## ORIGINAL ARTICLE

# EPIDEMIOLOGICAL INVESTIGATION OF LIFESTYLE ASSOCIATED MODIFIABLE RISK FACTORS AMONG MEDICAL STUDENTS

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## ABSTRACT

**Background:** Non-communicable diseases (NCDs) are the leading causes of death globally, out of 57 million global deaths in year 2008, 63%, were due to NCDs. Over 80% of cardiovascular and diabetes deaths, and almost 90% of deaths from chronic obstructive pulmonary disease, occur in low-and middle-income countries. A large percentage of NCDs are preventable through the reduction of their four main behavioural risk factors: tobacco use, physical inactivity, harmful use of alcohol and unhealthy diet. Thus, there is a need to carryout rigorously implemented surveys that estimate the risk factors of NCDs among Medical students.

**Objective:** This study was undertaken to estimate the Load of lifestyle associated risk factors& their correlates in apparently healthy medical students.

**Materials and Methods**: The cross sectional study will be carried out among students of Medical Institute in Western Uttar Pradesh, India. Student's interview will be done through an age appropriate modified Global school based student health survey structured self-administrated questionnaire on life style associated risk factors. The statistical analysis will be done using SPSS 17- Chi-square test, t-test and ANOVA.

**Result:** This study documented a prevalence rate of active smoking among the study population 6.4% as against 84.2% for non-smoking. Drinking of alcohol as one of the behavioural risk factors for NCDs was also documented by this present study is 1.8% for binge drinking status and 3.8% for heavy drinking status.

**Conclusion:** The study shows a high prevalence of NCD related risk factors in medical students. Primary prevention may be one way to lower the risk burden of NCDs.

**Keywords:** Physical inactivity, Obesity, Diabetes Mellitus, Non-Communicable diseases.

## INTRODUCTION

Non-communicable diseases (NCDs) are the leading causes of death globally, out of 57 million global deaths in 2008, 63%, were due to NCDs.[1] Over 80% of cardiovascular and diabetes deaths, and almost 90% of deaths from chronic obstructive pulmonary disease, occur in low- and middle-income countries. [1] Even in African countries,NCDs are rising rapidly and are projected to exceed communicable, maternal, perinatal, and nutritional diseases as the most common causes of death by 2030. [2] NCDs also kill at a younger age in low- and middle-income countries, where 29% of NCD deaths occur among people under the age of 60, compared to 13% in high-income countries. . [2] The estimated percentage increase in cancer incidence by 2030, compared with 2008, will be greater in low (82%) and lower-middle-income countries (70%) compared with the upper-middle (58%) and high-income countries (40%).[3] A large percentage of NCDs are preventable through the reduction of their four main behavioural risk factors: tobacco use, physical inactivity, harmful use of alcohol and unhealthy diet.[1]Thus, there was a need to carryout rigorously implemented general population surveys that estimate the risk factors of NCDs among Medical students.

## OBJECTIVES

In this study, we intend to investigate the prevalence of lifestyle associated risk factors for non-communicable diseases inapparently healthy medical students; and epidemiological correlates of life style associated risk factors for non-communicable diseases in apparently healthy medical students.

## METHODOLOGY

The cross sectional study was carried out among the student of a Medical Institute of Western Uttar Pradesh,

India. Study proposal was submitted to the institutional ethical committee and received favourable response. Purpose of the study was explained to all prospective subjects. The written consent was taken from each participant before interview and examination. Student's interview was done through an age appropriate modified Global school based student health survey structured self-administrated questionnaire on life style associated risk factors. .[4] The sections of the questionnaire asked about the following: (i) height, weight, and family history of Non-communicable diseases; (ii) personal habits in nutrition, physical activity, smoking, and alcohol consumption; (iii) basic knowledge on smoking, alcohol use, nutrition, and physical activity.

Dietary practices were assessed by putting questions on dietary preference, fast-food intake, fruit consumption, extra table salt added. Physical activity was ascertained by asking for daily physical activity (running, fast walking, biking, dancing) for at least 30 minutes/day during the past 7 days and during a typical week, any involvement in sports at college or in the community and the time spent at hostel in sitting activities like watching T.V. and video games was also asked.[4] History of any single trial of smoking and 6 months for alcohol was taken. Students reporting consumption of ≥ 5 drinks of alcohol on a single occasion in the past month were considered binge drinkers. Women reporting an average consumption of >1 daily drink or men and average of >2 daily drinks in the past month will be considered heavy drinkers.[5] History of passive smoking was also ascertained. Family history of hypertension and obesity in parents or grandparents and stress felt in any which was by the students (subjective) was also be inquired. Subsequently anthropometric measurements and blood pressure was taken. Blood pressure measurement was carried out according to World Health Organization (WHO) standardized criteria. [6]

The blood pressure was measured using mercury sphygmomanometer. Measurements were taken from morning till noon and on the right arm of subjects seated and at rest for at-least 5 minutes, no less than 30 minutes after any meal. Three readings were taken and the mean value obtained from the three readings was taken as the final observation and used in the analysis. Hypertension was defined according to WHO criteria as systolic blood pressure140 mmHg or diastolic blood pressure 90 mmHg. [6] Mean blood pressure will be defined as 1/3systolic pressure +2/3 diastolic pressure. The pulse pressure was calculated as the difference between systolic and diastolic pressures. [5] Height and weight was measured using standardized methods. Height was measured to the nearest millimetre using a wall mounted measuring scale without footwear during maximal inspiration. The weight was measured using a bathroom scale weighing machine with students wearing light summer clothing. According to BMI calculated Subjects were be classified into three categories: acceptable weight- BMI<25; overweight-BMI 29.9 and obese-BMI>30. [7]

The fasting glucose test was performed according to the WHO recommendations. [8] A fasting blood sample (FBS) was obtained from all of the subjects. Venous blood specimens was taken after 12 hours fasting for the measurement of glucose, uric acid, and lipids, including: total cholesterol, fasting plasma triglyceride (TG), high density lipoprotein cholesterol (HDLC) and low density lipoprotein cholesterol (LDLC) *using colorimeter and estimation kits*. The statistical analysis was done using SPSS ver.17. Chi-square test, t-test, and ANOVA were applied wherever applicable.

## RESULT

We studied occurrence of life style associated risk factors among in medical students, their awareness regarding risk factors, prevention, and lifestyle practices they adopt. This study has found a marked unhealthy lifestyle practices as eating habits, less physical activity and some addictions in medical students.

The mean height and weight of the study population was 167.3 cm and 68.2 Kg respectively. Males alone measured on average 173.9 cm and 70.6 Kg while females measured 157.7 cm and 58.9 kg respectively. Mean BMI of the study population was 25.1Kg/m2. Of this, males and females recorded an average of 24.3 $Kg/m^2$and 25.2 $Kg/m^2$ respectively. (Table 1)

The means of FBS, serum total cholesterol, and fasting serum TG were 83.3±10.1 mg/dl,163.7±42.2 mg/dl, and 103.7±49.9 mg/dl, respectively. On the basis of American Diabetes Association definition of diabetes (FBS> 126 mg/dl), none of the subjects had diabetes. Mean of serum HDL, serum LDL, total cholesterol/HDL ratio, and LDL/ HDL were42.6±11.7mg/dl,105.2±38.1 mg/dl, 4.09±1.32, and 2.39±1.11, respectively. Statistically significant difference among male and female was found only for serum TG and HDL mean value (Table 2).

**Table 1: Vital & Anthropometric Measurements of the Study Population according to Sex**

| Anthropometry | Total (n=103)* | Male (N =56)* | Female (N =47)* | P Value |
|---|---|---|---|---|
| Weight (Kg) | 68.2±12.9 | 70.6±12.3 | 58.9±10.7 | <0.001 |
| Height (cm) | 167.3±8.9 | 173.9±7.8 | 157.7±6.7 | <0.001 |
| BMI (kg/m2 | 25.1±3.9 | 24.3±3.9 | 25.2±3.9 | 0.246 |
| SBP (mmHg) | 116.7±11.6 | 118.1±10.4 | 116.6±12.1 | 0.500 |
| DBP (mmHg) | 74.4±7.8 | 76.7±7.3 | 75.8±8.5 | 0.565 |

*Value in mean±sd

**Table 2: Lipid Parameters of Study Population according to Sex**

| Lipid Parameters | Total (n=103)* | Male(n=56)* | Female (n=47)* | P value |
|---|---|---|---|---|
| TC | 163.7±42.2 | 172.1±42.7 | 156.7±32.8 | 0.046 |
| HDL | 42.6±11.7 | 40.7±9.7 | 50.8±15.7 | 0.0001 |
| LDL | 105.2±38.1 | 107.1±39.1 | 95.8±36.7 | 0.136 |
| TC/HDL | 4.09±1.32 | 4.39±1.29 | 3.19±1.02 | <0.001 |
| LDL/HDL | 2.39±1.11 | 2.57±1.19 | 2.02±0.93 | 0.011 |
| Serum TG | 103.7±49.9 | 108.2±57.9 | 71.2±27.2 | <0.001 |
| Fasting Blood Sugar (FBS) | 83.3±10.1 | 84.1±11.3 | 79.2±7.1 | 0.011 |

TC-Total cholesterol, HDL-High density lipoprotein, LDL-Low density lipoprotein, TG- Triglyceride; *Value in mean±sd

On the basis of obesity classification only 12.6% males were obese whereas 21.4% females fall in same category. Among males ratio between students of normal and abnormal BMI was almost equal but among female students this ratio was more towards abnormal BMI category. Most of the students were in category of normal blood pressure. No students had systolic blood pressure ≥ 140 mmhg and 7.7% students had Diastolic BP ≥ 90 mmhg. (Table3)

**Table 3: Physical Characteristics Related Risk Factors**

| | Total (n=103)* | Male (n=56)* | Female (n=47)* | P value |
|---|---|---|---|---|
| **BMI group (kg/m²):** | | | | |
| ≤ 25 (normal) | 50 (48.30) | 29 (51.80) | 21 (44.70) | 0.4774 |
| 25-30 (overweight) | 36 (34.90) | 20 (35.70) | 16 (34.10) | |
| > 30 (obese) | 17 (16.50) | 7 (12.60) | 10 (21.40) | |
| **Blood Pressure (mmhg)** | | | | |
| Systolic BP ≥ 140) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0.3951 |
| Diastolic BP ≥ 90 | 8 (7.70) | 6 (10.70) | 2 (4.20) | |

* Figure in parenthesis indicate percentage

**Table 4: Dietary Habits Physical Activity Related risk factors**

| | Total (n=103)* | Male (n=56)* | Female (n=47)* | P value |
|---|---|---|---|---|
| **Type of regular food intake:** | | | | |
| Vegetarian | 37 (36.2) | 18 (32.10) | 19 (40.40) | 0.3827 |
| Nonvegetarian | 66 (63.8) | 38 (67.90) | 28 (59.60) | |
| **Drink carbonated drinks** | | | | |
| ≥ 1 time per day in past 30 days | 81 (78.9) | 49 (87.50) | 32 (70.20) | 0.0301 |
| Fast food ≥ 3 times/week | 61 (63.5) | 33 (58.90) | 32 (68.10) | 0.3375 |
| Extra table salt | 22 (22.3) | 13 (23.20) | 10 (21.30) | 0.8145 |
| Fruit intake (at least once a day) | 100 (97.1) | 55 (98.20) | 44 (95.70) | 0.8097 |
| Watching TV/Computer/Video Games ≥ 3 hrs/day | 31 (30.8) | 19 (33.90) | 13 (27.70) | 0.4934 |
| **Physical activity** | | | | |
| ≥ 3 days/week (at-least 30 minutes) | 45 (44.4) | 32 (58.9) | 14 (29.80) | 0.0129 |
| ≤ 3 days/week (at-least 30 minutes) | 51 (50.7) | 21 (37.50) | 30 (63.90) | |
| No physical activity | 7 (7) | 3 (5.40) | 3 (8.50) | |

* Figure in parenthesis indicate percentage

**Table 5: Risk Factors Related To Personal Habits of Medical Student:**

| | Total (n=103)* | Male (n=56)* | Female (n=47)* | P value |
|---|---|---|---|---|
| **Smoking** | | | | |
| Active Smokers | 6 (6.40) | 6 (10.70) | 1 (2.10) | 0.2717 |
| Passive smokers | 10 (9.50) | 7 (12.50) | 3 (6.40) | |
| Non smokers | 87 (84.20) | 43 (76.80) | 43 (91.50) | |
| **Alcohol intake** | | | | |
| Binge drinkers | 2 (1.80) | 2 (3.60) | 0 (0.00) | 0.7737 |
| Heavy drinkers | 4 (3.80) | 3 (5.4) | 1 (2.10) | |

* Figure in parenthesis indicate percentage

Among respondents most of the students were non-vegetarian. Only 36.2% were vegetarian 98.2% males and 95.7% females consumed fruits at least once in a day. Most of the respondents (78.9%) engaged in intake of carbonated drinks ≥ 1 time per day in past 30 days. This was observed to be higher among males (87.5%) than females (70.2%). 63.5% respondents were consume fast food ≥ 3 times/week and this was observed to be higher among females (68.1%) than males (58.9%).In order to estimate the level of risk of subjects

with regards to daily salt intake, they were interviewed on extra salt intake. Average 22.3% students responded positively for this.(Table 4)

Physical activity is a major determinant of health. Physical activity exceeding the minimum recommended amounts helps improve physical fitness, reduces the risk of chronic diseases and disability and helps prevent unhealthy weight gain. 44.4% students were evolving in physical activity for ≥ 3 days/week (at-least 30 minutes). In this group male and female ratio was found nearly 2:1. Overall females showed much less physical activity than males (ratio almost 2:1). Only 30.8% students were watching TV/Computer/Video-Games ≥ 3 hours/day and in this category also males dominates females. We found about 70% of the students with low level of physical activity. (Table 4)

Among the behavioural risk factors for non-communicable diseases, majority of the respondents (84.2%) are described as never smoked followed by 7.2% and 4.5% which are described as passive smoker and active smoker respectively. 91.5% of females and 76.8% of males were non-smokers. Various forms of drinking status among respondents were observed by the study. Among respondents 1.8% was binge drinkers as against 3.8% heavy drinkers. Drinking status was higher among males (9.0%) than females (2.1%). Sex difference in personal habits was found statistically non-significant (Table 5).

Most of the students (34.0%) had only single risk factor followed by 27.2% students with two risk factors. 21.4% students were free of any risk factor whereas only 3.8% respondents had all four risk factors. In our study 21.4% population has no risk factors, only 3.8% has all four risk factors.(Table 6)

**Table 6: Number of Risk Factors Facing Participants in the Study**

| Number of Risk Factors | Frequency (%) |
|---|---|
| 0 | 22 (21.40) |
| 1 | 35 (34.00) |
| 2 | 28 (27.20) |
| 3 | 14 (13.60) |
| 4 | 4 (3.80) |

## DISCUSSION

We studied occurrence of life style associated risk factors among in medical students, their awareness regarding risk factors, prevention, and lifestyle practices they adopt. This study has found a marked unhealthy lifestyle practices as eating habits, less physical activity and some addictions in medical students.

The study observed statistically significant differences in between males and females in terms of height and weight. Increased weight is associated with increased risk of NCD particularly hypertension and diabetes. This is also stressed by previous studies that weight gain is associated with an increase pulse, hypertension incidence and the age-related rise in systolic blood pressure.[9,10] Average BMI of the entire study subject was found 25.1 Kg/ m2. This finding is close to that reported by the previous study in which the mean BMI of the study subject was 28.4 ±7.4.[11] The study observed no significant difference between males and females in terms of BMI values. This finding is contrast with other studies in which BMI was reported lower in men than among women.

Among other important vital measurement for NCDs, average systolic and diastolic resting blood pressure is found lower than that recorded by the previous studies. [12,13] Males recorded a higher resting systolic as well as diastolic blood pressure than females among the entire study population . This corresponds to that obtained by the previous studies. [12, 13] This means that males are at a higher risk of developing both systolic and diastolic hypertension than females.

Mean fasting blood sugar level, total cholesterol level (TC), LDL Level, and LDL/HDL ratio was higher among males than females but difference is statistically no significant. Statistical significant sex difference was found only for serum TG and HDL. These findings are supported with that documented by Mehan et al., 2007.[14]

Hyperlipidaemia plays a strong role in CHD and was the second major risk factor in a previous study in Iran. Hypercholesterolemia and hypertension are both associated with endothelial dysfunction, and their coexistence is associated with an increased incidence of cardiac events in epidemiological studies. An increased concentration of LDLC or total cholesterol at baseline is a minor risk factor for CAD. Both high fasting cholesterol and high fasting TG strongly predicted coronary events.

Prevalence of overweight in our study was greater than the Polish study but less than the studies conducted in Greece. [15] Self-reported prevalence of overweight in US medical students was much higher than that found in our study. A study conducted in US also found that medical students both male and female were less likely to be overweight. This could be attributed to the young age of students.

Overweight/obesity is a complex multifactorial chronic disorder and the American Heart Association (AHA) has recently classified it as a modifiable risk factor for NCD. The obesity causes an approximately threefold increase in CHD risk.

Our finding are different with that documented by the previous studies that recorded a prevalence of 11.6% in 1996 and 14.3% in 1997 being overweight or obese among females of the study participants.[16,17] Flegal et al, 2002 reported a higher prevalence of obesity among males than females[18] but a reverse trend was reported by this study on obesity. Additionally, similar finding was documented by a previous study on chronic non-communicable diseases risk factor survey in Iraq in which females reported of higher overweight than

males.[19] Additionally, findings from this present study on the issue that obesity is more prevalent among females than males does not support that of Biritwum et al. and Sugathan et. al. [20,21]These disparities in the finding may be due to geographical and economic effects on the respondents.

Hypertension is one of the most powerful and prevalent contributor of atherosclerotic cardiovascular disease although our study was on a small scale, we found interesting results for blood pressure measurement in medical students. Majority of the students were normotensive. This finding is close to that documented by Mehan et al[14].

On the part of fruit and vegetable consumption, this study documented that most of the respondents were non vegetarian but more than 95% were taking fruit at least once a day. This finding by the present study corresponds to that reported by the previous study with regard to dietary habits though a contrast with regard to fruit intake as compared to the previous study which documented an average of 4.7 days per week of fruit intake. [22]

This means that on the average, none of the respondents meet the basic minimum requirement as recommended by WHO, that ideally one should serve fruit and vegetables for at least 4-5 times daily, for which a standard serving of fruit or vegetable constitute about 80gm.This finding from the present study correspond to that documented by Maham et al in their similar study in which subjects had low daily intake of vegetables and fruits. [14]

Fruits and vegetables play an important role in improving general health. Fruit and vegetable consumption is inversely related to total and low density lipoprotein cholesterol and with risk of non-communicable diseases. The consumption of fruits by medical students in our study was higher than that observed in Polish medical students but in case of consumption of fast food and carbonated drinks findings are in support with the finding in polish medical students. This similarity may be due to some adaptation of western life style in Indian society.

Physical activity is a major determinant of health. Physical activity exceeding the minimum recommended amounts helps improve physical fitness, reduces the risk of chronic diseases and disability and helps prevent unhealthy weight gain. We found about 70% of the students with low level of physical activity. This finding is consistent with that documented by the previous study in which physical inactiveness among males and females were 23% and 22%. [20]

Significantly low level of physical activity can be attributed to the lifestyle of a medical student that requires long hours of sitting due to study. In a study on American medical students it was found that their personal physical activity levels were higher than those of age-matched peers in the general population. [23] Medical students are expected to adhere better to health principles than the general population however; with regard to physical activity their practices are poor as compared to the general population. The factors responsible for this need to be studied in detail and adequate measures should be taken by the medical schools/college to increase the number of students engaging in and maintaining regular physical activity habits to increase health in general and also to decrease the risk of developing non-communicable disease.

Our findings related with smoking pattern among medical students are much lower than that reported by the previous study. [20, 24, 25]

The prevalent rate of active smoking documented by the current study is in close relation to that documented by Hublet et al. [26]Smoking among males documented by the current study is almost but among females, prevalence rate significantly lower than that observed by Hublet et al. [26] Prevalence rate of smoking was observed among females by current study was found much lower than in Poland and Austria. Cigarette smoking contributes to a third of all deaths from coronary artery disease. Synergy between smoking and other risk factors substantially increases the risks of cardiovascular death associated with these factors.

Finding for drinking alcohol are greatly contradict with that reported by the previous studies on the similar subject in which alcohol usage among the study subjects was higher.[20,22] Alcohol consumption was very low in our study in accordance with disciplinary atmosphere in the campus and some positive pressure of the society.

In our study 21.4% population has no risk factors, only 3.8% has all four risk factors but these findings are in contrast with finding of the study among American medical students. [23] This may be due to difference in cultural and social norms.

Furthermore, the trend towards clustering of multiple behaviour risk factors in particular subgroups, as found in our results and in other studies, emphasises the need for targeting multiple behaviours with comprehensive and integrated programs. Multiple-behaviour interventions may not only have a much greater impact on public health than single-behaviour interventions, but they may also be more effective and efficient at achieving these goals. Identifying subgroups of the population with a cluster of lifestyle risk factors could lead us to understand the mechanisms by which societal factors affect development of risk factors and thus lead to a radical population-wide approach to prevent the development of risk factors. This kind of population-based approach aims to remove the underlying impediments to healthier behaviours and to control the adverse pressures. In other words, it aims to improve the aspects of the physical, social, and economic environment that predispose people to an unhealthy lifestyle.

However, these "classical" risk factors, along with known non-modifiable risk factors such as age, sex and family history, cannot fully explain why some people develop myocardial infarction and stroke, while others

do not. Although recent policy acknowledges broader influences on health, strategies for preventing CHD have relied heavily on mass health promotion aimed at persuading individuals to minimize behavioural risks. There is little evidence that this approach has been successful.

## CONCLUSIONS

One of the primary aims of this study was to investigate modifiable lifestyle risk factors in medical students. The modifiable risk factors identified in this study are obesity, tobacco smoking, unhealthy dietary practices and physical inactivity. These are all major risk factors for the development of different lifestyle diseases. Primary prevention may be one way to lower the risk burden of NCD. In this way the study highlights a need to promote better lifestyle practices in terms of implementation of knowledge to promote health, better dietary practices and improved physical activity in medical students. It is therefore recommended that medical schools/colleges should increase the proportion of students adopting and maintaining a healthy lifestyle and hence become prevention-oriented and more productive physicians.

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