

“Assess The Relationship Between HRR And Cardiac Biochemical Parameters Among Nursing Students”

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ABSTRACT

Background of the Study: Cardio-respiratory fitness has a major role in reduction of incidence of cardiovascular disorders among the population of India. HRR (Heart rate recovery) is one of the prime factor which act as an indicator for cardio-respiratory fitness. HRR can be influenced by the body's cardiac biochemical parameters.

Aim: The aim of the study is to find out the relationship between HRR (Heart rate recovery) and Cardiac Biochemical Parameters among Nursing Students

Methods: Quantitative exploratory research design was adopted for this study. 150 BSc Nursing students from KGMU College of Nursing were selected for this study. Association and correlation between cardio-repertory determinant (HRR) and demographic variables were analysed using inferential and non-inferential statistical method. The association between the variables was assessed by using Chi square and fisher exact significance test and correlation was assessed by Kendall's Tau C.

Results: The study results projects that HDL and T4 are significantly associated with HRR. The variable HDL is very slightly positively (0.175) correlated with Heart rate recovery and the variable T4 is very moderately positively correlated (0.355) with Heart rate recovery.

Conclusion: The study result projects HDL & T4 associated with HRR. Also showing a very slight positive correlation between HRR and HDL and T4 is moderately positive correlated with HRR.

Key words: Cardio-respiratory fitness, Heart rate recovery (HRR), Biochemical Parameters, Nursing, students

INTRODUCTION

Cardio respiratory fitness (CRF) refers to the ability of the circulatory and respiratory system to supply oxygen to skeletal muscles during sustained physical activity. Cardio- respiratory fitness have a major role in reduction of incidence of cardiovascular disorders and mortality among the population of India¹. Recent data have shown that the cause of large national health burden of chronic diseases is due to behavioural dimensions such as physical inactivity and low levels of cardio-respiratory fitness². The identified modifiable risk factors that can affect cardio respiratory fitness included blood pressure and fasting blood levels of glucose, triglycerides, total cholesterol and high-density lipoprotein and cholesterol³. HRR is defined as the return of heart rate to baseline following a stressful period⁴. Because the combination of parasympathetic and sympathetic activity is related to the reduction on heart rate after exercise^{4,5}, it represents the autonomic nervous system's balance. HRR is one of the prime factors which act as indicator for cardio-respiratory fitness^{4,5}. Lower HRR reading after maximal⁵ and submaximal exercise⁶ indicate an imbalance in the autonomic nervous system⁵. This scenario is linked to a higher risk of cardiovascular and cardiometabolic event⁷, as well as chronic illness mortality⁵. HRR can be influenced by the body's cardiac biochemical parameters¹.

The possible tracking of cardiovascular disease risk factors from childhood to adulthood makes it important to increase our understanding of the complex relationships between physical activity, cardio-respiratory fitness and cardiovascular risk factors early in life. Furthermore, since clustering of risk factors is evident in childhood and persists into young adulthood the presence of multiple risk factors could indicate the acceleration of atherosclerosis in such population⁸⁻¹¹. Researcher has noticed high incidence of mortality due to cardiovascular disorder among young adults¹ which can be prevented by proper screening techniques. Although a specific risk factor influences the risk that a person will have cardiovascular disease, risk factors tend to aggregate and usually appear in combination¹².

HRR helps to predict the cardiovascular diseases in early stages thereby reducing the disease progression. From this perspective the researcher planned to explore the relationship between HRR and various cardiac biochemical parameters (Haemoglobin, Triglyceride level, HDL, LDL, Cholesterol, RBS, T3, T4, TSH, ECG, Uric Acid, X-Ray Chest, 2D Echo, Peak Expiratory Flow Rate)¹²⁻¹⁷

From the previous knowledge, the aim of the present study was to identify relationship between HRR and cardiac Biochemical Parameters among young nursing students.

Material and Method

The descriptive exploratory study was adopted to evaluate the influencing factors of cardio- respiratory fitness of the nursing students and explored the relation and association between cardiovascular fitness (HRR) and Biochemical parameters. The present study was approved by ethical committee of King Georges Medical University, Lucknow, Uttar Pradesh, India (ref.code:84th CCMIID/PI). This study was conducted in 150 BSc Nursing students aged 18-25 years, who were studying in KGMU College of nursing Lucknow. The entire participant enrolled after the written informed consent form according to inclusion and exclusion criteria.

Inclusion criteria: nursing student who were in between the aged 18-25 yrs. having no history of cardiovascular illness.

Exclusion criteria: Participant who had history if any pathology related to cardio- vascular system. Participant who had history of Asthma and who had health issues during the time of enrolment like fever, dysmenorrhea, cough, respiratory infection.

A Pro Bodyline treadmill was used for the exercise testing which was conducted according to the Modified Bruce Protocol. Pre-test phase: I. pre-exercise HR was measured and recorded. II. The submaximal targeted exercise HR was estimated using the formula for estimating MHR $[(208 - (0.7 \times \text{age}) \times 85\%]$. The values were recorded on the form. The purpose of treadmill was described. Each of the stages were as per tolerance with a goal to achieve steady-state HR (HRss) at each workload as long as HRss has been achieved, the speed & incline was increased at the end of three-minute interval.

Test administration: I. The treadmill tests starts at 1.7 mph & 10% incline. The maximal HR were recorded. II. The test was terminated until the subject's HR response exceeds 85% of MHR the participant's responses were exceeded 115 bpm for two stages upon completion of test. III. The nursing students were cool down on the treadmill, walking with moderate speed until breathing returns to normal & HR drops below 100 bpm. The point at which exercise testing was stopped, when the desired heart rate was reached.

Post test phase: The measurement of HRR was done after 1 minute of maximal heart rate by using the formula $HR_{max} - HR_{rest/after\ 1minute}$.

The values of HRR were considered <20 low, 21-52 normal and >53 High.

Cardiac Biochemical Parameters (Haemoglobin, Triglyceride level, HDL, LDL, Cholesterol, RBS, T3, T4, TSH, , Uric Acid, ECG X-Ray Chest, 2D Echo, Peak Expiratory Flow Rate) were evaluated by hospital (KGMU) standard protocol.

Statistical Analysis:

Data was analysed by with the help of inferential & non inferential statistics. The association between the variables were assessed by using Chi square and fisher exact significance test and correlation was assessed by using Kendall's Tau C.

Results:

In the view of demographic variables Table-1 shows that most of the individuals were age group of 24-25 (33.33%), maximum were females (66%). All the individuals except one (married) are unmarried. All of them are Pursuing B.Sc. Nursing. All of them are financially dependent. Maximum of them (73%) stays in urban area. Family income of most of them is >25000 (30%). Most of them are vegetarians (55%).on the basis of frequency of fast Majority of the sample belongs to the category of 0-2days/week (58%) and remaining 42 % in the category of 3 and more than 3 days per week. Majority of sample take feast 0-2 per week (92.67%) and remaining will be in the category of 3 and more feast per week(7.33%) Most of these consume fast food between 0 to 2 times in a week (58%). Maximum individuals do not have drug indulgence (95%). Maximum does physical exercise occasionally (44%).For most of the individuals Heart Rate recovery is normal (68%).

Table 1: Frequency & Percentage distribution of Demographic variables

Variable	Category	Frequency	Percent
Age	18-19	24.00	16.00
	20-21	45.00	30.00
	22-23	31.00	20.67
	24-25	50.00	33.33
Gender	Male	51.00	34.00
	Female	99.00	66.00
Marital Status	Married	1.00	0.67
	Unmarried	149.00	99.33
Educational status	Pursuing B.Sc. Nursing	150.00	100.00
Financial dependency	Dependent	150.00	100.00
Place of stay	Rural	40.00	26.67
	Urban	110.00	73.33
Family income	>5000	14.00	9.33
	5001-10000	23.00	15.33
	10001-20000	29.00	19.33
	20001-25000	39.00	26.00
	>25000	45.00	30.00
Diet	Veg	83.00	55.33
	Non-Veg	67.00	44.67
Freq. OF Fast Food	0-2	87.00	58.00
	3 or above	63.00	42.00
Freq. OF Fast	0-2	147.00	98.00
	3 or above	3.00	2.00
Freq. OF Feast	0-2	139.00	92.67
	3 or above	11.00	7.33
Drug indulgence	No	143.00	95.33
	Other	6.00	4.00
	Over counter	1.00	0.67
Physical Exercise	Not at all	25.00	16.67
	Occasionally	66.00	44.00
	Once a week	17.00	11.33
	Twice week	16.00	10.67
	3 time week	26.00	17.33
Heart Rate Recovery	Low	41.00	27.33
	Normal	102.00	68.00
	High	7.00	4.67

Figure 1 showing that only 4.67% of the participant were having high HRR, 27.33% were having low HRR and 68% having normal HRR.

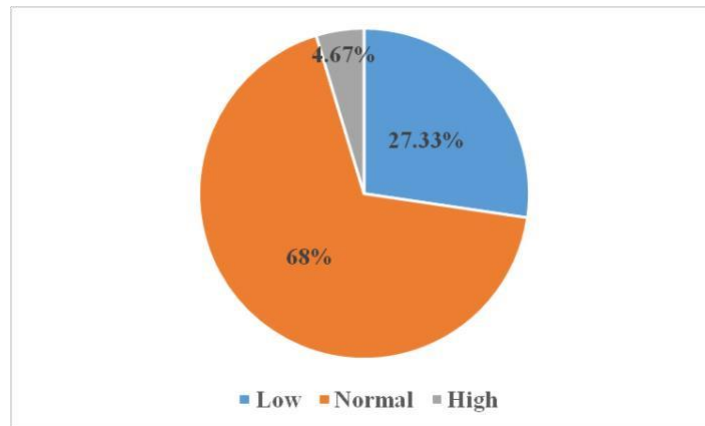


Fig1: Frequency & Percentage distribution of Demographic variables according to HRR

Table-2 shows that there was no significant correlation between demographic variable & with HRR. However there is a scope that if sample size increases some or all of the cardiac biochemical findings may come out to be significantly related with HRR Max .

Table 2: Association and correlation of HRR with selected demographic variables

Variable	Category	Heart Rate Recovery time			Chi Square (p-Value)	Fisher's Exact Significance	Correlation (Kendall's tau c)
		Low	Normal	High			
Age	18-19	6	17	1	3.295 (0.771)	0.756	-0.063 (0.321)
	20-21	12	30	3			
	22-23	6	23	2			
	24-25	17	32	1			
Gender	Male	18	30	3	2.993 (0.224)	.207	0.091 (0.233)
	Female	23	72	4			
Marital Status	Married	0	1	0	0.474 (0.789)	>0.999	-0.006 (0.321)
	Unmarried	41	101	7			
Socionomic status	Rural	7	32	1	3.633 (0.163)	0.180	-0.083 (0.175)
	Urban	34	70	6			
Family income	>5000	7	7	0	5.846 (0.664)	0.709	0.122 (0.059)
	5001-10000	7	15	1			
	10001-20000	7	21	1			
	20001-25000	11	26	2			

	>25000	9	33	3			
Diet	Veg	22	58	3	0.584 (0.747)	0.802	-0.001 (0.994)
	Non-Veg	19	44	4			
Freq. OF Fast Food	0-2	25	57	5	0.855 (0.652)	0.701	.013 (0.864)
	3 or above	16	45	2			
Freq. OF Fast	0-2	41	99	7	1.441 (0.487)	0.617	0.018 (0.090)
	3 or above	0	3	0			
Freq. OF Feast	0-2	39	93	7	1.251 (0.535)	.843	0.016 (0.630)
	3 or above	2	9	0			
Drug indulgence	No	40	96	7	1.261 (0.868)	.834	0.013 (0.482)
	Other	1	5	0			
	Over counter	0	1	0			
Physical Exercise	Not at all	7	16	2	4.333 (0.826)	0.825	0.008 (0.898)
	Occasionally	18	45	3			
	Once a week	7	9	1			
	Twice week	4	12	0			
	3 time week	5	20	1			

Table-3 Depicts that HDL and T₄ are significantly associated with HRR. The variable HDL very slightly positively (0.175) correlated with Heart rate recovery and the variable T₄ is very moderately positively correlated (0.355) with Heart rate recovery.

Table 3: Association & Correlation HRR with cardiac Biochemical Parameters

Variable	Category	Heart Rate Recovery time			Chi Square (p-Value)	Fisher's Exact Significance	Correlation (Kendall's tau c)
		Low	Normal	High			
Hemoglobin	Low	16	30	3	2.256 (0.689)	0.460	0.032 (0.580)
	Normal	24	71	4			
	High	1	1	0			
Triglyceride level	Low	1	0	0	5.081 (0.279)	0.262	-0.032 (0.375)
	Normal	35	96	7			
	High	5	6	0			
HDL	Low	16	14	2	14.443 (0.006)	0.004	0.175 (0.006)
	Normal	20	65	2			
	High	5	23	3			
LDL	Low	1	6	0	6.326 (0.176)	0.139	-0.059 (0.158)
	Normal	34	92	6			
	High	6	4	1			
Cholesterol	Low	10	17	2	4.146 (0.387)	0.279	0.010 (0.857)
	Normal	29	84	5			
	High	2	1	0			
RBS	Low	2	1	1	5.705 (0.222)	0.128	0.004 (0.891)
	Normal	38	98	6			
	High	1	3	0			
T3	Low	0	5	0	2.971 (0.563)	0.494	-0.032 (0.072)
	Normal	40	96	7			
	High	1	1	0			
T4	Low	1	3	0	10.859 (0.028)	0.025	0.355 (0.043)
	Normal	39	99	6			
	High	1	0	1			
TSH	Low	1	3	0	1.816 (0.769)	0.870	0.018 (0.466)
	Normal	39	92	7			
	High	1	7	0			
ECG	Normal	37	92	6	0.150 (0.928)	0.791	0.008 (0.860)
	Abnormal	4	10	1			
Uric Acid	Low	4	6	0	3.127 (0.537)	0.598	-0.004 (0.923)
	Normal	33	91	7			
	High	4	5	0			
X-Ray Chset	Normal	41	100	7	0.954 (0.621)	>0.999	0.012 (0.163)
	Abnormal	0	2	0			
2D Echo	Normal	41	99	7	1.441 (0.487)	0.617	0.018 (0.090)
	Abnormal	0	3	0			

Peak Expiratory Flow Rate	Normal	40	101	7	0.572 (0.751)	0.539	-0.013 (0.507)
	Abnormal	1	1	0			

DISCUSSION

The present study intended to find out the relationship between HRR and selected cardiac Biochemical Parameters among Nursing Students. The findings of the present study have been discussed with the objectives, Hypothesis, review of literature, Methodology and data analysis and interpretation. The obtained data is presented in the following headings.

In the view of demographic variables Most of the individuals are of age group 24-25, maximum are females (66%). All of them are Pursuing B.Sc. Nursing. All of them are financially dependent. Maximum of them stays in urban area. most of the individuals Heart Rate recovery were normal (68%).only 4.67% of the participant were having high HRR, 27.33%were having low HRR .

In this present study there were no significant association & Correlation was found with demographic variable and HRR. In a previous study done by Shishehbor MH et al 2002 similar context conducted, on association of educational status with heart rate recovery: a population-based propensity analysis, 5246 healthy adults from a population-based cohort were examined. The results showed that, an abnormal heart rate recovery was more common in those adults who did not graduate from high school in comparison to those who had attended at least some college (50% [440/874] vs. 28% [701/2549]). The results also stated that for age, sex, and heart rate recovery, educational status was a weaker predictor¹⁸.

The study results projects that HDL and T4 are significantly associated with HRR. The variable HDL very slightly positively (0.175) correlated with Heart rate recovery and the variable T4 is very moderately positively correlated (0.355) with Heart rate recovery.

In a similar research conducted by Lian-Yu Lin, et al 2008, on Correlation Between Heart Rate Recovery and Metabolic Risks in Healthy Children and Adolescents. In the study 993 healthy children and adolescents aged 12–19 years with reliable measures of cardiovascular fitness were examined. HRR parameters 1–3 min after exercise were calculated from exercise test results. Anthropometric and metabolic risk factors as well as metabolic Z score were obtained. The results showed that the HRR parameters were inversely correlated with most of the metabolic risks, including waist circumference, systolic blood pressure (SBP), serum triglycerides, and serum C-reactive protein (CRP) levels, and were positively correlated with serum HDL levels¹⁹. Bruno M. Costa et al 2020 found that the maximum speed, duration of the tests, HRmax (bpm), HRmax (%) and RPE in three treadmill incremental tests were not significant different ($p > 0.05$)²⁰.

The similar findings were found in the study which was conducted by Elad Maor et al 2013, on Differences in heart rate profile during exercise among subjects with subclinical thyroid disease. They had assessed clinical thyroid disease associated alternations in HRR. As part of the study they evaluated 3799 subjects and HRR was noted after the treadmill test. The result showed that seventy patients had Sub Clinical Hyperthyroidism and 273 had Sub Clinical Hypothyroidism. Compared with age- and sex-matched normal subjects, Sub Clinical Hyperthyroidism in subjects with increased resting heart rate (83 ± 17 vs. 76 ± 12 beats per minute [bpm], $p=0.006$), a significantly higher heart rate recovery (94 ± 12 vs. 90 ± 12 bpm, $p=0.045$), and a significantly lower heart rate reserve (80 ± 20 vs. 87 ± 18 bpm, $p=0.006$). Subjects with Sub Clinical Hypothyroidism showed a trend toward a decreased resting heart rate (75 ± 13 vs. 77 ± 15 bpm, $p=0.09$) and had a significantly lower recovery heart rate (88 ± 12 vs. 90 ± 13 bpm, $p=0.035$)²¹. In a previous study by Anand A et al 2020, in a study of obese participant found insignificant association with HRR²².

CONCLUSION

The study results projects that there is no association and correlation between HRR and selected demographic variables. However the study found an association with the cardiac biochemical parameters i.e. HDL and T₄. The study shows very slight positive correlation between HRR and HDL and moderately positively correlation with T₄and HRR. However there is a scope that if sample size increases some or all of the cardiac biochemical findings may come out to be significantly related with HRR_{Max}

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CONFLICT OF INTEREST: Author declare no conflict of interest

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