Harsukh Educational Charitable Society
International Journal of Community Health and Medical Research
Journal home page: www.ijchmr.com doi: 10.21276/ijchmr
Official Publication of "*Harsukh Educational Charitable Society*" [Regd.]
ISSN E: 2457-0117 **ISSN P:**2581-5040 **Index Copernicus value 2016** = 52.13

Original Research

Comparison Of Cardiographic Assessment With Body Mass Index- A Prospective Study

Shashi Pandey[1], Pramod Porwal[2], Manoj Kumar[3], Amitabh Agarwal[1]

[1]Associate Professor, [2]Assistant Professor,[3]Professor and Head, Department of Physiology, T S M Medical College and Hospital , Lucknow, Uttar Pradesh, India

ABSTRACT
Background: Obesity increases cardiac adverse events via risk factors associated with metabolic syndrome like dyslipidemia, hypertension and glucose intolerance, and also effects from sleep disorders associated with obesity. Hence; we planned the present study for carrying out cardiographic assessment in subjects with different body mass index. **Materials & methods:** The present study included cardiographic assessment in subjects with different body mass index. A total of 150 subjects were included in the present study. All the subjects were broadly divided into two study groups with 75 subjects in each group. One group was obese group, while the other group was non-obese group. After giving the subjects a 10 minutes of rest, 12-lead ECG was taken using 12-lead ECG machine. Recording of the standard 12-lead electrocardiograms was done in the subjects in the postprandial state and supine position. Following parameters were measured: Heart rate (HR), P wave duration, QRS interval, and PR interval. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Mean P wave duration among subjects of obese and non-obese group was 102.3 and 95.2 milliseconds respectively. Significant results were obtained while comparing the mean P wave duration among subjects of obese and non-obese group respectively. However; non- significant results were obtained while comparing the QRS duration, PR interval and QT interval among subjects of both the study groups. **Conclusion:** Higher prevalence of abnormal ECG findings occurs in obese subjects. However; further research is this field of medicine is recommended.

Key words: Body mass index, Electrocardiogram, Obesity

Corresponding Author: Dr. Pramod Porwal, Assistant Professor, Department of Physiology, T S M Medical College and Hospital , Lucknow, Uttar Pradesh, India

This article may be cited as: Pandey S, Porwal P, Kumar M, Agarwal A. Comparison Of Cardiographic Assessment With Body Mass Index- A Prospective Study HECS Int J Comm Health Med Res 2018; 4(4):84-87

INTRODUCTION

Obesity is serious public health problem with established cardiovascular co-morbidities and a major cause of sudden death in developed as well as developing countries currently. Obesity increases cardiac adverse events via risk factors associated with metabolic syndrome like dyslipidemia, hypertension and glucose intolerance, and also effects from sleep disorders associated with obesity.[1- 3] Electrocardiogram (ECG) abnormalities are associated with an increased risk of adverse cardiovascular outcomes, including high resting heart rate (HR), prolonged PR interval, QRS duration and QT interval and abnormal shift in electrocardiographic axes. The relationship between Blood Pressure (BP) and risk of cardiovascular event is continuous, consistent and independent of other risk factors.[4- 6]
Previous studies have shown that ECG in the obese appears to have leftward shift of QRS axis and low QRS voltage. These studies assessed ECGs in the obese and normal weight, and did not consider the underweight or degrees of the obese.[7- 9] Hence; we planned the present study for carrying out cardiographic assessment in subjects with different body mass index.

MATERIALS & METHODS

The present study was planned in the department of Physiology of T.S.M.Medical college and hospital and it included cardiographic assessment in subjects with different body mass index. A total of 150 subjects were included in the present study. All the subjects were broadly divided into two study groups with 75 subjects in each group. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the subjects after explaining in detail the entire research protocol. One group was obese group, while the other group was non-obese group. Subjects with body mass index (BMI) of less than 25 kg/m^2 were kept in the non-obese group, while the subjects with BMI of more than 25 kg/m^{2}were kept in obese group. Portable weighing

machine was used for measuring the body weight of the subjects. Vertical height scale was used for measuring the height of the subjects. Subjects of the present study were between the age group of 15 to 35 years. Diabetic and hypertensive patients and patients with negative history of any other systemic illness were excluded from the present study. Detailed demographic and clinical profile of all the patients was carried out. We conducted thorough clinical examination of all the subjects of the present study. After giving the subjects a 10 minutes of rest, 12-lead ECG was taken using 12-lead ECG machine. Recording of the standard 12-lead lectrocardiograms was done in the subjects in the postprandial state and supine position. Following parameters were measured:

- Heart rate (HR),
- P wave duration,
- QRS duration, and
- PR interval
- QT interval

All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi-Square test and Mann-Whitney U test were used for assessment of level of significance.

RESULTS

In the present study, a total of 150 subjects were assessed, out of which, 75 in each group. Mean age of the subjects of obese group and non-obese group was 26.6 years and 28.4 years respectively. There were 38 males and 37 females among the obese group, while there were 39 males and 36 females among the non-obese group. Mean BMI of the subjects of the obese and non-obese group was 22.8 and 30.7 Kg/m^2 respectively.

Mean pulse rate per minute among the obese and non-obese subjects was found to be 82.5 and 79.2 respectively. Non-significant results were obtained while comparing the pulse rate among subjects of both the study groups. Mean systolic and diastolic blood pressure of the obese groups was significantly higher in comparison of the subjects of the non-obese group respectively.

Mean P wave duration among subjects of obese and non-obese group was 102.3 and 95.2 milliseconds respectively. Significant results were obtained while comparing the mean P wave duration among subjects of obese and non-obese group respectively. However; non- significant results were obtained while comparing the QRS duration, PR interval and QT interval among subjects of both the study groups.

Table 1: Comparison of demographic details among subjects of both the study groups

Parameter	Obese group	Non-obese group
Number of subjects	75	75
Males	38	39
Females	37	36
Mean age (years)	26.6	28.4
Mean BMI (Kg/m^2)	22.8	30.7

Graph 1: Demographic data

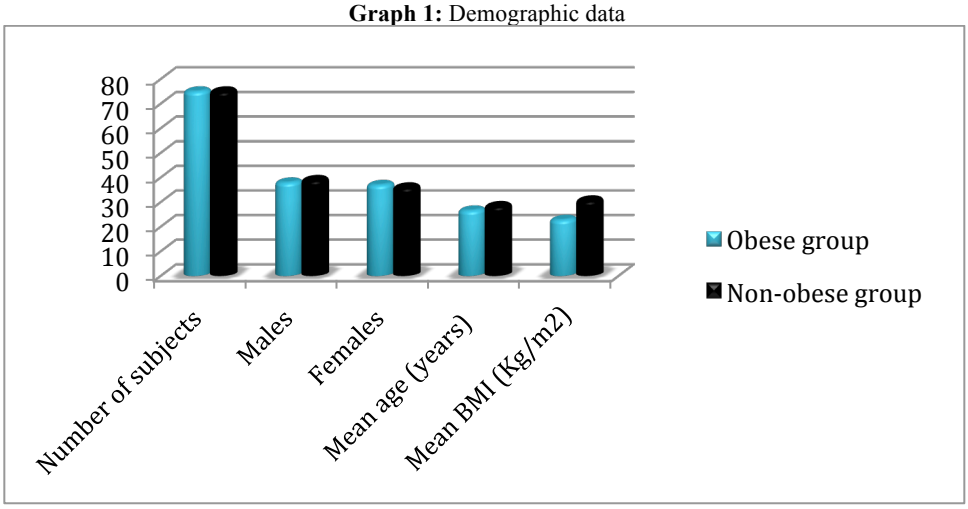


Table 2: Comparison of vital parameters

Parameter	Obese group	Non-obese group	P-value
Pulse rate/minute	82.5	79.2	0.52
Systolic blood pressure (mm of Hg)	129.5	121.8	0.02*
Diastolic blood pressure (mm of Hg)	88.8	81.4	0.01*

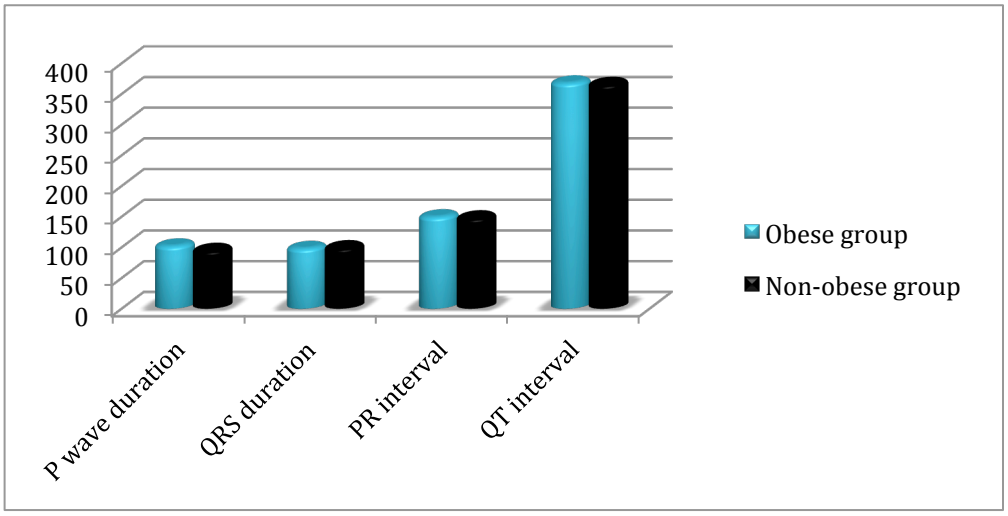
*: Significant

Table 3: Comparison of ECG variables

Parameter	Obese group	Non-obese group	P- value
P wave duration (milliseconds)	102.3	95.2	0.01*
QRS duration (milliseconds)	98.3	99.5	0.88
PR interval (milliseconds)	147.4	149.7	0.91
QT interval (milliseconds)	368.1	365.8	0.27

*: Significant

Graph 2: ECG variables among subjects of both the study groups



DISCUSSION

Obesity is associated with a wide variety of electrocardiographic (ECG) abnormalities. Most of these reflect alterations in cardiac morphology. Some serve as markers of risk for sudden death. Key ECG abnormalities or alterations occurring with disproportionately high frequency in obese subjects include: leftward shifts of the P wave QRS and T wave axes, various changes in P wave morphology, low QRS voltage, various markers of left ventricular hypertrophy (particularly the Cornell voltage and product), T wave flattening in the inferior and lateral leads, lengthening of the corrected QT interval and prolonged QT interval duration.[10] Hence; we planned the present study for carrying out cardiographic assessment in subjects with different body mass index. In the present study, a total of 150 subjects were assessed with 75 in each group. Mean age of the subjects of obese group and non-obese group was 26.6 years and 28.4 years respectively. Kosar F et al evaluated P-wave duration and P dispersion (Pd) in obese subjects, and to investigate the relationship between P-wave measurements, and the clinical and echocardiographic variables. The study population consisted of 52 obese and 30 normal weight control subjects. P-wave duration and P-wave dispersion were calculated on the 12-lead ECG. As echocardiographic variables, left atrial diameter (LAD), left ventricular end-diastolic, and end-systolic diameters (LVDD and LVSD), left ventricular ejection fraction (LVEF), interventricular septum thickness (IVST), left ventricular posterior wall thickness (LVPWT), and left ventricular mass (LVM) of the obese and the control subjects were measured by means of transthoracic echocardiography. There were statistically significant differences between obese and controls as regards to P max (maximum P-wave duration) and Pd (P dispersion). Correlation analysis showed that Pd in the obese patients was related to any the clinical and echocardiographic parameters including BMI, LAD, LVDD, IVST, LVPWT, and LVM. Their data suggested that obesity affects P-wave dispersion and duration, and changes in P dispersion may be closely related to the clinical and the echocardiographic parameters such as BMI, LAD, IVST, LVPWT, and LVM.[11]

In the present study, non- significant results were obtained while comparing the pulse rate among subjects of both the study groups. Mean systolic and diastolic blood pressure of the obese groups was significantly higher in comparison of the subjects of the obese group respectively. Rodrigues JCL et al recalibrated six ECG criteria for LVH against gold-standard cardiac magnetic resonance (CMR) and assessed the impact of obesity. One hundred and fifty consecutive tertiary hypertension clinic referrals for CMR (1.5 T) were reviewed. Patients with cardiac pathology potentially confounding hypertensive LVH were excluded (n=22). The final sample size was 128 (age: 51.0±15.2 years, 48% male). LVH was defined by CMR. From a 12-lead ECG, Sokolow–Lyon voltage and product, Cornell voltage and product, Gubner–Ungerleidger voltage and Romhilt–Estes score were evaluated, blinded to the CMR. ECG diagnostic performance was calculated. LVH by CMR was present in 37% and obesity in 51%. Obesity significantly reduced ECG sensitivity, because of significant attenuation in mean ECG values for Cornell voltage, Cornell product and for Gubner–Ungerleider voltage. Obesity also significantly reduced ECG specificity, because of significantly higher prevalence of LV remodeling (no LVH but increased mass-to-volume ratio) in obese subjects without LVH, which correlated with higher mean ECG LVH criteria values. Obesity-specific partition values were generated at fixed 95% specificity; Cornell voltage had highest sensitivity in non-obese (56%) and Sokolow–Lyon product in obese patients (24%). Obesity significantly lowers ECG sensitivity at detecting LVH, by attenuating ECG LVH values, and lowers ECG specificity through changes associated with LV remodeling.[12]

In the present study, Mean P wave duration among subjects of obese and non-obese group was 102.3 and 95.2 milliseconds respectively. Significant results were obtained while comparing the mean P wave duration among subjects of obese and non-obese group respectively. However; non- significant results were obtained while comparing the QRS duration, PR interval and

QT interval among subjects of both the study groups. Sun GZ et al explored the associations between obesity and ECG intervals and axes in children and adolescents. A cross-sectional observational study of 5,556 students aged 5–18 years was performed. Anthropometric data, blood pressure and standard 12-lead ECGs were collected for each participant. ECG variables were measured manually based on the temporal alignment of simultaneous 12 leads using a CV200 ECG Work Station. The results of their study indicated that in children and adolescents, general and abdominal obesity is associated with longer PR intervals, wider QRS duration and a leftward shift of frontal P-wave, QRS and T-wave axes, independent of age, gender, ethnicity and blood pressure.[13]

CONCLUSION

From the above obtained results, the authors conclude that higher prevalence of abnormal ECG findings occur in obese subjects. However; further research in this field of medicine is recommended.

REFERENCES

1. Verdecchia P, Carini G, Circo A, Dovellini E, Giovannini E, Lombardo M, et al. Left ventricular mass and cardiovascular morbidity in essential hypertension: the MAVI study. J Am Coll Cardiol. 2001;38(7):1829–35.
2. From AM, Scott CG, Chen HH. The development of heart failure in patients with diabetes mellitus and pre-clinical diastolic dysfunction a population-based study. J Am Coll Cardiol. 2010;55(4):300–5.
3. Paolisso G, Galderisi M, Tagliamonte MR, de Divitis M, Galzerano D, Petrocelli A, et al. Myocardial wall thickness and left ventricular geometry in hypertensives. Relationship with insulin. Am J Hypertens. 1997;10(11):1250–6.
4. Zile MR, Baicu CF, Bonnema DD. Diastolic heart failure: definitions and terminology. Prog Cardiovasc Dis. 2005;47(5):307–13.
5. Kiencke S, Handschin R, von Dahlen R, Muser J, Brunner-Larocca HP, Schumann J, et al. Pre-clinical diabetic cardiomyopathy: prevalence, screening, and outcome. Eur J Heart Fail. 2010;12(9):951–7.
6. Phillips RA, Krakoff LR, Dunaif A, Finegood DT, Gorlin R, Shimabukuro S. Relation among left ventricular mass, insulin resistance, and blood pressure in nonobese subjects. J Clin Endocrinol Metab. 1998;83(12):4284–8.
7. Raev DC. Which left ventricular function is impaired earlier in the evolution of diabetic cardiomyopathy? An echocardiographic study of young type I diabetic patients. Diabetes Care. 1994;17(7):633–9. doi: 10.2337/diacare.17.7.633.
8. Galvan AQ, Galetta F, Natali A, Muscelli E, Sironi AM, Cini G, et al. Insulin resistance and hyperinsulinemia: no independent relation to left ventricular mass in humans. Circulation. 2000;102(18):2233–8.
9. Carroll JJ, Smith N, Babson AL. A colorimetric serum glucose determination using hexokinase and glucose-6-phosphate dehydrogenase. Biochem Med. 1970;4(2):171–80.
10. Fraley MA1, Birchem JA, Senkottaiyan N, Alpert MA. Obesity and the electrocardiogram. Obes Rev. 2005 Nov;6(4):275-81.
11. Kosar F1, Aksoy Y, Ari F, Keskin L, Sahin I. P-wave duration and dispersion in obese subjects. Ann Noninvasive Electrocardiol. 2008 Jan;13(1):3-7. doi: 10.1111/j.1542-474X.2007.00194.x.
12. Rodrigues JCL, McIntyre B, Dastidar AG, et al. The effect of obesity on electrocardiographic detection of hypertensive left ventricular hypertrophy: recalibration against cardiac magnetic resonance. Journal of Human Hypertension. 2016;30(3):197-203.
13. Sun GZ, Li Y, Zhou XH, et al. Association between obesity and ECG variables in children and adolescents: A cross-sectional study. Experimental and Therapeutic Medicine. 2013;6(6):1455-1462. doi:10.3892/etm.2013.1337.

Source of support: Nil
Conflict of interest: None declare