MS and preventions to avoid the complications.

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