

ORIGINAL ARTICLE

SUSCEPTIBILITY FOR NON-COMMUNICABLE DISEASE RISK FACTORS: LONGITUDINAL DATA ANALYSIS OF A COHORT OF MEDICAL STUDENTS

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ABSTRACT

Background: Non-communicable diseases (NCDs) account for great mortality and morbidity contributing to 77% of deaths due to NCDs globally. The study aimed to determine the levels of risk factors of NCDs among medical students viz a viz physical activity, diet, smoking and to evaluate trends of these risk factors over two years period.

Materials & Methods: It was a longitudinal study, conducted at a private medical college in the capital city of Pakistan, from April 2022 to September 2023. The data regarding NCD risk factors was collected using WHO STEPS questionnaire from the cohort of undergraduate students at two distinct times. All students who consented to participate were included. SPSS v.25 was used for data entry and analysis.

Results: Less than 3% of 135 students met WHO's recommended daily intake of fruits and vegetables, with prominent decrease being observed among boarders. There was a decrease in the mean servings of fruits (0.98 to 0.93) and vegetables (1.19 to 1.13) across study period. The self-reported smoking rate remained consistently low. An increase in physical activity, BMI and gender-specific waist hip ratio (WHR) was observed during study period.

Conclusion: Most medical students consumed fruits and vegetables less than the recommended daily requirements. Some individuals showed improvements in their physical activity levels. Abdominal obesity increased especially in females, which pose risk for metabolic complications.

KEY WORDS: Abdominal obesity; Body mass index; Cardiovascular disease; Daily intake; Diabetes mellitus; Non-communicable diseases; Physical activity; Risk factors; Vegetables.

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INTRODUCTION

Non-communicable diseases (NCDs) account for great mortality and morbidity especially in low- and middle-income countries contributing to 77% of deaths due to NCDs globally.¹ The spectrum of NCDs, which encompasses cardiovascular diseases, diabetes, various cancers, and chronic respiratory conditions, illustrates the complex interrelationship

of prevalent risk factors such as tobacco consumption, insufficient physical activity, excessive alcohol intake, and suboptimal dietary practices.² Though NCDs commonly affect the elderly population but individuals of all ages may get this disease. These diseases may start in the earliest years of life and keep progressing with age.³ Investing in healthy lifestyle habits early can help prevent chronic illnesses, leading to better overall health and lower healthcare expenses in the subsequent years.⁴

Medical students, as prospective healthcare practitioners, are anticipated to engage in healthier lifestyle choices and attain superior health outcomes compared to the general populace, attributable to their enhanced health literacy, educational qualifications, and experiential interactions with patients.⁵ It is crucial for them to embrace preventive strategies as part of their social responsibility.⁶ However, the demanding five-year medical education presents

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challenges that require balancing rigorous academic pressures with maintaining their own well-being.⁷ In West Bengal, most of students were at risk to develop NCDs due to cumulative effect of risk factors.⁸ In a study in Saudi Arabia, 47% medical students were overweight and 4.7% were physically inactive⁹, while 20.4 % of the medical students in Nepal study were smokers.¹⁰ In Bangladesh, less than a quarter of students (22.3%) consumed five or more servings of fruits and vegetables per day.¹¹ Anthropometric measures like Body mass index (BMI) and waist hip ratio (WHR) are used to assess obesity and risk for metabolic complications and NCDs.¹²

In India, health promotion activities and strategies are added in MBBS curricula, in order to address the rising trend of NCDs in country.¹³ Students must ideally be well equipped with the knowledge and skills to adopt healthy lifestyles to be able to flourish.⁷ In Pakistan, the unhealthy lifestyle of physicians prevails due to a lack of lifestyle medicine training.¹⁴ Risk factors for NCDs are prevalent among students, yet few follow-up studies exist to track changing trends. This study through its longitudinal design, will help fill research gaps and offer insights crucial for universities policy makers to take measures for NCDs prevention in young population. The objective of the study was to determine the levels of risk factors of non-communicable diseases among medical students viz a viz physical activity, diet, and smoke consumption and to evaluate trends of these risk factors in a cohort of medical students for session 2022-23.

MATERIAL AND METHODS

This longitudinal study was conducted on a cohort of first-year MBBS students at a private medical college in Islamabad. Both genders, aged 18 years and above were asked to participate using convenient sampling and only those unwilling to participate or absent on day of data collection were excluded. A questionnaire was adapted from WHO STEPS survey for Pakistan based on the key NCD risk factors was used to gather data on demographics and risk factors like diet, physical activity, and tobacco use. Body measurements were taken according to WHO guidelines. The faculty members of Community

medicine department took these measurements by following the standard techniques. Participants were requested to put off their shoes and empty pockets before stepping on weighing scale for their weight measurement. For measuring the height, they were asked to stand straight and measurement was taken from the tip of their heads until the tip of their toes using a stadiometer. using measuring tape, waist circumference was taken just above your belly button and hip circumference around largest part of hips. Rest of the data was filled by students themselves. this practice was done twice, soon after admission (2022) and again in the start of second year (2023).

A pilot study with 20 students helped modify the questionnaire. BMI (≥ 25 kg/m² for Asians) and waist-hip ratio (≥ 0.90 for men, ≥ 0.85 for women) were used to assess obesity and related risks. SPSS version 25 was used to analyze data. The categorical variables were expressed as frequencies and percentages, and means and SD were calculated for age, BP, and BMI. To appreciate difference between two measurements, t-test was used, considering significant difference at p-value <0.05.

RESULTS

In the year 2022, the response rate was 134/151(88.7%) and mean age was 19.2 \pm 0.975 years. In 2023, response rate was 135/149(90.6%) with mean age of 20.09 \pm 0.796 years. The two students migrated from the college. Demographic profile of students is shown in table 1.

Majority (72.4%) of students’ mothers were housewives, and the fathers of 35.8% of students were government employees. Fifty (37.3%) and 13(9.70%) students gave a positive family history of diabetes mellitus and cardiovascular disease, respectively.

Less than 3% students ate WHO recommended 5 servings of fruits and vegetables per day. Majority reported to consume only 1-2 servings per day of fruits (73%) and vegetables (79%).

In 1st year, the mean number of servings was 0.98(0.498) for fruits and 1.19(0.564) for vegetables. Mean fruit and vegetable consumption was statistically significant with boarding status (p=0.002,

Table 1: Demographic profile of participants (n=134 in year 2022, n=135 in year 2023)

Variable	Categories	Year 2022		Year 2023	
		N	%	N	%
Gender	Male	50	37.3	51	37.8
	Females	84	62.7	84	62.2
Boarding Status	Boarders	51	38	54	40
	Non-boarders	83	62	81	60

0.003) but not with gender ($p=0.06, 0.073$) or BMI ($p=0.333, 0.809$).

In 2nd year, there was a decrease in average consumption for both fruits and vegetables with mean number of servings per day 0.93 (0.54) and 1.13(0.467) respectively. Fruit consumption varied significantly by boarding status ($p<0.001$) and gender ($p=0.033$). However, vegetable consumption did not show significant differences by gender ($p=0.276$) or boarding status ($p=0.551$). The consumption of fruits was statistically different among boarders and nonboarders but not with gender, in both years.

Physical inactivity time per day fell from 549.7 minutes in 2022 to 509.91 minutes in 2023, approaching statistically significant($p=0.057$) level. In 2nd year, the average days of physical activity improved to 3.59 per week compared to 2.98 days in a week in first year, but still less than WHO recommended 5 days per week. The difference in physical activity was statistically significant with gender ($p<0.001$), not with boarding status($p=0.437$).

Regarding self-reported smoking status, 2 started daily smoking in 2nd year while none smoked daily in first year. The prevalence of obesity (BMI > 25kg/m²) increased from 22.3% in 2022 to 22.9% in 2023.

There was overall increase BMI among both males and females in both years. It was not significantly different across genders or boarding status. Figure I show the proportion of students in subcategories of BMI across the 2 years.

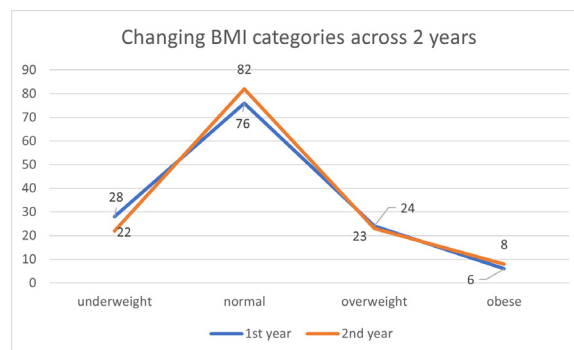


Figure I: Changing BMI categories of Students across 2 years

The increase in WHR was observed. However, difference in mean WHR among females was statistically significant in two years. There was no statistically significant difference regarding boarding status for BMI ($p= 6.56$) and WHR ($p=0.422$). Table 2 shows the differences among variables measured over time.

Table 2: Comparative Analysis of variables.

Variables	First-year	2 nd year	P-value
Mean number of servings of fruit	0.98(0.498)	0.93(0.543)	0.412
Mean number of servings of vegetables	1.19(0.564)	1.13(0.467)	0.059
Frequency (%) of Smokers (self-reported)	0(0)	2(0.014%)	-
The mean time (minutes) of physical inactivity	549.97(314.11)	509.91(260.782)	0.265
Days/week spent in moderate-intensity activity	2.98(2.19)	3.59(2.077)	0.057
BMI	21.9(4.383)	22.2(4.221)	0.546
WHR	0.8225(0.071)	0.85(0.136)	0.011*
SBP	111.60(11.03)	104.97(13.53)	<0.001*
BMI females	21.9(4.48)	21.8(4.07)	0.99
BMI males	22.0(4.25)	22.9(4.48)	0.330
WHR females	0.79(0.057)	0.83(0.162)	0.029*
WHR males	0.86(0.070)	0.88(0.074)	0.132
BMI hostilities	21.8(4.13)	22.7(4.78)	0.315
BMI non-hostilities	22.06(4.55)	22.01(3.8)	0.937

BMI; body mass index, SBP; systolic blood pressure; WHR; Waist-hip-ratio.

*Statistically significant at $p<0.05$, obtained after applying t test

DISCUSSION

In our study, the mean number of servings was 0.98(0.498) for fruits and 1.19(0.564) for vegetables which is quite less than with an average serving of fruits was 2.03 ± 1.756 servings/day and 2.24 ± 1.150 servings/day of vegetable among medical students of Delhi.¹⁵ This difference may be due to regional dietary patterns, with vegetarianism being more common in Delhi because of religious reasons. In our study, majority reported to consume 1-2 servings per day of fruits (73%) and vegetables (79%), comparable to study done in Somaliland¹⁶, where vast majority of participants had ≤ 1 serving of fruits daily (97.7%) and ≤ 1 serving of vegetables daily (98.2%).

In our study, the overall BMI showed no significant differences between males and females ($p=0.546$), similar to study results among Indonesian university students ($p= 0.41$).¹⁷ Females' WHR in our study varied significantly across study period, similar to Malay female students who have high values both for BMI and WHR.¹⁸ However, the WHR was significantly higher in another study in Indonesian males ($P < 0.001$).¹⁷ Besides lifestyle changes, this difference may be due to genetic predispositions and body fat distribution among populations.

The duration of physical inactivity in our study approximates 9.1 hours (549min) is much higher compared to 5.37 hours per day in a study among students in Riyadh.¹⁹ This may be because of availability of resources in different regions. Very less individuals were smokers in our study compared to 20.4 % in study sample in Nepal.¹⁰ This discrepancy may be due to self-reporting bias.

This was a single center study. It was self-reported survey, so information bias cannot be excluded. This study provides only data for two years but is sufficient to emphasize that there is a need to help students make healthy choices for themselves so that they can lead healthy and active life.

CONCLUSION

The study findings revealed that a significant proportion of medical students consumed fruits and vegetables below the recommended daily requirements. Abdominal obesity increased, particularly among females, posing a heightened risk for metabolic complications. This study emphasizes the significance of ongoing monitoring of behavioral risk factors. Periodic data collection serves as a standard for authorities to plan and implement effective strategies for promoting health and well-being among medical students.

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REFERENCES

1. World Health Organization. Non-communicable

diseases: key facts [Internet]. Geneva: WHO; 2021 Apr 13 [cited 2022 Jan 14]. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>

2. Uddin R, Lee EY, Khan SR, Tremblay MS, Khan A. Clustering of lifestyle risk factors for non-communicable diseases in 304,779 adolescents from 89 countries: A global perspective. *Prev Med.* 2020;131:105955. <https://doi.org/10.1016/j.ypmed.2019.105955>
3. Budreviciute A, Damiati S, Sabir DK, Onder K, Schuller-Goetzburg P, Plakys G, et al. Management and prevention strategies for non-communicable diseases (NCDs) and their risk factors. *Front Public Health.* 2020;8:788. <https://doi.org/10.3389/fpubh.2020.574111>
4. Dalal M, Cazorla-Lancaster Y, Chu CG, Agarwal N. Healthy from the start: lifestyle interventions in early childhood. *Am J Lifestyle Med.* 2022;16(5):562-9. <https://doi.org/10.1177/15598276221087672>
5. Dayoub E, Jena AB. Chronic disease prevalence and healthy lifestyle behaviors among US health care professionals. *Mayo Clin Proc.* 2015;90(12):1659-62. <https://doi.org/10.1016/j.mayocp.2015.08.002>
6. Gong E, Yu Y, Yang Y, Li Z, Zhou B, Zhao Y, et al. Are medical students confident about preventive counselling for non-communicable diseases? A cross-sectional survey of medical students in China, USA, and Australia. *Lancet Glob Health.* 2016;4 Suppl 1:S17. [https://doi.org/10.1016/S2214-109X\(16\)30022-5](https://doi.org/10.1016/S2214-109X(16)30022-5)
7. Nasir U, Butt AF, Choudry S. A study to evaluate the lifestyle of medical students in Lahore, Pakistan. *Cureus.* 2019;11(3):e4328. <https://doi.org/10.7759/cureus.4328>
8. Goswami S, Dutt R, Sengupta S, Chaudhuri S, Ahmad S, Yadav AK. Prevalence of non-communicable diseases' risk factors among medical students in South Kolkata, West Bengal. *Natl J Community Med.* 2018;9:334-9.
9. Rahamathulla MP, Sha MM. Frequency and awareness of risk factors of non-communicable diseases among university students in Saudi Arabia. *Pak J Med Sci.* 2020;36(4):740-5. <https://doi.org/10.12669/pjms.36.4.2400>
10. Mishra SR, Neupane D, Shakya A, Adhikari S, Kallestrup P. Modifiable risk factors for major non-communicable diseases among medical students in Nepal. *J Community Health.* 2015;40(5):863-8. <https://doi.org/10.1007/s10900-015-0012-6>
11. Sultana T, Faruque M, Banik PC, Sultana S, Amin F, Zaman MM. Non-communicable disease risk factors among the trainee doctors of a tertiary level diabetes hospital in Bangladesh. *Lifestyle Med.* 2021;2(4):e45. <https://doi.org/10.1002/lim2.45>
12. Lahole S, Rawekar R, Kumar S, Acharya S, Wan-jari A, Gaidhane S, et al. Anthropometric indices and its association with hypertension among young medical students: A 2-year cross-sectional

- study. *J Family Med Prim Care*. 2022;11(1):281-6. https://doi.org/10.4103/jfmpc.jfmpc_1231_21
13. Pati S, Sinha R, Mahapatra P. Non-communicable disease risk reduction teaching in India: a curricular landscape. *Front Public Health*. 2019;7:133. <https://doi.org/10.3389/fpubh.2019.00133>
 14. Nasir U, Farooq Butt A, Choudry S. A study to evaluate the lifestyle of medical students in Lahore, Pakistan. *Cureus*. 2019;11(3):e4328. <https://doi.org/10.7759/cureus.4328>
 15. Sadiq T, ul Hassan M, Feroz S. Implementing lifestyle medicine in undergraduate medical education at Riphah International University, Pakistan. *Am J Lifestyle Med*. 2023 Jul 3:15598276231186530. <https://doi.org/10.1177/15598276231186530>
 16. Khokhar A, Singh SK, Bharti A, Sharma M, Mishra S. Study on pattern of consumption of fruits and vegetables and associated factors among medical students of Delhi. *Int J Res Med Sci*. 2021;9(6):1667-73. <https://doi.org/10.18203/2320-6012.ijrms20212234>
 17. Ahmed SH, Meyer HE, Kjøllesdal MK, Marjerrison N, Mdala I, Htet AS, et al. The prevalence of selected risk factors for non-communicable diseases in Hargeisa, Somaliland: a cross-sectional study. *BMC Public Health*. 2019;19:1-10. <https://doi.org/10.1186/s12889-019-7101-x>
 18. Oktariza RT, Kalanjati VP, Tirthaningsih NW. Body mass index, waist-hip ratio and fasting blood glucose levels amongst the university students. *Folia Med Indones*. 2021;57(1):53-7. <https://doi.org/10.20473/fmi.v57i1.14661>
 19. Doustjalali SR, Gujjar KR, Sharma R, Shafiei-Sabet N. Correlation between body mass index (BMI) and waist to hip ratio (WHR) among undergraduate students. *Pak J Nutr*. 2016;15(7):618-24.
 20. Alhammad SA, Almutairi FM, Bajsair AS, Alghamdi AS, Algarni FS, Aldaihan MM, et al. Physical activity levels among undergraduate students at the College of Applied Medical Sciences, King Saud University, Riyadh: a prevalence study. *Medicine*. 2023;102(48):e36386. <https://doi.org/10.1097/MD.0000000000036386>

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	SM, NA
Acquisition, Analysis or Interpretation of Data:	SM, NA, MR, SKB, MR
Manuscript Writing & Approval:	SM, NA, MR, SKB, AA, UF

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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