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Behavioural and Physiological Risk Factors for Non-Communicable Diseases Among University Postgraduates in Mysore

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ABSTRACT

The commonest causes of increased morbidity and mortality among the populations are non-communicable diseases (NCDs). The trend has reversed in which those of younger age are dying more than the older age group. This is largely due to risk factors in younger age group like behavioural and modifiable ones namely tobacco use, consumption of unhealthy diet, low physical activity and consumption of alcohol. This data on important behavioural risk factors among the young population could be used for proper planning and implementation of health care strategies. This study was conducted in the University campus in Mysore. Details regarding the behavioural risk factors of NCDs was collected using a structured proforma amongst 400 students. Anthropometry and blood pressure was also measured using standard techniques. Current tobacco use among students was 10.5% and consumption of alcohol was 17.2%. The most prevalent risk factor was the low intake of fruits and vegetables 93.8%, followed by inadequate physical activity 48.5%. The high prevalence of risk factors of NCDs among students emphasises an immediate requirement for wellness programs and screening of health-related events.

KEY WORDS: Non communicable diseases, Risk factors, Younger age

Introduction

The commonest causes of increased morbidity and mortality among the populations are non-communicable diseases (NCDs). NCDs account for more than 70% of deaths worldwide[1]. Common NCDs that claim lives are diseases of cardiovascular system, cancer and diabetes. In India the situation is similar in which more than 60% of deaths occur due to NCDs[2, 3]. The trend has reversed in which those of younger age are dying more than the older age group[4]. This is largely due to risk factors in younger age group like behavioural and modifiable ones namely tobacco abuse, consumption of unhealthy diet, low physical activity and consumption of alcohol. Chances of increased mortality are more if morbidities like high blood pressure and obesity coexist[5, 6].

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The World Health Organisation highlights major NCDs like diseases of cardiovascular system, malignancies, diabetes and diseases of respiratory system as the leading causes of mortality[7].

Of late NCDs have become prevalent in adolescents and young adults because of their adoption of lifestyle that include adverse behaviours and poor dietary habits[8]. Prevention of NCDs among adolescence is of paramount importance because the risk factors for NCDs get imbibed in these shaping years and those become lifelong deleterious habits that pose a risk for development of diseases in the adulthood. Along with the lifestyle changes, poor health care system has been the core factor for development of NCDs[9]. The rise in NCDs among adolescents has been one of the worst public health crises the world has witnessed. Immediate and sustainable interventions are required for reducing the morbidity and mortality and in reducing the healthcare burden. Though NCDs have become a global priority, the knowledge and preventive measures among university students are yet to improve. According to a study in Saudi Arabia, the prevalence of NCDs remains high among university students with more than 50% of them having a risk of type 2 Diabetes Mellitus[10].

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Studies all over the world have linked unhealthy lifestyles as the major risk factors for development of NCDs among adolescents[11, 12]. According to NFHS-6 data, In India 36.3% men, 8.4% women above the age of 15 use tobacco and 18.9% men, 1.1% women consume alcohol. In Karnataka 28.6% men, 9.4% women use tobacco products and 17.3% men and 0.8% women consume alcohol[13]. Social support also plays a significant role in prevention of NCDs, albeit indirectly. Health status of students is significantly influenced by the lack of social support since the students cannot inculcate healthy behaviours (eating healthy food, doing regular exercise, and staying away from drugs) and improve their mental and intellectual conditions (stress and depression, lack of concentration) that increases the likelihood of developing non-communicable diseases (NCD) such as Diabetes and Cardiovascular diseases[14]. There is a paucity in regional data on risk factors among young population in Mysore and University of Mysore campus provides a chance to gather data among wide variety of young students from different background. This data on important behavioural risk factors among the young population could be used for proper planning and implementation of health care strategies.

Objectives:

To determine the core behavioural (tobacco use, alcohol consumption, diet and physical exercise) and physiological (BMI and blood pressure) risk factors of non-communicable diseases among postgraduate students.

Methods

Study Design

A cross-sectional study design was used.

Study Population

The study population was postgraduate students at the University of Mysore (UOM), Manasa Gangotri campus.

Study Period

The research was conducted in the UOM campus over an 18-month period, from December 2016 to May 2018.

Eligibility Criteria

Inclusion Criteria:

1. Postgraduate students at UOM who provided written informed consent.

Exclusion Criteria:

1. Students who were not present on the day of data collection

2. Students from countries other than India.

Sampling Procedure

Sample Size: The sample size is calculated by 'estimation technique for proportion' using the formula $N = z^2pq/d^2$ with level of Significance (α**)** = 5%, z =1.96 at 95% CI, absolute allowable error (d) =5%. Taking the prevalence of tobacco smoking 27%[15], alcohol consumption 21.4%[16], unhealthy diet 64.08%[17], physical inactivity 89.86%[17] the sample size calculated was 315, 269, 368, 146 respectively. Amongst these, 368 was selected as the sample size.

Sampling Method: List of courses in UOM is taken as sampling frame. There are 66 courses and number of students collectively in first and second year is around 4000. 10% of the courses was taken up for study, so around 7 courses were selected. Sampling interval (K) for the "courses" is calculated by dividing total number of courses 66 by required number of courses which is 7. Thus, the sampling interval K is 9. The first course was selected using lottery system of simple random sampling and this method is adopted because each course has an equal chance of being selected. Then the sampling interval was used to select further courses. Suppose "i" is the first selected course among the first 9 courses (Sampling interval) then the sampling chain is i+K, i+2K, i+3K ..... and so on, where K is sampling interval. Then all the students registered in the selected courses belonging to first and second year who meet the eligibility criteria will be included. As soon as the required sample size is met, the systematic random sampling technique is stopped. Course number selected: 2, 11, 20, 29, 38, 47, 56, 65. Name of the course according to course number: Anthropology, Commerce, Food science and nutrition, Kannada (MA), Master of Business Administration, Philosophy, West Asian Studies, Social work. Total participants in selected courses respectively: 6, 153, 7, 73, 117, 15, 8, 21.

Data Collection

Informed consent was obtained from all participants. Data was collected using a pre-tested semi-structured questionnaire covering sociodemographic characteristics and behavioural risk factors (tobacco and alcohol use, fruit and vegetable consumption, physical activity). Physical measurements (height, weight, waist and hip circumference, blood pressure) were also collected.

- Current Tobacco user: It is defined as anyone who at the time of survey, uses tobacco in any form either

daily or occasionally for past one year (cigarettes, bidi, chewing tobacco, gutkha, hookah)

- Current alcohol user: Defined as those who consume one or more than one drink of any alcohol in the year preceding the survey.
- Diet: One standard serving of fruits and vegetables is equivalent to 80 grams, translated into different units of cups depending on types of vegetables and fruits. WHO recommends consumption of at least 400 grams of vegetables and fruits per day or 5 servings of 80 grams of fruits and vegetables per day.
- Vegetables are considered to be 1 serving if: Raw green leafy vegetables = 1 cup (Spinach, salad, etc), other vegetables, cooked or chopped raw = ½ cup (Tomatoes, carrots, pumpkin, corn, cabbage, fresh beans, onion, etc), Vegetable juice =1/2 cup.
- Fruit is considered to be 1 serving if: Apple, banana, orange = 1 medium size piece, Chopped, cooked, canned fruit = ½ cup, Fruit juice = ½ cup (Juice from fruit, not artificially flavoured).

Unhealthy diet was defined as those who were consuming less than 5 servings of fruits and vegetables per day.

Healthy diet was defined as those who were consuming more than 5 servings of fruits and vegetables per day.

- Physical Activity: It was categorized as moderate and vigorous intensity activities in three domains such as work related, leisure related and travel. Metabolic equivalent (MET) is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/hour. It is estimated that compared to sitting quietly, a person's caloric consumption is four times as high when being moderately active and eight times as high when being vigorously active. So moderate and vigorous activity in work or leisure related domain is allotted 4 and 8 MET value respectively. Walking or cycling is allotted 4 MET value. Time spent on each type of activity per week, and intensity is multiplied and summed up to get the individual's activity levels. Adequate physical activity was defined as those who were having activity of at least 600 MET minutes per week. Inadequate physical activity was defined as those who were having activity of less than 600 MET minutes per week.

Anthropometric measurements

- Height: Measurements were marked on the wall using non stretchable measuring tape.
- Weight: Electronic weighing scale was used.
- Waist measurement is taken at the level of midpoint between the inferior margin of the rib and crest of the ileum in the mid-axillary plane, using a non-stretchable tape over light clothing at the end of a normal expiration; with the arms relaxed at the sides. A cut off level of 90 cm for males and 80 cm for females was considered normal.
- Hip circumference was measured at the maximum circumference over the buttocks with light clothing with the arms relaxed at the sides.
- Body Mass Index (BMI): BMI was calculated by the formula:

Body Mass Index = Weight in Kilograms/ Height in meter^2

- Under Weight: The person with BMI less than 18 is considered underweight, 18 and 23 is considered normal and above 23 is considered as overweight / obese.
- Blood pressure: It was measured using digital blood pressure monitor. Participants with systolic blood pressure above 140 mmHg and diastolic blood pressure above 90mmHg were categorised as hypertensive. Participants with systolic blood pressure between 120 mmHg and 139 mmHg and diastolic blood pressure between 80-89 mmHg were categorized as pre hypertensives.

Ethical Considerations

Ethical approval was obtained from the institutional ethical committee prior to the study.

Statistical Analysis

Data was entered into Microsoft Excel, and descriptive statistics (frequency and proportions) were calculated. The chi-square test for association and binomial logistic regression was utilized to analyse data, with R software employed for statistical analysis. A significance level of 5% was set.

Results

The results of the study conducted among 400 postgraduate students are presented below, including sociodemographic profiles, behavioural risk factor prevalence, and the predictors associated with the risk factors.

1. Sociodemographic Characteristics

The study participants' age ranged from 21 to 30 years, with a mean age of 22.38 years (SD ±1.19). Of the 400 subjects, 56.5% were male and 43.5% were female. Majority of participants (88.5%) were Hindu and approximately half (52.8%) were from rural areas. Over half of the students (51.2%) resided in hostels as in [Table. 1].

Table 1: Distribution of study subjects according to sociodemographic characteristics (N=400)

SI. No.	Sociodemographic Variable	Categories	Frequency	Percentage
1	Gender	Male	226	56.5
		Female	174	43.5
2	Religion	Hindu	354	88.5
		Muslim/ Christian	46	11.5
3	Native	Rural	211	52.8
		Urban	189	47.2
4	Place of stay	Home	148	37
		Hostel	205	51.2
		Paying guest	47	11.8
5	Diet	Mixed	318	79.5
		Vegetarian	82	20.5
6	Socioeconomic Status (Modified BG Prasad)	Upper (Class I & II)	194	48.4
		Middle (Class III)	107	26.8
		Lower (Class IV & V)	99	24.8

2. Prevalence of Behavioural Risk Factors

The primary objective was to estimate the burden of NCD risk factors. The most prevalent risk factor was the low intake of fruits and vegetables (93.8%), followed by inadequate physical activity (48.5%) [Table. 2].

Table 2: Prevalence of behavioural risk factors among study participants

Behavioural risk factors	Yes Frequency (%)	No Frequency (%)
Tobacco use (N=400)	42 (10.5%)	358 (89.5%)
Alcohol use (N=400)	69 (17.2%)	331 (82.8%)
Low intake of fruits/vegetables (N=400)	375 (93.8%)	25 (6.2%)
Inadequate physical activity (N=400)	194 (48.5%)	206 (51.5%)

3. Pattern and Reasons for Risk Factors

- **Tobacco:** Of the 42 current tobacco users, 71.4% preferred smoking, and 14.3% were daily users. Curiosity was the primary reason for initiation (71.4%).
- **Passive Smoking:** Out of 400 participants, exposure to passive smoking was reported by 46.2% of participants, mostly occurring in public places (70.3%).
- **Alcohol:** Among 69 current users, 84.1% consumed alcohol less than once a month. The mean age of initiation for alcohol was 17.7 years.
- **Diet:** Amongst 400 participants, 93.8% were consuming low quantity of fruits and vegetables.
- **Physical Inactivity:** 48.5% participants had inadequate physical activity.

4. Anthropometric Measurements

Over 30% of participants were classified as overweight or obese based on BMI. High waist circumference was observed in 20.5% of the total subjects, notably higher in females (32.8%) compared to males (11.1%) as seen in [Table. 3].

Table 3: Anthropometric measurements among study participants

Variable	Males (%) N=226	Females (%) N=174	Total (%) N=400
BMI			
Underweight	18(7.9%)	13(7.5%)	31(7.8%)
Normal	140(61.9%)	102(58.6%)	242(60.5%)
Overweight/obese	68(30.2%)	59(33.9%)	127(31.7%)
Waist circumference			
Normal	201(88.9%)	117(67.2%)	318(79.5%)
High	25(11.1%)	57(32.8%)	82(20.5%)
Waist to hip ratio			
Normal	176(77.9%)	138(79.3%)	314(78.5%)
At risk	50 (22.1%)	36(20.7%)	86(21.5%)
Systolic blood pressure			
Normal	134(59.3%)	119(68.4%)	253(63.2%)
Pre hypertension	90(39.8%)	55(31.6%)	145(36.3%)
Hypertension	2(0.9%)	0(0%)	2(0.5%)
Diastolic blood pressure			
Normal	159(70.4%)	135(77.6%)	294(73.5%)
Pre hypertension	59(26.1%)	39(22.4%)	98(24.5%)
Hypertension	8(3.5%)	0(0%)	8(2%)

5. Clustering of Behavioural Risk Factors

The majority of participants (46.8%) exhibited at least two risk factors, while 10% had three risk factors, and 2% reported all four risk factors. Only 2% were completely free from the studied risk factors.

6. Association and Multivariate Analysis

Binary logistic regression was used to identify independent predictors for behavioural risk factors as shown in [Table. 4].

Table 4: Predictors of Behavioural Risk Factors

Risk Factor	Significant Predictor Category	Adjusted Odds Ratio (AOR)	95% CI	p-value
Tobacco Use	Male Gender	3.36	1.41 - 8.04	0.006
	Paying Guest Stay	3.31	1.09 - 8.50	0.034
	Commerce Course	4.72	1.61 - 13.86	0.005
Alcohol Use	Male	2.7	1.338-5.499	0.006
	Hindu Religion	4.93	1.72 - 14.11	0.003
	Paying Guest Stay	3.66	1.51 - 8.87	0.004
Low Fruit/ Vegetable consumption	Mixed Diet	2.55	1.08 - 5.99	0.032
	Male Gender	5.35	1.96 - 14.64	0.001
	Hostel Stay	0.23	0.07 - 0.73	0.013
Inadequate Physical activity	Female	1.858	1.138-3.033	0.013

Tobacco Use: Significant associations were found with gender (p=0.007), place of stay (p=0.008), and course (p=0.006).

Alcohol Use: Upper socioeconomic class students were significantly more likely to use alcohol (p=0.019).

Low intake of fruits and vegetables: Males and students who stayed in hostels had higher risk of consuming less quantity of fruits and vegetables.

Inadequate physical activity: Females had higher risk of physical inactivity.

Discussion

A critical period of transitioning from adolescence to adulthood while in university is a crucial period of time where lifestyle habits are laid down[18]. Our study provides an analysis that is comprehensive, of the behavioural and physiological risk factors for Non-Communicable Diseases (NCDs) among postgraduate students in university students in Mysore. The findings in our study show a prevalence of modifiable risk factors to be high with around 93.8% of students accounting for inadequate consumption of fruits and vegetable intake and also 36.3% students had pre-hypertension.

Behavioural Risk Factors: Substance Use And Dietary Habits

Current tobacco use among university postgraduate students was 10.5% and consumption of alcohol was 17.2% in our study. This is lower than in many studies, but it is significant in view of the younger age of our study participants. The major reasons for the origination and development of these habits were curiosity, followed by peer pressure and stress busters (tobacco - 71.4%, alcohol -73.1%). These findings are similar to the findings in recent studies in youth in India, mentioned in secondary analysis of NFHS5 data by Shiv Kumar Mudgal *et al*. using the data from aspirational districts in India that hint at social amalgamation, peer pressure and coping with stress as key factors towards adverse habits[19, 20]. It is worth noting that students who stayed in accommodations as Paying Guests were at higher odds of tobacco usage (AOR 3.31) and consumption of alcohol (AOR 3.66). This can be mainly due to the absence of supervision by the parents, and also encouragement from peers in conditions that are not monitored, contrasting to the students who live at their homes supervised by their parents or stay in hostels that are closely monitored by wardens.

93.8% of our study subjects reported an insufficient consumption of fruits and vegetable. This is similar to the findings of a study done amongst adults in Vizag, Sonipat by Ganpule *et al*., study among 300 adults in Kerala done by Abraham SS *et al.* and study amongst adolescents in Varanasi done by Rathi NS *et al.* who reported that a large majority of the population (80 % to 90%) in India fails to consume fruit and vegetable intake as per the recommendation of World Health Organisation (WHO) which recommends five servings of fruit and vegetable intake per day[21-23]. In our study, male students consumed unhealthy diet five times more than the opposite gender (AOR 5.35). Hostel stay proved to be a factor that protected from a poor diet (AOR 0.23). This may be mainly because of proper and regular meals supplied by mess, on the contrary those staying as Paying Guests have to depend on street foods that are void of nutrients and are sometimes dense in calories.

Physical Inactivity and Gender Disparities

Around half of the study subjects (48.5%) did not indulge in physical activity. Female students were found to be more physically inactive in comparison to male students (AOR 1.858), a finding that has been observed to a great extent globally[24] according to study done in Poland amongst 385 University female students by Kotarska K *et al.* and study done in North India amongst University students by Verma AK *et al.* shows India is no exception[25]. This gap among genders in physical inactivity is mainly due to barriers in social and cultural environments, a dearth of infrastructure in sports

catering to female students along with fears of safety of female students during exercise in the outdoor environment as mentioned in a narrative review by Jhou J *et al.*[26, 27] and a study done amongst adolescents in Italy by Roselli *et al.*[28] These factors serve as major contributing factors for an increasing prevalence of metabolic disorders among women especially young women.

Physiological Risk Factors: The Rising Burden of Obesity and Hypertension

The parameters especially physiological ones that are considered in our study are early indicators for cardiovascular outcomes that may occur in future. In our study, more than 30% of the subjects were overweight or obese of which the gender difference in waist circumference was prominent: a high waist circumference was observed among females (32.8%) compared to males (11.1%) as given in [Table. 3] and amongst 242 students who were classified as having normal BMI, 11.6% had increased waist to hip ratio. This is a characteristic of the “thin-fat" phenotype in Indian population in which individuals can have a BMI that is normal along with a large amount of visceral fat. These individuals have a greater tendency for developing “metabolic syndrome."[29].

Moreover, pre-hypertension was found in high proportion of study subjects (36.3%) whose mean age was 22 years. Although clinical hypertension was found among a low proportion (0.5%), the finding of pre-hypertension among an increased number of individuals points to a "time bomb" that is ticking rapidly shown in a study done by Al Quaiz *et al.*[30] amongst the adults in Riyadh indicating adverse cardiovascular outcomes in future. Research ,world over points that an increased blood pressure in the adolescence most likely results in mortality by heart disease in future as shown in population based cohort study done in Sweden by Adillo AH *et al.*[31] and a systematic review on blood pressure amongst adolescents in Asia by Islam B *et al.*[32] The difference in staying at home and a higher Body Mass Index, 45.9% as compared to 21% in hostels, indicates that staying at home may unexpectedly nurture habits that are sedentary in nature or intake of more calorie rich food at home in contrary to the campus life that is active.

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