

## ORIGINAL PAPER

**Prevalence of hypertension among university students**

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**Abstract**

*Objectives:* To determine the prevalence of hypertension among a sample of university students and determine the predisposing factors, the risk factors and outcome variables in the selected sample.

*Design:* The study is cross-sectional prevalence study.

*Setting:* Freshmen and finalists medical students from Khartoum College of Medicine. Manshia, Khartoum.

*Patients and Methods:* Casual Blood pressure was recorded from freshman and finalist students. Blood pressure readings were recorded between 9 AM– 12 PM. All collected data was entered into SPSS data sheet. The following parameters were recorded: Age, sex, academic year, smoking, family history of hypertension stroke or diabetes, history of headache, salt intake, systolic and diastolic BP and body mass index.

*Results:* The prevalence of hypertension (BP>140/90) among the group of 15-30 years old was found to be 2%. High diastolic BP (>89mmHg) was found in 15% of the sample and pre-hypertension was prevalent in 39%. The study has shown that smoking, family history of hypertension, obesity, university academic year, salt excess and lack of physical exercise are predictors of hypertension.

There is significant association between high diastolic BP, BMI and academic year (more in finalist). Pearson's Chi Square was 0.022 and 0.002, respectively. This indicates that academic year and BMI are significant predictors of hypertension in this sample of young university students.

*Conclusion:* The overall prevalence of Hypertension in this sample of university students was 2%. High diastolic pressure (>89 mmHg) was found in 15% of the sample. An association between hypertension and BMI was found to be significant and that finalists have significantly higher BP than freshmen.

**Keywords:** hypertension in the young, hypertension in Sudan, university students and hypertension, risk factors, hypertension.

**Introduction**

Hypertension ranks as the commonest among cardiovascular disease and is one of the most common causes of cardiovascular mortality rate in the world.<sup>1,2</sup>

The World Health Organization attributes hypertension, or high blood pressure, as the leading cause of cardiovascular mortality. The World Hypertension League (WHL), an umbrella organization of 85 national hypertension societies and leagues, recognized that more than 50% of the hypertensive populations worldwide are unaware of their condition. The UN health

targets include a 25% reduction in the prevalence of uncontrolled hypertension and a 30% reduction in dietary salt. Further, the Global Burden of Disease Study estimated that 18% of premature deaths and 7% of global disability are related to increase in blood pressure.<sup>3</sup>

Hypertension is often referred to as the "Silent Killer", because in most cases patients are asymptomatic until they develop target organ damage which results in: stroke, left ventricular hypertrophy, heart and renal failure.

The problem of hypertension is increasingly becoming a major health concern in Sudan.

Ahmed and Aboud reported the prevalence of hypertension as ranging from 8%-12%.<sup>4,5</sup> A recent paper by Ahmed et al reported that hypertension was detected in (18.2%) of subjects.<sup>6</sup> (8%) had newly discovered hypertension and (10.2%) were known hypertensives. They noted that there was no difference in symptoms between patients with hypertension versus normotensives. Only 40.8% were on drug treatment, of which 42.6% were controlled. They concluded that there is a rise in the prevalence of hypertension in Sudan.

Similar situations are reported by other African workers who documented that hypertension is the commonest cardiovascular disease in Africa and that country like Egypt has rates as high as 20% and up to 30% in South Africans.<sup>7,8</sup>

Several studies documented the prevalence of hypertension among children and young adults.

Shisana reported that a third of the adult South African population is hypertensive.<sup>9</sup> Among adolescents and young adults (15 - 24 years old) the incidence is ~10%.<sup>9</sup> and there has been a startling increase, with the prevalence approximately doubling in this age group within a decade.<sup>10</sup> There are some risk factors predisposing to these high rates among them are obesity, high salt intake and lack of physical activity. Reddy also from South Africa reported that other reasons include the 'risk transition', which is characterized by urbanization, a change in diet and lower levels of physical activity.<sup>11</sup>

Simao from Angola who carried out a study among university students reported that the prevalence of hypertension and its risk factors among undergraduate students in Lubango-Angola concluded that the prevalence of hypertension ranges from 20.3 to 26.7% of the students.<sup>12</sup>

Hypertension among school children has been described before. In Sudan, a study of children in secondary school in the capital Khartoum found that rates of overweight and obesity were 28.5% and 5.6%, respectively. Obese children carried a relative risk of systolic hypertension of 14.6.<sup>13</sup> In Primary School children prehypertension was detected in 4.9%<sup>14</sup>

More than 90% of the hypertensive young people (defined by WHO as people whose age ranks in the range 10-24) seen in this study have no obvious cause and are labelled as primary or essential hypertension. Mechanisms implicated in the pathogenesis of primary hypertension in the young include low birth weight (the Barker-Brenner hypothesis)<sup>15</sup> and hyperuricemia.<sup>16,17</sup> Assadi has reported that approximately 10% of young adults with hypertension have secondary hypertension.<sup>18,19</sup> Among the causes of secondary hypertension in this age group are glomerulonephritis, renal artery stenosis, pheochromocytoma, Conn's disease, Cushing Syndrome, coarctation of aorta, contraceptive pill, cocaine and amphetamines. These causes should be excluded during history taking, clinical examination and specific investigation to rule out the causative factors. Ideally affected students should be followed up by physicians.

With the current lifestyle and the emergence of increasing rates of hypertension in the young we decided to embark on this study with the objective of determining the prevalence of hypertension among a sample of young people (university students) and recording the predisposing factors, the risk factors of cardiovascular disease (CVD) and outcome variables in the selected sample of first year and finalist students.

### **Subjects and Methods**

Data from asymptomatic participating students were obtained on age, sex, academic year, smoking, family history of hypertension, stroke, diabetes and recurrent headache and dizziness were entered in a specifically designed datasheet. Additionally Salt intake and physical activity were recorded

All students were asked a group of specific questions about: history of hypertension or previously recorded elevated BP during casual illness or medical checkup, or any history of kidney or heart disease, diabetes and previous medications such as contraceptive pill, or use of alcohol or tobacco or illicit drugs e.g. cocaine or amphetamines. Students who show any physical abnormality were referred for full examination and investigations.

Casual Blood pressure was recorded from freshman students and finalist in the university using Accuson Mercury Sphygmomanometer which was standardized and calibrated with STD blood pressure machine. All blood pressure

readings were recorded between 9 am – 12 PM. Subjects are requested to sit for 3 minutes before blood pressure is recorded. At least 2 reading were taken for each subject. Each subject is given a code number for example 001. Weight was recorded by Health-O-Meter weighing scale. Height was measured using commercial tape measure.

Measurements of Body Mass Index, systolic and diastolic BP were carried out. In this article we followed the JNC 7grading of hypertension.<sup>20</sup>We also adopted JNC 8 definition of hypertension (BP >140/90) and treatment algorithms.<sup>21</sup>

### **Statistical Analysis:**

The data was analyzed using SPSS software. The continuous variables, which were expressed as mean  $\pm$ SD, were compared by Student t test.

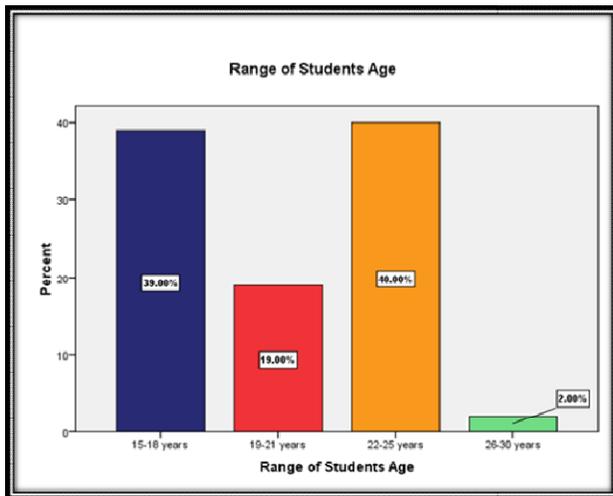
The frequency was obtained from all the variables as percentage. The mean was obtained from the numerical variables and compared by Student T-test and  $\chi$ -square in order to find the significance of the difference.

### **Ethical privacy statement**

The study was approved by the department of Community Medicine. Consent was obtained from each participating student and information obtained concerning their BP, medical and family history was confidential and will not be released without prior permission from those concerned. Student's identity is protected by code number

**Results**

Out of a sample size of 114 only 100 students completed their data the rest were excluded due to incomplete data. Male: Female ratio was 1:2.4. Students age ranges were shown in Figure 1

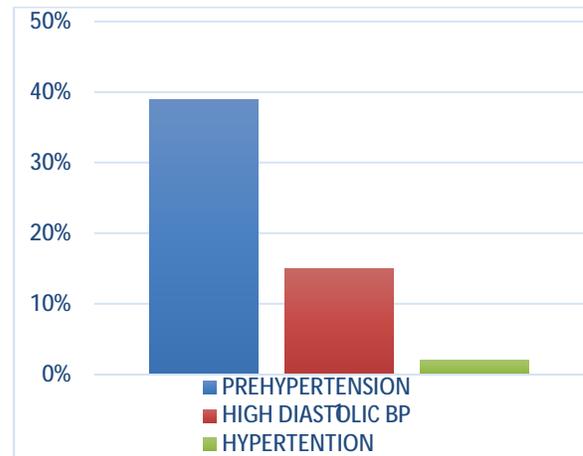


**Figure 1:** age range of 100 students taking part in the study.

The mean BP for this generation of students were: mean BP for males 116/76 while mean BP for females =102/70. The total population mean BP was 109/73 ± STD (16.7/11.5).

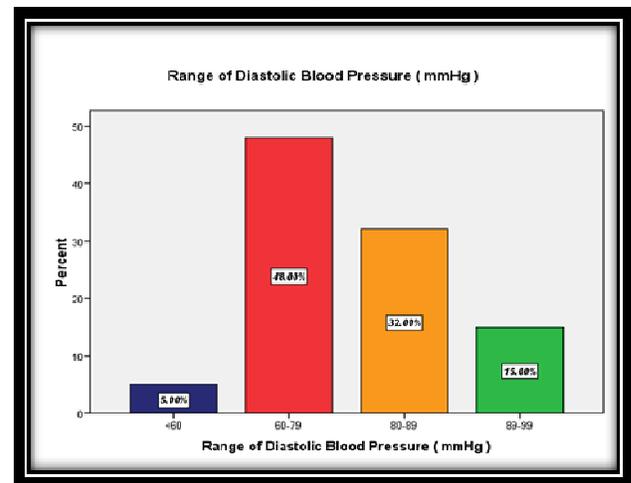
Based on JNC 8 definition of hypertension as BP> 140/90, the prevalence of hypertension in this age group was 2% and 39% of the students were in the pre-hypertensive BP range (130-139/85-89) while 15% were found to have high diastolic BP > 90 mmHg (Figure 2)

Cardiovascular risk factors were detected with the following percentage among students: 25% of students were smokers,



**Figure 2:**Prevalence of hypertension among university students

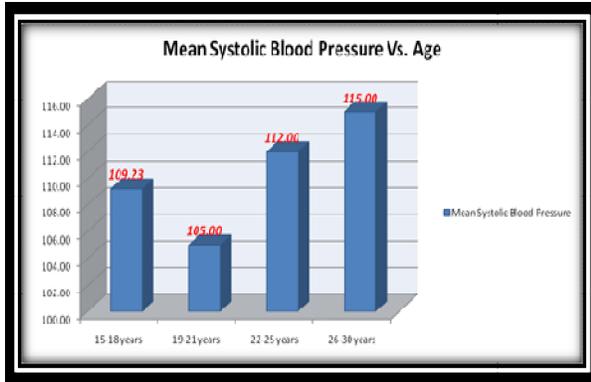
20% had family history of hypertension, 18% had family history of stroke and 22 had DM. 15% were obese. (BMI>30)



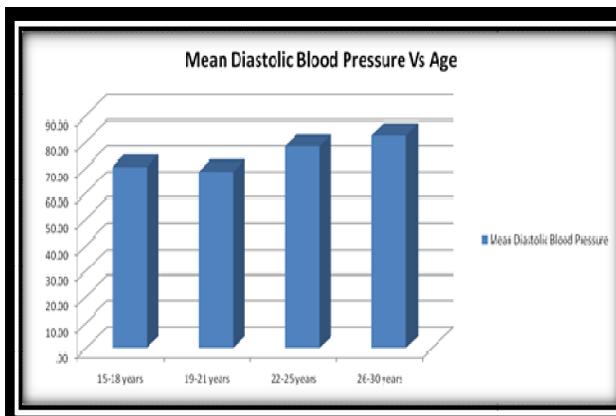
**Figure 3:** Range of diastolic BP among students in the study.

There is significant difference between smokers and non-smokers with trend towards high BP in smokers. History of stroke in the family is associated with trends for higher systolic BP in the study group but the difference is not statistically significant while family history of diabetes mellitus is seen in 22% of students with high BP and is thus a predictor for hypertension.

Comparing freshmen and finalists mean systolic and diastolic BP; finalists have statistically higher BP than freshmen Figure 4 and 5.



**Figure 4:** Means systolic BP among freshmen and finalists.



**Figure 5:** Mean diastolic BP among freshmen and finalists.

## Discussion

There is growing evidence that increasing rates of hypertension exist among young adults (18-25).<sup>22</sup> Several workers have come to similar conclusions; the NHANES survey 2011–2012 put the incidence of hypertension in the 18–39 year age group at 7.3%.<sup>23</sup> Similarly Merwe from New Zealand has reported a prevalence of 9.2% among young adults.<sup>24</sup>

When diagnosing hypertension as BP >140/90, as per JNC8, only 2% of this sample are hypertensive. However a group of 15% of students had diastolic BP in the range 90-99 mmHg which is above the JNC 8 level for normal diastolic BP. This group should receive special attention and have their BP followed up and treated to the lower target of 90 mmHg. This is in keeping with JNC 8 guidelines which recommended young people > 30 years to be treated to a diastolic target of 90 mmHg (140/90).

The prevalence of diastolic hypertension was high at the rate of 15% which indicates that our rates are higher than those of Aboud, who performed a similar study in university students back in 1982 and found diastolic hypertension to affect 8-12%.<sup>4</sup>

A significant finding in this study is that 59% of students have low systolic BP while 39% are in the low to normal range of systolic BP. Systolic BP may be normal or low in young subjects due to soft arterial wall and for this reason. The variation of systolic BP between adults and young was supported by the work of Canonico.<sup>25</sup>

We consider diastolic BP above 90mmHg as an indicator for future hypertension in this age group.

Our rates are low when compared to more recent study (2008) carried out by Simao in Angola, which reported the prevalence of hypertension as 20.3% and that smoking, alcohol and obesity were the main predictors of hypertension.<sup>12</sup>

There is association between diastolic BP increase and diabetes, smoking, family history of hypertension and lack of physical exercise but is not significant as judged by Pearson's Chi Square.

A significant association between high diastolic BP, academic year (finalist versus freshmen) and BMI was recorded; Pearson's Chi Square was 0.022 and 0.002, respectively. This indicates that academic year and BMI are significant predictors of hypertension in this sample of young university students. High BMI is a recognized risk factor for hypertension; however academic year has not been shown before to play as risk factor for hypertension. The explanation for this may be that university students are under increasing tension which reaches maximum as they head towards the final examination.

There is also evidence in this study that support smoking, family history of hypertension, obesity, university grade, salt excess and lack of physical exercise as predictors of hypertension in the young.

The study provides proof that hypertension starts early in life and the damage it causes remain undetected until complications start to appear. In certain cases people are diagnosed during routine checkup or qualifying medical examination for employment but the majority remain undetected.

In this study 43% of students had headache and 33% had dizziness indicating the need for BP check in the event of those two symptoms.

Surprisingly there is strong history of Diabetes mellitus 22%, hypertension 20% and stroke 18% in the families of students with hypertension, in this sample, thus confirming the importance of family history. As the study has confirmed the presence of hypertension among university students of the age 15-30 years, it is relevant to

investigate those with high BP so as to exclude secondary treatable causes at this early stage of their disease.

The appearance of the high rates of hypertension in the young is of concern, as it heralds an explosion of cardiovascular disease, cerebrovascular disease and chronic kidney disease in the coming years putting an additional burden on health services. This situation should alert health authorities to adopt a strong prevention strategy to be directed towards young people. Efforts to improve life style at this age are often fruitful and will lead to reduction in the rates of hypertension.

The study has provided the important finding, that the mean normal BP at this age group in Sudan is equal to 110/73±16/11 mmHg.

### **Conclusion**

The prevalence of hypertension as defined by JNC-8 was 2% and pre-hypertension formed 39% among this sample of university students. 15% of the students had diastolic BP in the region 90-99 mmHg. This makes diastolic BP an early feature and an indicator for hypertension in this age group.

There is significant trend to higher BP among finalist when compared to freshmen and a significant correlation between hypertension and obesity.

### **Recommendations**

We recommend voluntary screening of all university students for hypertension.

Health authorities should be alerted to this developing health problem and a strategy that takes immediate action to identify those with hypertension and offer them the

necessary counseling and preventive measures.

Those with high BP should seek medical advice and treatment under care of a physician.

Young people should be encouraged to adopt lifestyle modification, abstain from illicit substances, smoking, and alcohol. They should reduce their salt intake and indulge themselves into regular physical activity.

### Limitations of the study

Although the study revealed important basic information about hypertension among the young; it investigated a small sample and consequently the findings cannot be extrapolated to the general population. A population-based study may be more suitable to look into the issue of hypertension among the young.

### Acknowledgement

We acknowledge the help and cooperation we found from all the freshmen and senior students of Khartoum Medical College 2011, the members of the teaching staff and employees.

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