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Original article

Patterns of physical activities influencing cardio vascular and respiratory functions

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ABSTRACT

Introduction: Physical activity is a cost effective way to decrease obesity and life style related health problems since it possess potential for having a major public health impact. The aim of the present study was to assess the influence of patterns of physical activity on cardio respiratory problems. **Methodology:** The study was carried out among 108 females and 100 males aged between 30-65 years from north India.Subjects enrolled in the study were suffering from one or more symptoms of metabolic syndrome and were advised brisk walk and to perform yoga (Hatha yoga) by their physicians. After assessing their activity status using standardized proforma, two groups were formed, one who were doing regular exercise (5 days/week) as advised and others who were not doing the exercise regularly. Only those who gave informed written consent were included in the study. Anthropometric and physiological measurements were taken using standard techniques. Fat percentage was assessed by bio electrical impedance technique. Dynamic respiratory functions were taken using portable spirometer. The two groups were compared for various markers of metabolic syndrome and respiratory functions. **Result:** Weight, BMI, fat percentage and waist circumference showed significant difference between two groups among both males and females. For respiratory functions ($FEV_{1.0}$, FVC and PEFR), females showed significant values ($p<0.001$).**Conclusion:** Physical activity would regulate the symptoms of metabolic syndrome and respiratory functions if regular exercise or activity is undertaken. Improvement was found among those who were regular in their exercise as compared to those who were not so.

KEYWORDS:physical activity, metabolic syndrome, fat percentage, respiratory functions, blood pressure.

INTRODUCTION

"Physical activity" is a universal term defined as "bodily movement that is produced by the contraction of skeletal muscles and that substantially increases the amount of energy you expend" [1]. It is a cost effective way to decrease obesity and other life style related problems since it possess potential for having a major public health impact. Many studies have documented an association between sedentary behavior and obesity [2]. Inverse relationship between habitual physical activity and obesity has been observed by Pietilainen et al [3]. Physical activity is also considered important in the prevention of weight gain [4-6].

According to WHO, globally there are more than 1 billion overweight adults and 300 million obese people. The problem of obesity is increasing in the developing world with more than 115 million people being affected by this chronic adversity. Along with overweight and obesity, various cardio respiratory problems are also increasing rapidly in developing countries including India.Regular aerobic physical activity increases exercise capacity and plays an important role in both primary and secondary prevention of cardiovascular disease [7-8].

Exercise can help control blood lipid abnormalities, diabetes and obesity. Aerobic exercise also was found to have an independent, modest blood pressure-lowering effect in certain hypertensive groups [9-11]. There is a relation

between physical inactivity and cardiovascular mortality whereas inactivity is seen as a risk factor for the development of coronary artery disease [12-14]. Modest levels of physical activity are beneficial for healthy lifestyle.Results of pooled studies revealed that persons who modify their lifestyle behavior after myocardial infarction to include regular exercise have improved rates of survival [15-18].

India can be stratified into multiple layers in terms of economy, castes, social background and life style patterns but the influence of these strata on obesity and cardio-respiratory health has been less explored. The present research aims to study the association of pattern of physical activity with cardio vascular or indictors/markers of metabolic syndrome and respiratory problems among north Indian population.

MATERIALS AND METHODS

The cross sectional study was carried out among 108 females and 100 males aged between 30-65 years from north India. Multistage stratified selective sampling was applied. Subjects enrolled in the study were suffering from one or more symptoms of metabolic syndrome (according to NCEP ATP III guidelines) and were advised brisk walk and/or to perform yoga (Hatha yoga) by their physicians. After assessing their activity status using questionnaire, two groups were formed, one who were doing regular exercise (5 days/week) as advised and others who were not doing the exercise regularly. Only those who gave informed written consent were included in the study.

Height, weight, waist circumference, hip circumference were taken by standard technique [18]. Blood pressure was taken by sphygmomanometer and average of two readings was taken into consideration. Fat percentage was assessed by bio electrical impedance technique through body composition analyzer (Tanita). Lipid profile was taken using cardio chek. Dynamic respiratory functions ($FEV_{1.0}$, FVC, FER, PEFR) were taken using portable spirometer. Body mass index (BMI), waist hip ratio (WHR) and waist height ratio (WHtR) were assessed.

BMI was classified according to WHO guidelines [19], BMI less than 18.5 as underweight and more than 24.9 as overweight/obese. WHR cut off points followed were 0.95 for males and 0.80 for females [20]. A WHtR cut-off point for both females and males was 0.50 [21]. Blood pressure, lipid profile and waist circumference cut offs were used according to NCEP ATP III guidelines.

These groups were compared for various markers of metabolic syndrome, obesity indices and respiratory functions. Physical activity status and other social parameters were assessed by self-administeredproforma and interview schedule.

Statistical analysis:

The data was analyzed using SPSS 16.0 version. For group comparison‘t’ test was applied. Multinomial logistic regression was applied for predicting cardio metabolic risk and obesity markers with irregular pattern of physical activity as predictors.

RESULTS

Mean and standard deviation values of adiposity markers and physiological variables among adult males and females of north India. Males and females were compared according to their pattern of physical activity respectively (t-value). It was found that those who were regular in their physical activity showed lower mean values for all the variables as compared to the irregular physical activity group. Significant difference was found between the measurements of two groups except DBP among females and SBP, DBP among males (Table 1).

Table: 1 Adiposity markers and physiological variables among adult males and females along with ‘t’ value

Variables	Females			Males		
	Regular (52)	Irregular (56)	‘t’	Regular (54)	Irregular (46)	‘t’
Weight (kg)	65.3±12.75	70.8±11.61	2.33†	75.1±13.66	88.4±15.03	4.62*
Body mass index (kg/m^2)	27.0±5.02	29.1±4.48	2.28†	26.0±3.92	29.6±4.52	4.30*
Fat percentage	33.1±7.91	37.0±5.71	2.93†	23.8±7.05	28.6±6.50	3.46*
Waist circumference (cm)	80.9±10.58	87.7±8.84	3.60*	90.0±9.60	100.1±10.20	5.09*
Systolic blood pressure (mmHg)	123.6±13.81	128.5±13.30	1.90‡	131.7±11.78	135.7±12.15	1.68
Diastolic blood pressure (mmHg)	76.7±10.48	79.6±8.41	1.56	83.8±9.27	86.6±8.76	1.38
WHR	0.80±0.06	0.84±0.06	2.72†	0.91± 0.06	0.97± 0.06	3.93*
WHtR	0.52±0.07	0.57±0.06	3.67*	0.53± 0.06	0.58 ±0.06	4.15*

Significance level for inter group comparison *p<0.001, †p<0.01, ‡p<0.05

Mean with standard deviation and t value of dynamic respiratory function among adult males and females were calculated. Males and females who were regular in their physical activity showed higher means as compared to the counterpart for dynamic lung functions. Females showed significant difference (p<0.001) between the categories of physical activity for $FEV_{1.0}$, FVC and PEFR. Males did not show significant difference between the two groups (Table 2).

Table: 2 Dynamic respiratory functions among adult males and females along with ‘t’ value

Variables	Females			Males		
	Regular (52)	Irregular (56)	‘t’	Regular (54)	Irregular (46)	‘t’
$FEV_{1.0}$ (lit.)	1.82±0.50	1.54±0.44	3.15*	2.42±0.63	2.39±0.72	0.25
FVC (lit.)	2.13±0.56	1.80±0.46	3.31*	2.90±0.78	2.85±0.76	0.33
FER (%)	85.2±7.97	83.3±7.97	1.30	82.8±8.16	83.3±8.80	0.28
PEFR (lit./ min)	228.5±77.85	178.9±75.07	3.39*	299.9±105.82	312.3±135.71	0.51

Significance level for inter group comparison *p<0.001, †p<0.01, ‡p<0.05

Mean with standard deviation and t value of lipid profile among adult males and females were calculated.Lower mean values were found among those who were regular in their physical activity among both males and females. Except HDL of females, all the variables showed statistically significant difference between the patterns of physical activity among both the genders (Table 3).

Table: 3 Lipid profile among adult males and females along with 't' value

Variables	Females			Males		
	Regular (26)	Irregular (29)	't' value	Regular (31)	Irregular (25)	't' value
Cholesterol	138.4±41.45	180.7±34.01	4.15*	139.4±34.58	228.0±79.80	5.17*
HDL	30.1±10.59	30.7±12.50	0.19	29.4±10.74	20.2±7.57	3.77*
Triglycerides	105.5±44.89	151.3±98.29	2.18‡	130.1±80.60	188.8±64.75	2.95†
LDL	99.1±22.15	121.2±40.05	2.56†	96.7±28.01	139.8±38.78	4.83*
TC/HDL	5.1±2.36	6.8±2.76	2.38†	5.4±2.63	13.3±6.90	5.84*

Significance level for inter group comparison *p<0.001, †p<0.01, ‡p<0.05

Odds ratio of irregular pattern of physical activity as predictor of cardio metabolic risk and obesity markers were calculated.Females of irregular physical activity had 2.56 times risk of developing obesity according to BMI category whereas they had 3.96 times chance of being in risk group of WHR.

The males on the other hand did not exhibit such a clear trend. The males were 8.94 times more at risk of becoming overweight /obese and about 3.80 times chance of being in risk category with respect to WHR (Table 4).

Cardio vascular risk with irregular physical activity was calculated. Males had 9.10 times more chance of risk of increasing triglycerides levels and significant chances of lowering the level of HDL with irregular activity. On the other hand females of irregular physical activity group had 3.23 times more risk of central obesity according to waist circumference(Table5).

Table: 4 Odds ratio with irregular physical activity

Variables	Categories	Females			Males		
		Beta	p value	CI 95%	Beta	p value	CI 95%
WHR	Risk	**3.96**	0.001	1.71-9.16	**3.80**	0.002	1.66-8.75
	Normal	0[a]			0[a]		
SBP	Risk	1.74	0.160	0.80-3.75	1.31	0.515	0.58-3.00
	Normal	0[a]			0[a]		
DBP	Risk	2.32	0.118	0.81-6.64	1.89	0.117	0.85-4.19
	Normal	0[a]			0[a]		
WC	Risk	**3.23**	0.007	1.38-7.54	**4.27**	0.006	1.50-12.11
	Normal	0[a]			0[a]		
Fat percent	Risk	2.74	0.082	0.88-8.51	**9.46**	0.001	2.92-19.08
	Normal	0[a]			0[a]		
BMI	Underweight	-	-	-	0.87	0.875	0.07-10.20
	Overweight	1.01	0.989	0.38-2.63	2.33	0.188	0.66-8.23
	Obese	**2.56**	0.066	0.94-7.00	**8.94**	0.001	2.31-34.58
	Normal	0[a]			0[a]		

Reference category: Independent variable: 0[a]
Dependent variable: Regular physical activity

Table:5Cardio vascular risk with irregular physical activity

Variables	Females			Males		
	Beta	p value	CI 95%	Beta	p value	CI 95%
HDL	1.00	0.844	0.96-1.05	0.90	0.002	0.84-0.96
Triglycerides	2.21	0.210	0.64-7.64	9.10	0.0004	2.69-30.85
WC	3.23	0.007	1.38-7.54	4.27	0.006	1.50-12.11
SBP	1.74	0.160	0.80-3.75	1.31	0.515	0.58-3.00
DBP	2.32	0.118	0.81-6.64	1.89	0.117	0.85-4.19
FBS	4.0	0.002	1.28-10.2	2.0	0.44	0.78-6.42

DISCUSSION

Adult males and females with different patterns of physical activity showed marked differences in different adiposity indices and cardio-respiratory health. Metabolic syndrome is a high-risk condition associated with overall and cardiovascular mortality [22-24].A sedentary lifestyle has been linked to the metabolic syndrome [25], obesity [26],

and diabetes [27] in multitude settings. High blood pressure is directly associated with risks of several types of cardiovascular diseases [28]. Hypertension and obesity have been implicated in several studies as a result of rapid modernization [29].

All the lung functions were found to be higher among the females who were regular in their physical activity indicating a better respiratory efficiency compared to the irregular ones. Physical activity is associated with maintenance of cardiorespiratory fitness. Change in physical activity habits has also been associated with change in cardiorespiratory fitness in direct proportionality thereby improving overall health [30].

In the US only 22 percent of adults are active for health in light to moderate-intense activity (i.e., 30 minutes five or more times per week), and 24 percent or more are sedentary (i.e., reporting no leisure time physical activity in the past month) [31]. It has also been estimated that 12% of the annual deaths in the US can be attributed to physical inactivity [32-34].

Garcia-Aymerich et al found that those who were suffering from chronic obstructive pulmonary disease (COPD) and perform some level of regular physical activity have lower risk of COPD and mortality [35]. A recommendation to maintain or increase the levels of regular physical activity should be considered in future health guidelines, which may play a significant role in public health benefits.Exercise reported as walking, stair climbing, and sports play related inversely to total mortality, primarily to death due to cardiovascular or respiratory causes [36].

This review of the epidemiological evidence regarding physical activity and cardiovascular disease (CVD) provides substantial evidence from many different populations that leisure time physical activity is associated with reduced risk of coronary heart disease (CHD) and cardiovascular mortality in both men and women and in middle-aged and older individuals. Physical activity appears to be a critical factor in both primary and secondary prevention of CHD. Adopting regular light or moderate physical activity routines in middle or older age confers significant benefit for CVD and all-cause mortality [37].

These findings add new evidence that overall physical activity levels along with continuity and consistence is an important determinant of longevity, and that health benefit can be obtained through an active lifestyle, exercise, or combinations of both [38].

Our results suggest that targeting physical activity changes in this population could be effective in preventing symptoms of metabolic syndrome and therefore in lowering cardiovascular-disease risk in the population.

CONCLUSION

Physical activity can regulate the symptoms of metabolic syndrome and respiratory functions if regular exercise or activity is undertaken. Improvement was found among those who were regular in their exercise as compared to the relatively sedentary group.

Competing interest: The authors declare that they have no competing interests.

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