"Assess The Relationship Between VO2 Max 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. Cardiovascular diseases are the Main cause of mortality in India .Most of the cardiovascular diseases are correlated to the various Biochemical Parameters of the body .The maintenance of these parameters in the normal limit can help to reduce the incidence rate of cardiovascular diseases. Various biochemical parameters have a key role in the cause of cardiovascular disorders including Cholesterol levels, Thyroid hormones, ECG and uric acid. These factors also can alter the other cardio -respiratory determinants such as VO2Max.

Aim: The aim of the study is to find out the relationship between VO2 Max and Cardiac Biochemical Parameters among young Nursing Students

Methods: Quantitative descriptive 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 of VO2 Max with demographic variables & cardiac biochemical parameters 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 LDL (0.001) and X-Ray chest (0.001) are said to be significantly related with VO2 max. Also, there is a Very slight negative correlation (-0.224) obtained between LDL and VO2max whereas very slight positive correlation is seen between X-Ray chest and VO2max (0.333).

Conclusion: The study result projects LDL & X- ray Chest is associated with VO2 max. The results show a very slight negative correlation between LDL & VO2 max and a very slight positive correlation between X-Ray chest and VO2max.

Key words: Cardio-respiratory fitness, VO2 Max, Cardiac 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 India[1]. 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 fitness[2]. 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 Thyroid hormone[3]. VO2 Max is defined as a measure of the maximum amount of oxygen body can utilize during exercise. It's also called peak oxygen uptake Trusted Source, maximal oxygen uptake, or maximal aerobic capacity. Tests that measure VO2 max are considered to be of gold standard for measuring cardiovascular fitness [4,5]. As the combination of parasympathetic and sympathetic activity

is related to the reduction of heart rate after exercise [4,5] , it represents the autonomic nervous system's balance. VO2 Max is one of the prime factors which act as indicator for cardio-respiratory fitness[4,5]. VO2 Max can be influenced by the body's cardiac biochemical parameters[1]

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[6-7]. 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 population[6,8-12,18]. Researcher has noticed high incidence of mortality due to cardiovascular disorder among young adults, one which can be prevented by proper screening techniques[17-19.] Although a specific risk factor influences the risk that a person will have cardiovascular disease, risk factors tend to aggregate and usually appear in combination[12].

VO2 Max 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 VO2 Max [6,7] 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)[13-17]

From the previous knowledge, the aim of the present study was to identify relationship between VO2 max 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 (VO2 Max) and Cardiac 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 participants were enrolled after signing a written informed consent form, as per the 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- (0.7x age) x85%].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 HRR has been achieved, the speed & incline was increased at the end of three-minute interval.[7]

Test administration: I. The treadmill tests starts at 1.7 mph. The maximal HR were recorded. II. The test was terminated until the subject's HR response exceeds 85% of MHR. To ensure test validity &

accuracy, the participant's HR responses should exceed 115 bpm for two stages upon completion of test. [20]

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 measurement of V̇O2 max in the laboratory provides a quantitative value of endurance fitness for comparison of individual training effects and between people in endurance training. Maximal oxygen consumption reflects cardiorespiratory fitness and endurance capacity in exercise performance.

In the study VO2 max was calculated with the help of following formula.
(Niel Uth, Henry Sorenson & Kristian Overgaard)
$VO_2Max = [HRR_{max} / HRR_{rest}] \times 15.3$ ml/Kg/Min

The obtained range was categorized in the following:

Table -1

FEMALES		
VALUE	**CRITERIA**	**CATEGORY**
<23.6	Very Poor	Poor
23.6-28.9	Poor	
29-32.9	Fair	Good
33.0-36.9	Good	
37.0-41.0	Excellent	Excellent
>41.0	Superior	

Table -2

MALES		
VALUE	**CRITERIA**	**CATEGORY**
<33	Very Poor	Poor
33-36.4	Poor	
36.5-42.4	Fair	Good
42.5-46.4	Good	

46.5-52.4	Excellent	Excellent
>52.4	Superior	

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[18].

Results:

In the view of demographic variables Table-3 shows that Most of the individuals are of age group 24-25 (33.33%), maximum are 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%). Most of these consume fast food between 0 to two times in a week (58%) and 98% sample are having the habit of 0-2 time per week fasting. Majority (92%) are having the habit of 0-2-time feast per week Maximum individuals do not have drug indulgence (95%). Maximum does physical exercise occasionally (44%). (79%) Heart Rate for most of the individuals is normal (68%). The VO2 Max is Normal for most of the individuals (66.67%).

Table 3: 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
VO2 Max	Low	46.00	30.67
	Normal	100.00	66.67
	High	4.00	2.67

Figure 1 showing that only 2.67% of the participant were having high VO2 Max, 30.67 % were having low VO2 Max and 66.67 % having normal VO2 Max

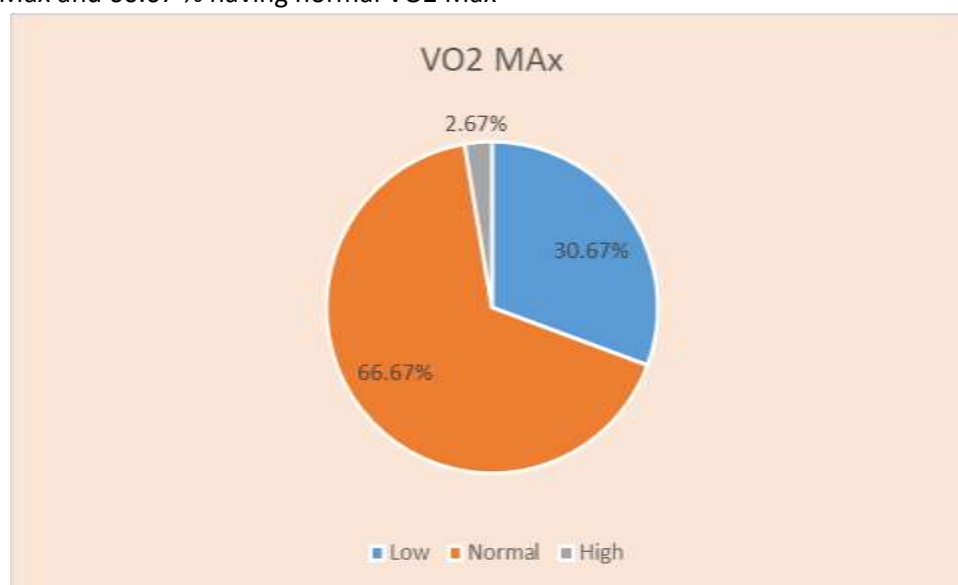Fig1: Frequency & Percentage distribution of Demographic variables according to VO2 max

Table-4 shows that there was no significant correlation between demographic variable with VO2 Max . However there is a scope that if sample size increases some or all of the demographic variables may come out to be significantly related with VO2 Max

Variable	Category	VO2 Max			

		Low	Normal	High	Chi Square (p-Value)	Fisher's Exact Significance	Correlation (Kendall's tau c)
Age	18-19	9	14	1	7.148 (0.307)	0.237	-0.060 (0.386)
		37.5%	58.3%	4.2%			
	20-21	11	32	2			
		24.4%	71.1%	4.4%			
	22-23	6	25	0			
		19.4%	80.6%	0.0%			
	24-25	20	29	1			
		40.0%	58.0%	2.0%			
Gender	Male	18	32	1	0.862 (0.650)	0.695	0.068 (0.359)
		35.3%	62.7%	2.0%			
	Female	28	68	3			
		28.3%	68.7%	3%			
Marital Status	Married	0	1	0	0.503 (0.777)	>0.999	-0.007 (0.318)
		0.0%	100.0%	0.0%			
	Unmarried	46	99	4			
		30.9%	66.4%	2.7%			
Place of stay	Rural	9	31	0	3.601 (0.165)	0.187	-0.065 (0.302))
		22.5%	77.5%	0.0%			
	Urban	37	69	4			
		33.6%	62.7%	3.6%			
Family income	>5000	3	11	0	11.682 (0.166)	0.177	0.077 (0.241)
		21.4%	78.6%	0.0%			
	5001-10000	11	10	2			
		47.8%	43.5%	8.7%			
	10001-20000	10	19	0			
		34.5%	65.5%	0.0%			
	20001-25000	11	28	0			
		28.2%	71.8%	0.0%			
	>25000	11	32	2			
		24.4%	71.1%	4.4%			
Diet	Veg	21	59	3	2.914 (0.233)	0.243	-0.130 (0.089)
		25.3%	71.1%	3.6%			
	Non-Veg	25	41	1			
		37.3%	61.2%	1.5%			
Freq. OF Fast Food	0-2	31	54	2	2.427 (0.297)	0.305	0.118 (0.114)
		35.6%	62.1%	2.3%			
	3 or above	15	46	2			
		23.8%	73.0%	3.2%			
Freq. OF Fast	0-2	46	97	4	1.531 (0.465)	0.587	0.022 (0.084)
		31.3%	66.0%	2.7%			
	3 or above	0	3	0			
		0.0%	100.0%	0.0%			
Freq. OF Feast	0-2	42	93	4	0.459 (0.795)	0.810	-0.022 (0.590)
		30.2%	66.9%	2.9%			
	3 or above	4	7	0			
		36.4%	63.6%	0.0%			

Drug indulgence	No	45	94	4	1.351	0.811	0.020
		31.5%	65.7%	2.8%	0.853		(0.303)
	Other	1	5	0			
		16.7%	83.3%	0.0%			
	Over counter	0	1	0			
		0.0%	100.0%	0.0%			
Physical Exercise	Not at all	9	16	0	8.790	0.258	0.028
		36.0%	64.0%	0.0%	(0.360)		(0.650)
	Occasionally	18	46	2			
		27.3%	69.7%	3.0%			
	Once a week	6	10	1			
		35.3%	58.8%	5.9%			
	Twice week	8	7	1			
		50.0%	43.8%	6.3%			
	3 time week	5	21	0			
		19.2%	80.8%	0.0%			

Table-5 shows that Chi-square and Fisher's exact test for LDL and X-Ray are said to be significantly related with VO2 max and Very slight negative correlation (-0.224) is obtained between LDL and VO2 max whereas very slight positive correlation is obtained between X-ray chest and VO2max (0.333).

Table -5 Association & Correlation of VO2 Max with Cardiac Biochemical Parameters

Variable	Category	VO2 Max			Chi Square (p-Value)	Fisher's Exact Significance	Correlation (Kendall's tau c)
		Low	**Normal**	**High**			
Hemoglobin	Low	16	32	1	4.964	0.262	0.004
		32.7%	65.3%	2.0%	(0.291)		(0.940)
	Normal	28	68	3			
		28.3%	68.7%	3.0%			
	High	2	0	0			
		100.0%	0.0%	0.0%			
Triglyceride level	Low	0	1	0	6.11	0.087	-0.046
		0.0%	100.0%	0.0%	(0.191)		(0.233)
	Normal	40	95	3			
		29.0%	68.8%	2.2%			
	High	6	4	1			
		54.5%	36.4%	9.1%			
HDL	Low	14	16	2	6.428	0.158	0.050
		43.8%	50.0%	6.3%	(0.169)		(0.427)
	Normal	23	62	2			
		26.4%	71.3%	2.3%			
	High	9	22	0			
		29.0%	71.0%	0.0%			
LDL	Low	3	2	2	20.716	0.019	-0.224
		42.9%	28.6%	28.6%	(<0.001)		(0.011)

	Normal	39	91	2			
		29.5%	68.9%	1.5%			
	High	4	7	0			
		36.4%	63.6%	0.0%			
Cholesterol	Low	7	21	1	2.492 (0.646)	0.453	-.057 (0.227)
		24.1%	72.4%	3.4%			
	Normal	37	78	3			
		31.4%	66.1%	2.5%			
	High	2	1	0			
		66.7%	33.3%	0.0%			
RBS	Low	0	4	0	5.732 (0.220)	0.215	-0.057 (0.026)
		0.0%	100.0%	0.0%			
	Normal	43	95	4			
		30.3%	66.9%	2.8%			
	High	3	1	0			
		75.0%	25.0%	0.0%			
T3	Low	0	5	0	2.938 (0.568)	0.387	-0.036 (0.059)
		0.0%	100.0%	0.0%			
	Normal	45	94	4			
		31.5%	65.7%	2.8%			
	High	1	1	0			
		50.0%	50.0%	0.0%			
T4	Low	1	3	0	0.578 (0.965)	0.839	-0.011 (0.621)
		25.0%	75.0%	0.0%			
	Normal	44	96	4			
		30.6%	66.7%	2.8%			
	High	1	1	0			
		50.0%	50.0%	0.0%			
TSH	Low	1	3	0	1.923 (0.750)	0.721	0.022 (0.390)
		25.0%	75.0%	0.0%			
	Normal	44	90	4			
		31.9%	65.2%	2.9%			
	High	1	7	0			
		12.5%	87.5%	0.0%			
ECG	Normal	43	89	3	1.729 (0.421)	0.309	0.053 (0.246)
		31.9%	65.9%	2.2%			
	Abnormal	3	11	1			
		20.0%	73.3%	6.7%			
Uric Acid	Low	4	6	0	1.804 (0.772)	0.724	-0.005 (0.901)
		40.0%	60.0%	0.0%			
	Normal	38	89	4			
		29.0%	67.9%	3.1%			
	High	4	5	0			
		44.4%	55.6%	0.0%			
X-Ray Chest	Normal	46	99	3	17.736 (<0.001)	0.033	0.333 (0.0307)
		31.1%	66.9%	2.0%			
	Abnormal	0	1	1			
		0.0%	50.0%	50.0%			
2D Echo	Normal	44	99	4	1.886 (0.390)	0.294	-0.030 (0.269)
		29.9%	67.3%	2.7%			

	Abnormal	2	1	0			
		66.7%	33.3%	0.0%			
Peak Expiratory Flow Rate	Normal	45	99	4	0.386 (0.825)	0.557	-0.011 (0.577)
		30.4%	66.9%	2.7%			
	Abnormal	1	1	0			
		50.0%	50.0%	0.0%			

DISCUSSION

The present study intended to find out the relationship between VO2 Max and cardiac Biochemical Parameters among young 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 (33.33%), maximum are 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%). Most of these consume fast food between 0 to two times in a week (58%) and 98% sample are having the habit of 0-2 time per week fasting. Majority (92%) are having the habit of 0-2-time feast per week. Maximum individuals do not have drug indulgence (95%). Maximum does physical exercise occasionally (44%). The VO2 Max is normal for most of the individuals (66.67%).

In this study there was no significant correlation found between demographic variable with VO2 Max, where as in a study conducted by Chul-Ho Kim, et al, on effect of aging on Relationships between Lean Body Mass and VO2max in Rowers, it was seen that older rowers showed low VO$_2$ max than their younger counterparts irrespective of the type of exercise used [21].

Association & correlation of VO2 Max with cardiac biochemical parameters shows that the p-value for Chi-square and Fisher's exact test for LDL and X-Ray Chest are said to be significantly related with VO2 max. Very slight negative correlation (-0.224) is obtained between LDL and VO2max whereas very slight positive correlation is obtained between X-Ray chest and VO2max (0.333). The p-values for all other variables are more than 0.05, therefore, no other cardiac biochemical parameters is significantly related with VO2 max.

Similar results were resembled in the article of Cleveland Clinic regarding the "Cholesterol Guidelines & Heart Health". It reveals that elevated low-density lipoprotein (LDL), the bad cholesterol, is a major cause of heart disease. LDL is the major causes the build-up of fatty deposits within the arteries, which will reduce or blocking the flow of blood and oxygen heart needs. This can lead to chest pain and leads to heart attack.[13]

Conclusion

The study result projects LDL & Chest X ray are associated with VO2 max. Also showing a very slight negative correlation between VO2 max and very slight positive correlation is identified between X-Ray chest and VO2max.

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