EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 7
Issue: 2
475-481
Year: 2020

PATTERNS OF VARIATION IN BLOOD PRESSURE PROFILE AND CAPILLARY OXYGEN SATURATION DURING ANTI-ORTHOSTATIC POSTURE CHANGE IN YOUNG HEALTHY ADULT GIRLS

***[1]Olorunfemi O.J., [1]Amah-Tariah F.S., [2]Asara Azibalua A. and [1]Banigo Tamunotonye**

[1]Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Choba, Port Harcourt, Nigeria.
[2]Bayelsa State College of Health Technology, Otuogidi Ogbia Town, Bayelsa State.

***Corresponding Author: Dr. Olorunfemi O. J.**
Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Choba, Port Harcourt, Nigeria.

Article Received on 20/12/2019 **Article Revised on 10/01/2020** **Article Accepted on 31/01/2020**

ABSTRACT

In orthostatic position that during exercise, blood pressures tend to increase and capillary oxygen saturation concomitantly tends to decrease after exercise. The present study was designed to investigate the effects of anti-orthostatic posture change on blood pressure profile and capillary oxygen saturation in healthy adult females. The research was carried out using 110 young healthy adult female humans between the ages of 15-30years. The subject's height and weights was measured to determine their body mass index after which was allowed to rest for 15minutes (on a couch) before their resting blood pressure was measured and recorded. After resting, immediately the blood pressure and oxygen saturation was taken, the subjects was subjected to ride an ergonometric cycle for one minute and immediately their blood pressure and oxygen saturation was measured using digital blood pressure meter and pulse Oximeter, the subjects was allowed to rest for 5minutes, after which the exercise was repeated and readings was measured. Statistical analysis was performed with SPSS model 2019, ANOVA analysis technique was used in the comparison of the height, weight, body mass index, pulse rate, systolic & diastolic blood pressure and oxygen saturation and was expressed as Mean±SD. Anti-orthostatic posture had negative effect on blood pressure profile after exercise and positive effect on capillary oxygen saturation in young healthy adult female humans, the analyzed results obtain from each values was statistically significant when compared to each other. The oxygen saturation mean value was normal at rest and both phases of the exercise regimen. The variation between oxygen saturation values in both phases of the exercise regimen and at rest was statistically significant (at $p < 0.05$).

KEYWORDS: orthostatic, capillary oxygen saturation, blood presuures, oximeter, exercise.

INTRODUCTION

'Orthostatic' means relating to upright posture. Orthostatic hypotension is defined as a sustained fall of systolic blood pressure by at least 20mmHg or diastolic blood pressure by 40mmHg within three minutes of standing or head-up tilt (Freeman et al; 2011). Since the magnitude of blood pressure drop also depends on baseline values, it was suggested that a drop of 30mmHg may be a more appropriate criteria for Orthostatic hypotension supine hypertension (Freeman et al; 2011). Anti-orthostatic is the opposite of orthostatic which means relating to lying and sitting Posture. The prevalence of orthostatic hypotension increases with age and is commonly associated with neurodegenerative diseases including Parkinson's disease, dementia with lewy bodies, multiple system atrophy and pure autonomic failure (Low 2008).

Orthostatic hypertension is an increase in blood pressure with upright posture or tilt (Fessel 2006). Orthostatic hypertension was related to excessive venous pooling which resulted in decreased cardiac, output followed by an excessive rise in plasma catecholamine's leading to vasoconstriction (Neal et al; 1996).

Posture is the attitude assumed by body either when the body is stationary or when it is moving. Posture is attained as a result of coordinated action of various muscles working to maintain stability (Gardiner 1957). Posture in easy terms can be understood as position in which you hold your body when standing or sitting.

Oxygen saturation sometimes referred to as O.sats or simply sats refers to the extent to which hemoglobin is saturated with oxygen. Hemoglobin is an element in the blood that binds with oxygen to carry it through the bloodstream to the organs, tissues and cells of the body. Normal oxygen saturation is between 96% and 98% (Deborah 2019).

A person blood oxygen level is an indicator of how well the body distributes oxygen from the lungs to the cells and it can be important for people's health (Joana 2018). Deborah (2019) reported that a drop in oxygen saturation level is referred to desaturation or hypoxemia and can be caused by any changes or damage in the variables such as decreased oxygen saturation may result from a lower concentration of hemoglobin such as in iron deficiency anemia, change in oxygen availability can be caused by a decreased concentration of oxygen in the inspired air such as at higher altitudes and when flying in an airplane and problem with gas exchange causing a decrease in oxygen saturation. In our society today, some people are not use to exercise, some people develop cardiovascular problems which can lead to death in some persons and also postural hypertension is a sudden drop in blood pressure and most commonly occur with someone who's rising from lying down or sitting position to stand, this work is to review the anti-orthostatic posture change in blood pressure profile and capillary oxygen saturation in young healthy female humans.

MATERIALS AND METHODS

Procedures

The procedure for the exercise regimen adopted the modified methods as proposed by WHO (1968) and Shephard *et al.*, 1968 as follows;

1. Questionnaire containing questions was distributed to each subject.
2. Each subject was allowed to rest for 3 minutes
3. After resting, each subject weight was measured and recorded using a weighing balance
4. The height of each subject was measured and recorded using a Standiometer
5. Each subject was allowed to rest (on a couch) for 15minutes
6. After resting the Blood pressure of each subject was measured and recorded using digital blood pressure reader
7. The Oxygen saturation of each subject was also measured and recorded using pulse Oximeter according to the modified method of Lotgering *et al*., 1991
8. After which each subject was subjected to heavy exercise (riding of ergonometric cycle) for 1 minute and immediately after the exercise the blood pressure and oxygen saturation was measured and recorded, calories burnt and distance were also recorded
9. Each subject was given a tea spoon of glucose D and was allowed to rest for 5 minutes
10. After resting each subject was subjected to heavy exercise again for 2 minute and immediately the blood pressure and oxygen saturation was measured and recorded, calories and distance were also recorded.

Ethical Consideration

Consent was obtained from individuals who agreed to participate in the study.

Population of Study

The study population includes 110 young healthy adult female students in university of Port Harcourt.

Sampling Techniques

Simple random sampling was used to select the sample for the study.

Research Design

This research work is a cross sectional observational study which aims at observing the effects of anti-orthostatic posture change on blood pressure profile and capillary oxygen saturation.

Data Collection

Each of the volunteer subjects gave answers to a questionnaire (see index) in which describe their smoking, drinking, sniffing habit and the environment to which they are been exposed to. Volunteer subjects carried out physical examinations measurement of height and weight and the body mass index (BMI) will be calculated from the weight (in kilograms) divided by height (in square meters).

Inclusion Criteria

Individuals who met the following criteria was involved in this study. These are;

1. Subjects without any health problems (asthma and heart failure etc.)
2. Subjects who are students of university of Port Harcourt
3. Subjects within the age of 15-30years.

Exclusion Criteria

Individual who met the following criteria was excluded from this study. These are;

1. Subjects with health problems (asthma and heart failure e.t.c)
2. Subjects who are not students of university of Port Harcourt
3. Subject whose age is beyond 15 and above 30years.

Method of Data Analysis

Continuous variables such as systolic blood pressure, diastolic blood pressure and oxygen saturation etc. were represented as Mean ± SD. Statistical analysis was done SPSS version 20.0 and the results were expressed as mean ± SEM. One-way ANOVA and Dunnet Post Hoc (multiple comparison) Test was used to compare the mean and P-Value ≤ 0.05 was accepted as statistically significant. Results are presented in tables.

RESULTS

Table 1: Anthropometric table of the volunteers.

Group (Years)	Weight (Kg ± SD)	Height (M ± SD)	Body Mass Index (Kg/M² ± SD)
Age (16-18)	60.6 ± 11.6	1.7 ± 0.1*	21.9 ±3.2
Age (19-21)	62.2 ± 14.2	1.7 ± 0.1*	22.1 ±4.8
Age (22-24)	62.7 ± 11.4	1.7 ± 0.1*	22.4 ± 3.7
Age (25-27)	65.1 ± 8.6	1.7 ± 0.1*	22.9 ± 2.2
Age (28-30)	68.5 ± 5.0	3.7 ± 2.8*	23.4 ± 2.1

Values are presented as Means ± SD. * means values are statistically significant when compared to each other. ($p < 0.05$)

Table 2: Calories burnt by young healthy adult female humans during both phases of the exercise regimen.

Groups (Years)	Calories After Exercise 1 (Cal ± SD)	Calories After Exercise 2 With Glucose (Cal ± SD)
Age (16-18)	5.1 ± 1.2	6.2 ± 1.6*
Age (19-21)	5.2 ± 1.4	6.5 ± 1.8
Age (22-24)	5.8 ± 2.1	7.1 ± 2.4
Age (25-27)	6.2 ± 1.6	7.9 ± 2.2*
Age (28-30)	5.8 ± 0.9	6.4 ± 0.1

Values are presented as Means ± SD. * means values are statistically significant when compared to each other. ($p < 0.05$)

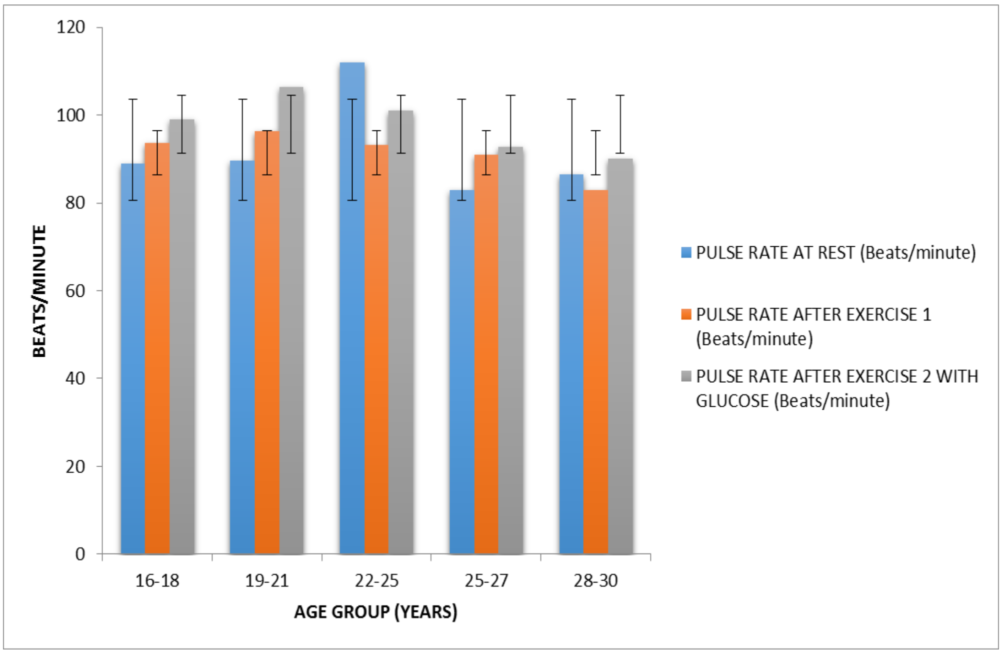

Figure 1: Bar chart showing the pulse rate of young healthy adult female humans at rest and during both phases of the exercise regimen.

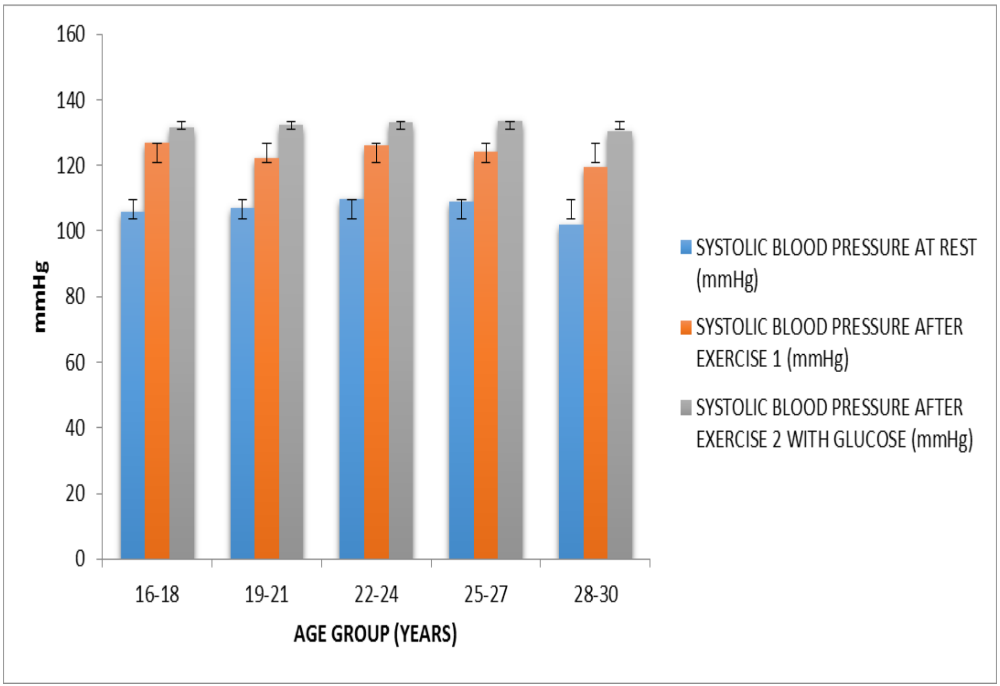

Figure 2: Bar chart showing the systolic blood pressure of young healthy female humans at rest and during both phases of the exercise regimen.

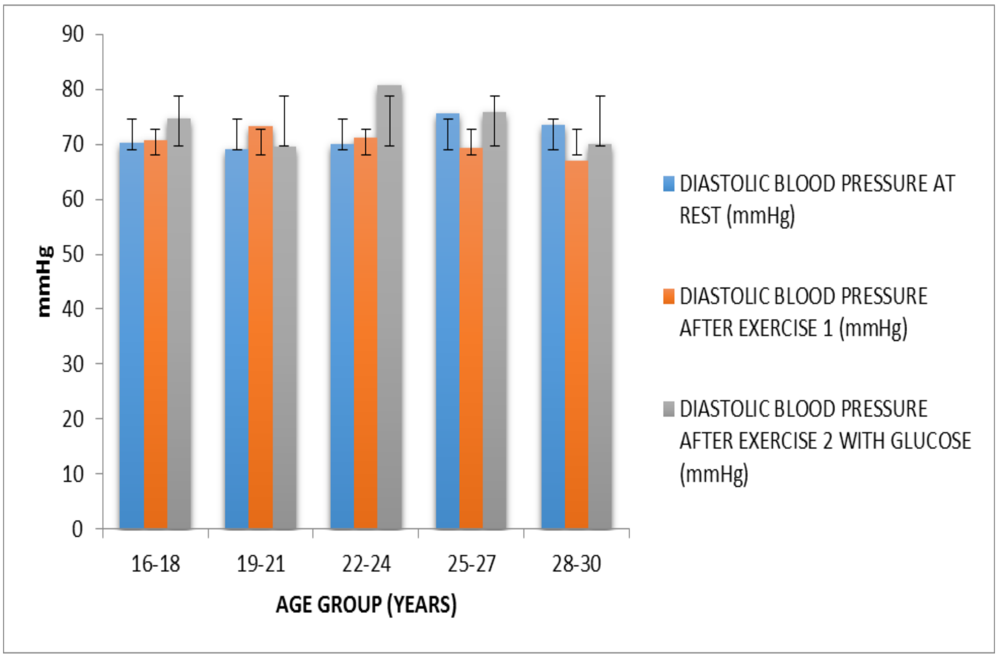

Figure 3: Bar chart showing the diastolic blood pressure of young healthy female humans at rest and during both phases of the exercise regimen.

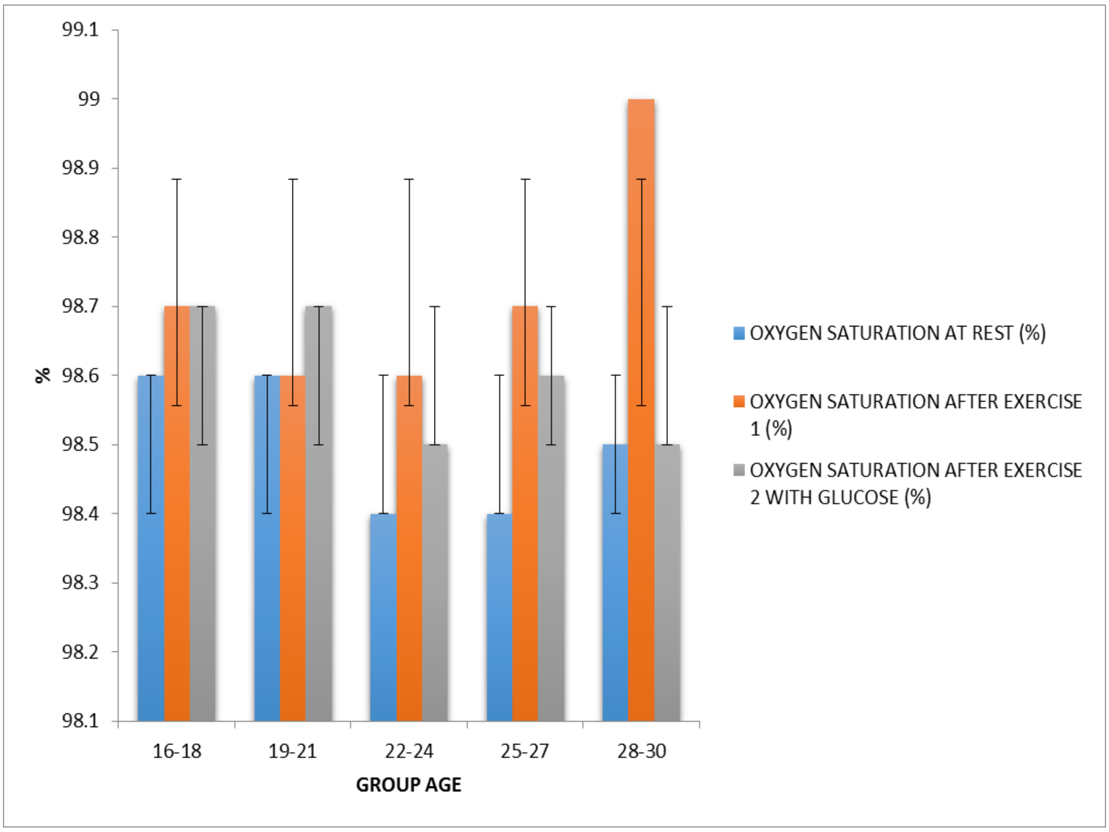

Figure 4: Bar chart showing the oxygen saturation of young healthy adult female humans at rest and during both phases of the exercise regimen.

DISCUSSION

In the research study carried out, the study investigated the influence of anti-orthostatic posture change (i.e. at rest and both phases of the exercise regime) on body mass index, pulse rate, blood pressure and oxygen saturation measurements in 110 young healthy adult female humans.

In table 1, it was observed that body mass index values increased with age. The smallest age group (16-18years) had the smallest mean value of 21.9±3.2Kg/M². Age group 19-21years and 22-24years had mean value of 22.1±4.8Kg/M² and 22.4±3.7Kg/M², respectively varying from each other with mean value of 0.1±1.0Kg/M². Age group 25-27years had a mean value of 22.9±2.2Kg/M² and the highest mean variation occurred in age group 28-30years with mean value of 23.4±2.1Kg/M².

From this study, the results obtained showed that age group 28-30years had highest weight mean value and highest body mass index mean value which tends to review that an increased in weight, increased body mass index when compared to those who are not. An increased in weight gain can be as a result of increased in muscle mass, fat deposits, lack of exercise and excess fluids such as water. This lends credence the observation of Gallagher and Meltzoff (1996) review that the mean body fat content in non-exercising civilian women with a body mass index of 25 increased from 30% for those between age 17 and 20years to 36% for age higher than 20year. The mean values of all the groups when compared at p<0.05 was statistically significant.

In this study research, the evaluation of oxygen saturation level at rest and in both phases of the exercise regimen was observed that oxygen saturation mean values was normal in the 110 young healthy adult female humans.

In figure 1., it was cleared that mean value of pulse rate at age group 16-18years increased significantly at rest with mean values of 88.9±14.32beats/min, the first phase of exercise with mean value of 93.7±16.6beats/min and the second phase of exercise with mean value of 99.0±17.3beats/min. Age group 19-21years and 25-27years also showed a significant increase in the three anti-orthostatic posture change used in this study, for age group 19-21years the mean values increased from 89.7±18.6beats/min at rest to 96.4±21.8beats/min in the first exercise to 106.4±17.0beats/min in the second phase of the exercise regimen, while age group 22-24years the mean values increased from 82.9±17.5beats/min at rest to 91.7±17.0beats/min in the first exercise and to 92.7±19.1beats/min in the second phase of the exercise regime.

Age group 25-27years, the mean value at rest is greater than the both phases of the exercise regimen, which had 112.0±16.3beats/min at rest, 93.1±16.7beats/min in the first exercise and 101.1±17.7beats/min in the second phase of the exercise. Age group28-29years had mean value of 86.5±37.5beats/min at rest and decreased to 83.0±43.8beats/min in the first phase of exercise and increased to 90.0±42.4beats/min in the second phase of the exercise. Age group 22-24years had the highest pulse rate at rest and age group 19-21years had the highest pulse rate mean value in both phases of the exercise, while age group 25-27years had the lowest mean value at rest and age group 28-30years had the lowest mean value in both phases of the exercise regimen. The mean values was statistically significant at $p<0.05$ when compared to all the age groups in the anti-orthostatic postural change (i.e. at rest, first and second exercise regimen).

From (figure 2, it was observed that the mean value of systolic blood pressure in all the groups increased significantly. Age group 16-18years increased significantly from 105.7±14.8mmHg at rest to 127.0±13.2mmHg in the first exercise to 131.6±17.3mmHg in the second phase of exercise and also had the highest systolic mean value during the first phase of the exercise regime. Age group 19-21years, increased from 107.0±15.7mmHg at rest to 122.1±14.2mmHg in the first exercise to 132.2±14.7mmHg in the second phase of the exercise. Age group 22-24years increased from 109.6±12.2mmHg at rest to 126.2±22.1mmHg in the first exercise to 133.2±25.7mmHg in the second exercise and had the highest mean value at rest.

Age group 25-27years increased from 108.9±14.8mmHg at rest to 124.0±20.5mmHg in first exercise to 133.5±13.1mmHg in the second phase of the exercise and had the highest mean value in the second phase of the exercise regime. Age group 28-30years increased from 102.00±0.0mmHg at rest to 119.5±27.6mmHg in the first exercise to 130.3±23.3mmHg in the second phase of exercise. It was observed that systolic blood pressure tend to increase from age group 16-18years to 19-21years to 22-24years, the results from this study agrees with Purjitha *et al.*, (2014), which reviewed that blood pressure tends to increase with increased age.

In figure 3, it was cleared that age group 16-18years had a significant variations in their mean values of their diastolic blood pressure from 70.2±10.4mmHg at rest to 70.8±8.8mmHg in the first exercise and 74.7±11.3mmHg in the second phase of exercise. Age group 19-21years, it was observed that in the first exercise had high mean value of 69.6±10.2mmHg compared to the mean value at rest (69.1±9.4mmHg) and in the second phase of the exercise (69.6±10.2mmHg). Age group 22-24years had significant variation in their mean values from 70.1±11.9mmHg at rest to 71.3±21.1mmHg in the first exercise to 80.6±21.4mmHg in the second exercise.

Age 25-27years, it was cleared that the mean value in the first exercise is low when compared to mean values at rest and the second phase of the exercise. It was also observed in age group 28-30years, the first exercise had low mean value when compared with mean value at rest and the second phase of exercise. The decreased in the mean value that occurred in both age group 25-27years and 28-30years corroborates the observation of Robert *et al* (2018) on the effect of exercise on cardiovascular function, review that during exercise, diastolic blood pressure falls and systolic pressure rises. Despite this variation, the mean values of the diastolic blood pressure is statistically significant ($p<0.05$) when compared with each other at rest and both phases of the exercise regimen.

Capillary oxygen saturation was concurrently monitored in the study and it was observed that the mean value of oxygen saturation at age group 16-19years increased from 98.6±0.7% at rest to 98.7±0.8% in the first exercise and second exercise (98.7±0.7%). In age group 19-21years mean values (98.6±0.5) remained same at rest and first exercise and increased to 98.7±0.5% in the second exercise. It was also observed that age group 22-24 had same mean values at rest and first phase of exercise; also age group 28-30years had same mean values at rest and first phase of exercise regimen. It was cleared that age group 16-18years and 19-21years had the highest mean value when compared with other groups, age group 22-24years and 25-27years had the smallest mean value when compared with each age group. It was observed that age group 19-21years and age group 22-24years had same and low mean values in the first exercise when compared with each other. It was also observed that in the second exercise regimen age group 16-18years and 19-21years have same and higher mean values when compared to each age group.

In the three phases of anti-orthostatic change it was observed that the first exercise had high mean value when compared to mean value at rest and the second exercise. The greatest oxygen perfusion of this group occurred in the first exercise and the best oxygen saturation of this group occurred in the first exercise with mean value of 98.6±0.7%. The highest mean value at rest and in both phases of exercise regimen occurred in the first exercise, in age group 28-30years with mean value of 99.0±0.0%. It was observed from the research study, that the results obtained from oxygen saturation mean value in some groups increased in first exercise and then decreased in second exercise.

Also from the results obtained from this research study, it was observed that the mean values of oxygen saturation in both phases of exercise was higher than the resting mean value, this maybe as a result of the type of diet (food high in chlorophyll such as green vegetables tends to increase oxygen saturation level). Even with the increased of oxygen saturation mean values at both exercises when compared to the mean value at rest, the mean values were still normal (had a normal range). The result obtained corroborated with Burcu et al(2015) which investigated that evaluation of oxygen saturation values in different body positions in healthy individuals remains normal. The mean values of all the age groups was statistically significant (p<0.05) when compared in both phases of the exercise regimen.

CONCLUSION

Blood pressure at rest when sitting was normal and increased during both phases of exercise, the amount of oxygen saturation of all subjects was normal and oxygen saturation increased after both phases of exercise when compared to resting position. Anti-orthostatic posture had negative effect on blood pressure profile after exercise and positive effect on capillary oxygen saturation in young healthy adult female humans. From the experiment the mean values for blood pressure profile and capillary oxygen saturation at rest and both phases of the exercise regimen was statistically significant (at p<0.05).

REFERENCES

1. Freeman, R., Wieling, W., Axelrod, F.B., Benditt, D.G., Benarroch, E., Biaggioni, I., Cheshire, W.P., Chelimsky, T., Cortelli, P., Gibbons, C.H., Goldstein, D.S., Hainsworth, R., Hilz, M.J., Jacob, G., Kaufmann, H., Jordan, J., Lipsitz, L.A., Levine, B.D., Low, P.A., Mathias, C., Raj, S.R., Robertson, D., Sandroni, P., Schatz, I., Schondorff, R., Stewart, J.M and Van-Dijk, J.G. Consensus statement on the definition of orthostatic hypotension, neutrally mediated syncope and postural tachycardia syndrome. *Journal of clinical autonomic respiratory,* 2011; 21: 69-72.
2. Low, P.APrevalence of orthostatic hypotension. *Journal of clinical autonomic respiratory*, 2008; 18(1): 8-13.
3. Fessel, J. and Robertson, D. Orthostatic hypertension. When pressure reflexes overcompensate. *Journal of Nat Clin Pract Nephrol,* 2006; 2: 424-429.
4. Neal, L.B., Shoshana, Z., Sandra, C., Janet, W., Morris, S and Melvin, COrthostatic hypertension due to vascular adrenergic hypersensitivity. Clinical pharmacology, 1996; 28: 42-46.
5. Gardiner, M.D. The principle of exercise therapy. *Journal of physiopedia*., 1957: 12-56.
6. Gardiner, M.D. and DavisThe principle of exercise therapy. *Journal of physiopedia*, 2011: 87-90.
7. Deborah, L. Oxygen saturation. *Journal of JSTOR*, 2019: 55.
8. Joana, C.S. low and normal blood oxygen level. *Journal of medicalnewstoday, 2012:* 12.
9. Exercise tests in relation to cardiovascular function. Report of a WHO meeting. World Health Organ Tech Rep Ser., 1968; 388: 1-30.
10. Shephard RJ, Allen C, Benade AJ, Davies CT, Di Prampero PE, Hedman R, et al. Standardization of submaximal exercise tests. Bull World Health Organ, 1968; 38(5): 765-75.
11. Lotgering FK, van Doorn MB, Struijk PC, Pool J, Wallenburg HC. Maximal aerobic exercise in pregnant women: heart rate, O2 consumption, CO2 production, and ventilation. J Appl Physiol., 1991; 70(3): 1016-23.
12. Gallagher, S. and Meltzoff, AThe earliest sense of self on oxygen saturation. *Jorunal of PUBMED,* 1996: 99.
13. Pujitha, K., Parvathi, G. and Munisekhar, K., Postural changes in heart rate and blood pressure with ageing. *International journal of physiotherapy and research,* 2014; 2(6): 751-56.
14. Burcu, C., Leyla K., Ulku Yapucu, G and Ayten, Z. Evaluation of oxygen saturation values in different body positions in healthy individuals. *Journal of clinical nursing*.**,** 2016; Volume25, Issue7-8 Pages 1095-1100.