

Hospital attending Cardiology outpatient department for master health checkup, aged between 30 to 65 years, who volunteered to take part in the study. The procedure was explained and written consent was obtained from the subjects. All the subjects underwent a detailed clinical examination regarding anthropological measurement & physiological measurement before being included in the study as per the study protocol. The subject selection was based on the predetermined exclusion-inclusion criteria.

Inclusion criteria:

Study group:

Controlled Hypertension for more than 2 years
Males and females aged 30-65 years
Normal Cardiovascular and Respiratory system on clinical examination
No history of Diabetes mellitus
No history of any acute infectious diseases
No history of any chronic diseases

Control group:

Normotensive population
Males and females aged 25-65 years
Normal body mass index (BMI: 19-25 Kg/m²)
Normal Cardiovascular and Respiratory system on clinical examination
No history of Diabetes mellitus
No history of any acute infectious diseases
No history of any chronic diseases

Exclusion Criteria:

< 25 years and > 75 years of age
History of Diabetes mellitus
History of Connective tissue disorders
History of Congenital heart diseases
History of Coronary artery disease
History of pericardial disease
History of valvular heart disease
History of cardiac arrhythmias
Patients where it was technically difficult to perform echocardiography
Abnormal Cardiovascular and Respiratory system on clinical examination

Cardiovascular Autonomic function tests were carried out in the morning in the department between 10 AM to 12 Pm after 2 hours of light breakfast, after intimate testing procedures with the subjects.

The Autonomic function tests which were performed to assess the cardiovascular sympathetic functional status:

- 1) **Cold Pressor test (cold pressure test):** Subject was instructed regarding the test. Blood pressure was recorded under basal conditions. Cold water was taken in a container. Subject was asked to submerge one of his upper limbs in cold water for 60 seconds. Blood pressure was recorded at the end of 60 seconds of submersion of the limb. Submersion of the limb in ice cold water increases systolic blood pressure by about 10-20 mm of Hg and diastolic blood pressure by about 10 mm of Hg.
- 2) **Hand Grip Test:** In the hand grip test, there is a rise in heart rate and blood pressure. The blood pressure rise is

due to increased sympathetic activity and heart rate rise is due to decreased parasympathetic activity. Subject was made to lie down in semi recumbent position. ECG electrodes were connected for lead II recording of ECG and sphygmomanometer for blood pressure measurement. Basal heart rate and blood pressure were recorded. Subject was asked to maintain a pressure of 30% of the maximum activity in the hand grip dynamometer for about 5 minutes. Heart rate and change in SBP, DBP were recorded.

- 3) **Blood pressure response to standing:** Patient is again allowed to assume a supine position, and a recording of blood pressure is done in the supine position. Patient is then asked to stand up and blood pressure is recorded at 0 and 1 minute intervals.

The Autonomic function tests which were performed to assess the cardiovascular parasympathetic functional status:

- 1) **Deep breathing test** - This test is used to assess the parasympathetic activity. Subject was instructed to maintain deep breathing at a rate of six breaths per minute and was made to lie down comfortably in supine position with head elevated to 30°. ECG electrodes were connected for recording Lead II ECG. While subject was breathing deeply at a rate of 6 breaths per minute (allowing 5 seconds each for inspiration and expiration) maximum and minimum heart rates were recorded with each respiratory cycle. Expiration to inspiration ratio was determined by using the formula.
- 2) **Valsalva Manoeuvre** - The Valsalva ratio is a measure of parasympathetic and sympathetic functions. Subject was made to lie down in a semi recumbent or sitting position. Nostrils were closed manually. Mouth piece was put into the mouth of the subject and the Mercury manometer was connected to the mouth piece. ECG machine was switched on for continuous recording. Subject was asked to exhale forcefully into the mercury manometer and asked to maintain the expiratory pressure at 40 mm of Hg for 10 – 15 seconds. ECG changes were recorded throughout the procedure, 30 seconds before and after the procedure. Valsalva ratio were calculated by using the formula.
- 3) **Heart rate response to standing:** On changing the posture from supine to standing heart rate increases immediately by 10-20 beats per minute. This response is detected by recording ECG in supine and standing postures. Subject was made to lie down in supine posture. ECG electrodes were connected from the subject to the cardiwin system. Subject was asked to relax completely for a minimum period of 10 minutes. Basal heart rate was recorded by using cardiwin system. Subject was asked to stand up immediately and change in heart rate is noted from the monitoring screen of cardiwin. Heart rate response to standing was determined by using the formula heart rate in standing position – heart rate in supine position.

Heart rate variability test: HRV was done between 9 am to 12 pm to minimize the effect of diurnal variation. Subjects were informed to fast at least before 12 hours to abort effect of food on HRV. Subject was asked to lie down comfortably on supine position for 5 minute before recording of HRV to avoid wrong results. Subjects were instructed to breathe quietly and avoid movement and not to talk while procedure