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Evaluation of Hemodynamic Changes in Medical Students with Static Exercise

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Abstract

In today's time individuals for the most part are exposed to stress and lack of time during college time. This increases the chances of neglecting healthy practices. Although the college life is a temporary phase, but the unhealthy habits picked up at this younger age generally persists in adult life. Ignorance in adopting healthy lifestyle especially for a medical student is most likely to have difficulty in promoting or establishing healthy opportunities for the patients. In addition to this, risk factors for chronic diseases are also increased in medical students. Considering all this information, present study was planned to evaluate the hemodynamic changes in medical students with static exercise .The study was carried on 50 volunteers aged 18-24 years. They performed static exercise in form of isometric hand grip. Parameters like heart rate and blood pressure were recorded before and after the exercise. The exercise was a 40% maximum voluntary contraction of forearm using a handgrip dynamometer. It was found that after the exercise both the parameters showed a decrease in their levels.

Keywords: hemodynamic, stress, medical students

Introduction

In last few years, chronic diseases have become the leading cause of death rather than infections. Among all preventable health problems diabetes, cardiovascular diseases and cancer are now among the most prevalent.[1]The factors that are strongly associated with these diseases include inappropriate nutrition, unhealthy lifestyle habits, lack of exercise, improper sleeping habits and many more.[2]Healthy active individuals not only benefit themselves but are a boon to the society as well. Such individuals have an improved morale, increase productivity; decreases absenteeism as well as decreases health care costs. They also have a good self esteem that gives ability to cope with stress and an improved psychological well being and physical capacity. Regular moderate or vigorous intensity exercise provides health benefits and also lowers the risks of lifestyle diseases is a well known fact.[3]

The behaviour of students during college life is considered to be temporary but if they pick up unhealthy habits at this stage they generally persist in

adult life too. For giving adequate nutrition and health education to the young, college arenas and university provide an important opportunity. During this time period for the most part they are exposed to stress and also lack of time poses a barrier for them to adopt healthy practices in day today life.[2] among adolescents physical activity has a marked role to decrease the levels of anxiety and stress and thus helps in increasing self esteem and self concept .Among the college population ,compared to others medical students are considered to have a better knowledge about dietary habits and healthy lifestyle. Inspite of the knowledge it is the attitude toward exercise, prevention of illness and health promotion that predicts the physical condition.[4]however this knowledge will be translated into practice in terms of maintaining a healthy lifestyle and adopting an attitude for good health is not certain. With the previous studies showing that medical students have a higher probabilities of suffering from chronic diseases, keeping this in mind the current study was designed to assess the practices of medical students regarding physical activity and how a simple procedure like hand grip dynamometer might help in assessing the physical fitness.

The physical fitness has a significant impact on the ability of the students to achieve an academic success. It is difficult for the students who are at risk for significant health problems to face numerous challenges and barriers to fulfil their potential and also achieving academic performance.

Material Method

The study was conducted on 50 volunteer's aged 18-21 years.HR and BR were recorded in all the subjects before and within one minute of completion of the static exercise. Blood pressure was recorded by using standard mercury sphygmomanometer [ ] and heart rate was calculated from lead II of the cardio fax electrocardiograph machine (Medicaid Systems)

The subjects recruited for the study were purely on volunteer basis from a tertiary care centre in Ludhiana. All the subjects were explained about the procedure and use of it .Those who agreed were recruited for the study after signing an informed consent. A detailed medical and related history was taken along with their general examination. All those subjects were enrolled for the study that fulfilled the inclusion criteria.

Inclusion criteria

i) Age group between 18-21 years

ii) Subjects with heart rate in range of 60-100 beats per minute

iii) Subjects with blood pressure ≤ 120/80

Exclusion criteria

i) Subjects who had a history of hypertension

ii) Diabetic

iii) Smokers

iv) Alcoholic

v) Renal disease

vi) Subjects who participated in any exercise training within one month of the onset of study

An average of four readings was noted for the resting parameters in the subjects after their screening. Blood pressure was measured in the non dominant arm in seated position before start of the exercise and within one minute of completion of the exercise. The SBP of ≤120 mm Hg and DBP was ≤80 mmHg was taken as normal.[4] Korotkoff phase I(appearance of sound) and korotkoff phase V (disappearance of sound) were taken as SBP and DBP respectively.[5] A continuous

recording of lead II on ECG machine (Cardiofax Medicaid Ambala) was taken and HR was calculated from RR interval. ECG paper was kept at a speed of 25 mm/sec. Heart rate was calculated as follows:

Heart rate = (60 × 25)/RR = 1500/RR. Before beginning of isometric exercise the subjects were explained about the use of handgrip dynamometer. They were also trained to maintain an effort that would enable them to hold a steady tracking on the pointer of the dynamometer at 40% of their maximum voluntary contraction (MVC). For each subject MVC was calculated. The subject was asked to exert a maximal effort for less than 2 seconds on HGD with their dominant hand to determine MVC. Another effort was made after giving a rest of three minutes. Three maximal effort recordings were taken and the greatest of three was taken as MVC.[6] Resting HR and BP of the subjects were measured and they were asked to exert force with their on the HGD approximately 40% of their MVC (maximum voluntary contraction) .they were asked to sustain it for a minimum period of 2 minutes or till fatigue ensued (they were cautioned not to exceed 4 minutes if fatigue does not sets in).After completion of IHG exercise BP and HR were again measured.

Data collected on various variables was analyzed statistically. Standard deviation and mean were computed .Data was analyzed using appropriate software.

Results

Table: comparison of hemodynamic parameters in subjects before and after exercise

Hemodynamic parameters	Before exercise		After exercise			
	Mean	SD	Mean	SD	T test	P value
SBP	112.48	3.43	105.04	4.55	5.529	0.000
DBP	70.64	4.957	64.08	4.334	4.979	0.000
HR	84.4	8.977	76.76	8.368	3.113	0.002

Discussion

This study was sought to examine the hemodynamic changes in medical students after static exercise which in our study was done using handgrip dynamometer. As hypothesized, we found a significant attenuation in pre to post systolic blood pressure and diastolic blood pressure as well as heart rate. Thus, exercise with a simple and inexpensive isometric hand grip dynamometer is sufficient to produce significant hypotensive effects in normotensive adults.

The results of our study added to the growing literature affirming the changes in blood pressure because of isometric handgrip training. The hemodynamic changes in our study not only helped to provide confidence but also reinforced previous findings. In exercise sympathetic and parasympathetic neural activity play a major role in adjusting the cardiovascular and hemodynamic changes. These exercise induced changes in autonomic neural flow are to meet the metabolic demands of exercising muscles. These adjustments during exercise to normalise the changes are mediated through pressor reflex and arterial baroreflex . The response is the outcome of an interaction between several influencing factors. With central afferent inputs from skeletal muscle receptors, arterial and cardiopulmonary receptors playing major role.

During isometric exercise an integration of cardiovascular,neural and muscular system is responsible for the heart rate response. With contraction of skeletal muscle there is activation of afferent fibres

by stretch and increased metabolic products from cellular activity along with rise in plasma catecholamines and decreased parasympathetic drive. Thus all contributing to a decrease in heart rate.

The apparent efficacy of the hand grip dynamometer has many practical benefits. The device in addition to its low cost with easy accessibility can be a broadly available intervention for hypertensive subjects with unpleasant side effects or financial burden. The handgrip dynamometer therefore can be used as a global priority for development of cost effective, accessible treatment option for hypertension.

Although this study is providing enough information but has limitations as our participants were young, apparently healthy and unmedicated for hypertension. Though it helped in determining the efficacy of isometric handgrip exercise on resting blood pressure; unfortunately the findings might not be generalized to hypertensive or older adults. However it might be among those who stand to benefit the least from an exercise intervention aimed to lower blood pressure. Clearly further research is required before clinical implications of handgrip exercise can be firmly asserted.

Conclusion

In present study results show that isometric handgrip or static exercise is effective in lowering arterial pressure in normotensive subjects. In prevention of hypertension isometric hand grip exercise is a non pharmacological and effective method to use. The peripheral vascular adaptations lead to the reduction in arterial pressure. The positives of such exercise are that it is quick, easy and can be performed in any location. These positive aspects increase the compliance for the exercise and thereby also increases the probability of positive outcomes.

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