ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Comparison of Heart Rate Variability and Lipid Profile Values in Young Adolescent Males and Females with Normal BMI.

Devaki PR[1]*, Saikumar P[1], Kanimozhi M[2], Prabhu K[3], and Kalaiselvi VS[4]

[1]Department of Physiology, [2]Final M.B.B.S Student , [3]Department of Anatomy , [4]Department of Biochemistry, Sree Balaji Medical College And Hospital, Bharath University , Tamil Nadu, India.

ABSTRACT

The incidence of cardiovascular disease is at rise among the younger age group. This is due to the modernization of life style. With the availability of modern equipment there is a decrease in the levels of physical activity. However, because of the deadline pressures in work environment there is an increase in the mental stress. Stress increases the discharge of sympathetic nervous system that may have a deleterious effect on cardiovascular autonomic regulation. Hence, it is necessary to assess the autonomic nervous system activity . Heart rate variability serves as a powerful tool to measure the resting autonomic tone. Very few studies have been done to assess the Heart Rate Variability changes in the young adolescent age group. To compare the lipid profile values and heart rate variability measures between young adolescent males and females of age group 17 -19 yrs. Thirty (30) adolescent females and thirty (30) adolescent males of age group 17-19 years with normal BMI without any other comorbid conditions were included in this study. Blood samples were collected to measure the lipid profile values in these subjects. ECG was recorded in lead 2 using RMS Polyrite - D to obtain resting HRV. The Total cholesterol and LDL values was significantly more in males when compared to females. LF and LF/HF ratio was significantly more in males than in females. The increase in LF value in males is an indicator of increased sympathetic activity in males when compared to females in young adolescent age group.

Keywords: Adolescent age group, Heart Rate Variability, Total Cholesterol, LDL Values.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

The sympathetic and parasympathetic branch of autonomic nervous system plays an important role in controlling the Heart rate and Rhythm [1] .In resting condition the vagal tone dominates [2] and variation in heart rate largely depends on vagal modulation [3]. Heart rate variability with its time domain and frequency domain measures is considered as an important tool for measuring the resting autonomic tone. Time domain measures when recorded over a period of 24 hrs is more sensitive than the simple bed side autonomic function tests [4]. Frequency domain analysis when performed under short term steady condition is useful in distinguishing the sympathetic from parasympathetic abnormalities [5]. The frequency domain parameters include LF, HF and LF/HF ratio. Sympathetic mediators are reflected in the low frequency power .Vagal mediators principally affects the high frequency power [6].Several factors alters the autonomic nervous system activity. With Modernization taking the toll of the health by means of unhealthy lifestyle and dietary patterns , there is also an increase in the levels of stress. Stress increases the sympathetic nervous system discharge. Studies have been done in women of perimenopausal age group and also in old age to assess the heart rate variability. With increased incidence of cardiovascular disease being reported in younger age group it is necessary to evaluate the autonomic nervous system activity in the younger age group so as to intervene at the earliest possible age to reduce the morbidity and thus the burden of the disease. Hence this study was done in young adolescent age group (17-19 yrs) in both males and females. Also in this study in females the HRV was recorded on the third day of the menstrual phase in the menstrual cycle to rule out the hormonal effect that may occur in the other phases.

MATERIALS AND METHODOLOGY

Inclusion criteria

60 students (Males -30, females -30) of age group 17-19 yrs, With normal BMI ranging between 18.5-25 were included in the study. It was ensured that the female subjects had regular menstrual cycle . BMI was calculated using quetlet index with the help of height and weight.

Exclusion criteria

Smokers, Alcoholics, Obese subjects, subjects taking drugs affecting autonomic nervous system were excluded from this study.

This study was approved by the Institutional ethical committee of our college. After getting written informed consent, subjects were asked to fill the proforma which includes the details of the inclusion and exclusion criteria. Height and Weight were measured. Blood pressure was measured using Non Invasive Blood Pressure Apparatus. All the measurements were done by the same person to avoid observer bias.

Subject prerequisites

Subjects were instructed to come with overnight fasting . Females the recording of ECG was done on the 3rd day of the menstrual cycle. Before recording ECG, the subjects were asked to empty their bladder.

Estimation of lipid profile

5ml of venous blood from the Anticubital vein was drawn to measure the lipid profile values. Serum Cholesterol, High –density lipoprotein and serum total triglyceride concentration were assayed by standard enzymatic colorimetric method using commercial kits.

ECG recording

ECG recording was done between 8-11 A.M at optimal temperature. ECG recording was done in supine position in lead 2 using RMS Polyrite D. This is a multichannel digital polyrite. GS1 was placed on the right loin and GS2 was placed on the left loin, ground electrode was placed on the arm . These leads were in turn connected to the ECG port of the polyrite machine. HRV icon was choosen on the desktop.

ISSN: 0975-8585

Subject details were entered and saved. Start icon was clicked and Acquisition mode was selected. After ensuring that there is no artifact ,recording mode was selected . Recording was done for 10 minutes. Stop icon was clicked to stop the recording. Analysis was done using RMS software version 2.5.2 at a sampling rate of 200 samples /sec

RESULTS

The results obtained were analysed using unpaired student T test with the help of SPSS software version 15

Table 1: Comparison of the anthropometric variables between males and females

PARAMETERS	MALES (n=30)	FEMALES (n=30)	P Value
HEIGHT (cm)	172.76 ± 7.9	154.60 ± 4.8	0.000***
WEIGHT (Kg)	63.2 ± 8.36	47.5 ± 5.2	0.000***
BMI (Kg/m^2)	21.2 ±2.3	20 ± 2.3	0.05*

P Value < 0.05* - significant . p Value <0.000 ***highly significant

Table 2: Comparison of lipid profile values between males and females .

PARAMETERS (mg/dl)	MALES (n=30)	FEMALES (n=30)	p-value
Total cholesterol	174.96±27.06	160.26± 22.40	0.02*
Triglycerides	102.43±19.3	115.23±14.8	0.006***
HDL	47.09±2.10	49.16±2.79	0.007***
LDL	103.51±25.9	87.7±22.30	0.01*
VLDL	20.48±3.86	22.9±3.06	0.01*

P Value < 0.05* - significant . p Value <0.000 ***highly significant

Table 3: Comparison of HRV parameters in males and females

Parameters	Males (n=30)	Females(n=30)	p-value
LF (nu)	70.79± 10.4	62.5±14.11	0.01*
HF(nu)	29.23± 10.4	37.4±14.12	0.01*
LF / HF ratio	2.98±1.77	2.09 ± 1.20	0.02*

P Value < 0.05* - significant

DISCUSSION

This study included 60 subjects (30 males, 30 females) of age group 17-19 years with normal BMI ranging between 18-25 Kg/m^2. Lipid profile was estimated in all the subjects . The Heart rate variability parameters were measured in all the subjects. The results were compared between male and female subjects .

In this study The Body Mass Index was more in males when compared to females as observed in table 1. However, it was within the normal range . The Total cholesterol and LDL levels were significantly more in males when compared to females (table -2). Frequency domain variables of Heart rate variability namely LF, LF/HF ratio were also significantly more in males when compared to the females (table -3) indicating sympathetic dominance in males. The HF value was significantly more in females indicating parasympathetic dominance in females.

LF values represents both sympathetic and parasympathetic activity whereas HF value is purely an indicator of parasympathetic activity. Increase in the parasympathetic tone within normal range indicates good control of vagus over the heart rate . It can be observed in this study that in males there was an increase in LF values as compared to the females .When comparing The HF values, it was more in females then the males . This is an indicator of good parasympathetic control over the heart rate in females . In a

study done by Saleem et al the LF values was found to be more in females when compared to males indicating sympathetic overactivity . This finding is in contradiction to our study (7). In par with our present study it was observed by Ramaekar et al that there is a lower sympathetic activity in females when compared to males this supports the cardioprotective phenomenon in females [8].

The decrease in LF values in females could be due to the cardioprotective action of the endogenous female sex hormone estrogen. In a study done by leicht et al , a significant correlation was observed between the peak estrogen levels and HRV measures [9]. Huikurie et al have demonstrated that there was a significant increase in the vagally mediated baroreflex sensitivity in postmenopausal women with estrogen replacement therapy. Hence, it can be understood that the plasma estrogen enhances the vagal modulation of the heart [10]. This may be the reason for the increased HF in our study in females when compared to males.

In our study the LDL levels are significantly lower in females when compared to the males. In a study done by Christensen etal it was found that increased cholesterol levels was associated with decrease in the 24 hours HRV in males [11]. In this study we have included males with normal cholesterol levels. However, it can be observed that even in the males with normal cholesterol levels the LF values was more when compared to the females indicating lower heart rate variability.

The increase in serum LDL levels in males is again a favouring factor for increasing the atherogenic property as it was observed by Berliner et al that serum LDL is oxidized by macrophages that may increases the atherogenic property by increasing the inflammatory process [12]. In a study done by Fu chu et al they have observed that in postmenopausal women the LDL Levels were significantly negatively correlated with the LF and LF/HF values [13]. Further in a study done by Cohen et al it was found that the magnitude of the endothelium-dependent vasodilatation significantly correlated with thepercentage change in LDL cholesterol concentration after administration of pravastatin [14]. It was also observed by Fu chu et al that LDL levels negatively correlated Baroreflex sensitivity [13].

Hence the increased LDL levels in males may interfere with the endothelium dependent vasodialatation and also the baroreflex capacity.This in turn might increase the LF values in males when compared to females .

Further studies comparing the HRV changes in different age group and assessing the stress levels may help us to decide on the age of intervention in males and females. further, Relating the levels of various hormones and the endothelium dependent vasodilatation may throw light on the protective mechanism of action of hormones on cardiovascular system .

CONCLUSION

The sympathetic activity at rest is definitely more in males when compared to females With normal BMI .with inherent protective mechanisms in females in the form of endogenous estrogen and reduced LDL levels , it is necessary that males have to be more cautious with life style modification as they have more added modifiable risk factors like smoking and alcoholism . Thus it is necessary that the life style modifications should be more appropriately started in younger age group for both the genders in particular the males so as to reduce the incidence of cardiovascular disease.

REFERENCES

[1] Jalife J, Michaels DC. Futura 1994 :173-205.
[2] Levy MN . Circ Res 1971;29:437-445.
[3] Chess GF, Tam RMK, Calaresu FR. Am J Physiol 1985 ;249 :H867-H875 .
[4] Ewing DJ, Martin CN ,Young RJ,Clark BF. Diabetes Care 1985:8 :491-498.
[5] Circulation 1996;93;1043-1065.
[6] Reed MJ, Robertson CE And Addison PS. Q J Med 2005 ;98:87-95.
[7] Shemaila saleem ,Muhammed Mazhar Hussain et al. J Pak Med Assoc 2012; 62:422-425.
[8] Ramaekers D, Ector H, et al. European Heart J 1998;19:1334-1341.
[9] Anthony S, Leicht , David . A.Hirning et al. Exp Physiol 2003;88441-446.
[10] Huikuri HV, Pikkujämsä SM, Airaksinen KE, Ikäheimo MJ, Rantala AO, Kauma H, et al. Circulation 1996;94:122-5.

[11] Christensen JH, Toft E, Christensen MS and Schmidt EB. Atherosclerosis 1999;145: 181-186.
[12] Berliner JA and Heinecke JW. Free Radic Biol Med 1996;20: 707-727.
[13] Fu chu. Chin J Physiol 2008 ; 51 -100-5 .
[14] Cohen JD, Drury JH, Ostdiek J, Finn J, Babu BR, Flaker G, Belew K, Donohue T and Labovitz A. Am Heart J 2000;139: 734-738.