

Effect of Physical Activity on Anthropometric and Cardiovascular Parameters

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Abstract

Background: Increasing sedentary lifestyle combined with the growing use of technology in daily life is causing higher levels of physical inactivity among persons of all ages, both in developed and developing countries. Therefore, this study was undertaken to analyze the differences in certain anthropometric and cardiovascular parameters in sedentary and non-sedentary workers. Cardiovascular disease (CVD) is one of the most common non communicable diseases which cause mortality and morbidity in both developed and developing countries. Although there are many other causes of cardiovascular diseases, sedentary life style is a notable cause of CVD. **Objectives:** The aim of the study was to assess the effect of physical activity on anthropometric parameters like weight, height, body mass index (BMI), waist circumference (WC), hip circumference (HC) and waist to hip ratio (WHR) as well as pulse, blood pressure among sedentary and non-sedentary workers. **Materials and Methods:** Total 60 healthy male subjects were selected randomly from the general population of Rajshahi city from January 2016 to December 2016. Out of which 30 were sedentary and 30 were non-sedentary subjects. Anthropometric parameters such as weight, height, BMI, WC and HC, WHR were assessed. Cardiovascular parameters such as pulse rate, blood pressure were also assessed. **Results:** In our study, there was statistically significant increase in anthropometric and cardiovascular parameters in sedentary subjects compared to non-sedentary subjects. **Conclusion:** This review provides clear evidence that low levels of physical activity are associated with an increased risk of weight gain and significant increase in blood pressure. Although our study is by no means exhaustive, it provides a glimpse into the variety of adaptations or alterations in anthropometric parameters that occurs due to sedentary life style, even in the absence of overt disease.

Keywords: Physical activity, Sedentary workers, Non-sedentary workers, Cardiovascular diseases.

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Introduction

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The lack of physical activity is a major underlying cause of death, disease, and disability. Preliminary data from a WHO study on risk factors suggest that inactivity, or sedentary lifestyle, is one of the 10 leading global causes of death and disability. More than two million deaths each year are attributable to physical inactivity. In countries around the world between 60% and 85% of adults are simply not active enough to benefit their health. Seden-

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tary lifestyles increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, and obesity, and substantially increase the risks of colon cancer, high blood pressure, osteoporosis, depression and anxiety.¹ The etiology of overweight and obesity is clearly multifactorial, but ultimately it is determined by the long-term balance between energy intake and expenditure. This review will consider the effects on body weight and the risk of obesity of sedentary lifestyles, within the context of dietary habits.² A sedentary life style includes less than 150 minutes of moderate physical activity or less than 60 minutes of vigorous physical activity per week.³ Obesity can be defined as a state of excess adipose tissue mass.⁴ Currently over weight and obesity are classified by Body Mass Index (BMI) [weight in kilogram/square of the height in meter-kg/m²]. In adults, overweight is defined as BMI of 25.0 to 29.9 kg/m²; obesity is defined as BMI $\geq$ 30 kg/m².⁵ The results of extensive research programs lead to the conclusion that physical activity increases

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longevity, to a large extent protect against development of the major non communicable diseases such as coronary heart disease, hypertension, stroke, non-insulin dependent diabetes mellitus, osteoporosis and colon cancer.⁶ Hypertensive heart disease was present in light workers five times more frequent than in heavy workers and obese individuals tend to be more inactive physically.⁷ There is increased risk of metabolic complications for men with waist circumference ≥ 102 cm and women with a waist circumference ≥ 88 cm.⁸ Physical activity may be a critical target for the specific prevention of visceral fat accumulation and corresponding health risk in obese subjects.⁹ Visceral fat is more metabolically active than subcutaneous fat and hence may be more deleterious to health.¹⁰ Avoiding a sedentary lifestyle during adulthood not only prevents cardiovascular disease independent of other risk factors but also substantially expands the total life expectancy and the cardiovascular disease-free life expectancy for men and women.¹¹

Materials and Methods

The present study was conducted in the department of Physiology of Rajshahi Medical College, Rajshahi from January 2016 to December 2016. The study was undertaken to analyze the differences in certain parameters in healthy sedentary and non-sedentary male subjects. 30 sedentary subjects and 30 healthy non-sedentary subjects were selected from the general population of Rajshahi city randomly. All the subjects gave consent after explaining the procedure of the non-invasive technique to them. A brief personal history, childhood obesity, detailed history of exercise and a clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results. Anthropometric parameters were measured in the morning session. Physical parameters such as weight in kilogram, height in centimeters, waist, hip and mid arm circumference in centimeters were measured.

The results were given as Mean $\pm$ Standard deviation. Comparisons were made between sedentary and non-sedentary subjects. Student's t-test (Unpaired) was used for comparisons between the groups. A p value ≤ 0.05 was considered as statistical significance. Subjects suffering from endocrinal disorders, hypertensive individuals, pregnant and lactating women, subjects with endovascular and cardiovascular diseases were excluded from the study.

The circumference technique measures body shape using a flexible plastic measuring tape, subjects were required to wear minimal thin cloth, the measurement is typically conducted in the morning before eating and after emptying the bladder. Subjects were measured in standing position and they were asked to breathe normally and gently which prevents the subject from contracting their abdominal muscles. Height was measured in centimeters with the standard position of the subject. It was measured by a plastic measuring tape after marking the subject to stand straight against an even wall. A sliding wooden head piece was used for accurate work.¹² Body weight of all the subjects was measured by using standardized weighing machine, which was calibrated in kilograms. The body mass index was derived by Quetlet's index from bodyweight (kg) / Height (m^2).¹³ Waist circumference was measured to the nearest centimeter with a plastic tape measure while the subjects were in the standing position at the end of gentle expiration. The following anatomical landmarks were used: laterally, midway between the lowest portion of the rib cage and iliac crest, and anteriorly midway

between the xiphoid process of the sternum and the umbilicus.¹⁴ Hip circumference was measured in centimeters (cm) in standing position with a plastic tape at the largest horizontal circumference around the buttocks.¹⁵ After completing the measurements, the waist circumference was divided by the hip circumference to determine the waist to hip ratio.¹⁶

Blood Pressure measurement (BP in mmHg) was recorded with a mercury sphygmomanometer, in supine position in the right upper limb by auscultatory method. Similarly, three readings were taken at an interval of 15 minutes each and an average of the three values calculated. Pulse rate/min was recorded by palpating the radial artery on the right side and counting was done for full one minute. The result for each parameter was compared between the sedentary and non-sedentary groups and was statistically analyzed.

Results

A total of 60 healthy adults male (30 sedentary workers and 30 non sedentary workers) were selected for the study.

Table 1: Distribution of basic health parameters

Parameters	Sedentary workers (mean±SD)	Non sedentary workers (mean±SD)	p value
Age (Years)	50.73 ± 6.05	50.63 ± 5.95	>0.005
Weight (Kg)	75.77 ± 6.13	59.23 ± 3.83	<0.005
Height (Meter)	1.67 ± 0.039	1.66 ± 0.032	>0.005
<i>p</i> ≤ 0.05 indicates level of significance (Unpaired Student's "t" test), SD; standard deviation.			

Table 1 show the distribution of different parameters of healthy adults, age expressed in year, weight in Kg and height in meters. Values of basic characteristics were expressed as mean ± SD (standard deviation). "*p*" value at or below 0.05 are representing statistically significant result.

Table 2: Distribution of anthropometric parameters

Parameters	Sedentary workers (mean±SD)	Non sedentary workers (mean±SD)	p value
BMI (Kg/m ²)	27.29 ± 2.27	21.38 ± 1.28	<0.005
WC (Inch)	38.63 ± 2.44	30.57 ± 2.45	<0.005
HC (Inch)	39.70 ± 2.86	33.07 ± 2.61	<0.005
WHR	0.97 ± 0.04	0.92 ± 0.03	<0.005
BMI; body mass index, WC; waist circumference, HC; hip circumference, WHR; waist-hip ratio, <i>p</i> ≤ 0.05 indicates level of statistical significance (Unpaired Student's "t" test), SD; standard deviation.			

Table 2 shows that the BMI of sedentary workers (27.29 ± 2.27) is more than of the non-sedentary workers (21.38 ± 1.28). So are the waist circumference (inch) in sedentary workers (38.63 ± 2.44) than in non-sedentary workers (30.57 ± 2.45), hip circumference (inch) in sedentary workers (39.70 ± 2.86) than in non-sedentary workers (33.07 ± 2.61) and waist-hip ratio in sedentary workers (0.97 ± 0.04) than in non-sedentary workers (0.92 ± 0.03). Hence these features are found to be significantly higher (*p* ≤ 0.05) in sedentary workers than in non-sedentary workers.

Table 3: Distribution of additional parameters

Parameters	Sedentary workers (mean±SD)	Non sedentary workers (mean±SD)	p value
Pulse (bpm)	82.37 ± 6.63	69.07 ± 4.47	<0.005
SBP(mmHg)	131.00 ± 10.61	110.67 ± 8.27	<0.005
DBP (mmHg)	85.17 ± 4.99	72.83 ± 6.90	<0.005
bpm; beats per minute, SBP; systolic blood pressure, DBP; diastolic blood pressure, <i>p</i> ≤ 0.05 indicates level of statistical significance (Unpaired Student's "t" test), SD; standard deviation.			

Table 3 shows the distribution of additional parameters. The pulse of sedentary workers (82.37 ± 6.63) is higher than of non-sedentary workers (69.07 ± 4.47). The systolic BP (mmHg) of sedentary workers (131.00 ± 10.61) is higher than of non-sedentary workers (110.67 ± 8.27). The diastolic BP (mmHg) of sedentary workers (85.17 ± 4.99) is higher than of non-sedentary workers (72.83 ± 6.90). Hence showing that, these parameters are found to be significantly higher (*p* ≤ 0.05) in sedentary workers than in non-sedentary workers.

Discussion

Many studies have shown the health burden of a sedentary Lifestyle. This is an analysis and discussion of the anthropometric and cardiovascular parameters assessed in sedentary and non-sedentary workers. In our study BMI was increased in sedentary subjects when compared to non-sedentary subjects and it was statistically

significant. Recent studies in adolescents and adults have demonstrate significant relationship between physical activity and other adverse health practices, such as consumption of less-healthy foods or increased fat intake. Inactive individuals tend to consume more quantities of dietary fat. These data suggest that inactivity tends to cluster with other health behaviors that have adverse effect on the quantity and location of body fat deposition which results in obesity.¹⁷ Modern life style associated with easy access to food, lack of exercise, sedentary life style, calories dense food, and excessive television and cell phone viewing is among the identified contributes to the obesity epidemics.¹⁸ In our study the mean WHR in sedentary subjects was increased by 0.04 which was statistically significant this may be due to lack of physical exercise leading to an increased deposition of fat in the abdomen in sedentary subjects. Abdominal obesity is defined as waist circumference >102 cm in men and > 88 cm in women. Physical inactivity decreases the production of Nitric Oxide (NO) by the abnormal endothelium, which leads to changes in vessel diameter leads to vascular structural changes which result in hypertension.¹⁹ The reason for the association between increased body weight and elevated blood pressure is unclear. One possibility is that obesity is associated with higher circulating levels of insulin (a consequence of insulin resistance) and consequently with enhanced renal retention of sodium, resulting in increased blood pressure.²⁰ Sedentary normotensive have 20–50% higher risk of developing hypertension than individuals who are undertaken physical exercise regularly.²¹ Systolic blood pressure increased by 6 mmHg and diastolic blood pressure by 4 mmHg for a 10% gain in body fat. Weight loss of 1 kg produced a 20% decrease in both systolic and diastolic blood pressure in hypertensive patients even when the sodium intake was kept constant. The most characteristic lipid disorder in obesity was elevated total cholesterol and triglycerides, high

LDL cholesterol and low HDL cholesterol. For every 1 kg of weight loss, there was corresponding reduction by about 1% in total cholesterol and LDL, a rise by 1% in HDL and a reduction by 3% in triglycerides.²² Another study (Tatiana Y. et al., 2010) shows that physical inactivity has become a major public health concern because it is the second leading single cause of death in the United States.²³ Visceral fat although influenced by calorie intake to a certain extent, visceral fat accumulation is a mechanism which is determined also by estrogen deficiency (post-menopausal hypertension) or enhanced corticoid influences. It is hypothesized that excess catecholamine triggers various adverse processes which, if persist, can lead or aggravate hypertension and insulin resistance. Visceral fat but not peripheral fat mass was correlated with atherogenic effect.²⁴ Overweight and obesity is strongly related to major cardiovascular risk factors such as raised blood pressure, glucose intolerance, type-2 diabetes and dyslipidemia. In our study that anthropometric parameters were increased in sedentary subjects which was statistically significant increase. Maintaining a healthy lifestyle, including exercise, will result in increased energy levels throughout working period. So, the benefits of regular physical activity are numerous, people who exercise live longer and healthier.

Conclusion

Sedentary life style was associated with increase in anthropometric parameters such as BMI, WC, WHR and it was also noticed in our study that cardiovascular parameters such as pulse and blood pressure was increased in sedentary subjects and was statistically significant. A better understanding of ethnic/racial differences in the development and progression of various complications in sedentary lifestyle is needed. Hormonal assay and lipid profile estimation along with fat parameters would have given a better understanding about sedentary life style and its consequences. We need to evaluate the strategies

and efficacy of physical activity in various diseases. Those who are sedentary, an exercise program are an excellent way to significantly improve their health. Maintaining a healthy lifestyle, including exercise, will result in increased energy levels throughout working period.

Conflict of Interest: Authors declare no conflict of interests.

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