Prehypertension and Hypertension in Medical Students of Northern Border University in Arar, Saudi Arabia

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ABSTRACT

Aim of the work: hypertension is the commonest cardiovascular disorder. Prehypertension in adolescents and young adults is a risk factor for developing hypertension in later years of life. The objective of this study was to determine the prevalence rate and risk factor associated with prehypertension and hypertension in the medical students of Northern Border University in Arar city, Saudi Arabia. **Methods:** this cross-sectional study included 232 students. The study subjects were selected by systematic random sampling method. This study included 232 medical students (136 male and 96 female). The study period was from 1 March to 31 May 2017. Students were given a predesigned and pretested questionnaire to collect the relevant data. **Results:** Fifty (52.1%) of females and 58.8% of males were pre-hypertensive and 1.5% from males were hypertensive. Family history of hypertension was positive in 66.7% of hypertensive or pre-hypertensive students (P<0.05), 18.2% were obese (P<0.05), 9.1% of hypertensive or pre-hypertensive students were diabetic (P>0.05), 31.8% were smokers (P>0.05), 10.6% were drug addicts (P>0.05), 18.2% only performing muscular exercise (P>0.05), 62.1% consume >5g salt /day (P<0.05)and 40.9% of them spent 2-5 hours in front of TV, Computer or mobile (P>0.05). **Conclusion:** in medical students of the Northern Border University, 52.1% of females and 58.8% of males were pre-hypertensive and 1.5% of males were hypertensive. Risk factors included obesity, family history, sedentary life and excess salt intake. So health-care providers should recognize the increased risk of prehypertension and hypertension and should seek to identify and manage the modifiable risk factors in those students.
Keywords: Prehypertension, Hypertension, Medical Students ,Northern Border , Arar,SA.

INTRODUCTION

Hypertension is the most common cardiovascular disorder and it is a major public health challenge to population in socio-economic and epidemiological transition[1].The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) defined hypertension as blood pressure >140/90 mmHg [2], when pre hypertinson was defined as individuals with blood pressure (BP) above optimal levels, but not clinical hypertension, i.e., systolic BP (SBP) 120-139 mmHg or diastolic BP (DBP) of 80-89 mmHg [3]. Prehypertension in adolescents and young adults is a risk factor for developing hypertension in later years of life. These disorders are seen affecting the younger age groups and adolescents at an increasing rate. With growing urbanization, socio-developmental and life style changes from traditional to modern have led to physical inactivity, stress on technology, computers and alarming consumption of junk food and other modified dietary patterns characterized by increased consumption of diets rich in fat, sugar and calories [4] has led to youth suffering from obesity and prehypertension. The mortality rate in pre-hypertinsive adults is 50% higher than normotensive counterparts. **Framingham** stated that pre-hypertension is strongly associated with an increased risk of myocardial infarction and coronary artery diseases [5].Prehypertension tends to be unnoticed; However early identification of prehypertension plays an important role in identification of modifiable factors required for prevention of cardiovascular problems [5].

Physicians across the globe are found to have higher prevalence of metabolic syndrome than previously expected [2], so we aimed in this study to identify the prevalence of pre-hypertension, hypertension and associated factors among adolescent medical students who were from similar socioeconomic status, dietary habits, and lifestyle. Many studies have been done around the world in this area. Studies from India have given varied prevalence of prehypertension, ranging from 20% to 80% [6,7]. Another studies determined the prevalence of cardiovascular risk factors among the medical students elsewhere [8,9] have all shown high prevalence of cardiovascular risk factors. Drug

therapy for prehypertension is not recommended for various reasons [10,11], but by detecting prehypertension some remedial measures must be adopted and some changes in life style should be done to prevent hypertension and its consequences as age advances. A study was targeting pre-hypertension provided an estimate of the future volume of the problem and assist in developing strategies for control of hypertension and its complications [3]. The objective of this study was to determine the prevalence rate and risk factor associated with pre hypertension and hypertension in medical students of the Northern Border University in Arar city, Saudi Arabia.

PARTICIPANTS AND METHODS

This was a cross sectional community based study. The study subjects were selected by systematic random sampling method. A total of 232 medical students were included in this study (136 male and 96 female); they were studying in the Faculty of Medicine, Northern Border University, Arar, KSA. The study period was from 1 March to 31 May 2017.

Data collection: participant students were given a predesigned and pretested questionnaire to collect the relevant data on Socio-demographic characteristics including grade, sex and marital status. Risk factors of high BP like family history of hypertension, physical activity, drug addiction and cigarette smoking, dietary habits like salt intake. Body weight and height were measured. Body Mass Index (BMI) was calculated using the formula weight (kg)/height (m2).

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 [12]. 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.

Statistical analysis

Collected data coded and analyzed using statistical package for the social sciences (SPSS, software version 16). Descriptive statistics for the prevalence and quantitative variables was used. Significance of non-parametric factors which were influencing pre-hypertension and hypertension like duration of time spent on TV/computer/Mobile, dietary habit, addiction etc. was done by Chi-square test.

ETHICAL CONSIDERATIONS

Data collectors gave a brief introduction to the participants by explaining the aims and benefits of the study. Informed written consent were obtained from all participants. Anonymity and confidentiality of data maintained throughout the study. There was no conflict of interest. **The study was done after approval of ethical board of Northern Border university.**

RESULTS

Table 1 showed that the total number of cases was 232; normal blood pressure was detected in 47.9% females and 39.7% males. 52.1% from females were pre-hypertensive and 58.8% were males. Also, we found that 1.5% from males were hypertensive with blood pressure (140-159\90-99) while, no female was detected with hypertension. About half (47.9%) of total female and 39.7% of males had normal diastolic blood pressure, 50% of females and 54.4% of males had a relatively higher diastolic blood pressure and 2.1% of females and 5.9% of males had a very high diastolic blood pressure ($\geq$ 90 mmHg). Only 14.6% of females and 22.1% of males had normal systolic blood pressure, 66.7% of females and 67.6% of males had systolic blood pressure from 120-139 mmHg, and 18.8% of females and 10.3% of males had systolic blood pressure more than 140 mmHg. **Table 2** showed that 6.1% of prehypertension and hypertension were in first grade, 12.1% were in the second grade, 19.7% in the third grade, 24.2% were in the fourth grade, 21.2% were in the fifth grade and 16.7% in the sixth grade (P=0.05). Also, the table showed that 78% of normal students were single and only 22% were married. 66.7% of pre hypertensive or hypertensive was single and almost 30% were married (P=0.03).

Table 3 showed the relationship between prehypertension and hypertension and factors influencing them among the studied students, it is clear that 6% of the underweight wasn't hypertensive or pre-hypertensive and 3% were hypertensive or pre-hypertensive. 34% of overweight wasn't hypertensive or pre-hypertensive and 40.9% were hypertensive or pre-hypertensive. Also, we found that 10% of obese students weren't hypertensive or pre-hypertensive and 18.2% was hypertensive or pre-hypertensive (P<0.05). Family history of hypertension was positive in 66.7% of hypertensive or pre-hypertensive students (P<0.05), 9.1% of hypertensive or pre-hypertensive students were diabetic (P>0.05), 31.8% were smokers (P>0.05), 10.6% were drug addicts (P>0.05), 18.2% were only performing muscular exercise (P>0.05), 62.1% consumed >5gm salt /day (P<0.05) and 40.9% of them spent 2-5 hours per day in front of TV, computer or mobile (P>0.05).

Table 1: the relationship between systolic and diastolic blood pressure level and sex of the studied students

Blood Pressure	Sex		Total (n=232)	value
	Female (n=96)	Male (n=136)		
Systolic Blood Pressure / Diastolic Blood Pressure				
• **Normotensive (<120/<80 mmHg)**	46	54	100	
	47.9%	39.7%	43.1%	
• **Prehypertension (120-139/80-89 mmHg)**	50	80	130	0.177
	52.1%	58.8%	56.0%	
• **Hypertension (140-159/90-99 mmHg)**	0	2	2	
	.0%	1.5%	.9%	
Diastolic Blood Pressure				
• **Normotensive (<80 mmHg)**	46	54	100	
	47.9%	39.7%	43.1%	
• **Prehypertension (80-89 mmHg)**	48	74	122	0.226
	50.0%	54.4%	52.6%	
• **Hypertension (≥ 90 mmHg)**	2	8	10	
	2.1%	5.9%	4.3%	
Systolic Blood Pressure				
• **Normotensive (<120 mmHg)**	14	30	44	
	14.6%	22.1%	19.0%	
• **Prehypertension (120-139 mmHg)**	64	92	156	0.101
	66.7%	67.6%	67.2%	
• **Hypertension (≥ 140 mmHg)**	18	14	32	
	18.8%	10.3%	13.8%	

Table 2: the relationship between prehypertension and hypertension, grade and marital status among the studied students

Grade	prehypertension and hypertension		Total(n=232)	P value
	No (n=100)	Yes (n=132)		
First	6	8	14	0.052
	6.0%	6.1%	6.0%	
Third	18	26	44	
	18.0%	19.7%	19.0%	
Second	10	16	26	
	10.0%	12.1%	11.2%	
Fifth	12	28	40	
	12.0%	21.2%	17.2%	
Fourth	20	32	52	
	20.0%	24.2%	22.4%	
Sixth	34	22	56	
	34.0%	16.7%	24.1%	
Marital status				
Single	78	88	166	0.039
	78.0%	66.7%	71.6%	
Married	22	44	66	
	22.0%	33.3%	28.4%	

Table 3: the relationship between prehypertension and hypertension and factors influencing them among the studied students

Factor	Prehypertension and Hypertension		Total	P value
	No (n=100)	Yes (n=132)	(n=232)	
BMI				
• Underweight	6	4	10	0.012
	6.0%	3.0%	4.3%	
• Normal	50	50	100	
	50.0%	37.9%	43.1%	
• Overweight	34	54	88	
	34.0%	40.9%	37.9%	
• Obese	10	24	34	
	10%	18.18%	37.9%	
Family history of hypertension				
• Yes	42	88	130	0.001
	42.0%	66.7%	56.0%	
• No	58	44	102	
	58.0%	33.3%	44.0%	
DM				
• Yes	6	12	18	0.269
	6.0%	9.1%	7.8%	
• No	94	120	214	
	94.0%	90.9%	92.2%	
Daily effort				
• High	18	0	18	0.001
	18.0%	.0%	7.8%	
• Moderate	38	38	76	
	38.0%	28.8%	32.8%	
• Low	44	94	138	
	44.0%	71.2%	59.5%	
Smoking				
• Yes	24	42	66	0.123
	24.0%	31.8%	28.4%	
• No	76	90	166	
	76.0%	68.2%	71.6%	
Drug addiction				
• Yes	14	14	28	0.179
	14.0%	10.6%	12.1%	
• No	86	118	204	
	86.0%	89.4%	87.9%	
Performing muscular exercise				
• Yes	24	24	48	0.169
	24.0%	18.2%	20.7%	
• No	76	108	184	
	76.0%	81.8%	79.3%	
Amount of daily salt intake /day				
• < 5 gm	56	50	106	0.004
	56.0%	37.9%	45.7%	
• >5 gm	44	82	126	
	44.0%	62.1%	54.3%	
Amount of fluid intake/day (in litter)				
• <3	60	62	122	0.041
	60.0%	47.0%	52.6%	

• **3-5**	34	66	100	
	34.0%	50.0%	43.1%	
• **> 5**	6	4	10	
	6.0%	3.0%	4.3%	
Number of hours spent in front of TV, Computer or mobile				
• **< 2**	62	70	132	0.099
	62.0%	53.0%	56.9%	
• **2-5**	28	54	82	
	28.0%	40.9%	35.3%	
• **>5**	10	8	18	
	10.0%	6.1%	7.8%	

DISCUSSION

The present study included 232 medical students, 96 females and 136 males. The overall prevalence of prehypertension and hypertension in the entire group was 56.89%. The prevalence of prehypertension in the present study was higher than the 21.7% prevalence reported from a study in a medical college [13]. A study of 100 medical students in Davangere showed that the prevalence of prehypertension was 64% [14] while, two studies of 100 boys and girls in a the Medical College in Wardha showed a prevalence of prehypertension in 52% [15]. Another study of 500 medical students in a Mangalore College showed a point prevalence of 55.4% [16]. A possible reason for the higher prevalence of prehypertension and hypertension in our group may be due the higher prevalence of overweight among our students. The Mangalore group had a lower prevalence of overweight of 31.8% (159/500) compared to the present study which showed a prevalence of 59.08% of overweight and obesity in the entire group. There was a significant correlation between excess weight and prehypertension or hypertension in our study, similar to findings in another study done in Coastal Karnataka [16].

In our study students who had more than 5 mg of salts in their diet daily showed pre-hypertension and hypertension which was statistically significant. Therefore, it can be concluded that dietary modification might have a significant role in controlling hypertension as proved in a study done by **Koley *et al*.** [17]. Our study did not find any significant relationship between BP measurement and other factors such as systolic blood pressure (p=0.101), diastolic blood pressure (p=0.226), academic year (p=0.052), DM (p=0.269), smoking (p=0.123), drug addiction (p=179), performing muscular exercise (p=0.169), number of hours spent in front of TV and computer or mobile (p=0.099). However, data from other studies have shown an association between these factors [14,18]. There was a significant correlation between pre-hypertinsion or hypertension and marital status (p=0.039), amount of daily salt intake /day (p=0.004), amount of fluid intake/day (in litter) (p=0.041) a high significant correlation with family history of hypertension and daily effort (p=0.000). In our studied group 66.7% had a positive family history of hypertension. This obviously implies that a strong family history is an independent risk factor, those students were prone to develop prehypertension prematurely.

CONCLUSION AND RECOMMENDATIONS

In medical students of the Northern Border University, 52.1% of females and 58.8% of males were pre-hypertensive and 1.5% of males were hypertensive. Risk factors included obesity, family history, sedentary life and excess salt intake. So health-care providers should recognize the increased risk of prehypertension and hypertension and should seek to identify and manage the modifiable risk factors in those students.

LIMITATIONS

The study involved a homogenous group of people with mostly similar backgrounds and socioeconomic parameters. The study has displayed facts based on a single visit, small sample size and lack of follow up data.

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REFERENCES

1. **Park K (2011):** Park's Text Book of Preventive and Social Medicine . 21st ed. Jabalpur: Bhanot Publishers. London. pp: 344–352.

2. **Shobha S and Avinash N (2012):** Prevalence of prehypertension amongst medical students in coastal karnatak. Journal of Evolution of Medical and Dental Sciences, 1(6): 974-981.

3. **Yadav S, Boddula R, Genitta G, Bhatia V, Bansal B, Kongara S** *et al*. (**2008**): Prevalence and risk factors of pre-hypertension and hypertension in an affluent North Indian population. Indian J. Med.,128(6):712-720.

4. **Elliot W and Black H (2007):** Prehypertension. Nat. Clin. Pract. Cardiovasc. Med., 4(10):538-548

5. **Qureshi A, Suri M, Kirmani J, Divani A and Mohammad Y (2005):** Is prehypertension a risk factor for cardiovascular diseases? Stroke, 36(9):1859-1863.

6. **Raju P, Sudhakar C and Umamohan C (2009):** a study of a primitive tribe in Kurnool district of Andhra Pradesh. Anthropologist, 11:167-172.

7. **Sharma A, Grover N, Kaushik S, Bhardwaj R and Sankhyan N (2010):** Prevalence of hypertension among schoolchildren in Shimla. Indian Pediatr., 47:873-879.

8. **Giri S, Sharma S, Timalsina S, Yadav V, Koirala S** *et al.* **(2012):** Cardiovascular health risk behavior among medical students in a teaching hospital. J. Nepal. Health Res. Counc., 10(22):187–191.

9. **Bertsias G, Mammas I, Linardakis M and Kafatos A (2003):** Overweight and obesity in relation to cardiovascular disease risk factors among medical students in Crete. Greece BMC Public Health, 3(3):8-16.

10. **King D, Everett C and Mainous A (2006):** Long term prognostic value of resting heart rate in subjects with prehypertension. Am. J. Hypertens., 19(8):796-800

11. **Ishikawa Y, Ishikawa J, Ishikawa S** *et al.* **(2010):** Prehypertension and the risk for Cardiovascular disease in the Japanese general population. J. Hypertension, 28(8):1630-1637.

12. **Chobanian A, Bakris G, Black H, Cushman W, Green and Izzo J (2003):** The 7th report of the joint national committee on prevention, detection, evaluation and teatment of high blood pressure. Hypertension, 42:1206–1212.

13. **Asmathulla S, Rajagovindan D, Sathyapriya V and Pai B (2011):** Prevalence of Prehypertension and its relationship to cardiovascular disease risk factors in puducherry (medical staff). Ind. J. Physio.l Pharm., 55:343-350.

14. **Kulkarni M, Hemagiri K and Malavika P (2011):** Prehypertension and associated factors among medical students of SSIMS and RC, Davangere - A cross-sectional study. J. Indian Med. Assoc., 109:733- 736.

15. **Kotpalliwar M, Wanjari A and Acharya S (2013):** Prevalence of prehypertension in young healthy individuals and its associated risk factors. Indian J. Med. Health care, 2:242-248.

16. **Setty S and Naik A (2012):** Prevalence of Prehypertension amongst medical students in Coastal Karnataka. J. Evol. Med. Dent. Sci.,1:975-980.

17. **Koley M, Mundle M, Ghosh S and Saha S (2013):** A short-term pilot study investigating the efficacy of dash diet in reducing systolic and/or diastolic blood pressure in patients with essential hypertension. Asian J. Pharm. Clin. Res., 6 (1):169-172.

18. **Brar S and Badaruddoza A (2013):** Epidemiology of blood pressure in relation to certain quantitative traits among urban Punjabi adolescents. Asian J. Pharm. Clin. Res., 6 (2):319-325.