

Prehypertension and Hypertension among Undergraduate Medical students of Misurata University, Libya: Prevalence and Associated Risk Factors

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Abstract:

Background/Objectives: Hypertension is one of the biggest health challenges, which is continuously increasing among young adults, especially students. This study aims to estimate the prevalence of prehypertension and hypertension among undergraduate medical students at Misurata University and to identify the associated risk factors.

Methods: A descriptive cross-sectional study that was conducted during the year 2024 on medical students attending faculty of Medicine, Misurata University, Libya. We collected data on sociodemographic information and risk factors using a self-administered questionnaire derived from the WHO STEPS instrument, and we measured the blood pressure and body mass index (BMI) of the participants. Data were analyzed using Statistical Package for Social Sciences version 25.0.

Results: A total of 333 participants, with a mean age of 22.2 ± 2.1 years, the prevalence rate of hypertension in this study was 12.3%, of them 16.8% and 9.7% were males and females respectively. Prehypertension was 12.5% of the total sample. Risk factors highly associated with hypertension ($P=0.0001$) were male gender, smoking habits, increased BMI, sleep hours less than 6 hours, too frequent intake of soft drinks and coffee. Conclusion: prevalence of hypertension and prehypertension together (25.8%) represent a call for the establishment of screening system for early detection at primary health care level.

Keywords: Prevalence, Hypertension, Pre-hypertension, Medical students, Risk factors.

مرحلة ما قبل ارتفاع ضغط الدم وارتفاع ضغط الدم بين طلاب كلية الطب البشري في جامعة مصراتة – ليبيا (الانتشار وعوامل الخطورة المصاحبة)

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الملخص:

بعد ارتفاع ضغط الدم أحد أكبر التحديات الصحية، والذي يتزايد باستمرار بين الشباب، وخاصة الطلاب. تهدف هذه الدراسة إلى معرفة مدى انتشار ارتفاع ضغط الدم بين طلاب الطب كلية الطب بجامعة مصراتة وتحديد عوامل الخطر المرتبطة به.

الطريقة: دراسة وصفية مقطعية أجريت خلال عام 2024 على طلاب كلية الطب البشري، جامعة مصراتة، ليبيا، حيث قمنا بجمع البيانات حول الخصائص الاجتماعية والديموغرافية وعوامل الخطر باستخدام استبانة، وقياس ضغط الدم ومؤشر كتلة الجسم (BMI) للمشاركين. تم تحليل البيانات باستخدام البرنامج الإحصائي SPSS.

النتائج: بلغ إجمالي عدد المشاركين 333 مشاركًا، بمتوسط عمر 22.2 ± 2.1 سنة، وقد كان معدل انتشار مرحلة ما قبل ارتفاع ضغط الدم وضغط الدم المرتفع في هذه الدراسة 12.5% و 12.3% على التوالي. وكانت عوامل الخطر المرتبطة بشدة بارتفاع ضغط الدم ($P=0.0001$) هي الجنس الذكري، وعادات التدخين، وزيادة مؤشر كتلة الجسم، وقلة النوم لساعات أقل من 6 ساعات، والإفراط في تناول المشروبات الغازية والقهوة.

الاستنتاج: يمثل انتشار ارتفاع ضغط الدم وما قبل ارتفاع ضغط الدم (25.8%) مرتفعاً لدى طلاب كلية الطب البشري بجامعة مصراتة، مما يدعو لإجراء فحص شامل للطلاب والكشف المبكر على عوامل الخطر والأسباب المحتملة وراء ارتفاع ضغط الدم.

الكلمات المفتاحية: انتشار، ارتفاع ضغط الدم، ما قبل ارتفاع ضغط الدم، طلاب الطب، عوامل الخطر.

1. Introduction:

Hypertension (BP) is a significant public health issue worldwide, accounting for over nine million deaths annually. Many cases of hypertension are often detected incidentally during routine medical examinations (Brar & Badaruddoza, 2013).

Prehypertension in young adults is associated with a higher likelihood of developing hypertension in later life. Hypertension increases the risk of various critical health conditions, including cardiovascular diseases, stroke, kidney failure, and eye disorders (Stanaway et al., 2018).

It has been observed that lifestyle changes in many regions of the world have shifted from traditional to modern practices. This transition has led to an increase in hypertension among young people and adolescents, driven by factors such as fast-food consumption, sedentary lifestyles, technological advancements, and other modifications in lifestyle and diet characterized by low physical activity and high-calorie intake rich in fats and sugars (Gupta & Mahajan, 2005).

Hypertension is linked to an increased risk of coronary heart diseases and myocardial infarction, while those with mild elevations in blood pressure may face lower risks. Early detection of hypertension is crucial for identifying modifiable factors that can help prevent cardiovascular diseases, as highlighted by Qureshi et al. in their study (Qureshi et al., 2005).

Several studies have reported varying prevalence rates of hypertension among medical students, ranging from 6% to 21.3% (Tayem et al., 2012; Alanazi et al., 2018; Abu-Zaiton & Al-Fawwaz, 2013). Nonmodifiable risk factors such as male gender, older age, and positive family history have been associated with hypertension, while various modifiable risk factors, including physical inactivity, tobacco use, alcohol consumption, and elevated body mass index (BMI), have also been linked to this condition (Brar & Badaruddoza, 2013; Bjertness et al., 2016; Virdis et al., 2010).

Dietary habits have also been associated with hypertension, such as low consumption of fruits and vegetables and high intake of fatty and fast foods (Leone, 2011; Ahad & Nowreen, 2018; Kar & Khandelwal, 2015).

With the rise of urbanization, socio-economic and lifestyle changes from traditional to modern ways have resulted in physical inactivity, smoking, excessive use of technology, eating excessive junk food, and high fat and calorie consumption. This has led to an increase in cases of obesity, prehypertension, and hypertension among the youth (Al-Taha et al., 2020).

Currently, there are no published data on the magnitude of prehypertension and hypertension among undergraduate medical students at Misurata University.

This study aims to estimate the prevalence of prehypertension and hypertension among undergraduate medical students at Misurata University and to identify the associated risk factors.

2. Methods:

Study design and sample size

A cross-sectional study was conducted on undergraduate students at faculty of Medicine at Misurata University, during the period from 12th January to 05th March 2024. The study included all students in the basic and clinical years (first to internship year). The sample size was calculated using Epi- Info Software version 7. Based on 50 % population proportion, and a confidence limit of 5%, the minimum required sample size at 95% confidence level was 384 adults. According to these calculations, 400 students were selected by systematic random sampling method, and invited to participate in the study, of whom 333 students provided complete responses.

The sample size from each grad was proportional to the number of students attending that grad.

Inclusion and exclusion criteria

The study involved selecting students who met certain eligibility criteria, such as apparently healthy students, and being willing to participate after signing an informed consent form were included in the study. Exclusion criteria included Students who had chronic diseases such as diabetes, renal disease or pregnant students and on medications like corticosteroids.

Data collecting

Participant students were given a predesigned and pretested questionnaire to collect the relevant data on Socio-demographic characteristics including educational year, gender, and risk factors of high BP like smoking, physical activity, family history of diabetes or hypertension, psychological stress, time spent on social media, salt intake, soft drinks and coffee intake, high calorie meals, vegetable and fruit intake, sleep habits, fast food intake, and fatty food consumption.

The questionnaire was tested in the field on 20 students before the start of the study to get feedback from respondents, and these 20 students were not included in the study. During pilot testing, questionnaire underwent several modifications.

Measurements

All measures were done according to standardization methods.

Weight was measured using digital scale to the nearest 0.1 kg with only light clothing, and for the determination of height, subjects were asked to take off their shoes, stand upright with their head up and the heel, buttock, and occiput against the wall. Height was recorded to the nearest 0.5 cm. Body Mass Index (BMI) was calculated using the formula weight (kg)/height (m²). (BMI) was categorized according to the

World Health Organization (WHO) where a BMI of < 25 kg/m² is considered normal, a BMI between 25 and 29 kg/m² is considered overweight, and a BMI $\geq$ 30 kg/m² is considered obese (World Health Organization, 1997).

Blood pressure (BP) was measured in sitting posture using a standard sphygmomanometer on two different occasions, with at least 10 min gap and the average was noted. WHO criteria were strictly followed. BP was classified as per the Joint National Committee on prevention, detection, evaluation and treatment of blood pressure. BP in pre-hypertension was 120-139/80-89 mmHg. Hypertension stage I was 140-159/90-99 mmHg. Hypertension stage II was 160 mmHg or above (Chobanian et al., 2003).

Ethical consideration

The study was approved by the Ethics Committee of Faculty of Medicine, Misurata University. The researchers complied with the International Ethical Guidelines for Epidemiological Studies. An informed verbal consent was obtained from all participants after explanation of the objectives and benefits of the research and confidentiality was ensured.

Data analysis

Collected data were coded and analysed using Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows), Version 25. Cross-tabulation and Chi-square test of significance were done between all factors studied as age, gender, BMI, physical activity, fruits and vegetables intake, family history of hypertension with the prevalence of prehypertension and hypertension. P value equal or less than 0.05 was considered as the level of significance.

3. Results:

The study was carried out with 400 medical students, of whom only 333 were interviewed. A response rate was 83%. Table (1) shows the characteristics

of the studied sample, it was found that the study sample age ranged between 18 and 29 years, with a mean of with a mean age of 22.2 ± 2.1 years. About two thirds (66.1%) of the study sample were females. As regards academic years, this table also demonstrate that almost quarter (24.9%) of the study sample were at second degree.

Table (2) and figure 1. reveal the prevalence of prehypertension and hypertension among medical students was (13.5%) and (12.3%) respectively.

Table (1): Characteristics of Medical Students among all grades

Characteristics	Mean $\pm$ SD	Total (n) %
Age (18-29 Years)	22.2 $\pm$ 2.1	
Gender		
Male	113	33.9
Female	220	66.1
Academic year		
1 ST Year	78	23.4
2 ND Year	83	24.9
3 RD Year	32	9.6
4 TH Year	48	14.4
5 TH Year	64	19.2
Internship	28	8.4

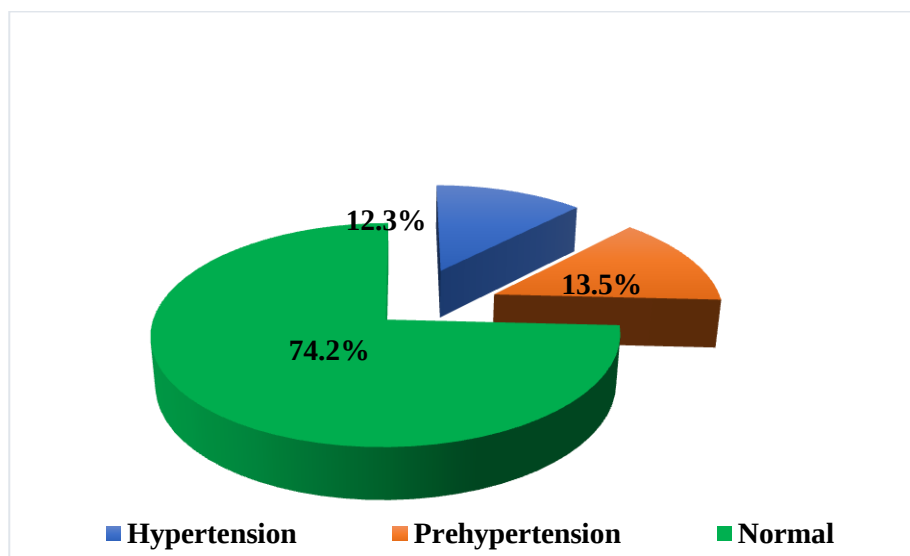


Figure (1): The prevalence of Prehypertension and Hypertension of the study sample

Factors associated with prehypertension and hypertension among medical student:

There was an association of prehypertension and hypertension with gender which was statistically significant ($P < 0.001$) as shown in figure 2. Prevalence of prehypertension was higher among males (22.1%) in comparison to females (9%), and prevalence of hypertension was higher in males (16.8%) than females (9.7%).

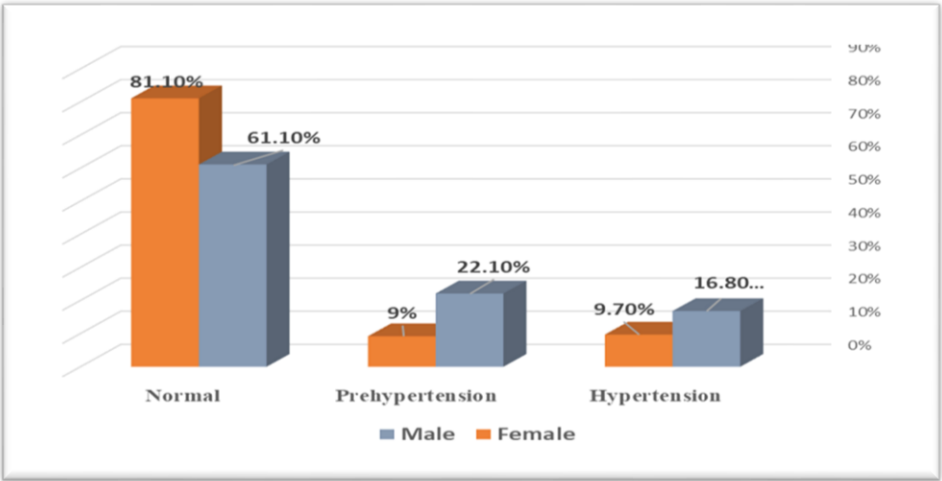


Figure (2): Graphic representation of prehypertension and hypertension according to Gender

Figure 2. shows the current smoking (33.3% and 44.4%, respectively), was highly associated ($P < 0.001$) with the prevalence of prehypertension and hypertension, and in former smoking (50%) was associated with the prevalence of prehypertension.

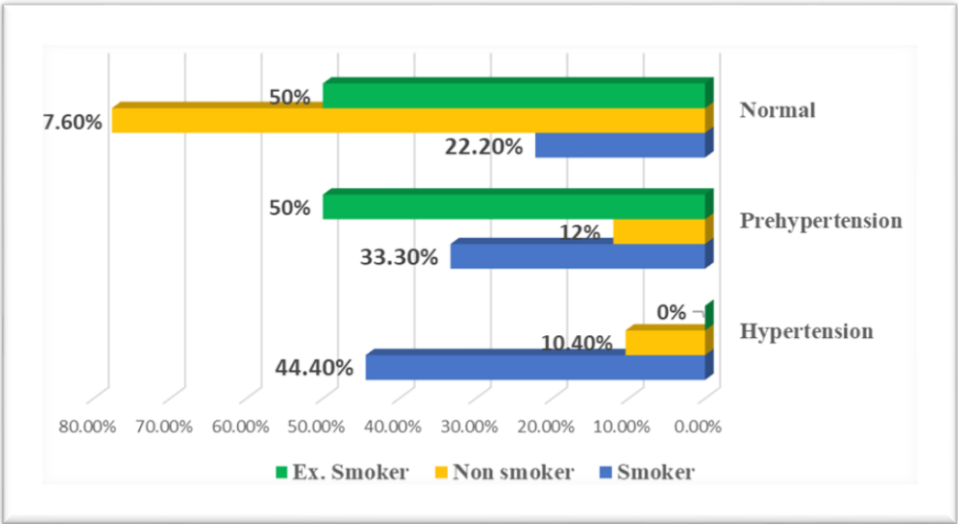


Figure (3): Graphic representation of prehypertension and hypertension according to Smoking

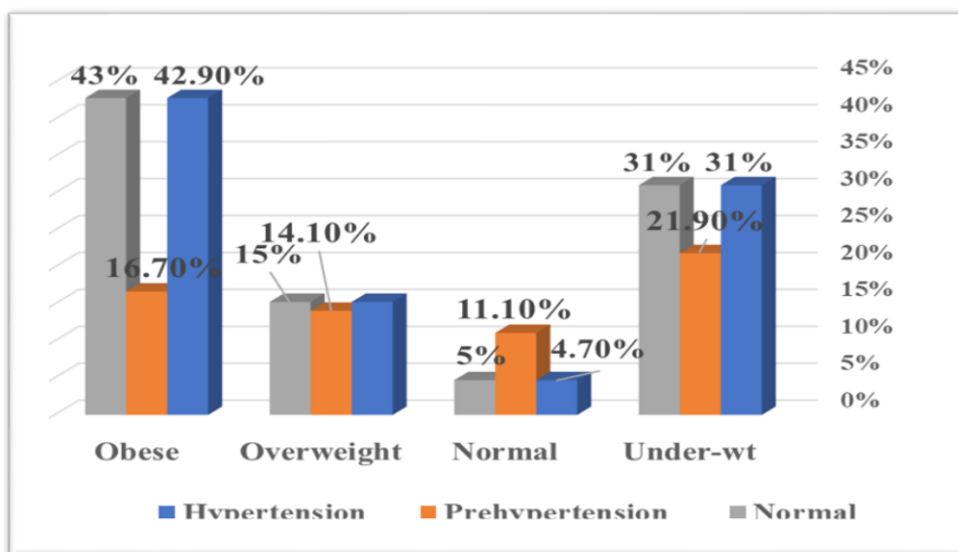


Figure (4): Graphic representation of prehypertension and hypertension according to BMI

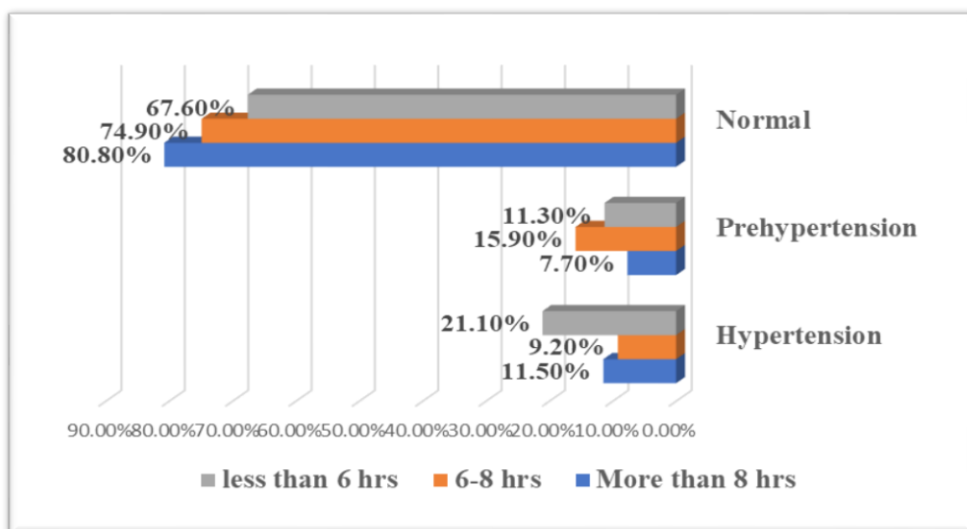


Figure (5): Graphic representation of prehypertension and hypertension according to Sleep hours

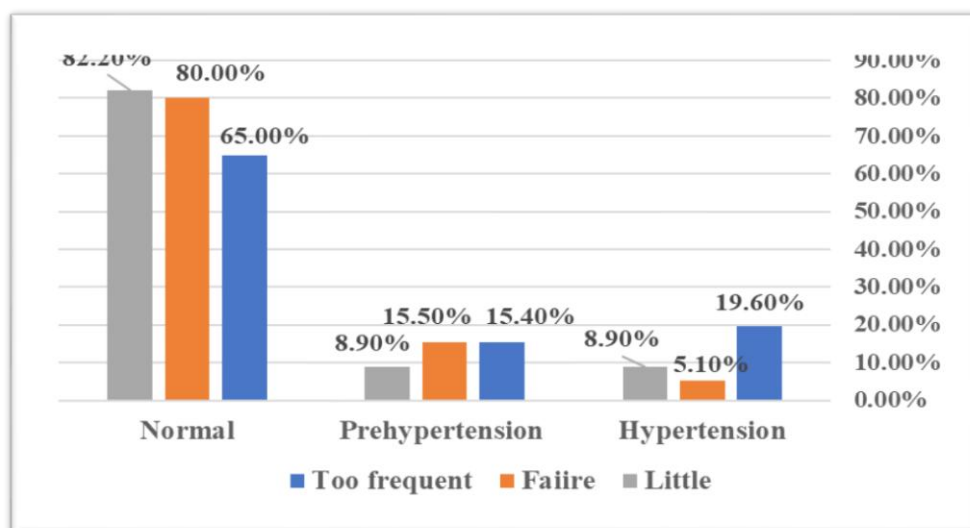


Figure (6): Graphic representation of prehypertension and hypertension according to soft drinks and coffee intake

4. Discussion:

Cardiovascular disease (CVD) has been the main cause of death on the world. The relationship between the level of blood pressure and the risk of CVD events is independent of other risk factor. The higher the blood pressure the greater the risk of heart attack, heart failure, stroke and kidney disease. The presence of additional risk factors such as smoking, diabetes and high cholesterol levels increases the CVD risk from hypertension (Emdin et al., 2017).

The prevalence of hypertension in this study was 12.3% (16.8% and 9.7% in males and females respectively), and of prehypertension prevalence was 13.5% (22.1% and 9% in males and females respectively), The overall prevalence of hypertension and prehypertension together is 25.8% which is similar to that found in a study in Palestine (Tayem et al., 2012), but lower than that reported by Alanazi et al in Saudi Arabia which was 56.89% (Alanazi et al., 2018).

The risk factors associated with hypertension which have significantly associated with hypertension, such, male gender, smoking habits, increased BMI, sleep hours less than 6 hours, too frequent intake of soft drinks and coffee.

Males were nearly two times more likely to have prehypertension and hypertension than females which is supported by the finding of several studies

conducted in other countries (Abu-Zaiton & Al-Fawwaz, 2013; Bjertness et al., 2016).

This difference in prevalence rate by gender still unclear; however, the role of androgens in regulating blood pressure gives some clue to differences between genders (Virdis et al., 2010).

This study showed that current smoking is also a significant risk factor for hypertension which agrees with other studies through the stimulation of the sympathetic nervous system; smoking has hypertensive effect (Leone, 2011; Ahad & Nowreen, 2018).

An association between BMI and hypertension was found in this study. The prevalence of hypertension was found to be 42.9 % among obese participants ($BMI \geq 30$) which is similar to another study that reported 45.48% of hypertensive had high BMI (Kar & Khandelwal, 2015).

Previous systematic reviews and retrospective studies consistently indicated that higher BMI values are associated with elevated BP in adults, a trend that has been widely confirmed (Zhang & Wang, 2021).

Our study did not find any significant relationship between BP measurement and other factors such as, physical activity, family history of diabetes or hypertension, psychological stress, time spent on social media, salt intake, high calorie meals, vegetable and fruit intake, fast food intake & fatty food consumption.

5. Conclusion:

In conclusion, the prevalence of hypertension and prehypertension together (25.8%) represent a call for the establishment of screening system for early detection at primary health care level. Community-based health education programs on the importance of the examination and follow-up processes for early detection of hypertension and prehypertension are recommended.

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Conflict of Interest: Nil.

References

- Abu-Zaiton, A., & Al-Fawwaz, A. (2013). Prevalence of diabetes, obesity, hypertension and associated factors among students of Al-albayt University, Jordan. *World Journal of Medical Sciences*, 9(1), 49–54.
- Ahad, F., & Nowreen, N. (2018). Prevalence of prehypertension among medical students and its correlation with anthropometric indices. *International Journal of Medical Science and Public Health*, 7(12), 1018–1023.
- Alanazi, A. M. J., Alenezi, Y. M., Alanazi, T. H., Alruwaili, B. A. S., Alanazi, A. M. M., & Alrawili, A. N. (2018). Prehypertension and Hypertension in Medical Students of Northern Border University in Arar, Saudi Arabia. *The Egyptian Journal of Hospital Medicine*, 70(1), 33–38.
- Al-Taha M., Al-Delaimey A., Alrawi R. (2020). Prevalence of hypertension among medical students and its lifestyle determinants. *Iraqi J Comm Med*, 33(1), 103–111.
- Bjertness, M. B., Htet, A. S., Meyer, H. E., Htike, M. M., Zaw, K. K., Oo, W. M., Latt, T., Sherapa, Y. L., Bjertness, E. (2016). Prevalence and determinants of hypertension in Myanmar – A nationwide cross-sectional study. *BMC Public Health*, 16(1), Article 590.
- Brar, S., & Badaruddoza. (2013). Epidemiology of blood pressure in relation to certain quantitative traits among urban Punjabi adolescents. *Asian Journal of Pharmaceutical and Clinical Research*, 6(2), 319–325.
- Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L., Jones, W. D., Oparil, S., Roccella, E. J. (2003). The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 report. *JAMA*, 289(19), 2560–2572.
- Emdin, C. A., Anderson, S. G., Salimi-Khorshidi, G., Woodward, M., MacMahon, S., & Dwyer, T. (2017). Usual blood pressure, atrial fibrillation and vascular risk: Evidence from 4.3 million adults. *International Journal of Epidemiology*, 46(1), 162–172.
- Gupta, M. C., & Mahajan, B. K. (2005). *Textbook of preventive and social medicine* (3rd ed.). Jaypee Medical Publishers.
- Kar, S., & Khandelwal, B. (2015). Fast foods and physical inactivity are risk factors for obesity and hypertension among adolescent school children in east district of Sikkim, India. *Journal of Natural Science, Biology, and Medicine*, 6(2), 356–359.

- Leone, A. (2011). Smoking and hypertension: Independent or additive effects to determining vascular damage? *Current Vascular Pharmacology*, 9(5), 585–593.
- Qureshi, A. I., Suri, M. F., Kirmani, J. F., Divani, A. A., & Mohammad, Y. (2005). Is prehypertension a risk factor for cardiovascular diseases? *Stroke*, 36(9), 1859–1863.
- Stanaway, J. D., Afshin, A., Gakidou, E., Lim, S. S., Abate, D., Abate, K. H., et al. (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: A systematic analysis for the Global Burden of Disease Study. *The Lancet*, 392(10159), 1923–1994.
- Tayem, Y. I., Yaseen, N. A., Khader, W. T., Abu Rajab, L. O., Ramahi, A. B., & Saleh, M. H. (2012). Prevalence and risk factors of obesity and hypertension among students at a central university in the West Bank. *Libyan Journal of Medicine*, 7, 1–5.
- Virdis, A., Giannarelli, C., Fritsch Neves, M., Taddei, S., & Ghiadoni, L. (2010). Cigarette smoking and hypertension. *Current Pharmaceutical Design*, 16(23), 2518–2525.
- World Health Organization. (1997). *Obesity: Preventing and managing the global epidemic: Report of a World Health Organization Consultation*.
- Zhang, Y. X., & Wang, S. R. (2021). High blood pressure in Chinese youth across categories of BMI and waist circumference. *Blood Press Monit*, 26(2), 124–8.