

# Sedentary Lifestyle and Prospective Health Risks: A Pilot Study Among Bangladeshi Corporate Professionals

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(Received: October 28, 2023; Accepted: January 2, 2024; Published (web): January 25, 2024)

## Abstract

Physical inactivity is one of the global health problems due to increased automation, moving less than before causing people to an elevated risk of developing various health conditions like obesity, hypertension, heart disease, etc. Most of the aforementioned diseases are linked to unhealthy lifestyles that are quite preventable. Although very few studies have been done related with sedentary lifestyle and its risks in Bangladesh, no study was focused on corporate professionals whom are at high health risk due to their job nature. This study therefore aims to explore the sedentary lifestyle and associated health and lifestyle related factors that might play role in the worsening of healthy life. Results of our study concluded that professionals belonging to age group between 25-29 years are most likely heading towards the risk zone of developing sedentary lifestyle associated risk according to WHO guidelines on sedentary lifestyle especially high body mass index (BMI 25 and more). Among the studied participants 78% were smokers and 21% were alcoholics. Moreover, 63% corporates reported that they could sleep 6 hour or less in a day, while 64% of the participants claimed that their stress level is high (7 to 10) in a 10 scale. Almost one fourth (24%) of the participants informed that they did not do any format of physical activity, and 26% participants were working for 5 years or more. Our data adequately pointed out some leading risk factors among the corporates that directly or indirectly provoke prospective health risks as described in numerous number of previous studies.

**Key words:** Sedentary lifestyle, health risk, obesity, unhealthy lifestyle.

## Introduction

The word "sedentary" comes from the Latin word "sedere" which means "sit" and therefore sedentary behavior is a term used to characterize the behaviors associated with low energy spending (Dunstan *et al.*, 2010). A person living a sedentary lifestyle may be called a "Couch Potato". This term was invented in the early 1970s by a comic artist Robert Armstrong. In his comic series, he presented a group of couch potatoes featuring sedentary characters who regularly watched TV in the form of meditation. Many publications in various news media platforms uses the term "Couch Potato" as one identified by prolonged periods of physical inactivity (Levy, 2014; Tremblay

*et al.*, 2011). Humans are designed to be active and, on the move, so a sedentary lifestyle is contrary to human nature. Activities such as hunting, gathering, farming, fishing and covering long distances by foot that requires strenuous physical activity was done by our ancestors which in turn helped them to live a longer and healthier life. A strong determinant of a positive and healthy life in the long run depends on a lot of factors and inclining towards an active lifestyle is among the most important one.

Around 2 million deaths are reported per year due to physical inactivity ("Physical Inactivity a Leading Cause of Disease and Disability, Warns WHO.," 2002), and preliminary findings from a

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DOI: <https://doi.org/10.3329/bpj.v27i1.71157>

WHO risk factor study suggests that sedentary lifestyle is among the world's ten leading causes of death and disability. An occupational physician discovered that the adverse effect physical inactivity had on human metabolism, cardiac output, physical function and well-being was identified as early as the 17th century (Owen *et al.*, 2010). A survey in 2008 reported that 36 percent adults were completely physically inactive while 59 percent responded that they never participated in any demanding physical activity which lasted for more than 10 minutes per week (Center for Health Statistics, 2008).

This undesirable shift towards decreased physical activity has led to an elevated risk of a plethora of chronic diseases like obesity, heart disease, type II diabetes, osteoporosis, muscle and skin disorders and even cancer among others, leading to increased healthcare burden and mortality (Wanjau *et al.*, 2023). In almost all developed and rapidly developing countries, level of inactivity is high. Majority of adults are not adequately active in developed countries. In developing world's rapidly growing big cities, physical inactivity has started to pose to be an even greater problem. Due to increased crowding, poverty, crime, traffic and low air quality and lack of public recreation facilities and sidewalks, maintaining proper level of physical activity has become a tough choice. Innovative progression and advancement in information technology, have brought the world literally in one's fingertips and thus making life more inactive (Inang and Stella, 2015). Chronic diseases are now the leading cause of death around the globe, with the exception of sub-Saharan Africa. Maintaining a generally unhealthy lifestyle and chronic diseases stemming from it are the most pressing public health concern in majority of the countries (Rimer & Glanz, 2005). Obesity as such is believed to affect children as well as adults. There is a sizeable assertion linking the time spent watching television and being overweight or obese in children and adolescents. For instance, 7216 children from a representative sample aged 7 to 11 years became overweight (increased from 17% to 44%) or obese (from 10% to 61%) because of physical inactivity with watching television and playing video games

(Tremblay and Willms, 2003). Another study also showed a relationship between sedentary and lifestyle factors with obesity (Tremblay and Willms, 2003).

A study was conducted on time spent on two sedentary behaviors – riding in cars and time spent watching television per week and their association with cardiovascular disease related morbidity and mortality (Wanjau *et al.*, 2023). Adults spent time for watching television, operating computer, playing video games or reading of books for long times with continuous sitting serious physical inactivity due to lack of muscle usage leading to cardio-vascular related diseases like elevated blood pressure, coronary artery disease and stroke among others (Rimer and Glanz, 2005).

It is also established that, inactivity plays an important role in diabetes, especially type 2 diabetes, which is known officially as non-insulin dependent diabetes mellitus, due to the fact that body cannot use insulin properly (Tremblay & Willms, 2003). People who watch television, play videogames or use computer for more than 40 hours per week are three folds more prone to develop type 2 diabetes compared to those who spend less time (Rimer & Glanz, 2005). Researchers showed that prolonged sitting time, mean physical inactivity, puts people at increased risk of type 2 diabetes irrespective of gender and age (Tremblay & Willms, 2003).

It is an inevitable theory that sedentary lifestyle is contributing to the growing risks of developing non communicable diseases in today's world (*GLOBAL STATUS REPORT on Noncommunicable Diseases 2014 "Attaining the Nine Global Noncommunicable Diseases Targets; a Shared Responsibility,"* n.d.). As the prevalence of chronic disease increases throughout the world due to sedentary lifestyle, there has been no such established study conducted on Bangladeshi citizens (*Preventing Chronic Diseases : A Vital Investment : WHO Global Report,* n.d.). Most people, though aware of the risks involved, still tend to take no measures to live a healthy life. As alarming as the outcome can be, promoting proper measure in proper time is a necessity through awareness and also by self-education (World Health Organization, 2002).

Although few studies have been done to evaluate the impact of sedentary lifestyle and relevant sociodemographic factors, none of the study was focused on corporate personnel whom were more vulnerable to different health risks because of their job nature. This pilot study aims to find out the extent of sedentary lifestyle among Bangladeshi corporates and relevant health and lifestyle factors that might deteriorate the quality of health and life of the population.

### Materials and Methods

Based on the associated risks with sedentary lifestyle, we conducted a survey among corporate professionals in Dhaka, Bangladesh. The survey took a total of six months to be completed. Data was collected by a structured set of questionnaires. To conduct the survey, the questionnaire was developed in reference to the IPAQ (International Physical Activity Questionnaire) and GPAQ (Global Physical Activity Questionnaire) developed by WHO for physical activity surveillance in countries. Initially the questionnaire was distributed to a pilot population of 15 participants to observe relevant outcomes. After analyzing the results based on our requirements for the study, the final set of validated questionnaires was developed which included all the required parameters and factors. The questionnaire was filled out by 100 participants including both males and females. The survey was conducted on corporate desk job holders, bankers and doctors. The reason behind the targeted audience was to portray a definite picture of sedentary lifestyle led by these professions. Prior to starting the survey, we explained about the purpose of conducting the study to the volunteer. We took written consent from each of the participants of the study. In few of the cases, we also considered verbal consent.

### Results

*Socio-demographic characteristics of participants:* We included socio-demographic parameters which included the likes of gender, age, occupation, and service tenure. Among the 100 volunteers, 51 were males and 49 were females. For

the ease of observation and analysis, the age group was divided into three categories: 25-29, 30-39 and 40-49. The majority of participants belonged to the 25-29 age range category. Although there was a variety in occupation among the members, including corporate desk job holders, bankers, doctors and others (teachers, pharmacists, nurse etc.), however, the majority of them held desk jobs in various corporations. In addition, their service time was divided into three categories: less than five years, five to nine years and more than nine years. Among them, majority of them had less than five years of service time. Details are described in the table 1.

We have summarized the lifestyle and health related issues of the participants in the table 2 below. It is clear from table 2 that a large number of the participants have had smoking and alcohol consumption habit. Smoking adds an additional disadvantage to those who lead sedentary lifestyles. As a result, it is evident that Bangladeshi corporate people smoke heavily, with men smoking more than women.

In the matter of experiencing anxiety, men were at a higher risk as a significant number of members responded in the survey on feeling of anxiety at level 8 and 9. As a result, the health and standard of living of Bangladeshi corporate people are at an alarming level. In terms of meals consumed daily, the majority of participants (n=45) consumed four meals per day. Nevertheless, the quantity of food they ingested is the concern. Weight increase and other physiological variables are correlated with the level of food consumption. Furthermore, a subset of individuals adhered to a dietary regimen consisting of five to six meals per day, potentially exacerbating their weight gain, whereas the rest of participants participated in just mild to moderate levels of physical exertion. Just 54% of the participants provided a positive response to the question about walking as a means of physical activity, while 24% of the participants had a negative attitude towards any sort of exercise. Another study asserted a definitive correlation between a sedentary lifestyle and obesity in young individuals (Barnett et al., 2018). This obesity can lead to a complex

interaction including type 2 diabetes mellitus and cardiovascular problems (Piché *et al.*, 2020). Numerous illnesses, including obesity, heart disease, hypertension, diabetes, hyperlipidemia and others,

may be brought on by leading a sedentary lifestyle. The way of life of Bangladeshi corporates is in such a precarious condition that it needs to be controlled or it spells serious repercussions in the future.

**Table 1. Socio-demographic characteristics of the study participants in Bangladeshi corporate.**

Variables	Category	Total Number (N)	Percentage (%)
Sex	Male	100	100%
	Female	Male: 51 Female: 49	
Age group in years	25-29	61	61%
	30-39	25	25%
	40-59	13	13%
Occupation	Corporate desk job	49 Male: 29 Female: 20	49%
	Banker	19 Male: 12 Female: 7	19%
	Doctor	7 Male: 1 Female: 6	7%
	Others	25 Male: 9 Female: 16	25%
	Service years	<5 Years	74
	5-9 Years	14	14%
	>10 Years	12	12%

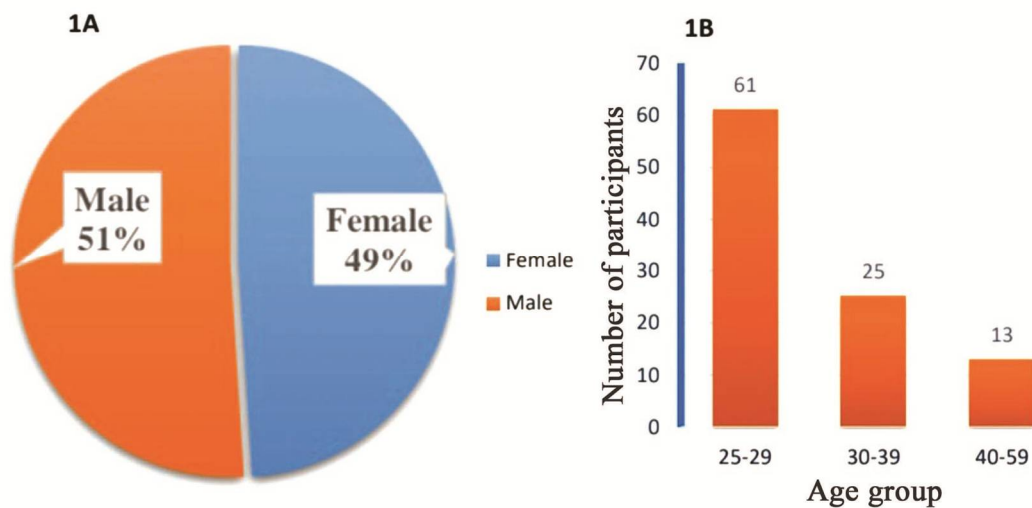


Figure 1. Age and gender wise distribution of the studied participants.

*Gender and age segmentations of participants:*

The study was conducted among 100 corporate professionals in Dhaka, Bangladesh. The gender was randomly selected and there were 49 females and 51 males. The age group was categorized into three groups comprising of age group I between 25-29 years, age group II between 30-39 years and age group III between 40-59 years. Age group I had the highest number of volunteers, 61, while age group III had the lowest number of volunteers, 13.

The study (Figure 1) was conducted among participants where almost 50% were both male and female. The graph and the data are showing that, a major group of participants were enlisted within the age range of 25-29.

*Body mass index (BMI) of the participants:* An individual's BMI within the normal clinical range is a crucial indicator for the assurance of current and future wellbeing. The body mass index is divided into four segments, which are- underweight (<18.5) Kg/M<sup>2</sup>, normal BMI (18.5-24.9) Kg/M<sup>2</sup>, overweight (25-29.9) Kg/M<sup>2</sup> and obese (>30) Kg/M<sup>2</sup> (Zierle-Ghosh & Jan, 2022). Because of its widespread acceptance in defining specific categories of body mass as a health concern, the BMI has been useful in population-based studies. However, it is becoming increasingly apparent that BMI is a poor indicator in determination of body fat percentage. In fact, the BMI does not aptly take into account the amount of fat present at various body sites (Nuttall, 2015).

Thus, the height was also taken into consideration to estimate the BMI of each individual among which 51% of studies population were recorded as overweight, where 35 of them were males and 16 were females. On the other hand 19% of the studied population were in obese group. Meanwhile, a mere 28% of the participants had a BMI within the normal range, while 19% of the individuals were classified as obese. The higher propensity of women to develop obesity in comparison to males is a concerning phenomenon. (Figure 2). Women's

obesity can lead to a number of illnesses, including diabetes, heart disease, breast cancer, endometrial cancer, cervical cancer and PCOS (Polycystic Ovary Syndrome). Also, obese women face difficulties in both contraception and fertility. Therefore, living a sedentary life can be especially life-threatening for women (Kulie *et al.*, 2011). Figure 2 clearly demonstrates that corporate professionals have a propensity to be overweight and obese, which is a potential risk factor for developing autoimmune illnesses such as diabetes, as well as hypertension, hyperlipidemia and cardiovascular diseases.

*Relationship between physical activity and stress:*

Stress is a term that collectively defines the experiences which are emotionally and physically challenging. Psychological stress has a really harmful effect on the physical and mental health which can cause severe diseases. It is said that, the relationship between physical activity and stress is that, they are reciprocally connected to each other. A daily exercise and physical activity decrease the level of stress. So, there is a clear relationship between physical activity and stress. Those who are regular to exercise are less prone to suffer from cognitive impairment, stress and mental depression (Stults-Kolehmainen & Sinha, 2014).

Insufficient physical activity quickly causes the body to mal adapt, resulting in significant reductions in quality of life. There is overwhelming evidence to suggest that the majority of chronic diseases can be attributed in part to a lack of physical activity. Active work or physical activities principally forestalls, or delays, chronic diseases, suggesting that persistent infection and chronic diseases are not necessarily an irreversible problem during life (Booth *et al.*, 2012). The pie chart above (Figure 3), makes it clear that few employees in the corporate sector engaged in physical activity. Only about half of the 100 participants (n=54) considered walking to be a form of physical activity, while 24 volunteers did nothing at all. This is extremely concerning because working

while seated can result in serious health issues. Additionally, the likelihood of developing diseases such as obesity, atherosclerosis, hyperlipidemia,

hyperglycemia, uncontrolled diabetes and others significantly increases if not even minimum physical activity is performed.

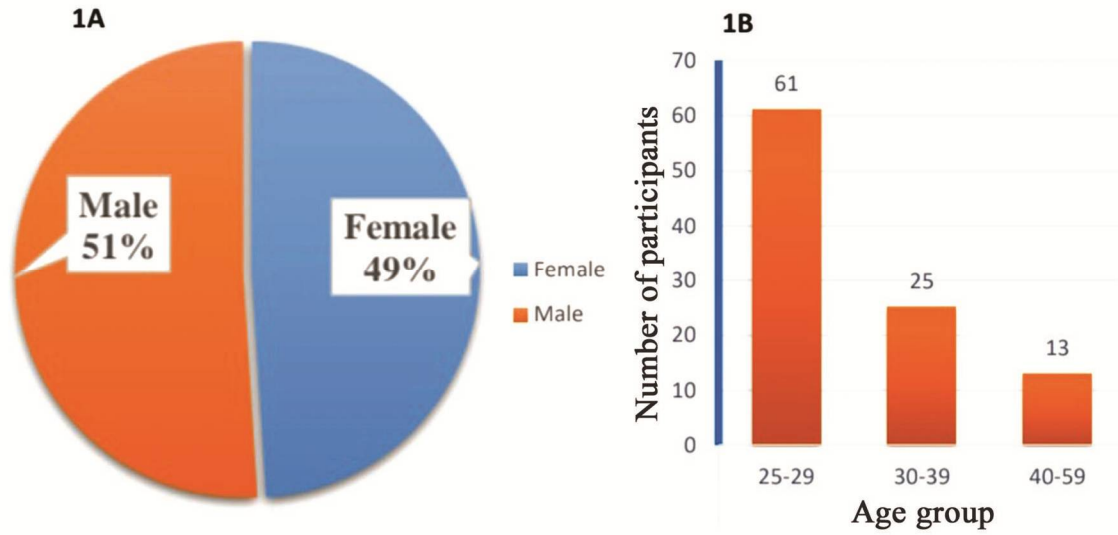


Figure 2. Results of the BMI (body mass index) of participants.

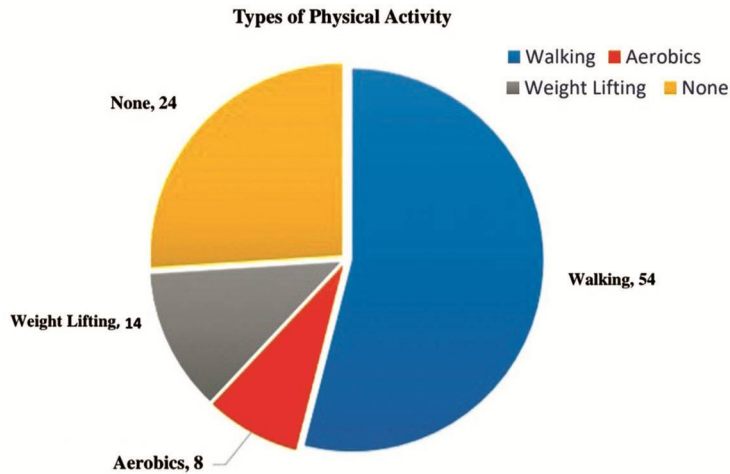


Figure 3. Graph presenting types of physical activity among participants.

According to the graph above (Figure 4), 50% of participants agreed to engage in 30 minutes of daily physical activity, while 19% agreed to engage in 60 minutes. Only 5% and 2% of participants, respectively, engaged in 90 or 120 minutes of daily physical activity. However, the alarming fact is that a significant portion of participants (n=24%) responded negatively to any form of physical activity. This may be the cause of their rising stress levels, deteriorating

health, diabetes, obesity, hypertension, cardiovascular diseases, endothelial dysfunction, non-alcoholic fatty liver disease, arterial dyslipidemia, breast cancer, PCOS, anxiety, depression, hemostasis and other conditions (Booth *et al.*, 2012).

Stress is a disturbing and possible forerunner while creating different physiological trouble and complexities. Stress can lead to a variety of complications, including cardiac arrest, hypertension

and headaches. This pilot study revealed that a good number of participant's experience significant stress. The study used a scale of one to ten, with one representing the lowest level of stress or nearly a stress-free life and ten representing the highest level of stress. This scale was used to assess the level of stress in the lives of the participants. Figure 5 showed that, 5 members professed to have experienced anxiety at level 4 (mild degree of stress) and 16 members professed to have experienced anxiety at level 5 (moderate degree of stress) on the stress measuring scale in this pilot study. The fact that the majority of participants indicated having stress levels 7 and 8 (moderate to severe), which are extremely dangerous levels, and that 13 and 9 volunteers, respectively, indicated having stress levels 9 and 10 (severe), which are completely harmful levels of stress to one's health, is a pressing concern here. Information in the bar graph above (Figure 5) additionally shows that, men were experiencing elevated levels of stress compared to ladies. This can be a potential explanation that, cardiovascular illnesses and hypertension including coronary failure are exceptionally common in men than that of women (Woodward, 2019). Another study found that active persons had lower heart rates than sedentary ones (Childs and de Wit, 2014). Physical exercise stimulates and modulates stress-relieving neurobiological signaling molecules such endogenous

morphine and nitric oxide pathways. Research indicated that stress hormones elevate blood glucose, leading diabetes and cardiovascular illness (Satyjeet et al., 2020; Sharma et al., 2022). Sedentary lifestyles and lack of exercise can cause moderate to severe stress in corporate workers, increasing their risk of diabetes and cardiovascular disease.

Therefore, it is evident that a sedentary lifestyle is associated with health conditions in a similar way to the relationship between stress and health issues. People working in Bangladesh's corporate sector routinely lead sedentary lives, resulting in a number of health issues. As a result diabetes, stroke, cardiac disease, heart attack, hypertension and hyperlipidemia have become commonplace in Bangladesh, posing a significant threat to the nation's future.

*Reclination time on a typical day among participants:* A total of 58 participants reported a constant reclination time between 7 and 10 hours, while 8 of the 100 participants reported a reclination time of 4 hours, as depicted in the preceding data (Figure 6). On the other hand, 11 participants consistently reported reclination times ranging from 12 to 15 hours. The participants may have developed physical issues like back pain, obesity, muscle cramps, and other symptoms due to their excessive sitting or recline time.

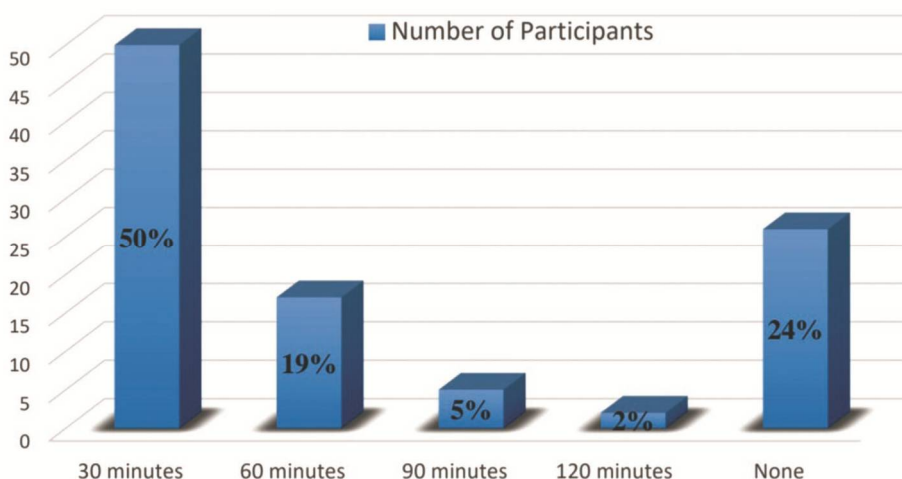


Figure 4. Duration of physical activity among participants per day.

**Table 2. Lifestyle and health related characteristics of study participants in Bangladeshi corporate**

Variables	Category	Total number (N)	Total percentage (%)
Smoking habit	Yes	78	78%
	No	22	22%
Alcohol consumer	Yes	21	21%
	No	79	79%
Duration of sleep per hour	<6 hours	29	29%
	6 hours	34	34%
	7 hours	28	28%
	>7 hours	9	9%
Stress level	Level 4	5	5%
		Male: 2 Female: 3	
	Level 5	16	16%
		Male: 3 Female: 2	
	Level 6	8	8%
		Male: 4 Female: 4	
	Level 7	16	16%
		Male: 13 Female: 3	
	Level 8	28	28%
		Male: 15 Female: 13	
Level 9	11	11%	
	Male: 3 Female: 8		
Level 10	9	9%	
	Male: 5 Female: 4		
Number of meals taken per day	3 meals	26	26%
	4 meals	45	45%
	5 meals	23	23%
	6 meals	6	6%
Physical activity	Walking	54	54%
	Aerobics	8	8%
	Weight lifting	12	14%
	None	26	24%



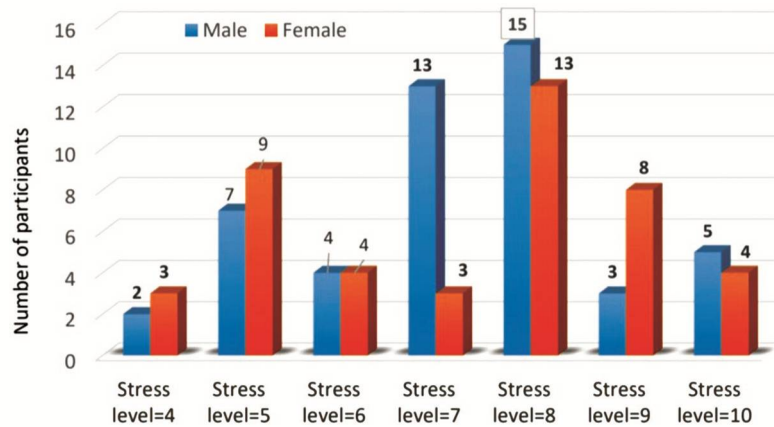


Figure 5. Graph representing stress level among the participants.

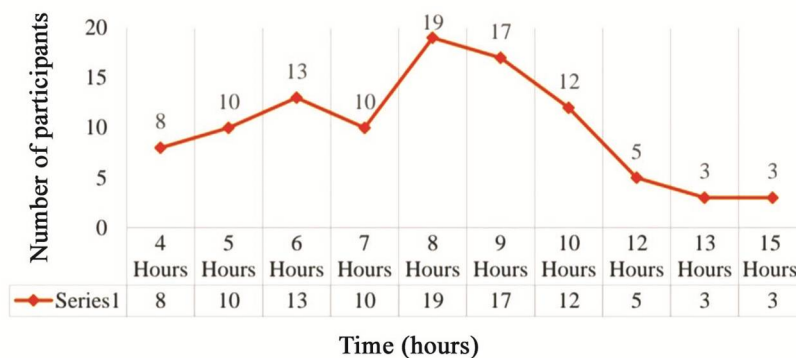


Figure 6. Reclination period of the studied participants.

**Discussion**

The aim for conducting this explorative study was to recognize determinants of physical activity and inactive behavior (sedentary) among corporate job holders. Randomly 100 participants were selected, both male and female, and a survey was conducted. Based on the results displayed above, it is evident that majority of the population is possibly at a high risk to suffer from multiple disorders related to leading a sedentary lifestyle. From our study, we have found a few shocking revelations. To highlight a few, it was observed that, 58 participants out of the 100 spend a constant 7-10 hours reclining on a typical day with a maximum sitting time of 8-9 hours being recorded for 36 participants. Over the past decade, there has been a rapid accumulation of epidemiological evidence, from both cross-sectional and prospective observational studies, to indicate that time spent in sedentary behaviors is a distinct risk factor for several health-

related outcomes. The data highlights strong associations between sedentary behavior and biomarkers linked to diabetes. (Salmon *et al.*, 2011; Stamatakis *et al.*, 2012), and obesity like 2-h plasma glucose (Cameron *et al.*, 2004), high lipids and abnormal glucose tolerance (Dunstan *et al.*, 2004, 2007). Watching TV for a prolonged time can cause obesity and type II diabetes mellitus in men and women (Hu *et al.*, 2001, 2003). Obviate it to mention that these detrimental relationships of sedentary time with health extend beyond developing markers of diabetes risk.

As mentioned, this prolonged sitting time contributes to many deadly outcomes. If we observe very keenly most of the diseases are interlinked with each other. Considering obesity as one of the main risks of leading a sedentary lifestyle, the survey findings of 72 participants of the 100 recorded having a body weight between 60-90 kg's consolidates this.

It is baffling that majority of the participants that reported of experiencing stress at a level within 8-10 on a scale of 10 being the highest, belonged to the age category 25-29 years with a reported service period of less than 5 years. The said number of populations did not engage in any sort of physical activities throughout the week and had a sleeping habit of 6 hours and less as per the survey report. According to the World Health Organization (WHO), global recommendations for physical activity for adults aged 18-64 includes recreational physical activity, transportation (such as walking or cycling), work (such as doing household chores), or planned exercise related to health that can be performed daily in family and community activities. Adults should do moderate to intense aerobic exercise per week for 150 minutes or more, whereas a vigorous-intensity aerobic exercise for 75 minutes or more, or moderate-intensity exercise should be done in equal combinations (Yang, 2019). Another study claimed that, the heart rate of individuals who regularly exercise was notably lower compared to those who lead a sedentary lifestyle (Childs & de Wit, 2014). It is evident that the sedentary lifestyle and the practice of avoiding physical activity are the risk factors that are causing cardiovascular ailments among Bangladeshi corporates.

The scientific explanation of stress is the excessive secretion of the hormone cortisol. Cortisol is a glucocorticoid which is a steroid hormone that is produced in the adrenal gland located in the top of both kidneys. This cortisol is produced from cholesterol and is responsible for stress management. It is usually released in response to events and situations such as morning awakening and acute stress. Over the last 15 years, studies have increasingly revealed that moderately high cortisol levels can cause problems (Reincke, 2000) that may include high blood pressure, osteoporosis as well as type 2 diabetes (Chiodini, 2011). Cortisol increases appetite and signals the body to shift metabolism to store fat leading to weight gain (Spencer & Tilbrook, 2011). It disrupts sleep patterns and causes fatigue because it interferes with other hormone cycles on a daily basis. Memory impairment caused by cortisol

contributes to mental foggiess or "brain fog." Because cortisol weakens the immune system, people are more likely to get sick. In rare cases, very high cortisol levels can lead to Cushing's syndrome, a rare but serious disease (Reincke, 2000). So, having extensive secretion of cortisol is causing stress and emotional stress significantly contributes to primary causes of mortality cancer, coronary heart disease, respiratory illnesses, hepatic cirrhosis etc. (Salleh, 2008).

Physical activities can improve mood by activating and regulating neurobiological signaling molecules such endogenous morphine and related nitric oxide pathways. From an evolutionary perspective, the different activities and self-regulatory pathways are interconnected. This is evident in the conversion of dopamine into morphine within the body, which in turn stimulates the release of nitric oxide by activating specific enzymes called constitutive nitric oxide synthases. These chemicals and systems have a demonstrable ability to reduce stress (Esch & Stefano, 2010). Elevated blood glucose levels can occur as a result of the secretion of hormones triggered by stress (Sharma *et al.*, 2022). Studies suggested that elevated mental stress increases the probability of recurrent cardiovascular disease (CVD) episodes, leading to higher mortality rates (Satyjeet *et al.*, 2020). It may be inferred that corporate professionals experienced moderate to severe stress as a result of a lack of physical activity and a sedentary lifestyle, both of which are possible risk factors for developing diabetes and cardiovascular illnesses in the long term.

Considering our survey results and the scientific findings we can make a probable assumption that these could be the risk factors and can lead to the possible health risk outcomes of the current young generation leading a sedentary lifestyle who are aged between 25-29 years.

### **Limitations**

As it was a pilot study, we were unable to establish a correlation between the participants and their respective medical conditions. Rather we found

the extent of sedentary lifestyle among the studies population and some established risk factors that might deteriorate quality of health and life. Further study is required nationwide to address this issue more elaborately.

### Conclusion

Fundamental research challenges include comprehending the connections between sedentary behaviors and health outcomes and monitoring these behaviors across populations. However, to develop evidence-based public health strategies and implement large-scale interventions to reduce population wide levels of sedentary behaviors, there is a need to understand the determinants of the behaviors themselves. Prospective studies and intervention trials should also be carried out to identify the environmental, social and personal factors that lead to prolonged time spent in particular sedentary behaviors.

To properly address prolonged sedentary behavior as a new public health issue, evidence is needed from actual intervention trials, in which the factors known to influence sedentary behavior are manipulated. It seems possible to get people to spend part of their sedentary time in a higher volume of light to moderate intensity physical activity. However, it should be determined by experiment. The feasibility and acceptability of changes have to be cautiously examined in populations where most of the adults are physically inactive in case of rigorous studies. In addition, it must be determined whether there may be adverse consequences of converting a significant portion of sedentary time to the time spent in activities like standing or light walking (Tremblay et al., 2010).

### Funding

We did not get any fund for this research.

### Conflict of interest

We declare no conflict of interest.

### References

- Barnett, T. A., Kelly, C. A. S., Young, D. R., Perry, C. K., Pratt, C. A., Edwards, N. M., Rao, G. and Vos, M. B. 2018. Sedentary behaviors in today's youth: approaches to the prevention and management of childhood obesity a scientific statement from the American Heart Association. *Circulation* **138**, E142–E159.
- Booth, F. W., Roberts, C. K. and Laye, M. J. 2012. Lack of exercise is a major cause of chronic diseases. *Compr. Physiol.* **2**, 1143-1211.
- Cameron, A. J., Welborn, T. A. and Zimmet, P. Z. 2004. Erratum: "Overweight and obesity in Australia: The 1999-2000 Australian diabetes, obesity and lifestyle study (AusDiab)" (The Medical Journal of Australia (2003) vol. 178 (427-432). *Med. J. Aust.* **180**, 418.
- Center for Health Statistics, N. 2008. Vital and Health Statistics Series 10, Number 242 December 2009. *Vital and Health Statistics, Series 10: Data from the National Health Survey*, **10**, 1-15.
- Childs, E., and de Wit, H. 2014. Regular exercise is associated with emotional resilience to acute stress in healthy adults. *Front. Physiol.* **5**, 1-7.
- Chiodini, I. 2011. Diagnosis and treatment of subclinical hypercortisolism. *J. Clin. Endocrinol. Metab.* **965**, 1223-1236.
- Dunstan, D. W., Healy, G. N., Sugiyama, T. and Owen, N. 2010. 'Too Much Sitting' and Metabolic Risk – Has Modern Technology Caught Up with Us? *Eur. Endocrinol.* **06**, 19.
- Dunstan, D. W., Salmon, J., Healy, G. N., Shaw, J. E., Jolley, D., Zimmet, P. Z. and Owen, N. 2007. Association of television viewing with fasting and 2-h postchallenge plasma glucose levels in adults without diagnosed diabetes. *Diabetes Care* **30**, 516–522.
- Dunstan, D. W., Salmon, J., Owen, N., Armstrong, T., Zimmet, P. Z., Welborn, T. A., Cameron, A. J., Dwyer, T., Jolley, D. and Shaw, J. E. 2004. Physical activity and television viewing in relation to risk of undiagnosed abnormal glucose metabolism in adults. *Diabetes Care* **27**, 2603-2609.
- Esch, T. and Stefano, G. B. 2010. Endogenous reward mechanisms and their importance in stress reduction, exercise and the brain. *Arch. Med. Sci.* **6**, 447–455.
- GLOBAL STATUS REPORT on noncommunicable diseases 2014 "Attaining the nine global noncommunicable diseases targets; a shared responsibility." (n.d.).

- Hu, F. B., Leitzmann, M. F., Stampfer, M. J., Colditz, G. A., Willett, W. C. and Rimm, E. B. 2001. Physical activity and television watching in relation to risk for type 2 diabetes mellitus in men. *Arch. Int. Med.* **161**, 1542-1548.
- Hu, F. B., Li, T. Y., Colditz, G. A., Willett, W. C. and Manson, J. A. E. 2003. Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. *JAMA*, **289**, 1785-1791.
- Inang, M. P. and Stella, O. O. 2015. *Sedentary Lifestyle: Health Implication. IOSR J. Nurs. Health Sci.* (IOSR-JNHS) **4**, 20-25.
- Kulie, T., Slattengren, A., Redmer, J., Counts, H., Eglash, A. and Schrage, S. 2011. Obesity and women's health: an evidence-based review. *J. A.m Board Fam. Med.* **24**, 75-85.
- Levy, R. M. 2014. The evolving definition of neuromodulation. *Neuromodulation* **17**, 207-210.
- Nuttall, F. Q. (2015). Body mass index: Obesity, BMI and health: a critical review. *Nutrition Today* **50**, 117-128.
- Owen, N., Healy, G. N., Matthews, C. E. and Dunstan, D. W. 2010. Too much sitting: the population health science of sedentary behavior. *Exerc. Sport. Sci. Rev.* **38**, 105-113.
- Physical inactivity a leading cause of disease and disability, warns WHO. (2002). *J. Adv. Nurs.* **39**, 518.
- Piché, M. E., Tchermof, A. and Després, J. P. 2020. Obesity phenotypes, diabetes and cardiovascular diseases. *Circ. Res.* **126**, 1477-1500.
- Preventing chronic diseases: a vital investment: WHO global report.* (n.d.). Retrieved April 8, 2023, from <https://apps.who.int/iris/handle/10665/43314>
- Reincke, M. 2000. Subclinical Cushing's syndrome. *Endocrinol. Metab. Clin. North Am.* **29**, 43-56.
- Rimer, B. K. and Glanz, K. 2005. *Theory at a glance A guide for health promotion practice.* Bethesda, MD US Department of Health and Human Services, National Institutes of Health, National Cancer Institute. - *References - Scientific Research Publishing.*
- Salleh, M. R. 2008. Life event, stress and illness. *Malays. J. Med. Sci.* **15**, 9-18.
- Salmon, J., Tremblay, M. S., Marshall, S. J. and Hume, C. 2011. Health risks, correlates and interventions to reduce sedentary behavior in young people. *Am. J. Prev. Med.* **41**, 197-206.
- Satyjeet, F., Naz, S., Kumar, V., Aung, N. H., Bansari, K., Irfan, S. and Rizwan, A. 2020. Psychological stress as a risk factor for cardiovascular disease: a case-control study. *Cureus* **12**, 10-13.
- Sharma, K., Akre, S., Chakole, S. and Wanjari, M. B. 2022. Stress-induced diabetes: a review. *Cureus* **14**, 1-6.
- Spencer, S. J. and Tilbrook, A. 2011. The glucocorticoid contribution to obesity. *Stress* **14**, 233-246.
- Stamatakis, E., Hamer, M. and Mishra, G. D. 2012. Early adulthood television viewing and cardiometabolic risk profiles in early middle age: results from a population, prospective cohort study. *Diabetologia* **55**, 311-320.
- Stults-Kolehmainen, M. A. and Sinha, R. 2014. The effects of stress on physical activity and exercise. *Sports Med.* **44**, 81-121.
- Tremblay, M. S., Colley, R. C., Saunders, T. J., Healy, G. N. and Owen, N. 2010. Physiological and health implications of a sedentary lifestyle.
- Tremblay, M. S., LeBlanc, A. G., Kho, M. E., Saunders, T. J., Larouche, R., Colley, R. C., Goldfield, G. and Gorber, S. C. 2011. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int. J. Behav. Nutr. Phys. Act.* **8**.
- Tremblay, M. S. and Willms, J. D. 2003. Is the Canadian childhood obesity epidemic related to physical inactivity? *Int. J. Obes.* **27**, 1100-1105.
- Wanjau, M. N., Möller, H., Haigh, F., Milat, A., Hayek, R., Lucas, P. and Veerman, J. L. 2023. Physical activity and depression and anxiety disorders: a systematic review of reviews and assessment of causality. *AJPM Focus* 100074.
- Woodward, M. 2019. Cardiovascular disease and the female disadvantage. *Int. J. Environ. Res. Public Health* **16**, 1165
- World Health Organization. 2002. The World Health Organization Report 2002: reducing risks, promoting healthy life. *WHO Library Cataloguing-in Publication Data*, 232.
- Yang, Y. J. 2019. An overview of current physical activity recommendations in primary care. *Korean. J. Fam. Med.* **40**, 135-142.
- Zierle-Ghosh, A. and Jan, A. 2023. Physiology, Body Mass Index. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; Jan-. PMID: 30571077.