Some Haemostatic Indices and Body Mass Index of Apparently Healthy Deskbound and Non-Deskbound Employees of a Tertiary Institution in Port Harcourt, Nigeria

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ABSTRACT

Background: Prothrombin time (PT) and international normalized ratio (INR) is typically used in conjunction with activated partial thromboplastin time (APTT) to evaluate the overall integrity of the intrinsic, extrinsic and common coagulation pathway and to monitor the treatment of coagulation disorders while BMI screens for weight categories ;an important health index. A high BMI can indicate high body fatness while a low BMI connotes risks of being underweight. These extremes have obvious health challenges. The aim of the study is to determine some haemostatic indices and body mass index in apparently healthy deskbound and non-deskbound employees of the Rivers State University, Port Harcourt.

Methods: A total of hundred (100) employees of the Rivers State University were recruited for this study comprising of 37 females and 63 males, out of which 53 were non-deskbound and 47 deskbound. The deskbound employees were those that work for an average of seven hours sitting down at a stretch while the non-deskbound work for an average of less than seven hours sitting down at a stretch. Using a structured questionnaire, demographic information was collected from each participant. The weight and blood pressure (BP) of each participant was taken using a weighing scale and a MOTECH digital BP monitor respectively. A standard venipuncture technique was used to collect 3ml of blood into 3.2% tri-sodium citrate anticoagulant (at the ratio of 9:1 blood-anticoagulant) for analysis. Activated partial thromboplastin time (APTT) and prothrombin time (PT) were analyzed using the Helena C4 semi-automated coagulation analyzer, photo-optical coagulation analyzer and the Agape test kit manufactured by Agape diagnostics Switzerland. International normalized ratio (INR) was calculated from the PT results. The data obtained was analyzed using Graphpad Prism software version 6.00 produced by Graphpad software Inc. USA. Data was presented as means, median, range and standard deviation. Comparison between two means was done using student t-test analysis.

Results: The mean ± SD of the PT, INR, APTT and BMI were 13.21 ± 1.97s, 1.03 ± 0.15, 29.7 ± 4.90s and 27.02 ± 2.95s in the same order and the reference

ranges established for both deskbound and non-deskbound employees as the following values: PT (s): 9.27-17.15, APTT (s): 19.9-39.5 and INR: 0.73-1.33. Comparison of the prothrombin time (PT), international normalized ratio (INR), activated thromboplastin time (APTT) and BMI between non-deskbound and deskbound staff showed a statistical significant difference for APTT (P=0.0119) and BMI (P=0.0427) while the PT and INR showed no significant statistical difference. However, all the measured haemostatic parameters were within the reference ranges.

Conclusion: The increased APTT observed among the deskbound employees is a pointer to an abnormal haemorrhage if their sedentary working lifestyle continues without any ameliorative measures. Also the increased BMI seen among the Deskbound employees connotes overweight and its attendant health consequences. It is therefore recommended that the deskbound employees should make it a point of duty to walk around in-between their working schedules to break the long hours of sitting down.

Key words: Deskbound, Non-Deskbound, Employees, Haemostatic, Body mass index, Indices

INTRODUCTION

Haemostasis is a complex process that is contingent on the complex interaction of platelets, plasma coagulation cascades, fibrinolytic proteins, blood vasculatures and cytokine mediators [1, 2, 3]. Upon tissue injury, the haemostatic mechanism employs a plethora of vascular and extravascular receptors, in accordance with the blood components, to seal off the impairments to the vasculature and closing it off from the encircling tissues [1,2, 3].
In normal healthy individuals, the haemostatic system is really a delicate balance of pro-coagulant and anticoagulant factors. Initially on vessel injury, pro-coagulant forces dominate resulting in a fibrin/platelet clot, which seals off the injured blood vessel. Once the endothelium has healed, anticoagulant and pro-fibrinolytic factors come into play allowing clot lysis and restoring blood vessel

patency [4]. When this equilibrium becomes compromised under any condition, this may lead to thrombotic or bleeding complications [4].

The haemostatic system acts to coordinate the delicate balance between bleeding and clot formation. Formation of a blood clot, or thrombus, is essential to prevent bleeding in the event of vascular injury; however, inappropriate thrombus formation can cause significant morbidity and mortality [5].

The prothrombin time is a measure of the integrity of the extrinsic and final common pathways of the coagulation cascade [6]. It is one of several blood tests routinely used in clinical practice to evaluate the coagulation status of patients. More specifically, PT would detect deficiencies of factors II, V, VII, and X, and low fibrinogen concentrations [7,8].

Prothrombin time/international

normalized ratio and activated partial thromboplastin time results together can help in diagnosing various haematologic disorders [9]. During oral anticoagulant therapy most of these factors are depressed, as also during the deficiencies of clotting factor activity which may be hereditary or acquired. There must be sufficient quantity of each coagulation factor, and each must function properly, in order for normal clotting to occur. A decrease can lead to excessive bleeding; too much may lead to excessive clotting [10].

The risk of thrombosis and the consequent cardiovascular events are closely coupled to aging and lifestyle factors such as a diet, smoking, and physical inactivity. Sedentary lifestyles increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, and obesity, and increase the risks of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression and anxiety. A physically active lifestyle therefore protect against cardiovascular disease [11, 12, 13]

Lifestyle changes, such as regular physical activity, have protective effects on cardiovascular disease, such as acute myocardial infarction and stroke [14] and habitual physical activity is accordingly recommended for populations at risk [15, 16].

Overweight and obesity, assessed either by body mass index (BMI), a measure of weight in kilograms divided by the square of height in meters, or waist-to-hip circumference ratio (WHR), are associated with increased cardiovascular morbidity and mortality [17,18]. Indeed, there is increasing evidence that moderate weight loss could result in regression of coronary arterial lesions and significantly reduces cardiac events and total mortality [19]. Increased body mass index correlates with increased high blood pressure, increased low-density lipoprotein, increased triglycerides, increased high blood sugar and increased inflammation. All these translates to increased risk for coronary heart disease, stroke and cardiovascular death.

Various markers of haemostasis and fibrinolysis have been identified as independent cardiovascular risk factors [20] and have been widely used in clinical practice. Standard coagulation assays include assessment of activated partial thromboplastin time (APTT), prothrombin time (PT), and thrombin time (TT) [21]. The assays are functional and evaluate the rate of clot formation when the coagulation cascade has been activated. In fact, APTT and PT are plasma markers of thrombogenicity.

The relevance of assessing the PT, INR and APTT and BMI in apparently healthy individuals is critical in evaluating their risks of developing coagulation disorders including thromboembolic and bleeding disorders. There is a paucity of data on the impact of lifestyle and environment on these parameter among university deskbound and non-deskbound employees hence this study

Materials and Methods

A total of 100 apparently healthy subjects comprising of 53 non-deskbound (14 females and 39 males) and 47 non-non-deskbound (22 females and 27 males) within the age range of 24-63 years were randomly selected from ten departments (Medical Laboratory Science, Chemistry, Physics, Mathematics, Animal and Environmental Biology, Bursary, Computer, Accounts, Microbiology and Plant and Biotechnology) of the university to participate in this study. Subject equal to or greater than 65 years; those suffering from known thrombotic disorders; those with high blood pressure and diabetes and those who have had a major ill-health in the last three months were excluded from the study. The weight and height of each participant was measured in kilogram using a measuring scale. The standing height of each participant was measured to the nearest centimetres (cm) using a measurement tape while blood pressure was measured using MOTECH digital BP monitor. A well-structured questionnaire was used to obtain the demographic information of the participants.

Three millilitres (3mls) of venous blood was collected into 3.2% tri-sodium citrate anticoagulant tube as described by [22]. A ratio of 1:9 of the 3.2% tri-sodium citrate and the blood respectively were mixed in the tube gently. The samples were then

Table 1: Details of Demographics, BMI and Blood Pressure of Both Non-deskbound and Deskbound Participants

Parameters	Number / Range
Total No. of Subjects	100 (Females: 37; Male: 63)
No. of Non-Deskbound Staff	53 (Females: 14; Males: 39)
No. of Deskbound Staff	47 (Females: 22; Males: 27)
Age Range(years)	24-63
Weight Range in Kilogram(Kg)	65 – 102
Height Range in Metres	1.57 – 1.88
Body Mass Index (BMI)	21.5 – 37.7
Systolic Blood Pressure Range (mmHg)	100 – 134
Diastolic Blood Pressure Range (mmHg)	70 – 90

Table 2: Range of the Haemostatic Parameters in Both Non-deskbound and Deskbound Participants

Parameters	Mean ± SD	Median	Range (Min-Max)
PT (seconds)	13.21 ± 1.97	12.90	9.27 – 17.15
APTT (seconds)	29.7 ± 4.90	29.05	19.9 – 39.5
INR	1.03 ± 0.15	1.01	0.73 – 1.33

Key: PT- Prothrombin time; APTT- Activated partial thromboplastin time; INR- International normalized ratio; BMI- Body mass index.

Table 3: Comparison of Mean ± Standard Deviation of the Studied Parameters between Non-deskbound and Deskbound Employees

Parameters	Non-deskbound	Deskbound	p-value
PT (seconds)	13.27 ± 1.82	13.15 ± 2.14	0.7685 (NS)
APTT (seconds)	28.59 ± 4.24	31.04 ± 5.30	0.0119 (S)
INR	1.03 ± 0.14	1.02 ± 0.16	0.7214 (NS)
BMI	26.42 ± 3.08	27.84 ± 3.80	0.0427 (S)

Key: PT- Prothrombin time; APTT- Activated partial thromboplastin time; INR- International normalized ratio; BMI- Body mass index; S – Significance; NS – Non-significance.

centrifuged for fifteen minutes at 3000rpm to obtain citrated platelet poor plasma. The supernatant plasma was then transferred into a plain test tube immediately. The sample was analyzed within two hours of collection.

Samples for APTT and PT were analyzed using the Helena C4 semi-automated, photo-optical coagulation analyzer (Helena Laboratories, United Kingdom) and the Agappe test kit manufactured by Agappe diagnostics Switzerland (Lot number: 301101769 Expiry date: March 2023). International normalized ratio was calculated from the result of the PT. The data obtained was analysed using Graphpad Prism software version 6.0 produced by Graphpad software Inc. USA. Data was presented as median, range, mean and standard deviation and comparison between two means was done using student t-test analysis with level of significance set at P= <0.05. Results were presented in Tables.

Results

Details of Demographics, Body Mass Index and Blood Pressure of Both Non-deskbound and Deskbound Participants

A total of 100 apparently healthy participants aged between 24-63 years were enrolled for the study comprising of 53 non-deskbound staff (14 females and 39 males) and 47 deskbound staff (22 females and 27 males). The weight range, height range, systolic and diastolic blood pressure range were 65-102kg, 1.57-1.88m, 100-134mmHg and 70-90mmHg in the same order. The demographic details of the participants are shown in Table 1.

Range of the Haemostatic Parameters in Both Non-deskbound and Deskbound Participants

Table 2 show shows the mean, standard deviation, median and range of PT, INR and APTT of the participants. The range of PT, INR, and APTT were 9.27-17.5s, 0.73 – 1.33 and 19.9 – 39.5s in the same order.

Comparison of Mean ± Standard Deviation of the Studied Parameters between Non-deskbound and Deskbound Employees

Comparison of the PT, INR, APTT and BMI between Non-deskbound and deskbound employees showed a statistical significant increase for APTT (P=0.0119) and BMI (P=0.0427). The PT and INR showed no statistically significant difference as shown in Table 3.

DISCUSSION

Prothrombin time and activated partial thromboplastin time are primary screening tests for coagulopathies [23]. In this study, the reference range obtained for PT (seconds) was 9.27-17.15, APTT (seconds): 19.9-39.5 and INR: 0.73-1.33 were within the normal range for PT (11-14 seconds) [15], 25-37 for APTT and a value below 1.1 for INR [24]. This is not in tandem with the upper and the lower limits of the study by Ihua *et al.* [25] which showed a range of 13.68-16.22s, 1.04-1.1 and 32.08-36.92s in the same order for apparently healthy controls recruited for a study conducted among diabetic patients in Port Harcourt but agrees with a study by Nnenna *et al.* [26] who obtained mean PT and APTT values of 13.60 and 32.56 respectively for apparently healthy controls in a study conducted in Calabar, Nigeria. The findings in the study is also consistent with a study by Buseri *et al.* [27], who reported a mean PT value of 12.9 seconds and that Seyoum *et al.* [28] conducted in Ethiopia which revealed a mean PT value of 13.6s, APTT value of 28.0s and an INR value of 1.16 for the apparently healthy controls used in their studies. The findings in this study is also consistent with the mean PT of 13.0s but lower than the mean APTT value of 34s found among apparently healthy males in a study conducted in India by Ahmed *et al.*[29]. The values for PT and APTT from the study are also in agreement with a study by Jiskani *et al.* [23], which revealed a mean PT, INR and APTT value of 12.56s, 0.9 and 31.49s in that order in apparently healthy control subjects in a study for hypertensive patients. Comparison between the PT, APTT, INR and BMI of non-deskbound and deskbound employees revealed no statistical difference for PT and INR. However, the APTT and BMI was statistically significant with an increase in the APTT and BMI in the deskbound employees. The variation in BMI and APTT could be as a result of the different number of sedentary working hours as required by the nature of their job descriptions.

Conclusion

In this study, the prothrombin (PT), international normalized ratio (INR) and activated partial thromboplastin time (APTT) among apparently healthy non-deskbound and deskbound employees of the Rivers State University were within the normal ranges even though APTT was significantly higher in deskbound than non-deskbound employees. Increased or prolonged APTT is a pointer to an abnormal haemorrhage. Increased BMI seen among the Deskbound employees connotes overweight and its attendant health implications.

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