Research Article

Hypertension and Pre-Hypertension with Associated Risk Factors Among MBBS Students of Shalamar Medical and Dental College, Lahore

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Abstract | Hypertension is a multifactorial chronic disease and a silent cause of high causalities around the globe. Both hyper and pre-hypertension affect all ages and professions, and are as common as flu infections by affecting 1 in every 5 persons. In order to determine frequency of hypertension and pre-hypertension among medical students and their association with various variable and fixed risk factors, this study was designed. The cross sectional study of 4 months was carried out on the students of Shalamar Medical and Dental College. Students were aged from 18-25 years and a sample of 100 students was enrolled by stratified random sampling after written consent. We recorded blood pressure at three different time points, one minute apart in sitting position after ten minutes of rest. The average of three measurements was considered as final reading. Data regarding related variables was entered and analysed using SPSS version 21. Out of 100 (43 males and 57 females), three students were hypertensive, 55 pre-hypertensive and 42 normotensive; among pre-hypertensive female students were more in number as compared to male students. Mean age was 21.6 years with increased frequency of pre hypertensive and hypertensive individuals in the first, second and final year class. A total of 64% pre-obese subjects were pre-hypertensive or hypertensive and 75% obese were also pre hypertensive or hypertensive. Frequency of intake of fast/junk food was higher among pre-hypertensive and hypertensive individual than normotensive and same among both genders. Median value of average sleep (hours) among pre-hypertensive subjects was lesser than of hypertensive subjects. Students expressed their concerns related to college timings and hectic routine and increased frequency of teaching sessions including assessments. Frequency of pre-hypertension was higher in the students especially in the first, second and final years of graduation (MBBS). Pre-hypertensive and hypertensive students were pre-obese or obese and had positive family history of hypertension, consumed fast/junk food in both genders. College timing and intensive routines were primary cause of irritation and aggression, which may result in hypertension.

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Introduction

Hypertension is a multi-factorial cause of deaths and is one of the most common chronic diseases occurring throughout the world. According to WHO,[1] 1 in every 5 individuals is suffering from hypertension however usually people are asymptomatic.[1] It is estimated that approximately 7 million

people die from hypertension and 1.5 billion suffer from this ailment annually.[2] It is also estimated that 9.4 million people die as a result of complications of hypertension each year.[2]In 2015, a group of cardiologists, on the World Hypertension Day at Dow University of Health Sciences, Pakistan, recorded that prevalence of hypertension was 50% among people ≥ 50 years of age and 30% among adults ≤30 years of age and 5-7% among children in Pakistan. According to the guidelines of WHO, hypertension is defined as systolic pressure ≥140 mmHg and diastolic pressure of ≥90 mmHg (normal being ≤120/80mmHg) and is strongly associated with increased body mass index (BMI), central obesity, sedentary lifestyle, poor glycemic control, high intake of processed and junk food, type A personality, blood group O and A, smoking, increased stress and anxiety.[2]Among adults (age ≥18 years) individuals are categorized or grouped into normal (<120 and <80 mmHg), pre-hypertension (120-139 and 80-89mmHg), stage I hypertension (140-159 and 90-99 mmHg), stage II hypertension (>160 and >100 mmHg) on the basis of systolic and diastolic blood pressure (BP) respectively and isolated systolic hypertension (>140 with diastolic <90 mm Hg).[3] About 90% of the people suffer from primary hypertension i.e. the cause cannot be ruled out while 10% suffer from secondary hypertension i.e. there is an underlying renal, vascular, hepatic, endocrine or any other pathological cause.[4] Criteria to diagnose is to take three different readings on alternate visits of the patient, with the patient being fully relaxed and in a sitting posture. Even the mere sight of doctor's white coat can cause anxiety and give false positive results, inducing white coat hypertension (estimated up to 10-15% in general population and 30% in patients with raised blood pressure).[5] In a study conducted at Shamnur Shivashankarappa Institute of Medical Sciences and Research Centre, India among 100 medical students aged between 18-24 years of age and a sample size of 100 (out of which 44 were males and 56 were females), 67% of the students were pre-hypertensive and 3-5% were hypertensive. The hypertensive students had equal male to female ratio and hypertension was associated with greater mean weight, BMI, waist circumference, lifestyle, poor glycemic control, personality types, smoking habits and degree and perception of stress among the students. It was also found out that medical students had a greater mean BP as compared to the students of other professions.[6] While considering these objectives, the present study was carried out to estimate the frequency of hypertension and pre-hypertension among medical students of Shalamar Medical and Dental College (SMDC), Lahore in the year 2016. Additionally, efforts were made to determine its association with various variable and fixed risk factors in the same cohort.

Materials and Methods

In this cross-sectional study, we determined frequency of hypertension (HTN) among the students of MBBS in Shalamar Medical and Dental College, Lahore. Operationally, we defined systolic BP as the maximum pressure (mm Hg) in the arteries between two successive heart contractions, diastolic BP as the minimum pressure (mm Hg) in the arteries between two successive heart contractions and BP was categorized as normotensive when systolic and diastolic values were (<120 and <80 mmHg), as pre-hypertensive (120-139 and 80-89mmHg), and as hypertensive (>140 and >90 mmHg) respectively.[5] Through stratified random sampling technique, we interviewed 100 college students from a total population of 685 students studying during the year of 2016 at the time of survey. We then interviewed the selected participants at the pharmacology laboratory of the college. The students were explained that it is a non-invasive method and were comfortably seated in a suitable environment, placing the sphygmomanometer at heart's level by the researchers themselves after being trained for it. We measured BP readings at three different times one minute apart while they were seated after ten minutes of rest. If any student was found anxious, his BP readings were retaken either in his class or cafeteria where he/she felt relaxed and comfortable at a different time or the very next day. After taking three readings, the average measurement (both Systolic and Diastolic) was recorded as final reading. Variables included age, class, weight, gender, BMI, BP (both Systolic and Diastolic), history of hypertension in family, its complications, associated risk factors relevant to behavior, lifestyle, routines, medicine intake, primary and secondary hypertension. Risk factors included habit of smoking, sedentary lifestyle or exercise (at least for 30 minute and 5 days a week), eating habits (colas, caffeine, fast food intake), raised cholesterol levels (>200 mg/dl), psychological issues, study stresses, sleep routine and disturbance, surrounding environmental pollution specially noise, personality type (A or B), use of unsafe water and presence of thyroid, kidney or any associated disease. After taking written consent, the data against above variables and bio-data

Table 1: *Comparison of biological and epidemiological risk factors among Normotensive, pre-hypertensive and hypertensive subjects (n=100).*

Variable	Categories	Normotensive (n=42)	Pre-hypertensives (n=55)	Hypertensives (n=3)
Gender	Male (n=43)	18	23	2
	Female (n=57)	24	32	1
Personality Type	A (n=33)	14	19	0
	B (n=67)	28	36	3
High (>200 mg/dl) Cholesterol	Yes (n=2)	0	2	0
	No (n=98)	42	53	3
Smoking Habit	Yes (n=11)	2	8	1
	No (n=89)	40	47	2
Fast/Junk Food intake	Yes (n=93)	37	53	3
	No (n=7)	5	2	0
Regular Sleep	Yes (n=66)	28	37	1
	No (n=34)	14	18	2
Sleep Disturbance	Yes (n=9)	2	6	1
	No (91)	40	49	2
Average Sleep Duration (hrs)	Less than 5 (n=3)	0	3	0
	5-7 (n=57)	24	32	1
	More than 7 (n=40)	18	20	2
Comfortable Environment	Yes (n=97)	41	53	3
	No (n=3)	1	2	0
Exercise Habit	Yes (n=46)	19	25	2
	No (n=54)	23	30	1
Family History	Positive (n=63)	24	36	3
	Negative (n=37)	18	19	0
Medicine Intake	Yes (n=46)	19	25	2
	No (n=54)	23	30	1
Source of Water Intake	Tap (n=27)	7	19	1
	Boiled /filtered (n=60)	28	30	2
	Bottled (n= 13)	7	6	0

of the student was recorded on the questionnaire, keeping confidentiality and ensuring anonymity. Data was analyzed using SPSS (statistical package for the social sciences) version 21 and Microsoft Excel. The frequencies & percentage of gender, year of study and BMI were given. BMI was categorized according to WHO criteria for Asian population as normal (18.5-22.99), pre-obese (23-26.99), obese (>27) and under-weight (<18.5). Mean, median, minimum, maximum, standard deviation of age, BP and exact sleep per night hours were presented in tables and graphs.

Comparison of selected risk factors with normotensive, pre-hypertensive and hypertensive and between both genders was also done. When asked through multiple response questions, some activities were expressed for being related to their irritation/aggression most of the time by these pre-hypertensive subjects.

Results and Discussion

Out of 100 students of SMDC, mean age (±sd) was 21.6 (±1.8) years with minimum 18 and maximum of 25 years. Overall prevalence of pre-hypertension was 55%, normotensive were 42%, and hypertensive was only 3%. Out of 43 males, 2 were hypertensive and 23 were pre-hypertensive, and similarly out of 57 females, 32 were pre hypertensive with 1 case of hypertension (Table 1). As far as distribution of students in different classes according to categories of BP, revealed increased frequency of pre hypertensive and hypertensive individuals in the first and second year class, and then it decreases in third year class but thereafter steadily increased in fourth and final year (Figure 1). All three hypertensive individuals were pre-obese or obese on the BMI categories. In Figure 2 it is shown that 64% pre-obese were pre-hypertensive or hypertensive (20 out of 31) and 75% obese were also pre-hypertensive or hypertensive (9 out of

12). BMI was weakly correlated with systolic and diastolic BP with Pearson's coefficient 'r' of 0.3 and 0.2, respectively. However systolic BP was strongly correlated with diastolic BP with Pearson's coefficient 'r' of 0.7. About 33 males and 25 females had raised BP values among the sample of 100 students.

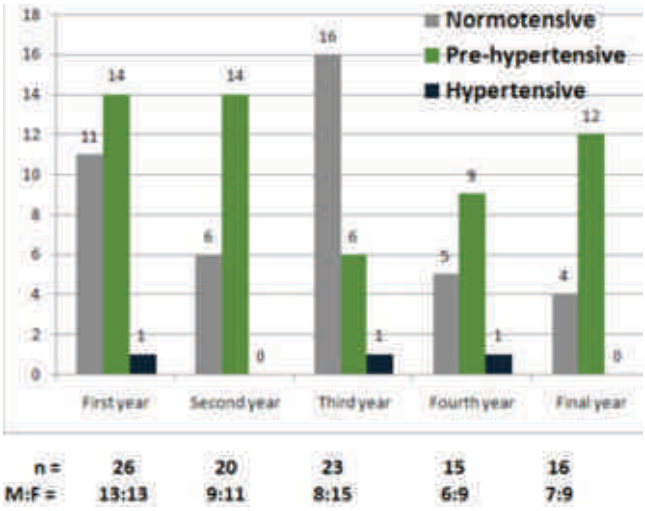

Figure 1: *Class-wise distribution of categories of BP of SMDC students (n=100).*

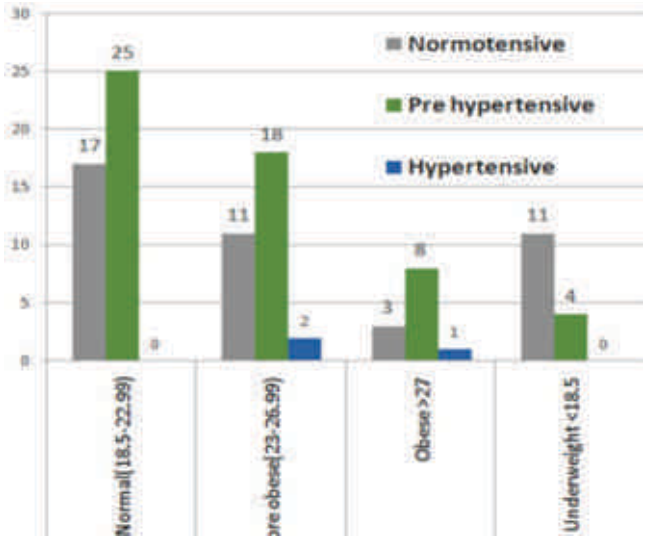

Figure 2: *Distribution of Normotensive, pre-hypertensive and hypertensive subjects on the basis of BMI categories (n=100).*

On comparison of biological and epidemiological risk factors with categories of BP (Table 1), percentage of habit of intake of fast/junk food was more among pre-hypertensive and hypertension individual than normotensive (Table 1). Those having positive history of hypertension in immediate family e.g. father, mother, brother, sister, grandparents (n=63), twenty have been diagnosed recently preceding this survey. Only two respondents recorded heart being involved as the complication of hypertension in their family members. Those who had a habit of consuming fast foods (n=97), majority (n=68) reported 'up to five' times per week followed by 'five to ten' times in 22 subjects. Similarly those who had habit of consuming soft/ fizzy drinks e.g. cola (n=92), majority (n=53) reported 'up to five' times per week followed by 'five to ten' times in 24 subjects. 34% (20 out of 58) students with raised BP values used to drink tap water as compared to 16% (7 out of 42) normotensive students. Among smokers (n=15) only five were regular and four were passive smokers. Out of 3 hypertensives, 1 was a regular smoker. Similarly, among pre hypertensive students (n=55), 3 were regular and 4 were occasional smokers. Among those who had habit of physical exercise (n=46), almost half (n=26) had 'one to five' years of duration of this life style followed by 'less than one' year in 19 subjects. Similarly again half (n=26) reported 'four to seven' times per week of exercise followed by 'one to three' times per week of exercise in 20 subjects. Majority (n=38) had reported 'walk' as form of exercise.

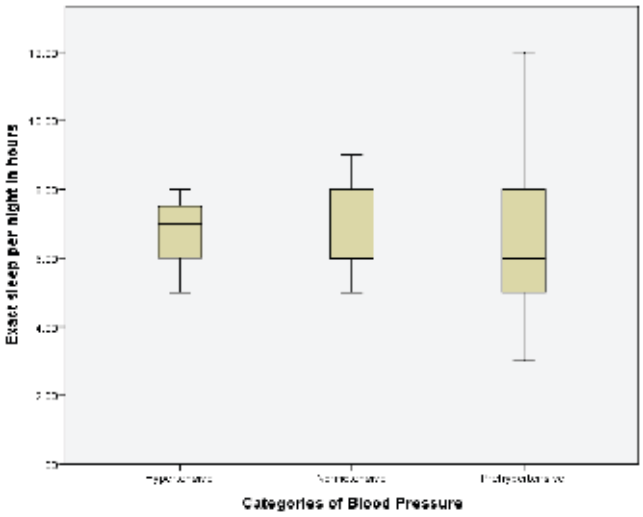

Figure 3: *Five point summary of exact sleep per night (hours) among Hypertensive, Normotensive and Pre-hypertensive subjects (n=100).*

In Figure 3, box-plot showed variation of average sleep of the study subjects among normotensive, pre-hypertensive and hypertensive individuals. Median value of average sleep in hours among pre-hypertensive subjects was recorded to be lesser than that of hypertensive subjects. However larger inter-quartile range was observed in pre-hypertensive subjects due to individuals with some extreme values (3, 4 and 10 and 12 hours). However overall mean value of average sleep in hours was 6.48 (±1.6) hours with minimum and maximum values of 3 and 12 hours. In Table 2,

it was shown that frequency of eating fast food was high between both genders.

Table 2: *Comparison of gender with selected biological and epidemiological risk factors among pre-hypertensive subjects (n=55).*

Variable	Categories	Male	Female	Total
Personality	A	9	10	19
	B	14	22	36
Smoking	Yes	8	0	8
	No	15	32	47
Exercise	Yes	6	19	25
	No	17	13	30
Fast Food	Yes	23	30	53
	No	0	2	02

When they were asked to express activities causing aggression, irritation and stress, some of the students expressed concerns related to college timings, and increased frequency of teaching sessions (like PBL, Tutorials etc.) and educational assessment tests.

From our study, a total of 55% of the students came out to be pre-hypertensive and these results are consistent with international literature.[7] Three percent were hypertensive again consistent with another research article[8] and 42% were normotensive. Out of the 55 pre-hypertensive patients, 16 had BMI on the higher side and 2 out of 3 hypertensives had higher BMI. Deranged BMI prevalence came out to be 29.7% which is similar to a study carried on students.[9] Increased BMI is itself associated with hypertension. Similarly, 36 out of 55 pre-hypertensive students and 3 out of 3 hypertensive students had positive family history of hypertension. Suggesting that students having positive family history developed hypertension in far greater numbers as compared to those who had no positive family history.[10] Family history imparts greater impact on the development of disease. Similarly a strong association between raised BP and consumption of fatty and junk food was found, 52 out of 55 pre-hypertensive and all three hypertensive students consumed junk food regularly or on alternate days. An international study carried out at University of Calgary shows that even the consumption of single fatty meal can lead to increased BP values and increased total peripheral resistance temporarily.[11] Sleep deprivation, lack of quality sleep or decreased sleep duration are also linked with increased BP.[12] Our study also shows that relation e.g. 33/55 pre-hypertensive slept on an average for 4-7 hours and similarly 1/3rd hypertensive's slept for less than 7 hours per night and nearly half of them had irregular sleep routine. Hypertension is also strongly associated with personality type A [13], however our research showed that 19/55 pre-hypertensive (34%) had type A personality and all 3 hypertensive students had type B personality, which can be explained on the basis that most of them were not sure of their personality types and had incomplete knowledge regarding the personality types. We could not establish a strong association between smoking and raised BP. It can be explained on the basis that the medical students were reluctant to disclose this personal information with the researchers, as they were being questioned for most of them were acquaintances and were not comfortable disclosing this habit. 49 out of 55 pre-hypertensive students used to drink tap, bottled or filtered/boiled water indicating an association between drinking tap water and raised BP, because this tap water also included electric coolers and electric dispensers. At most of the places filtered water or filtered water bottles are being used and students misinterpreted this question that may led to increase. Similarly we also tried to establish a relationship between stress and hypertension, as increased amount of stress can also lead to raised BP.[14]Our data showed that students of 1st, 2nd and 5th year had the highest number of pre-hypertensive students probably due to increased course work in 1st year and 2nd year. In final year this may be due to intensive course work with clinical training. As this study involved students from private medical college, where majority opted this profession because of their parents.

However, we could not establish a strong relationship between average study hours, environmental pollution, hyper-lipidemia, associated thyroid or kidney disease (despite including them to rule out the cause of secondary hypertension). Similarly, a relationship with steroids or other medicines intake was not established because of small sample and restriction or limitation to cross sectional study design.

Conclusions

Occurrence of pre-hypertension is high in the students whereas hypertension is low. Maximum frequency of pre-hypertensive and hypertensive individuals was recorded in the first, second and final year students. Pre-hypertensive and hypertensive students were pre-obese or obese and had positive family his-

tory and a same trend was noticed between both genders. Almost all such subjects also consumed fatty and junk food. Upon investigations, college timing, intensive routine, course work and clinical training were the major causes of their irritation and aggression.

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