

A Study to Assess Physical Fitness Index using Modified Harvard Step Test in Relation with Body Mass Index Among B.Sc. Nursing 1st Year Students in a Selected College at Bhilai, (C.G.)

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Abstract: The Physical Fitness index measures the physical fitness for Muscular work and the ability to recover from the work. The present study was undertaken to assess the physical fitness index using Modified Harvard Step Test in B.Sc. Nursing 1st year students age group of 17 to 20 years. **Method:** Descriptive study was done on 60 B.Sc. Nursing 1st year students and Physical Fitness Index was measured using Modified Harvard step test. **Data Analysis:** Statistical analysis was done using descriptive analysis and Chi square test. **Result:** Statistical analysis shows that physical fitness in B.Sc. Nursing 1st year students is not satisfactory. Maximum students 30(50%) were having poor physical fitness index, 25(41.67%) were having low average physical fitness and 5(8.33%) were having average physical fitness index. Maximum students 44(73.33%) were having normal body mass index, 10(16.67%) were underweight, 5(8.33%) were pre obesity/overweight, 1(1.67%) were obese. Correlation between physical fitness index and body mass index of B.Sc. Nursing 1st year students shows that there is a moderate negative correlation between PFI & BMI as $r = -0.48$ which means as BMI increases, PFI decreases. **Conclusion:** physical fitness of B.Sc. Nursing 1st year students in selected college at Bhilai is not satisfactory.

Keywords: Physical fitness index, Modified Harvard step test, Body Mass Index, Physical activity.

1. Introduction

Adolescence is a life phase in which the opportunities for health are great and future patterns of adult health are established. Health in adolescence is the result of interactions between prenatal and early childhood development and the specific biological and social-role changes that accompany puberty, shaped by social determinants and risk and protective factors that affect the uptake of health-related behaviours. The shape of adolescence is rapidly changing the age of onset of puberty is decreasing and the age at which mature social roles are achieved is rising. New understandings of the diverse and dynamic effects on adolescent health include insights into the effects of puberty and brain development, together with social media. A focus on adolescence is central to the success of many

public health agendas, including the Millennium Development Goals aiming to reduce child and maternal mortality and HIV/AIDS, and the more recent emphases on physical health, mental health, injuries, and non-communicable diseases. Greater attention to adolescence is needed within each of these public health domains if global health targets are to be met. Strategies that place the adolescent years centre stage rather than focusing only on specific health agendas provide important opportunities to improve health, both in adolescence and later in life.

To grow and develop in good health, adolescents need information, including age-appropriate comprehensive sexuality education; opportunities to develop life skills; health services that are acceptable, equitable, appropriate and effective; and safe and supportive environments. They also need opportunities to meaningfully participate in the design and delivery of interventions to improve and maintain their health. Expanding such opportunities is key responding to adolescent's specific needs and rights.

Tremblay MS (2010) describes physical fitness is a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Physical fitness is generally achieved through proper nutrition, moderate-vigorous physical exercise, and sufficient rest. Before the industrial revolution, fitness was defined as the capacity to carry out the day's activities without undue fatigue. However, with automation and changes in lifestyles physical fitness is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypo kinetic diseases, and to meet emergency situations.

University of Rochester Medical Centre (2015) describes that exercise is an important part of keeping teens healthy. Encouraging healthy lifestyles in children and teens is important for when they grow older. Lifestyles that are learned in childhood are more likely to stay with the child into

adulthood. Some changes in lifestyle can be harder to make as a person ages. The best way to promote healthy lifestyles is for the whole family to become involved. Teenagers need at least 60 minutes of moderate to vigorous physical activity on most days to maintain good health and fitness and for healthy weight during growth. Physical activity should include aerobic, muscle-strengthening, and bone-strengthening exercises. Parents are encouraged to limit a teen's screen time (TV, video game, phone, tablet, and computer) to less than 2 hours daily and replace these sitting activities with activities that require more movement.

According to the *American Heart Association and the President's Council on Fitness, Sports, and Nutrition (2012)* benefits from regular exercise or physical activity improves blood circulation throughout the body, keeps weight under control, improves blood cholesterol levels, Prevents and manages high blood pressure, prevents bone loss, boosts energy level, releases tension, improves the ability to fall asleep quickly and sleep well, improves self-image, helps manage stress, fights anxiety and depression, increases enthusiasm and optimism, increases muscle strength.

According to *WHO (2018)* globally 28% of adults aged 18 and over were not active enough in 2016 (men 23% and women 32%). This means they do not meet the global recommendations of at least 150 minutes of moderate-intensity, or 75 minutes vigorous-intensity physical activity per week. In high-income countries, 26% of men and 35% of women were insufficiently physically active, as compared to 12% of men and 24% of women in low-income countries. Low or decreasing physical activity levels often correspond with a high or rising gross national product.

In India the overall prevalence of insufficient physical activity in adolescents in 2001 was 76.6 per cent which has now decreased to 73.9 per cent in 2016. Among boys the prevalence of physical activity in 2001 was 76.6 per cent which has climbed down to 71.8 per cent in 2016. Among girls it was 76.6 per cent in 2001 which has decreased slightly to 76.3 per cent in 2016.

2. Methodology

Study design: Descriptive research design

Study setting: P.G. College of Nursing, Hospital Sector, Bhilai

Sample size: 60

Sampling: Non probability convenient sampling

Inclusive Criteria: In the present study inclusion criteria are those female B.Sc. Nursing 1st year students who are:

- Between age group of 17-20 years
- Present at the time of data collection.
- Willing to participate in the study.
- Don't have any musculoskeletal deformity or injury
- Blood pressure within normal limits (100-120 mmHg systolic and 70-80mmHg diastolic)
- Spo2 within normal limits (95% or higher)

Exclusion Criteria: This includes female B.Sc. Nursing 1st year students who are:

- More than 20 years.
- Not present at the time of data collection.
- Who are not willing to participate in the study
- Students with physical or musculoskeletal disabilities
- Students with hypertension
- Students with Spo2 less than 95%

Material: Modified Harvard step bench = 33cm, Stop Watch, Metronome, Weight & Height measurement machine PFI was calculated by using following formula.

Procedure: The Subject was advised to step up on the Modified Harvard steps of 33cms height once every two Seconds (30 per minute) for 5 minutes, a total of 150 steps.

At one, three and five minutes during the test, pulse rate was recorded as

- PR1 (Pulse Rate 1) – 1 min after exercise
- PR2 (Pulse Rate 2) – 2 min after exercise.
- PR3 (Pulse Rate 3) – 3 min after exercise



Fig. 1. Modified Harvard step test

Physical fitness Index (%) (PFI %)

$PFI = \text{Duration of exercise in seconds} \times 100 / 2(\text{pulse } 1+2+3)$
Grading of physical fitness of B.Sc. Nursing 1st year students

Table 1
Physical Fitness Index Score

Rating	Fitness Index (Long Form)
Excellent	>97
Good	83-96
Average	68-82
Low Average	54-67
Poor	<54

(By Brouha at al.)

Body mass index (BMI) is a value derived from the mass (weight) and height of a person. The BMI is defined as the body mass divided by the square of the body height, and is expressed in units of kg/m², resulting from mass in kilograms and height in meters.

Grading of Body mass index of B.Sc. Nursing 1st year students.

Table 2
Body Mass Index Score

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal or Healthy Weight
25.0 – 29.9	Pre-Obesity/Over weight
≥30	Obese
30.0 -34.9	Obesity class 1
35.0-39.9	Obesity class 2
Above 40	Obesity class 3

(WHO)

According to the inclusion & exclusion criteria subjects were included in study. The subjects were given rest for 5 min in a chair. Resting pulse rate was measured in that resting position. After explanation subjects were told to do modify Harvard step test in a rhythmic manner & the data were recorded. The detail procedure of exercise test was explained to the subjects & actual demonstration was given before starting test in order to allay apprehension.

3. Results

A. Physical Fitness Index of B.Sc. Nursing 1st year students after administering modified Harvard's step test

Table 3
Analysis of Physical Fitness Index (PFI) of B.Sc. (N) 1ST year students after administering Modified Harvard's Step test

PFI Rating	Frequency	Percentage	Mean, Median, SD
Excellent (>97)	0	0	Mean=47.24 Median=46.89 SD=15.46
Good (83-96)	0	0	
Average (68-82)	5	8.33	
Low average (54-67)	25	41.67	
Poor (<54)	30	50	
Total	60	100	

Table 3 depicts the assessment of physical fitness index of B.Sc. Nursing 1st year students. Maximum students 30(50%) were having poor physical index, 25(41.67%) were having low average physical fitness and 5(8.33%) were having average physical fitness index.

B. Body Mass Index of B.Sc. Nursing 1st year students

Table 4
Analysis of Body Mass Index (BMI) of B.Sc. (N) 1ST year students

BMI (Kg/M ²)	Frequency	Percentage	Mean, Median, SD
Underweight< 18.5	10	16.67	Mean=21.03 Median=20.54 SD=2.81
Normal (18.5-24.9)	44	73.33	
Pre-Obesity/Overweight (25-29.9)	5	8.33	
Obese (>=30)	1	1.67	
Total	60	100	

Table 4 depicts that analysis to assess the body mass index of B.sc Nursing 1st year students. Maximum students 44(73.33%) were having normal body mass index, 10(16.67%) were underweight, 5(8.33%) were pre obesity/overweight, 1(1.67%) were obese.

C. Correlation between Physical Fitness Index & Body Mass Index of B.Sc. Nursing 1st year students

Table 5
Analysis of correlation between level of Physical Fitness Index and Body Mass Index among B.Sc. Nursing 1st year students

Relationship	Mean	SD	'r'	Inference
Physical Fitness Index	47.246	15.463	-0.48	Moderate negative correlation
Body Mass Index	21.03	2.819		

Table 5 shows that there is a moderate negative correlation between PFI & BMI as $r = -0.48$ which means as BMI increases, PFI decreases.

D. Association of Physical Fitness Index with selected socio demographic variables

From table 6, there is a significant association between physical fitness and mother's education and physical activity as the calculated chi-square value (18.81, 7.11) was greater than table value (18.41, 5.99) at df (10,2) respectively.

E. Association of Body Mass Index with selected socio demographic variables

From Table 7, there is a significant association between body mass index and age, religion, income and siblings as the calculated chi-square value (24.94, 33.35, 9.79, 24.9) was greater than table value (21.66,3.84, 9.79, 24.9) at df (3,3,9,9) respectively.

4. Discussion

The present study was undertaken to assess the physical fitness index using Modified Harvard Step test in relation with Body Mass Index among B.Sc. Nursing 1st year students in a selected college at Bhilai, (C.G.) the physical fitness index of B.Sc. Nursing 1st year students. Maximum students 30(50%) were having poor physical index, 25(41.67%) were having low average physical fitness and 5(8.33%) were having average physical fitness index.

The findings of the study are supported by the study conducted on Students of Physiotherapy from Ahmadabad Physiotherapy College, Bopal, Ahmadabad initiated by Dharmesh Parmar (2013) to assess the physical fitness index

Table 6
Analysis of association between the levels of physical fitness among B.Sc. Nursing 1st year students with selected demographic variables

Socio Demographic Variables	Chi-Square	df	Critical Value at 0.05	Inference
Age	5.07	6	12.59	Not significant
Religion	3.69	2	5.99	Not significant
Father education	10.61	10	18.31	Not significant
Mother education	18.81	10	18.41	Significant
Father occupation	5.44	6	12.59	Not significant
Mother occupation	3.26	6	12.59	Not significant
Family monthly income	6.16	6	12.59	Not significant
Sibling	9.89	6	12.59	Not significant
Diet	0.66	2	5.99	Not significant
Participation in Physical activity	7.11	2	5.99	Significant

Table 7

Analysis of association between the Body Mass Index among B.Sc. Nursing 1st year students with selected demographic variables

Socio Demographic Variables	Chi-Square	df	Critical Value at 0.05	Inference
Age	24.94	3	21.66	significant
Religion	33.35	3	3.84	significant
Father education	11.92	15	24.99	Not significant
Mother education	15.90	15	24.99	Not Significant
Father occupation	3.48	9	6.91	Not significant
Mother occupation	3.07	9	6.91	Not significant
Family monthly income	9.79	9	6.91	significant
Number of Sibling	24.9	9	6.91	significant
Diet	1.69	3	7.82	Not significant
Participation in Physical activity	1.89	3	7.89	Not Significant

using Modified Harvard Step Test in young adult in the age group of 17 to 24 years with varying degree of physical activities. Convenient sampling technique is used for sample selection. Cross sectional study was done on 105 physiotherapy students and Physical Fitness Index was measured using Modified Harvard step test. Statistical analysis was done using descriptive analysis and Chi square test. Analysis shows maximum student 35(33.33 %) having fire physical index, 28(26.66%) having good physical fitness index, 25(23.80%) having poor physical fitness index and 17(16.19%) were having excellent physical fitness. Physical fitness of physiotherapy students in Ahmadabad Physiotherapy College is not satisfactory and Female is having better physical fitness.

Analysis to assess the body mass index of B.Sc. Nursing 1st year students. Maximum students 44(73.33%) were having normal body mass index, 10(16.67%) were underweight, 5(8.33%) were pre obesity/overweight, 1(1.67%) were obese.

Jageet Kaur (2008). Measuring Body Mass Index, the study was carried out on 251 subjects aged 17 years to 43 years. Out of 251 participants 24(9.56%) participants were estimated underweight, 204(81.27%) were normal weight and 23 (9.16%) over weight. Out of 23 (9.16%) subjects 15 (5.97%) were pre obese and 8(3.18%) participants were obese class I. According to age it was observed that in 17-21years there were 159 students. Out of these 16(10.06%) subjects estimated as underweight and 135(84.90%) were having normal weight whereas 5(3.18) were overweight. In 22-26 years, there were 68 students. Out of these 8(11.76%) subjects were estimated as underweight category and 55(80.88%) having normal weight whereas 5(7.35%) were overweight. The current study shows the prevalence rate of obesity collectively from all age groups we find the prevalence of obesity and underweight is approximately equal to each other. There is a need to be aware of both as they can lead to problems in late life. The overweight is prone to cardiovascular, diabetes etc. while the underweight may be anaemic, suffering from mal-nutrition and more prone to infection.

Analysis of correlation between level of Physical Fitness Index and Body Mass Index among B.Sc. Nursing 1st year students shows that there is a moderate negative correlation between PFI & BMI as $r = -0.48$ which means as BMI increases, PFI decreases.

The findings of the study are supported by study on Body mass index, physical activity, and physical fitness of adolescence the study conducted by Ratna Candra Dewi were carried out in 2021 at Indonesia. The study samples totalled 70

male and female students at a junior high school. The findings show that 15 (21.4%) students are underweight (BMI ≤ 18.4), 48 (68.6%) students are having normal body mass index (BMI 18.5-25) and 7(10%) students are overweight (BMI ≥ 25.1). the findings of the study suggest that an increased fat mass percentage is associated with decreased levels of physical fitness, and an increase in fat free mass significantly increases physical fitness in healthy young adults. In addition, obesity in terms of percentage fat mass is a better determinant than BMI for low physical fitness.

5. Conclusion

Physical fitness of B.Sc. Nursing 1st year students in selected college at Bhilai is not satisfactory. This may be due to the sedentary life style and lack of sporting activities & also over emphasis on academic pursuits.

This study has clearly established that physical activity is an important determinant and predictor of physical fitness. Pulse rate variability (pre and post exercise) was minimum among subjects who had excellent physical fitness and it was maximum among subjects who had poor physical fitness index. It is important for future Physiotherapist to know their level of present fitness and try to improve it.

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