Frequency of Elevated Resting Heart Rate Among Young Healthy Adults with Normal BMI

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ABSTRACT

It was an observational, cross-sectional study conducted at Ziauddin University, Karachi, from 10th March to 31st August 2021, to investigate the frequency of elevated resting heart rate in healthy young adults with normal BMI. A total of 420 participants were recruited for the study with age ranging from 18-30 years. Subsequently, candidates with normal BMI ranging between 18-24 kg/m^2 were selected for the evaluation of elevated resting heart rate (RHR). The participants underwent an assessment of their heart rate at rest with a pulse oximeter whereas, stadiometer was used for height and weight measurements. The frequency of the elevated RHR (HR= 90-100 bpm) was found to be 49.6% with a mean RHR of 90.85 ± 12.45 bpm. The correlation between RHR and body weight was found to be weak (r = 0.141, p = 0.027) showing little or no association. Whereas, RHR and height depicted a moderate negative correlation (r = 0.160, p = 0.012). This study demonstrated high frequency of RHR in a young population. Efforts are needed to control the increased RHR.

Key Words: *Resting heart rate (RHR), Young adults, Cardiovascular disease (CVD), BMI, Tachycardia.*

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Cardiovascular disease (CVD) refers to the condition that includes narrowing of blood vessels and weakening of cardiac musculature that manifest into numerous complications like myocardial infarction, ischaemia, stroke, angina pectoris, cardiomyopathies, and valvular heart disease. Several risk factors like hypertension, dyslipidaemia, obesity, diabetes mellitus, and atherosclerosis are associated with aforementioned cardiovascular complications.[1]

CVD is universally reported to be a lethal debility for all genders as a study estimated the death ratio to be 17.3 million, because of CVD that is approximately 30% of all deaths.[2] The death rate because of CVD is anticipated to rise up to 23.4 million by 2030 globally. In South Asia, the population is deduced to be at risk for CVD due to conditioning factors like socioeconomic status, early life influences, education, and awareness. The latest WHO data published in 2017 stated that deaths in Pakistan due to CVD have outreached to be 21.76% of the total deaths. The age-adjusted death rate ranks Pakistan 13th in the world.[3] Literature suggested a number of risk factors that predict the chances of CVD in an individual that leads to such deaths. However, among them, one prominent factor that was previously not classically significant has now acquired attention over the last few decades.[4]

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RHR has advanced from an unrecognised clinical index to a relevant marker of cardiovascular risk. A diverse body of literature reported unfavourable outcomes relative to the elevated RHR that had predicted both cardiovascular and non-cardiovascular risk and mortality.[5] Existing literature reported elevated RHR as the prime marker for cardiovascular disease among many others. However, there is no study found to be conducted in Pakistan that investigates the prevalence of elevated RHR, especially in young adults. Thus, to enhance the awareness of elevated RHR as a self-standing factor for the plausibility of cardiovascular disease in Pakistan, a prevalence study is necessitated to identify the population at risk and to provide guidelines and forestall future generations.

This cross-sectional study was conducted on young adults at Ziauddin University. Four hundred and tweny students participated in this study through purposive sampling. Before enrollment, the participants had to undergo extensive screening, comprising of blood pressure measurement, medical and family history, physical fitness level, and questions related to addictions, sleep patterns, financial and economic stressors and drug history. Thirty individuals did not comply with the extensive procedure and hence, the sample size was reduced to 390. After further screening, 143 participants did not meet the inclusion criteria and thus, a sample size of 247 was augmented for this research.

All the normal healthy young adults of age 18 to 30 years in the range of normal BMI were included in the study where 204 were females and 43 were males. However, individuals with any known case of myocardial infarction, arrhythmias, cardiomegaly, malignancy, endocarditis, myocarditis, recent trauma,

cardiac surgery, and people receiving beta blockers were excluded from the study. The participants were enrolled in the study after providing informed consent. The details of height and weight were obtained *via* a stadiometer and were documented in the assessment form generated by the researchers. BMI was calculated using the universal formula and interpretations were made based on the standard values. To assess the RHR pulse, oximeter was used. The participants were given a rest of 5 minutes before the assessment and 3 readings of the heart rate were obtained. The mean of these three readings was documented in the assessment form. Furthermore, the RHR of the young adults was classified into bradycardia, normal, elevated RHR, and tachycardia respectively.

Data analysis was performed in the study using the 20.0 version of SPSS. The baseline characteristics of the participants were determined through descriptive statistics by using mean and standard deviation. Furthermore, the prevalence of the elevated RHR was also described in terms of frequency and percentages. The Kolmogorov-Smirnov test was run to determine the normality that revealed the asymmetrical nature of the data. Therefore, the Spearman Coefficient of Correlation was run to determine the relationship of elevated RHR, height, and body weight of the participants. Statistically, the values were analysed at the Confidence Interval of 95% considering the p-value <0.05.

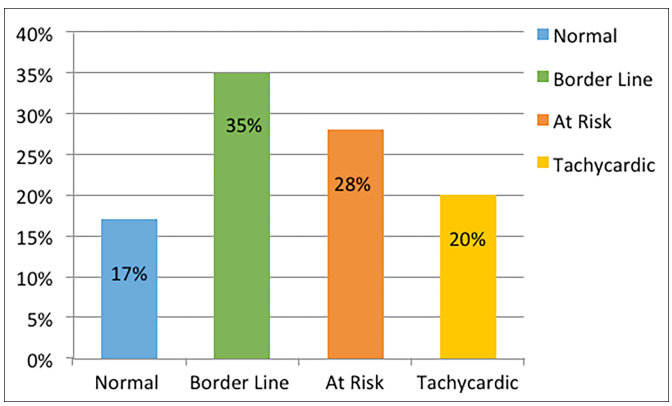

Figure 1: Categorical representation of RHR.

Table I: The correlation of RHR with body weight and height.

Spearman's rho		Body Weight	Height
Resting Heart Rate	Correlation coefficient	0.141*	0.160*
	Sig. (2-tailed)	0.027	0.012
	n	247	247

** Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).*

The prevalence of the elevated RHR (HR = 90-100 bpm) was found to be 48.4% (n=120). Among these, 28% of participants (n = 70) lay in the elevated RHR category (HR = >90), also known as the risk category. Whereas, 20% (n = 50) were found to be tachycardia (HR = >100). The remaining 35% of participants (n = 86) were found to be at borderline (HR= 80-90) and only 17% (n = 41) lay in the normal heart rate category (HR = 60+ <80). However, no participant was categorised as bradycardiac as shown in Figure 1. Moreover, Spearman's rho was applied to investigate the association between RHR, body weight, and height. The correlation between RHR and body weight was found to be weak (0.141) with a p-value of 0.027 showing little or no association as shown in Table I. Whereas, RHR and height depicted a moderate association of 0.160 with a p-value of 0.012.

This study aimed to target people having a normal BMI with no history of heart disease. It distinctly classified the healthy population *versus* those at risk, i.e. individuals falling in the normal category, elevated RHR category, and the population who had already crossed the borderline of risk, i.e. individuals falling in the category of tachycardia, which according to the authors' knowledge, no other study has done presently. BMI and RHR were considered confounding over each other, which amazingly contradicts the results. In this study, no significant association was witnessed between BMI and RHR. Moreover, this study population showed no association between gender and RHR at all, which probably would be because of a significantly larger female population in comparison to the male population. The limitation of this study included a sample size consisting of more females than males and considering only two variants apart from a number of others which could affect RHR. Moreover, this study lacked any follow-up evaluation to rule out the persistent risk of elevated RHR.

The study concluded that a large proportion of the young adult population have their heart rates elevated and thus, sincere work is needed to control the increased RHR to have a healthy life.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

MS: Conceived the research topic, organised draft and references.
MAH: Performed statistical analysis and its interpretation.
OS: Conducted literature review and wrote the draft.
SR: Drew chart and table, reviewed the draft critically before the final submission.
All authors approved the final version of the manuscript to be published.

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