

THE CARDIOVASCULAR PARAMETERS IN MALES AND FEMALES AT REST - A CROSS-SECTIONAL OBSERVATIONAL STUDY IN A MEDICAL COLLEGE OF CENTRAL INDIA

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Abstract

Background: Heart Rate Variability (HRV) has been investigated under various conditions to identify the factors influencing it. It is thought to be a reliable measure of autonomic control linked to cardiovascular health. Studying cardiovascular markers in both males and females at rest is the goal. **Methodology:** This study included 80 healthy male participants and 80 healthy female participants who were between the ages of 19 and 20. Without giving any consideration to their physical training, the UG medical students from NKP SIMS & RC, Nagpur were chosen as the normal subjects. The paired 't' test is used to compare parameters before and after exercise in same-sex groups (e.g., females or males). **Results:** Women had a significantly higher heart rate than men. Men have significantly higher systolic and diastolic blood pressure than women. Females perform substantially more cardiac work compared to males. **Conclusion:** Our study found that females had higher resting heart rate and cardiac work, while males had higher systolic and diastolic blood pressure.

Key Words: Heart Rate Variability (HRV), Heart rate (HR), Systolic and Diastolic blood pressure (SBP, DBP).

Introduction

Heart Rate Variability (HRV) is a reliable predictor of autonomic regulation and cardiovascular health. It has been examined in various settings to identify the factors that influence it. The most commonly reported characteristics are age,⁽¹⁻⁶⁾ gender,⁽⁵⁻⁸⁾ heart disease,⁽⁹⁾ neurological disease,⁽¹⁰⁻¹²⁾ and exercise,^(6,9,13,14) HRV decreases with sympathetic activity and increases with parasympathetic activity. HRV indicates autonomic control of the cardiovascular system.

Heart Rate Variability (HRV) refers to the variation in time intervals between successive heartbeats. It's a key indicator of autonomic nervous system function, reflecting the body's ability to respond to stress and regulate internal processes. The Key Aspects of HRV are 1. Measurement: Time-Domain Methods: Analyze the intervals between heartbeats directly (e.g.,

SDNN, RMSSD). 2. Frequency-Domain Methods: Use power spectrum analysis to examine different frequency components of heart rate changes (e.g., LF, HF). 2. Significance: Autonomic Balance: High HRV generally indicates a healthy balance between the sympathetic (fight or flight) and parasympathetic (rest and digest) branches of the autonomic nervous system. Stress and Recovery: Higher HRV is often associated with better stress resilience and recovery, while lower HRV can signal stress, fatigue, or potential health issues. 3. Factors Influencing HRV: Physical Fitness: Regular aerobic exercise tends to increase HRV, Sleep Quality: Better sleep is linked to higher HRV, Age: HRV typically decreases with age, Lifestyle: Stress, diet, hydration, and substance use (like alcohol or caffeine) can all impact HRV. 4. Clinical Applications: Health Monitoring: HRV is used in assessing conditions like anxiety, depression, and cardiovascular diseases. Performance Tracking: Athletes often monitor HRV to optimize training and recovery.

Methodology

The study included 80 healthy male and female participants aged 19 to 20 years. Normal subjects were picked among UG medical students at NKPSIMS and RC Medical College, without regard for physical training. A physical examination of all subjects was performed before the start of the procedure using a proforma. We omitted cases with pulmonary, cardiovascular, or other illnesses. All of the female individuals were investigated during the preovulatory phase of the menstrual cycle. All subjects were studied between 11 a.m. and 2 p.m. After the volunteer met the criteria, they were briefed about the experimental protocol and asked to sign a form of informed consent to participate in the study. Only one person declined to participate at that point. Apparatus used: Handgrip dynamometer, calibrated ECG machine, weight machine, sphygmomanometer, stethoscope, and measuring tape. We used handgrip exercise to measure systolic and diastolic blood pressure, as well as cardiac work (Arbitrary units) in all selected patients. Cardiac work⁽¹²⁾ is computed by multiplying heart rate by mean blood pressure. Cardiac work is equal to heart rate multiplied by X. Mean blood pressure = heart rate x DBP+1/3 (pulse pressure). Similarly, cardiac work was computed immediately after the handgrip exercise using the numbers obtained. The parameters, including heart rate, blood pressure, and cardiac work, were measured before and after the handgrip exercise and compared between male and female volunteers using the unpaired 't' test.⁽¹⁶⁾ The paired 't' test is used to compare parameters in same-sex groups (e.g., females or males) after the exercise.⁽¹⁶⁾

Observations And Results

Table 1: Demographic distribution of baseline parameters

Baseline characters	Mean
Mean age	
Males	19.8
Females	19.2
Mean Height	
Male	165.10
Female	153.50
Mean Body weight	
Male	56.18
Female	44.78

The mean age of all the selected males is 19.8 years and of the female's subjects is 19.2 years. The mean height of all the selected males is 165.10 cm and mean height of all the selected females is 153.5 cms. The mean body weight of all the selected males is 56.18 kg and the selected female subjects is 44.78 kg.

Table 2: Comparison of heart rate, systolic blood pressure, diastolic blood pressure and cardiac work in males and females before handgrip exercise

Parameter	Male (n=80)	Female (n=80)	"t" value	"p" value
Heart rate (beats/min)	64.27	75.11	1.99	$p < 0.05$
Systolic Blood pressure (mm hg)	118.19	106.56	6.75	$p < 0.001$
Diastolic blood pressure (mm hg)	78.9	74.68	2.69	$p < 0.01$
Cardiac work (arbitrary units)	6098.56	6617.87	2.42	$p < 0.05$

The above table shows heart rate is significantly increased in females than in males. The systolic and diastolic blood pressure are significantly higher in males than females.

Discussion

The European Society of Cardiology Task Force and the North American Society of Pacing and Electrophysiology⁽¹⁸⁾ have supplied reliable reference data in the temporal domain for the evaluation of cardiovascular risk, as previously mentioned. The European Society of Cardiology (ESC) and the Heart Rhythm Society (HRS) provide guidelines that address various aspects of cardiovascular health, including the implications of Heart Rate Variability (HRV) and blood pressure (BP) in both males and females. While these organizations primarily focus on arrhythmias and device therapy, they acknowledge the importance of HRV and BP as indicators of cardiovascular health. HRV is recognized as an important indicator of autonomic nervous system function and overall cardiovascular health. The ESC emphasizes the role of HRV in assessing risk in patients with heart disease, particularly in predicting mortality in those with heart failure and after myocardial infarction. The recommendations highlight that lower HRV is associated with higher cardiovascular risk, stressing the importance of monitoring in both genders, as women may exhibit different HRV patterns due to hormonal influences. Monitoring HRV can be useful for understanding the response to treatments and interventions, although specific guidelines on HRV in everyday practice may be less emphasized. The ESC provides comprehensive guidelines on hypertension management, emphasizing the importance of BP control in both males and females. The recommendations include individualized target BP levels, with considerations for gender differences; for example, women may experience different responses to antihypertensive medications due to hormonal factors. The guidelines stress the importance of lifestyle interventions for both genders to manage BP effectively. The ESC and HRS guidelines underscore the importance of HRV and blood pressure in assessing cardiovascular health in both males and females. Monitoring these metrics can help identify individuals at risk and guide treatment strategies. Furthermore, recognizing gender differences is crucial for personalized patient care, ensuring that interventions are effective and appropriate for each individual's physiological context.

Ongoing research is needed to refine these guidelines further and enhance understanding of how HRV and BP relate to cardiovascular health across different populations. It's unclear, though, if they apply to young, healthy individuals or other factors like level of exercise. According to our research, women's heart rates were noticeably higher than men's. Males have substantially higher diastolic and systolic blood pressure than females. Women perform a great

deal more cardiac work than men do. Current research aligns with the work of Harold B. Falls, Rebecca J. Donatelle, and others.

Conclusion

Our study found that females had higher resting heart rate and cardiac work, while males had higher systolic and diastolic blood pressure. Furthermore, recognizing gender differences is crucial for personalized patient care, ensuring that interventions are effective and appropriate for each individual's physiological context. Ongoing research is needed to refine these guidelines further and enhance understanding of how HRV and BP relate to cardiovascular health across different populations.

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