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Original Article

To Assess the Relation of Obesity and Heart Rate in Known Population- A Clinical Study

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***ABSTRACT*:**
Background: Heart rate variability measures the effect of autonomic function on the heart alone. Therefore, it could be the most useful method to investigate the effect of obesity on cardiovascular disease. The present study was conducted to evaluate the correlation between BMI and Heart rate variability in overweight and underweight young adults. **Materials & Methods:** The present study was conducted in the department of Physiology on 80 subjects of both genders. Body mass index (BMI) of the subjects were measured by asking the subjects to stand on height measuring stand and the height is measured in meter. After a rest period of 5 minutes, HRV was determined for each of the subjects. **Results:** out of 80 subjects, males were 35 and females were 45. The difference was non- significant (P- 0.1). BMI (Kg/ m^2) in over weight subjects was 28.2 ± 1.12 and in under- weight 19.1 ± 0.54. Pulse rate in overweight subjects was 86.52 ± 4.2 and in under- weight subjects was 70.42 ± 3.36. The difference was significant (P< 0.05). Average Sup-TP (ms^2) in over weight was 1280.3± 125.8 and in underweight was 1811.6± 352.6. Sup-LF (ms^2) in over weight was 762.1± 62.8 and in underweight was 828.0± 46.7, Sup-HF (ms^2) was 525.2 ± 161.8 and in underweight was 1166.2± 356.2. The difference was significant (P< 0.05). **Conclusion:** Author concluded that HRV related traits like RP, Sup-LF, Sup-HFnu and Sup-HF values should be periodically monitored for overweight group of people for early detection of heart related complicacy.
Key words: Body mass index, Heart rate, Obesity.

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INTRODUCTION

Various literatures have hypothesised that many factors are associated with development of obesity such as insulin resistance, hypertension and reduced high density lipoprotein. On the other hand it has also been suggested that a reduction in autonomic function might be the mechanism for the increased prevalence of cardiovascular disease in obesity which also plays an important role in regulating energy expenditure and body fat content.[1]

The autonomic nervous system is a control system that acts largely unconsciously and regulates

bodily functions such as the heart rate, digestion, respiratory rate, pupillary response, urination, and sexual arousal through its two branches: the sympathetic and parasympathetic nervous systems.[2] Heart rate variability (HRV) measures the effect of autonomic function on the heart alone. Even a slight variation in autonomic regulation of the heart changes the heart rate and rhythm. The HRV looks through beat-to beat variation during electrocardiogram (ECG) recording. Therefore, it could be the most useful and the simplest noninvasive method to investigate the effect of obesity on CVD.[3]

Heart rate variability measures the effect of autonomic function on the heart alone. Therefore, it could be the most useful method to investigate the effect of obesity on cardiovascular disease. On the other hand, malnutrition to many Indians is a age old problem. Many students of our country are going to school/ colleges without sufficient nutrition. It is estimated that approximately 50 percent of adults are undernourished on the basis mass index (BMI; kg/m2) of less than 18.5. They also have height deficit which may be indicative of stunting brought on by marginal intakes during childhood.[4] The present study was conducted to evaluate the correlation between BMI and Heart rate variability in overweight and underweight young adults.

MATERIALS & METHODS

The present study was conducted in the department of Physiology. It comprised of 80 subjects of both genders. All were informed regarding the study and written consent of obtained.

Body mass index (BMI) of the subjects were measured by asking the subjects to stand on height measuring stand and the height is measured in meter. After that weight was measured by using weight machine and weight is recorded in kg. BMI is calculated as Height/ weight (kg/ meter^2).

After a rest period of 5 minutes, HRV was determined for each of the subjects after comfortably lying down on bed (supine condition). By using RMS Polyrite D instrument continuous ECG tracing was taken for 5 minutes to obtain Frequency domain (Spectral) analysis by Total Power (TP), High Frequency (HF), High Frequency normalized unit (HFnu), Low Frequency (LF), Low Frequency normalized unit (LFnu) & LF/HF ratio and Time Domain analysis by SDNN (Standard deviation of Two Successive NN interval) and RMSSD (Square root of Mean Squared differences of successive NN interval). Results were tabulated and subjected to statistical analysis using chi- square test. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Total- 80		
Males	Females	P value
35	45	0.1

Table I shows that out of 80 subjects, males were 35 and females were 45. The difference was non- significant (P- 0.1).

Table II Mean of BMI and pulse rate of subjects

Parameters	Over-weight	Underweight	P value
BMI (kg/m^2)	28.2 ± 1.12	19.1 ± 0.54	0.01
Pulse rate	86.52 ± 4.2	70.42 ± 3.36	0.05

Table II shows that BMI (Kg/ m^2) in over weight subjects was 28.2 ± 1.12 and in under- weight 19.1 ± 0.54. Pulse rate in overweight subjects was 86.52 ± 4.2 and in under- weight subjects was 70.42 ± 3.36. The difference was significant (P< 0.05).

Table III Average values of HRV parameters of the subjects

Parameters	Over-weight	Underweight	P value
Sup-TP (ms^2)	1280.3± 125.8	1811.6± 352.6	0.001
Sup-LF (ms^2)	762.1± 62.8	828.0± 46.7	0.5
Sup-HF (ms^2)	525.2 ± 161.8	1166.2± 356.2	0.001

Table III shows that average Sup-TP (ms^2) in over weight was 1280.3± 125.8 and in underweight was 1811.6± 352.6. Sup-LF (ms^2) in over weight was 762.1± 62.8 and in underweight was 828.0± 46.7, Sup-HF (ms^2) was 525.2 ± 161.8 and in underweight was 1166.2± 356.2. The difference was significant (P< 0.05).

DISCUSSION

Abdominal obesity is considered to be more dangerous than general obesity because the visceral fat has been shown to secrete certain cytokines and chemicals that are involved in atherogenesis and alterations in the autonomic balance. There is evidence that elevated resting heart rate (>80–85 beats/min) is directly associated with risk of developing hypertension, atherosclerosis and plaque disruption leading to various cardiovascular events. Increased RHR is considered as an independent risk factor and a prognostic factor for cardiovascular and non-cardiovascular related diseases.[5] Though the RHR is influenced by several constitutional and environmental factors, the most important determinants are parasympathetic and sympathetic influences. Thus, quantifying RHR can give an index of the load imposed on the heart and the state of imbalance between sympathetic and parasympathetic activity. The autonomic dysfunction associated with obesity could lead to changes not only in RHR and arterial blood pressure, it could also alter the responses to changes in posture.[6]

In this study, out of 80 subjects, males were 35 and females were 45. BMI (Kg/ m^2) in over weight subjects was 28.2 ± 1.12 and in under- weight 19.1 ± 0.54. Pulse rate in overweight subjects was 86.52 ± 4.2 and in under- weight subjects was 70.42 ± 3.36. This is similar to Han et al.[7]

In study of Talay et al[8] anthropometric measures were obtained and indices of obesity (body mass index [BMI], waist circumference [WC], waist-to-hip ratio [WHR], waist-to-stature ratio [WSR]) were calculated. RHR in standing and supine positions were obtained from radial pulse. General obesity (BMI≥25.0 kg/m2) was found in 45.5% students. Central obesity (WC>85 cm or WSR>50.0) was found in 36.8% students. RHR was significantly correlated with BMI, WC and WSR (r=0.305, 0.300, 0.299 respectively, p<0.01). Subjects above the obesity indices cut-off points had significantly higher values of RHR in both standing and supine positions compared to NW individuals (p<0.05). There was a greater reduction in RHR on changing the posture to supine state in OB group.

We found that average Sup-TP (ms^2) in over weight was 1280.3± 125.8 and in underweight was 1811.6± 352.6. Sup-LF (ms^2) in over weight was 762.1± 62.8 and in underweight was 828.0± 46.7, Sup-HF (ms^2) was 525.2 ± 161.8 and in underweight was 1166.2± 356.2. This is similar to Katagiri et al.[9]

CONCLUSION

Author concluded that HRV related traits like RP, Sup-LF, Sup-HFnu and Sup-HF values should be periodically

monitored for overweight group of people for early detection of heart related complicacy.

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