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Original Article

CARDIOPULMONARY FITNESS AMONG NURSING STUDENTS OF MID-WESTERN NEPAL: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Background

Cardiopulmonary fitness in terms of maximum aerobic capacity (VO_2max) reflects the total physical fitness of a person. Nursing students, who are the future health care workers and a role model, are more likely to encourage their patients to adopt healthy habits. However, there is a gap of evidence about nursing student's physical fitness. Thus, this study aimed to assess the cardiopulmonary fitness in terms of VO_2max among the nursing students of Nepalgunj Nursing campus, Banke, Nepal.

Methods

A cross sectional study was conducted to assess the cardiopulmonary fitness among the nursing students enrolled in Nepalgunj Nursing Campus using a non-probability purposive sampling technique. Queen's College Step test was conducted along with anthropometric measurements. Descriptive analysis, and chi square test was done using SPSS v20. Ethical approval was taken from the Institutional Review Committee, Institute of Medicine, Tribhuvan University (Ref-99(6-11) 077/078).

Results

Total 189 female nursing students participated whose mean age was 21.06µ3.41 years. Thirty-six (19%) were overweight and 11 (5.8%) were obese. Out of total, 56 (29.6%) had a high-risk waist hip ratio. Almost half (42.9%) of the respondents had superior level of VO_2max with mean VO_2max value of 43.605µ10.686. There was a significant association between VO_2max and BMI (χ^2= 18.856, p= 0.016).

Conclusion

There is superior level of cardiopulmonary fitness among the young nursing adults. Since BMI is associated with VO_2max, one should be aware of maintaining a normal BMI.

Keywords: Cardiopulmonary fitness, Nursing students, VO_2max

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INTRODUCTION

The world is facing an epidemic of chronic non-communicable diseases and physical inactivity is one of the major risk factors.[1] Appropriate participation in some form of physical activity provides young people with musculoskeletal, cardiovascular, neuromuscular and psychological benefits. Physical fitness is one of the indicators of healthy lifestyle and has positive effect on physical, mental, and social wellbeing of an individual.[1] In 2017, there was 5,850,044 premature deaths in Nepal. Among which 11.3% accounts for cardiovascular disease (CVD).[2]

Cardiopulmonary fitness in terms of maximum aerobic capacity (VO_2max) reflects the total physical fitness of a person. VO_2max , the maximum amount of oxygen can be taken up and utilize by body during severe exercise is a most widely used parameter to assess the cardiopulmonary fitness.[3] There is a strong relation between cardiopulmonary fitness and CVD mortality.[4-7] Cardio-pulmonary fitness in terms of maximum aerobic capacity (VO_2max) is a gold standard index for physical fitness.[4,8]

Nursing students who are the future health care professionals are expected to be an example to adopt healthy lifestyle by others.[9,10] However, evidence shows that many nursing students engage in risky health behaviours and are physically inactive[11-13] Lack of time, laziness, strenuous professional training, busy work schedule, busy learning schedule, lack of energy and exercise not fitting around study or placement schedules are the most notable hindering factors.[8,10] Nursing students are the future health care professionals and have a significant role to provide physical activity counseling to patients. It is established that nurses who are physically active and live a healthy life encourage patients more directly and advise them on healthy lifestyles.[14] Furthermore, promoting physical activity in nursing students has the potential to increase their self-esteem and life satisfaction and decrease the risk of anxiety and depression.[15]

Meanwhile there is a gap of evidence about nursing student's physical fitness in Nepal. Thus, this study aimed to assess the cardiopulmonary fitness in terms of VO_2max among nursing students of Nepalgunj Nursing campus, Banke, Nepal.

METHODS

A cross sectional observational study was conducted among the nursing students of Nepalgunj Nursing Campus. A non-probability, purposive sampling technique was used to select the participants. The data was collected from August 2020 to September 2020.

Ethical clearance was taken from the Institutional Review Committee (IRC) of the Tribhuvan University, Institute of Medicine, Kathmandu, (Ref-99(6-11) 077/078) prior to starting the study and then permission from the study site was taken. The participants were explained about the study purpose and their rights in the participation. Verbal and written informed consent were obtained from each of them. All the nursing students enrolled in the proficiency certificate level and bachelor level, willing to participate and without any medical or surgical conditions were enrolled in the study. There were only 3 male nursing students in the campus who were excluded from the study to generalize the overall findings to the female students.

Sample size was estimated using the modified Cochran's formula

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

Where n_o is Cochran's sample size recommendation for smaller population = 385

N is the population size = 228 (Total Nursing students in Nepalgunj Nursing Campus) and

n is the new adjusted sample size.

Using the formula, we got:

$$n = \frac{385}{1 + \frac{(385-1)}{228}} = 143.431372$$

Although the estimated sample size was 143 from the Cochran's modified sample size calculation, we collected the data from 189 samples to increase the generalizability.

Measurement of weight: The weight was measured by digital weighing scale (Accuweight Digital Scale). The scale was kept on a flat surface and the participant was requested to stand in the center of the scale facing front with bare foot and minimal clothing without any support.

Measurement of height: The height was taken using a stadiometer (Prime Surgical) bare foot upon firm even surfaced floor.

Measurement of waist circumference: The waist circumference (WC) was measured at the level of umbilicus, halfway between the iliac crest and costal margin during expiration in standing position directly over the skin using an in-elastic measuring tape (CeAnGye).[16,17]

Measurement of hip circumference: The hip circumference (HC) was measured at the point of greatest circumference around hips and buttocks with an in-elastic measuring tape without indenting the soft tissue.[18]

Using the height and weight, BMI was calculated and computed. BMI cutoff levels were adopted as per Asia Pacific guidelines.[19] Similarly, Waist hip ratio (WHR)

was also calculated using WC and HC.[17]

Cardiopulmonary fitness test: The cardiopulmonary fitness of the nursing students was measured through Queen's College Step Test.[18] Stepping was be done on a stool of 16.25 inches for a total duration of 3 minutes at the rate of 22 cycles per minute. A metronome app (Tuner and Metronome-soundcorset tuner) was used to pace the stepping cycle (four-step cadence; up-up-down-down). After completion of the exercise, subjects were asked to remain standing, and the carotid pulse rate was measured for 15 seconds starts from the 6th second of the recovery period. This 15 second carotid pulse rate was converted into beats per minute and VO_2max was calculated using the equation given below. Then after, the calculated VO_2max was further classified according to the categories of Katch et. al. [5,20]

VO_2max (ml/kg/min) = 65.81-(0.1847 x pulse rate in beats per min)

All the collected data was then compiled, organized, coded and then analysed using a statistical package for social sciences (SPSS v.20). Descriptive statistics was used to calculate frequency, percentage, mean and standard deviation. Inferential statistics · chi square test was done to determine the correlation and association between VO_2max with the BMI and WHR.

RESULTS

Total of 189 nursing students participated in the study with the mean age of 21.06µ3.42 years. The general characteristics of the participants are shown in (Table 1).

Table 1: General characteristics of the participants

General Characteristics	Mean
Age (yrs)	21.06±3.42
Height (cm)	154.08±5.93
Weight (kg)	51.05±8.61
Waist circumference (cm)	73.18±9.35
Hip circumference (cm)	88.94±8.19

(Table 2). revealed that the majority of the participants had normal BMI. Meanwhile only few have been identified to be overweight and obese.

Table 2: Distribution of body mass index among the participants

BMI Categories (kg/m²)	Frequency (n)	Percentage (%)
Normal (BMI=18.50-22.9)	142	75.1
Overweight (BMI=23.0-27.4)	36	19.0
Obese (BMI ≥27.5)	11	5.8
Mean BMI	21.69±3.185	

Although most of the participants had normal WHR, high risk WHR was still present among few (Table 3).

Table 3: Distribution of waist hip ratio among the participants

WHR Categories	Frequency (n)	Percentage (%)
Normal WHR (≤0.85)	133	70.4
High risk WHR (>0.85)	56	29.6
Mean WHR	0.8225±0.70	

Majority of the respondents had superior level of Vo_2max (Table 4).

Table 4: Distribution of VO_2max among the participants

VO2max Categories	Frequency (n)	Percentage (%)
Poor (23.60-28.9)	1	0.53
Fair (29.0-32.9)	5	2.65
Good (33.0-36.9)	43	22.80
Excellent (37.0-41.0)	59	31.21
Superior (>41.0)	81	42.90
Mean VO_2max	43.605µ10.686	

(Table 5) displays that majority of the participants with normal BMI had superior level of VO_2max whereas poor level of VO_2max was present only in one obese participant which was absent among participants with normal BMI and overweight.

Table 5: Distribution of VO_2max according to body mass index and waist hip ratio

Variables	VO_2max					
BMI	Poor n (%)	Fair n (%)	Good n (%)	Excellent n (%)	Superior n (%)	Total (n)
Normal BMI	0 (0)	1 (0.70)	35 (24.65)	40 (28.17)	66 (46.48)	142
Overweight	0 (0)	3 (8.33)	7 (19.44)	16 (44.44)	10 (27.78)	36
Obese	1 (9.09)	1 (9.09)	1 (9.09)	3 (27.27)	5 (13.89)	11
WHR						
Normal WHR	1 (0.75)	5 (3.76)	26 (19.55)	40 (30.08)	61 (45.86)	133
High risk WHR	0 (0)	0 (0)	17 (30.35)	19 (33.93)	20 (35.71)	56

The result also revealed that there was a significant association between VO_2max and BMI (?2=18.856, p=0.016) but not with WHR (Table 6).

Table 6: Association of VO2max with body mass index and waist hip ratio

Variables	VO_2max					$\chi 2$	p value
	Poor (n)	Fair (n)	Good (n)	Excellent (n)	Superior (n)		
BMI							
Normal BMI	0	1	35	40	66	18.865	0.016*
Overweight	0	3	7	16	10		
Obese	1	1	1	3	5		
WHR	0	3	21	24	37	7.300	0.121
Normal WHR	1	5	26	40	61		
High risk WHR	0	0	17	19	20		

*Significant at p value <0.05

DISCUSSION

The study revealed that there is superior level of VO_2max among almost half (42.9%) of the young nursing adults, which is similar to the findings of the study conducted in Kathmandu suggesting higher aerobic capacity among nepalese adult due to lifestyle and geographical differences compared to other South Asian countries.[5]

In this study, majority (75.1%) of the young adults have normal BMI followed by few were overweight (19%) and obese (5.8%), which is similar with the findings of a study conducted among medical students in United Kingdom with 80.5% of the students having normal BMI and 11.3% being overweight[21] but contradictory to the study conducted in Pakistan revealing 44% of overweight/obesity.[22] This study also revealed that superior level of VO_2max was proportionately higher among young adults with normal BMI compared to overweight and obese which is supported by many studies suggesting that increased BMI is associated with decreased VO_2max.[3,21-23]

Similarly, the study also showed that higher proportion of the young adults had normal WHR and the majority (45.86%) of the young adults with normal WHR had the superior level of VO_2max compared to high-risk waist hip ratio. This finding is supported by the study showing inverse relation of Waist circumference, body fat and sedentary individuals who usually have high risk WHR with poor VO2max.[5,21-23]

Since, the findings of the study is limited to only young female adults of one nursing campus of Western Nepal, it cannot be generalized to young adults of the nation and to male young adults.

CONCLUSION

There is superior level of cardiopulmonary fitness among the young nursing adults. However, the proportion of poor VO_2max is present among young adults with obesity. Thus, maintaining a normal BMI is crucial to prevent premature cardiovascular morbidities and mortalities.

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