Risk of Non-Communicable Diseases among Medical Students and Strategies of Prevention: A Review Article

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Abstract

University life-stage is a unique transitional period from adolescence to adulthood. This period is characterized by deterioration in health behaviors, including less activity, poor eating habits and adoption of smoking habit, with expected bad health outcomes in the form of NCDs. Thus, it is an important life stage for establishing life-long health habits that could reduce NCDs risk. This narrative review aims to provide information on the risk of NCDs among medical students, and how to decrease this risk. A systematic search was conducted in PubMed, Embase, Cochrane Library, and Web of Science databases, WHO website, and grey literature was searched through Google Scholar including scientific literature published from August 2016 until August 2023.

Keywords:-NCDs risk, medical students, university/college students, Non-Communicable Diseases prevention, chronic diseases prevention, lifestyle behavior

Introduction

A systematic review study analyzed published literature on the prevalence of the four lifestyle diseases which include obesity, hypertension, diabetes, and cancer among university students worldwide. Results showed that overweight and obesity had the highest prevalence of 45.6%, while prevalence of prehypertension and hypertension was 32.0%. Type 1 diabetes had a relatively high prevalence in college students (21.7%), and type 2 diabetes was found in lower percentage (12.95%). Cancer had the lowest prevalence of about 2%. The study also Showed the

average estimated prevalence of these lifestyle diseases across five different regions of the world as shown in (Table I) **(1)**.

Table I: average estimated prevalence of lifestyle diseases across five world regions (1)					
Diseases	North America	Europe	Asia	Africa	Caribbean
Overweight/Obesity	27.45%	20.5%	24.1%	9.3%	25%
Hypertension	30.5%	7%	9.8%	26.7%	25%
Diabetes	4.3%	2%	2.2%	1%	8%
Cancer	2.3%	2.45%	1.47%	0.64%	0.2%

A cross-sectional study in India found that prevalence of diabetes mellitus among medical students was 2.36%, and of prediabetes was 17.57% **(2)**

A study conducted on University Students in Saudi Arabia found that frequency of overweight and obesity was 25.9% and 5.1% respectively. It also reported that 1.1% of the students included in the study had pre-diabetes and 0.8% had diabetes and about 56.2% of them had no knowledge about NCDs and their risk factors **(3)**.

A cross-sectional study conducted among nursing students in Tanta university, Egypt found that about one third of both male and female students were overweight (28.6% and 30.4%) respectively, and 8.6 % of males and 8.4 % of females were obese. More than half of males (57.1%) and about one third of females (33.7%) were classified as prehypertension. The study also showed that most of the studied students, both males and females, were physically inactive (71.4% and 81.2%) respectively **(4)**.

More than two-thirds of deaths due to NCD are associated with risky behaviors that was adopted in young age. The risk of acquiring these diseases is increased by tobacco use, unhealthy diets, and physical inactivity. Globally, more than 150 million young people use tobacco **(5)**.

University life brings major changes in lifestyle, including less parental control and increased autonomy. The new environment also brings stress, and the new freedom may be associated with higher tobacco consumption, decreased physical activity, and low fruit and vegetable consumption. Moreover,the field of study of the student seems to be a factor which influences the lifestyle. A study performed in health, and other disciplines in Spain, reveals that students enrolled in other disciplines showed higher prevalence of tobacco smoking than health students. Health students also had higher consideration of physical activity **(6)**.

University students are at increased risk of risky behaviors that could lead to multiple physical health problems. They are consuming a diet with high calories, fat, and sodium, and low in nutrients, having low level of physical activity and sedentary lifestyle, and smoking cigarettes.

Youths are more vulnerable to health - risky behavior than adults because the centers of the brain responsible for judgment, decision making, emotion and impulse control are not fully developed yet (7). Additionally, University students are at risk of adopting sedentary lifestyle as most of their time spent in classes, studying, or in front of computers (8).

A large cross-sectional study conducted on university students from 24 countries in Africa, the Americas and Asia found that 15.9% of the included students had three or more behavioral risk factors for NCD (9).

Physical activity patterns are influenced by the sociocultural conditions. A study in the United Arab Emirates, showed a marked difference between male and female students in physical activity (10).

Research has addressed the effect of physicians' own lifestyle habits on their counseling practices in relation to promoting health and preventing diseases. Study findings showed that physicians' personal habits are important predictors of their counseling habits of patients. Physicians who have healthy lifestyle habits serve as role models and frequently counsel and motivate their patients to modify unhealthy lifestyle habits, such as poor diet, physical inactivity, and cigarette smoking. So, it is increasingly important that medical students who are the future practitioners have better learning opportunities in healthy behaviors and lifestyle management which in turn will have greater impact on the health of public and community (11).

Slovenian study in medical students showed unhealthy changes in lifestyle habits, which were associated with increased length of study. That is, the situation had reached a crisis point For the third-year students, may be because the initial enthusiasm over study choice had worn off, and stress had become less manageable during the period of transition between preclinical and clinical studies (12).

It is important to understand health-risky behaviors among youths, as modifications in these behaviors can improve all dimensions of health and decrease the risk of NCDs later in life.Moreover, there is evidence that lifestyle behaviors acquired during youth years, tend to persist in adulthood. Also, eating poorly for four years or even more in medical students, will cause malnutrition which will be manifested by fatigue, inability to handle stress, and anxiety. So, College is the best time for students to learn the importance of devoting more time and energy to health and fitness programs (6-12).

Prevention of non-communicable diseases

Strategies for prevention of NCDs should include small and large-scale human cooperation (Figure I). The importance of NCDs prevention arises from the NCDs direct impact on the national income. Productivity loss on a large-scale is the result of the frequent absence and the inability to work threats to the national economy. The strategy to prevent NCDs is based on management of risk factors that addresses individual, society, country, and global levels. The

most important dimension of this prevention strategy is lifestyle management at the individual level with focus on actions which can help increase the awareness of risk factors management in the society **(13)**.

Figure I: small and large-scale human cooperation for prevention of NCDs.
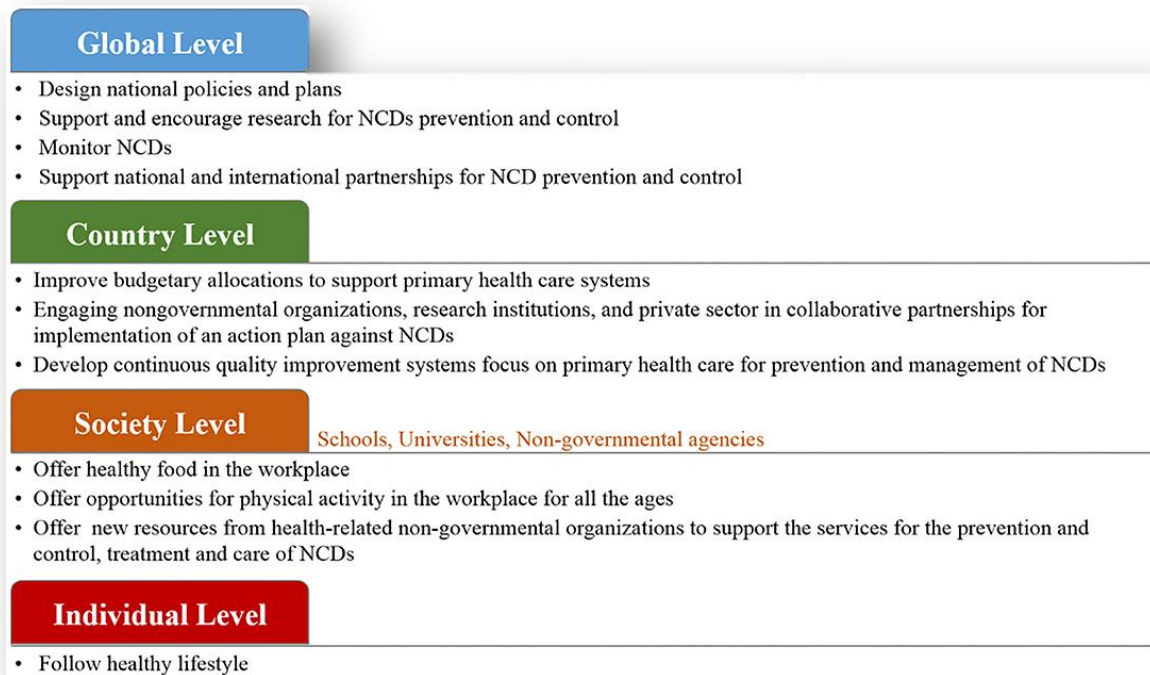
Youth have a right to the highest attainable standard of health and well-being. They are the future in which we invest many hopes. Yet, appropriate protection and treatment from known risk factors and effective prevention from NCDs are rarely offered by the current health systems **(14)**.

Examples of studies aimed at preventing NCDs on the individual level:

A quasi-experimental study was conducted in Bangladesh among adults to assess the effect of health education on risk factors of NCDs and found significant increase in the consumption of fruit and vegetables, decreased salt intake, and increased total weekly (MET) of physical activity **(15)**.

A randomized controlled trial in Thailand was conducted among obese women 30-50 years old. A lifestyle modification program with nutritional counseling, health education and exercise training were conducted. Results showed that weight loss was significantly higher in the intervention group than in the control group, also blood pressure, fasting blood sugar, and waist circumference were significantly improved. Triglyceride levels slightly improved while HDL cholesterol was slightly lowered **(16)**.

Also, a pre-post interventional study was conducted to evaluate changes in NCDs risk factors, associated with the "Healthy Choices at Work program (HCWP)", at a commercial power plant in South Africa. The study results showed significant increase in the prevalence of adequate fruit and vegetable intake from 27% to 64%, and in meeting physical activity guidelines from 44% to 65%. There was also significant improvement in systolic and diastolic blood pressure, and in total cholesterol. Moreover, the cardiovascular risk score significantly decreased by 4.5% (17).

An Intervention study was conducted in India among adults in a rural area using mHealth intervention package and showed significant reduction in behavioral risk factors (unhealthy diet and physical inactivity) in the intervention group compared to control group. Also, there was significant difference in BMI, systolic blood pressure, and fasting blood glucose level between both groups (18).

A.   Lifestyle modification interventions.

A.1)   Healthy diet:

A dietary pattern represents the total of what individuals eat and drink habitually, and the parts of this pattern act synergistically with each other to affect health. So, the dietary pattern may predict overall health state and disease risk better than individual foods or nutrients. A healthy dietary pattern includes nutrient-dense foods and beverages from all food groups, in recommended quantities, and within calorie limits. Following healthy dietary pattern at each stage of life not only supports the individual's health at that point in time, but also supports his health in the next stage of life and possibly for future generations. If healthy dietary pattern was established early in life and sustained thenceforth, the effect on health would be significant. Healthy dietary pattern establishing and maintaining can help lowering diet related NCDs risk. While consumption of foods and beverages that are not nutrient dense may result in disease expression later in life. Thus, high intake of such unhealthy foods throughout the individual's lifespan can increase his risk of developing NCDs (19).

Physical activity:

Physical activity is defined by WHO as any body movement produced by skeletal muscles that needs energy expenditure. Physical activity includes all movement during leisure time, for transport between places, or as part of an individual's work. Globally, one in four adults do not meet the recommended levels of physical activity and more than 80% of the adolescent population in the world is insufficiently active. Those who are insufficiently physically active have a 20% to 30% higher risk of death than people having sufficient physical activity (20)

Regular physical activity can have immediate benefits (e.g., better mood, less stress, better sleep) in addition to long-term benefits (e.g., better bone health and lower risk of many NCDs). Some physical activity is better than none. To gain the most health benefits from physical exercise, adults require at least 150 to 300 minutes of moderate intensity aerobic activity, such as brisk

walking or dancing, per week in addition to muscle-strengthening activity, such as weightlifting or push-ups, at least 2 days per week **(19)**.

Countries and communities should take action to provide their people with more opportunities to be active and to increase physical activity. Policies to increase physical activity should aim to ensure that walking, cycling and other forms of non-motorized means of transport are accessible and safe. Workplace policies should encourage being physically active during the workday. Childcare, schools, and high education institutions should provide supportive and safe spaces and the necessary facilities for students to spend their free time actively. Also, primary, and secondary schools should provide quality physical education that gives children the opportunity to develop behavioral patterns that will encourage them to remain physically active throughout their lives. Sports and recreation facilities should give opportunities for everyone to access and participate in different sports, dance, and active recreation. In addition to the important role of health care providers in giving advice and support to patients to be regularly active **(20)**.

A.2) Tobacco smoking cessation:

Tobacco use generally refers to the use of any tobacco product. Tobacco products, as defined by the US Food and Drug Administration, include any product which is made or derived from tobacco for human consumption (except those which meet the definition of drugs), including cigarettes, cigars, hookah tobacco, pipe tobacco, dissolvables, nicotine gels, smokeless tobacco products (e.g., dip, snuff, snus, and chewing tobacco), vapes, hookah pens, electronic cigarettes (e-cigarettes), and any other electronic nicotine delivery system. Smoking refers to inhaling and exhaling of smoke produced from combustible tobacco products as cigarettes, cigars, and pipes. While vaping refers to inhaling and exhaling of aerosols produced from e-cigarettes. E-cigarettes usually contain nicotine, the addictive ingredient in tobacco, but they may also contain other substances **(21)**.

Effective interventions for tobacco smoking cessation include behavioral counseling and pharmacotherapy, either individually or in combination. Combining behavioral and pharmacotherapy interventions has been found to increase rates of tobacco smoking cessation compared with using either one of them alone. Most combination interventions involve behavioral counseling over several sessions (usually four), with total contact time ranging usually from 90 to 300 minutes. The biggest effect was found in interventions with eight sessions or more, although the difference in effect among sessions number was insignificant. Behavioral interventions can be offered in the primary care setting or referred to community settings with primary care physician feedback. The current pharmacotherapy options approved by the FDA for treating tobacco smoking dependence are nicotine replacement therapy (NRT) (which includes nicotine transdermal patches, gum, lozenges, nasal spray, or inhalers), bupropion hydrochloride sustained release (SR), and varenicline **(21)**.

B.   Screening.

B.1)   Screening for Obesity:

BMI is the most common screening test used for obesity because it is easy to measure, reliable, and closely correlated with body fat. Waist circumference measurement can capture the elevated cardiovascular risk due to central adiposity even in non-obese individuals. So, waist circumference is more closely associated with visceral adiposity. Waist-to-hip ratio measurement has no advantage over waist circumference alone, so it is infrequently used. Skinfold thickness measurement needs training for accuracy, so it is an undesirable screening test. Therefore, all adults should be screened for overweight and obesity by BMI measurement as part of routine physical examination. It is also recommended that waist circumference should be measured in persons with BMI between 25 and 35 kg/m^2**(22).**

B.2)   Screening for hypertension:

Screening should be done every year in adults 40 years or older and in adults at high risk for hypertension (e.g., Black individuals, individuals with high-normal blood pressure, or overweight or obese individuals). Screening less frequently (every 3-5 years) as appropriate for adults aged 18 to 39 years who are not at high risk for hypertension and with normal blood pressure measurement. The USPSTF recommends screening adults 18 years or older for hypertension with office blood pressure measurement (OBPM) and recommends for obtaining blood pressure measurements outside clinical setting for confirmation of diagnosis before starting treatment. (A recommendation) **(23).**

B.3)   **Screening for Hyperlipidemia** According to **UpToDate, 2021 (24):**

Lipid screening Should be performed in men at age 35 and in women at age 45 for patients with low cardiovascular risk. While, for patients with **high cardiovascular risk** (e.g., diabetes mellitus, hypertension, tobacco smoking, family history of premature CHD), lipid screening should be performed in men between the ages of 25 to 30 and in women between the ages of 30 to 35. It can be appropriate to start screening earlier or later based on the individual's willingness to participate in a program for lifestyle modification or to initiate statin treatment.

Technically, only total cholesterol and HDL cholesterol are needed for screening, as most lipid screening is obtained to be used for cardiovascular risk assessment. However, costs are generally similar, and triglycerides may add important information in specific patients, so screening mostly performed with the full lipid profile. A fasting test may have the benefit of that the patient will not be forced to return for a second test if the first non-fasting test is abnormal (total cholesterol >250 mg/dL as it may be elevated because of high triglycerides, or HDL cholesterol <40 mg/dL as low HDL cholesterol is associated with hypertriglyceridemia in many cases). However, if a

fasting test is not practical, non-fasting total cholesterol and HDL cholesterol are to be ordered. A fasting lipid profile must be ordered for patients who have family history of genetic hyperlipidemia or hypertriglyceridemia is suspected. Also, fasting lipid profile is the better test in cases of overweight, obesity, diabetes, or medications that raise triglycerides such as steroids.

CVD risk assessment and lipid screening should be performed every five years in patients who are not on preventive medications since their CVD risk is below some threshold. On the other hand, measurements should be repeated every three years in patients near a threshold for treatment (based on CVD risk or LDL cholesterol goal), in those with high CVD risk based on their lipid profile values. There are no studies that definitively determine an appropriate age to stop lipid screening. However, in patients having more than one previous normal lipid profile, screening is suggested to be stopped at age 65.

B.4) **Screening for Diabetes** According to **ADA, 2022 (25):**

1.   Adults with overweight or obesity who have one or more of the following:

•   First-degree relative with diabetes

•   High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)

•   History of CVD

•   Hypertension

•   HDL cholesterol level <35 mg/dL and/or a triglyceride level >250 mg/dL

•   Women with polycystic ovary syndrome

•   Physical inactivity

•   Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)

2.   Patients with prediabetes should be tested yearly.

3.   Women who were diagnosed with GDM should have testing every 3 years.

4.   All other patients should begin testing at age 35 years.

B.5) **Screening for tobacco smoking:**

All adults should be asked about tobacco use, whether risk factors for use are present or not, and they should be encouraged to stop tobacco use. Risk factors for smoking include male gender, age younger than 65 years, homosexuality or bisexuality, low and middle socioeconomic level, disability, and anxiety. Common approaches for assessment of tobacco use include The 5 As: (1) Ask about tobacco use; (2) Advise to quit using clear, personalized messages; (3) Assess

willingness to quit; (4) Assist in quitting; and (5) Arrange for follow-up and support and The "Ask, Advise, Refer," approach which encourages to ask patients about tobacco use, advise them to quit, and refer them to telephone quit lines, other cessation interventions, or both **(26)**.

Conclusion

Overall, the available data shows that University life-stage is characterized by deterioration in health behaviors with increased risk of NCDs so establishing life-long health habits at this stage could reduce NCDs risk, and that there is high prevalence of overweight and obesity among medical students. Also, it shows that more than 80% of NCDs could be prevented by adoption of healthy lifestyle.

No Conflict of interest.

References:

[1]   Nagheer D, Irvin R, and Younger-Coleman N (2017): Overview of the Prevalence and Associated Risk Factors of Lifestyle Diseases in University Students. International Journal of Clinical Medicine; 8(5):344-352.

[2]   Rao T, Chaudhary R, and Jain J (2017): Prevalence and Risk Factors of Diabetes among Young Students of a Medical College in Central India. International Journal of Biomedical and Advance Research;8(11):416-20.

[3]   Rahamathulla M and Sha M. (2020): Frequency and Awareness of Risk Factors of Non-Communicable Diseases among University Students in Saudi Arabia. Pakistan journal of medical sciences;36(4):740-45.

[4]   Essa H and El-Shemy M (2016): Prevalence of lifestyle associated risk factors for non-communicable diseases and its effect on quality of life among nursing students, faculty of nursing, Tanta University International Journal of Advanced Research;3(5):429-46.

[5]   Hauerslev M and Luke Allen L (2018): Young People and Noncommunicable Diseases – Vulnerable to Disease, Vital for Change. International Journal of Noncommunicable Diseases; 3(2):45.

[6]   Cicchella A, Vecenane H and Usca S (2022): Healthy Lifestyles of University Students, According to Demographics, Nationality, and Study Specialty with Special Reference to Sport Studies. Front. Educ. 7:889603.

[7]   Oraby E, Abdelsalam A, and Ali S (2016): Health Risky Behaviors Among University Students: Prevalence and Effect of Health Education Program. The Egyptian Journal of Community Medicine; 34(4):13-33.

[8]   Carballo-Fazanes A, Rico-Díaz J, Barcala-Furelos R, Rey E, Rodríguez-Fernández JE, Varela-Casal C et al. (2020): Physical Activity Habits and Determinants, Sedentary Behavior and Lifestyle in University Students. International journal of environmental research and public health;17(9):3272.

[9] Pengpid S and Peltzer K (2021): Prevalence and correlates of multiple behavioural risk factors of non-communicable diseases among university students from 24 countries, Journal of Public Health; 43(4):857–66.

[10] Doyle C, Khan A, and Burton, N (2019): Recreational Physical Activity Context and Type Preferences among Male and Female Emirati University Students. International Health; 11(6):507-12.

[11] Brehm B, Summer S, Khoury J, Filak A, Lieberman M, and Heubi J (2016): Health Status and Lifestyle Habits of US Medical Students: A Longitudinal Study. Annals of medical and health sciences research; 6(6):341-347.

[12] Žnidarič M, Zavodnik I, and Šrajer L (2020): Lifestyle of medical students. Acta Medico-Biotechnica; 13(1):21–25.

[13] Budreviciute A, Damiati S, Sabir D, Onder K, Schuller-Goetzburg P, Plakys G et al. (2020): Management and Prevention Strategies for Non-communicable Diseases (NCDs) and Their Risk Factors. Frontiers in Public Health; Public Health Education and Promotion.

[14] Hauerslev M and Luke Allen L (2018): Young People and Noncommunicable Diseases – Vulnerable to Disease, Vital for Change. International Journal of Noncommunicable Diseases; 3(2):45.

[15] Mondal R, Sarker R, Acharya N, and Banik P (2019): Effectiveness of Health Education-Based Conventional Intervention Method to Reduce Noncommunicable Diseases Risk Factors Among Rural Population. Cardiovascular Diagnosis and Therapy; 9(1):30-34.

[16] Thiabpho Ch, Changbumrung S, Soonthornworasiri N, Yoddumnern-Attig B, Thaboot P, Nissayan P, et al. (2018): Intensive Lifestyle Modification Program on Weight Loss and Metabolic Syndrome Risk Reduction Among Obese Women in Rural Areas of Thailand. Journal of Health Research; 32(3):203-16.

[17] Schouw D, Mash R, and Kolbe-Alexanderb T (2020): Changes in Risk Factors for Non-communicable Diseases Associated with the 'Healthy Choices at Work' Programme, South Africa. Global Health Action;13(1):1-11.

[18] Sharma M, Banerjee B, Ingle G, and Garg S (2017): Effect of mHealth on modifying behavioural risk-factors of non-communicable diseases in an adult, rural population in Delhi, India. mHealth;3(10):42-50.

[19] Dietary Guidelines for Americans (DGA) 2020 – 2025; Ninth Edition (2020): Chapter 1: Nutrition and Health Across the Lifespan.

[20] World Health Organization (WHO) (2020): Physical Activity. Available from: https://www.who.int/news-room/fact-sheets/detail/physical-activity. Accessed on September 26, 2022.

[21] US Preventive Services Task Force (USPSTF) (2021): Interventions for Tobacco Smoking Cessation in Adults, Including Pregnant Persons; US Preventive Services Task Force

Recommendation Statement. The Journal of American Medical Association (JAMA);325(3):265-79.

[22] UpToDate (2021): Obesity in adults: Prevalence, screening, and evaluation. Available from: https://www.uptodate.com/contents/obesity-in-adults-prevalence-screening-and-evaluation#H2. Accessed on September 27, 2022.

[23] US Preventive Services Task Force (USPSTF) (2021): Screening for Hypertension in Adults; US Preventive Services Task Force Reaffirmation Recommendation Statement. JAMA;325(16):1650-56.

[24] UpToDate (2021): Screening for lipid disorders in adults. Available from: https://www.uptodate.com/contents/screening-for-lipid-disorders-in-adults. Accessed on September 27, 2022.

[25] American Diabetes Association (ADA) (2022): Diabetes Care; Volume 45, Supplement 1. Downloaded from: https://diabetesjournals.org/care/issue/45/Supplement_1. Accessed on August 10, 2022.

[26] US Preventive Services Task Force (USPSTF) (2021): Interventions for Tobacco Smoking Cessation in Adults, Including Pregnant Persons; US Preventive Services Task Force Recommendation Statement. The Journal of American Medical Association (JAMA);325(3):265-79.