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"Comparison of Cardiovascular Risk Factors between Sedentary and Non Sedentary Workersin Rajshahi Metropolitan Area"

Dr. Emu Ghosh[1], Dr.Palash Kumar biswas[2],Dr.Sampurna Sen[3],
Dr. Nadira Parvin[4], Dr.Manik Chandra Nath[5]

[1]*Assistant Professor (Physiology), Ad-dinSakinaWomens's Medical College, Jashore, Bangladesh*
[2]*Assistant Professor, Department of Paediatrics,Jashore Medical College, Bangladesh*
[3]*Assistant Professor, Department of Pathology,Ad-dinSakinaWomens's Medical College, Jashore, Bangladesh*
[4]*Assistant Professor, Dept. of Pharmacology and Therapeutics, TMSS Medical College, Bogura, Bangladesh*
[5]*Assistant Professor, Department of Physiology, BGC Trust Medical CollegeChattagram, Bangladesh.*
Corresponding contributor: *Dr. Emu Ghosh*

Abstract
Background: *Cardio vascular disease (CVD) is one of the most common non communicable diseases which causes 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. It is revealed that there is higher prevalence of CHD reported in sedentary workers. More than two million deaths each year are attributable to physical inactivity.*
Aim of the study: *The aim of this study was to compare cardiovascular risk factors between sedentary & non sedentary workers.*
Methods and Materials*: This cross sectional comparative study was carried out in the Department of Physiology and the Department of Biochemistry of Rajshahi Medical College & Hospital from January to December 2016. A total sample of 60 healthy adults was included in this study and divided into two equal groups.In Group I there were 30 sedentary workers and in Group II there were 30 non-sedentary workers. Fasting lipid profile and fasting blood sugar were measured by using semi auto analyzer (EMP-168 Biochemical Analyzer). Unpaired t-test and chi-square test was employed for the statistical analysis of data to compare each group.*
Results: *BMI, waist circumference, hip circumference, and waist/hip ratio, Blood pressure (systolic and diastolic), serum level of triglyceride, total cholesterol, low density lipoprotein (LDL) and glucose were found significantly higher in sedentary workers than in non-sedentary workers where the p value was<0.05. However HDL-C did not show any significant difference between sedentary and non-sedentary workers.*
Conclusion: *The present study found that beside HDL-C, all other parameters are significantly higher in sedentary workers. As a result, all the findings are favor of developing cardiovascular diseases. So a comprehensive non-sedentary life style should be designed to prevent cardiovascular diseases and to prevent premature mortality related to cardiovascular diseases. However it is necessary to carry out longitudinal study in Cohort with large sample size to confirm our findings.*
Keywords*: Cardiovascular, Risk Factors, Sedentary, LDL, HDL.*

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I. Introduction

Sedentary behavior has been defined as any waking behavior characterized by an energy expenditure ≤1.5 metabolic equivalent of tasks (METs) while in a sitting or reclining posture[1]. A sedentary life styleincludes less than 150 minutes of moderate physical activity or less than 60 minutes of vigorous physical activity per week [3]. Those who do not fulfill the above mentioned criteria, they are non-sedentary. Cardio vascular disease (CVD) is one of the most common non communicable diseases which cause mortality and morbidity in both developed and developing countries as well as all over the world[2]. Bangladesh is not an exception and the trend is rising day by day. A consistent association between sedentary life style and coronary heart disease (CHD) has been demonstrated in epidemiological studies, thereby explaining the higher prevalence of CHD reported in sedentary workers. Conversely, epidemiological and other evidence suggest that regular exercise habits protect against the development of cardiovascular disease, and may also improve sense of well-being and protect against some complications of diabetes, lung disease and osteoporosis. 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.The majority of cardiovascular disease (CVD) is caused by risk factors that can be controlled, treated or modified. According to World Heart Federation, cardiovascular risk factors can be classified into modifiable and non-modifiable types. Modifiable factors include hypertension, tobacco use, diabetes or pre-diabetes, unhealthy diet, dyslipidemia, over weight. Non-modifiable factor are aging, male sex, positive family history. Hypertension is the leading cause of CVD worldwide. Globally, nearly one billion people have hypertension; of these, two thirds are in developing countries. Hypertension is one of the most important causes of premature death worldwide and the problem is growing; in 2025, an estimated 1.56 billion adults will be living with hypertension (WHO 2012).Diabetes was responsible for 1.3 million deaths globally in 2008. CVD accounts for about 60 per cent of all mortality in people with diabetes. The risk of cardiovascular events is from two to three times higher in people with type 1 or type 2 diabetes and the risk is disproportionately higher in women. Cardiovascular risk increases with raised glucose values. Lack of earlydetection and care for diabetes result in severe complications, including myocardial infraction,strokes, renal failure, amputations and blindness.

II. Objectives

General objective:

- To compare cardiovascular risk factors between sedentary & non sedentary workers.

Specific objectives:

- To measure anthropometric parameters like Body mass index (BMI),waist circumference (WC), Hip circumference (HC), waist to hip ratio (WHR) among sedentary and non-sedentary workers.
- To measure pulse, blood pressure among sedentary and non-sedentary workers.
- To measure the fasting lipid profile in sedentary and non-sedentary worker.
- To measure the fasting blood glucose level in sedentary and non-sedentary worker.

III. Methodology And Materials:

This study was a cross sectional analytical study conducted in the Department of Physiology and the Department of Biochemistry of Rajshahi Medical College & Hospital from January to December 2016.Study population was included:Teachers, bankers, rickshaw poolers, day laborers, and field a worker residing in Rajshahi and the total sample size was 60 in number. All the participants werehealthy male adults. Among the total participants 30 were sedentary workers and 30 were non sedentary workers.The study was approved by Institutional Review Board (IRB) and Ethical Review Committee (ERC) of the mentioned medical college. The proper written consents were taken from all the participants' before starting the intervention.The significance of difference was calculated by unpaired t-test and chi-square test.

Inclusion Criteria:

1. Apparently healthy
2. 40 to 60 years of age
3. Male

Exclusion Criteria:

1. Known case of hyperlipidemia
2. Known case of any endocrine disease
3. known case of cardiovascular disease
4. Known case of chronic illness
5. History of smoking

The healthy adults who fulfilled the inclusion criteria were enrolled in this study. After taking informed consent, complete history taking and physical examination were done and recorded in a preformed data sheet. Following an overnight fasting (10-12 hours), 3 ml of venous blood samples were drawn into test tubes (from the antecubital space of the forearm) by venipuncture after taking all aseptic precautions. After coagulation, serum was separated by centrifugation at 3000 rpm for 10 minutes. Then serum was utilized for estimation of fasting blood glucose and lipid profile. Fasting blood glucose and lipid profile were estimated by using semi auto analyzer at Biochemistry lab, Rajshahi medical college, Rajshahi.

IV. Results

A total of 60 healthy adults (30 sedentary workers and 30 non sedentary workers) were selected for the study. Fasting blood sample was collected after 12 hours of fasting by venipuncture after taking all aseptic precautions. Serum was used for estimation of FBG level and lipid profile. FBG and lipid profile were done by standard laboratory procedure in all individual in this study. The results were expressed in mmol/L. Collected data were analyzed by using statistical package for Social service (SPSS) computer software program and the tests for significance were calculated by using unpaired t-test and chi-square test. Fasting blood glucose and lipid profile was analyzed at Biochemistry lab, Rajshahi medical college, Rajshahi. Lipid profile and blood glucose was estimated by using semi auto analyzer (EMP-168 Biochemical Analyzer). Table I shows the distribution of different parameters of healthy adult's age in (years), weight in (Kg), height in (meters). Values of basic characteristics were expressed as mean ± SD (range). P value at or below 0.05 are representing statistically significant result. The mean age and height is slightly higher value in sedentary workers than non-sedentary workers but the difference is not statistically significant where P value >0.05.The mean weight shows higher value in sedentary workers than non-sedentary workers which is statistically significant where P value <0.05.In this study we found, the mean BMI of sedentary workers (27.29±2.28) is more than of the non-sedentary workers (21.38±1.3). So the mean waist circumference (inch) in sedentary workers (38.63±2.44) more than in non-sedentary workers (30.57±2.45), mean hip circumference (inch) in sedentary workers (39.7±2.86) more than in non-sedentary workers (33.1±2.57) and mean waist/hip ratio in sedentary workers (0.97±0.04) more than in non-sedentary workers (0.92±0.03). Hence these features are found to be significant higher in sedentary workers than in non-sedentary workers statistically.Besides these, the distribution of cardiovascular parameters. The pulse of sedentary workers (82.37±6.63) is higher than that of non-sedentary workers (69.07±4.47). The systolic BP (mmHg) of sedentary workers (131±10.61) is higher than that of non-sedentary workers (110.67±8.27). The diastolic BP (mmHg) of sedentary workers (85.17±4.99) is higher than that of non-sedentary workers (72.83±6.9). Hence showing that, these parameters are found to be significantly higher in sedentary workers than in non-sedentary workers.In this study except the HDL-C all other three components, ie. TG, LDL-C and Total Cholesterol show higher value in sedentary workers which is statistically significant. HDL-C also slightly higher value in sedentary workers but the difference is not statistically significant. A p value >0.05 is figured out from the different level of HDL-C among sedentary and non-sedentary workers.In this study we found, hyperlipidemia among sedentary worker is 23(76.6%) and non-sedentary worker is only 9(30%) which is statistically significant p value <0.05.The test of significance was calculated using chi-square-test where p =0.0002 (Statistically significant) which is <0.05.On the other hand we found, blood glucose level is significantly higher in sedentary workers (8.33±6.17) than in non-sedentary workers (4.41±1.12).On the other hand, diabetes among sedentary worker is 18(60%) and non-sedentary worker is only 2(6.6%) which is statistically significant p value <0.05.The test of significance was calculated using chi-square-test where p =0.0001 (Statistically significant) which is <0.05.

Table I: Distribution of basic health parameters of participants (N=60)

Parameters	Group I	Group II	p-value
(Unit)	Mean±SD	Mean±SD	
Age (Years)	50.73±6.05	50.63±5.95	>0.05[NS]
Weight (Kg)	75.77±6.13	59.23±3.83	<0.05
Height (Metres)	1.67±0.039	1.66±0.035	>0.05 [NS]

NS=Not significant

Table II: Distribution of anthropometric parameters (N=60)

Parameters	Group I	Group II	p-value
(Unit)	Mean±SD	Mean±SD	
BMI (KG/m^2)	27.29±2.28	21.38±1.3	<0.05
Waist Circumference (Inch)	38.63±2.44	30.57±2.45	<0.05
Hip Circumference (Inch)	39.7±2.86	33.1±2.57	<0.05
Waist/Hip ratio	0.97±0.04	0.92±0.03	<0.05

Table III: Distribution of cardiovascular parameters (N=60)

Parameters	Group I	Group II	p-value
(Unit)	Mean±SD	Mean±SD	
Pulse	82.37±6.63	69.07±4.47	<0.05
Systolic BP (mmHg)	131±10.61	110.67±8.27	<0.05
Diastolic BP (mmHg)	85.17±4.99	72.83±6.9	<0.05

Table IV: Distribution of the fasting lipid profile (N=60)

Parameters	Group I	Group II	p-value
(Unit)	Mean±SD	Mean±SD	
Triglyceride (TG) (mmol/L)	2.61± 0.48	1.43±0.29	<0.05
Total Cholesterol (mmol/L)	5.23±0.6	3.88±0.59	<0.05
HDL-C	0.99±0.07	0.97±0.08	>0.05 NS
LDL-C	3.03±0.67	2.15±0.62	<0.05

NS=Not significant

Table V: Distribution of hyperlipidemia among Participants (N=60)

Group↓	Hyperlipidemia			
	Yes		No	
	n	%	n	%
Sedentary	23	76.67	7	23.33
Non Sedentary	9	30.00	21	70.00
Total	32		28	

Table VI: Distribution of diabetic involvement among participants (N=60)

Group ↓	Diabetes		
	Yes	No	Total
Sedentary	18 (60%)	12(40%)	30
Non Sedentary	2(6.6%)	28(93.4%)	30
Total	20	40	60

V. Discussion

Physical activity protects human being by regulating their weight and improving body's use of insulin. Regular physical exercise has possible effect on improving lipid metabolism. Regular physical activity associated with decreased risk of chronic diseases like diabetes mellitus type-2, coronary heart disease, hypertension. Exercise is very important for health andfitness.It has multiple beneficial effects on our body[4]. Exercise increases parasympathetic activity with a minor decrease in sympathetic activity so resting heart rate decreases. There is more time for filling ventricles with blood and for delivery of oxygen and nutrients to the body and heart muscles. Exercise reduces blood level of nor epinephrine as well as sympathetic activity which decreases vasoconstriction of arterioles to decrease blood pressure (Gandapur et al., 2001)[5].On the other hand, physical inactivity has become a major public health concern. Physical inactivity is associated with increased risk of morbidity or worsening of many chronic diseases and health conditions. Some of these maladies include cardiovascular diseases (CVD), stroke, certain cancers, osteoporosis, obesity,type-2 diabetes, and hypertension(Kesaniemi et al., 2001)[17].A number of tests were done among the study population to find out contribution of physical activity on cardio vascular risk factors. Results of lipid profile are considered as good indicators of whether someone is prone to develop stroke or myocardial infraction, caused by atherosclerosis. So lipid profile was done to determine the risk of cardio vascular diseases. Lipids and lipoproteins are essential constituents of the body and their activities assist in maintenance of the body homeostasis. Sedentary lifestyle, as predisposed by sedentary work has been led to lipid disorders (Ebele et al., 2009).A sedentary lifestyle is a type of lifestyle common in modern civilizations, which is characterized by sitting most of the day, in an office or at home (Varo *et al*., 2003)[6,7.] It is believed to be a factor in obesity and other disorders (Myron et al., 2003). Individuals who expend less than 2,000 calories per week through exercise have a higher risk of heart disease than active persons (Nelson *et al*., 1994; Rockhill*et al*., 1999). A growing body of research is beginning to elucidate the mechanistic pathways that contribute to the health risks associated with sedentary behaviors. Some of the mechanisms may include adverse alterations to cardiac function, glucose homeostasis, and lipid metabolism. Recent findings suggest that physiologic mechanisms associated with excessive sedentary behavior are different than the physiologic benefits of regular exercise (Hamilton et al., 2014). Additional research to ascertain the patho-physiologic mechanisms associated with total and segmented components of sedentary behavior is well warranted (Katzmarzyk et al ., 2009).This study has been conducted on 30 sedentary workers and 30 non-sedentary healthy adults male after careful matching of age and life style factors. Purposive random sampling technique was used to select each study subject[9,10,11.] The aim of our study was to evaluate the impact of sedentary lifestyle on cardiovascular risk factors. Fasting blood glucose and lipid profile status was measured after overnight fasting because consumption of food transiently increases TG level which may cause misinterpretation of the findings. Blood glucose and lipid profile was measured using semi auto analyzer because it is reliable and readily available[8]. Central obesity are associated with accumulation of multiple

metabolic abnormalities such as HTN, diabetes, dyslipidemia, glucose intolerance. We have found that waist circumference (inch), hip circumference (inch) and waist/hip ratio were significantly higher in sedentary workers than in non-sedentary workers. This observation coincides with (Jayalakshmi et al., 2011). It may be due to physical inactivity which has adverse effect on the quantity and location of body fat deposition resulting obesity. Modern life style associated with easy access to food, lack of exercise, sedentary life style, calories dense food, and excessive television viewing is among the identified contributors to the obesity epidemics (vippaldadhiam et al., 2005).In this study it is found that the pulse rate, systolic BP and the diastolic BP (mmHg) significantly higher in sedentary workers than in non-sedentary workers. This findings is similar with sarker et al.(1999), Jayalakshami et al. (2011). Physical inactivity decreases the production of Nitric Oxide (NO) by the abnormal endothelium, which leads to changes in vessel diameter resulting hypertension (kelm.,1990). 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 (Brenner et al.,1988)[12]. Different study shows that low HDL cholesterol might not cause cardiovascular disease as originally thought has now generated renewed interest in raised concentrations of triglycerides. This renewed interest has also been driven by epidemiological and genetic evidence supporting raised triglycerides, remnant cholesterol, or triglyceride-rich lipoproteins as an additional cause of cardiovascular disease and all-cause mortality. Triglycerides can be measured in the non-fasting or fasting states, with concentrations of 2–10 mmol/L conferring increased risk of cardiovascular disease, and concentrations greater than 10 mmol/L conferring increased risk of acute pancreatitis and possibly cardiovascular disease. (Nordestgaard and Varbo, 2014)This study found significant difference of the mean triglyceride, total cholesterol, LDL-C level between sedentary and non-sedentary workers.This finding is similar with Sanghavi et al.(2011) Gandapur et al.(2001) Ebele et al (2009)[13,14]. Sedentary work causes adverse health effect by following possible mechanism: activity of lipoprotein lipase(LPL) is reduced by 80% to 90% and low energy expenditure lead to obesity, metabolic syndrome, insulin resistance, type2 diabetes mellitus, HTN. The cellular event of decrease LPL activity is transcription of an inhibitory gene suppresses LPL by a posttranslational mechanism.All are significant risk factor for CVD. A further important mechanism is decreasing the expression of endothelial NO syntheses and thereby decrease NO. (Hamilton et al., 2007)[15,16]. Visceral fat is metabolically active, producing free fatty acids and inflammatory cytokines that drain directly into the liver via portal circulation. Fat deposits in the liver are associated with overproduction of VLDL, predisposing the patient to atherogenic dyslipidemia, elevated triglycerides, low HDL cholesterol, and small dense LDL cholesterol. Although LDL cholesterol levels may not be elevated, the number of particle may be increased, and the small dense particle more readily enter the arterial wall and are oxidized, leading to atherosclerosis (Johnson and Weinstock, 2006; Koh*et al.*, 2008).This study found no significant difference of HDL-C level of sedentary workers and non-sedentary workers. This finding is consistent with Oyelola et al.,(1993).They concluded that exercise appeared to decrease the TC:HDL ratio in athletes by lowering LDL-cholesterol, while the HDL-cholesterol remained unaffected. Its cause is due to change in the distribution of HDL subfraction without alteration of total HDL concentration. In this study the blood glucose level is significantly higher among the sedentary workers than non-sedentary workers which may lead to develop cardiovascular disease[17]. This result coincides with Gandapur et al.(2001), sarker et al.(1999) and Hamilton (2014). Physical inactivity which leads to obesity and insulin resistance. Decreased skeletal muscle contractions from prolonged sedentary time may reduce plasma glucose uptake through blunted translocation of GLUT-4 glucose transporters (Hamilton et al., 2007)[20].One of the strength of this study is that we have included only healthy adults in our study after careful matching of age and life style factors. Moreover, we have included different types of sedentary and non-sedentary workers for comparison. One of the weakness of this study was that we have done a cross-sectional study on smaller sample size. To establish, the cause-effect relationship, longitudinal study on larger sample size should be done. Moreover multiple subdivisions of exercise habit should be compared to establish the influence of physical activity on lipid profile status. In addition, Apolipoproteins, VLDL remnant should be measured in relation to lipid profile status[18]. Additionally, lipid peroxide level as well as anti-oxidants levels should be measured in relation to lipid profile status.It has been observed that sedentary lifestyle increased the lipid and lipoprotein levels of the subjects studied. The abnormal increase in the lipid profile parameters, blood glucose, BP, pulse, anthropometric parameter of sedentary workers studied could be the result of lack of exercise[19]. So, regular, longer training program at higher working intensity and reduced fat diet should be encouraged to evoke significant positive changes in blood lipid concentrations and other risk factors of heart disease such as blood pressure and obesity (Ebele et al. 2009).

LIMITATION OF THE STUDY

This was a single centered study with small sample size.In this study,Apo lipoproteins were not measured and both the gender was not taken.So, the findings of this may not reflect the exact scenario of the whole community.

VI. Conclusion

Hyperlipidemia, hyperglycemia, hypertension, and obesity are important risk factors for cardiovascular diseases. The aim of this study was to compare the effect of sedentary and non-sedentary activities on risk factors for CVD. From the observation and result of the present study, we opine that sedentary work is associated with increase in anthropometric parameters such as BMI, WC and WHR. Cardiovascular parameters such as pulse rate, systolic blood pressure and diastolic blood pressure were increased in sedentary subjects. It is also revealed that there are significant increase in level of triglycerides, LDL-C, Total cholesterol, glucose, among the people who are sedentary workers. So, this study observed that sedentary work increases the risk of cardiovascular diseases. As a result, physical activities is necessary for healthy living because it helps in maintaining low level of lipid,blood glucose, blood pressure.These principles include avoiding sedentary activities to reduce cholesterol, TG and blood glucose level and increase physical activities. .

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