

Blood Pressure Profile of Young Adults at the Faculty of Medicine Universitas Indonesia

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ABSTRAK

Latar belakang: hipertensi tetap menjadi beban global. Komplikasi hipertensi yang tidak diakui dapat meningkatkan mortalitas seperti yang ditunjukkan oleh laporan WHO 2013 bahwa hipertensi menyebabkan 9,4 juta kematian di seluruh dunia. Tidak ada data sebelumnya di Indonesia tentang status tekanan darah pada orang dewasa muda dengan tingkat pendidikan yang sama. Mahasiswa kedokteran berisiko tinggi terkena hipertensi dini karena kebiasaan gaya hidup modern. Tujuan penelitian ini untuk menentukan profil tekanan darah mahasiswa kedokteran sebagai perwakilan dari populasi dewasa muda. **Metode:** kami mengukur prevalensi hipertensi pada mahasiswa kedokteran. Semua mahasiswa kedokteran yang setuju untuk berpartisipasi mengisi kuesioner. Setelah itu, kami melakukan pemeriksaan fisik dan memperoleh sampel darah dan urin untuk menyaring tekanan darah, perkiraan laju filtrasi glomerulus, dan profil lipid. **Hasil:** prevalensi mahasiswa dengan prehipertensi atau hipertensi adalah 29,6%. Rata-rata LFG adalah 105,45 ml/menit/m². Total kolesterol rata-rata dalam batas normal. **Kesimpulan:** prevalensi hipertensi pada mahasiswa kedokteran tinggi. Studi ini menunjukkan bahwa deteksi dini hipertensi adalah kunci untuk mengobatinya sejak dini dan karenanya mengurangi morbiditas dan mortalitas.

Kata kunci: profil, mahasiswa kedokteran, hipertensi, penyakit ginjal kronis, dislipidemia.

ABSTRACT

Background: hypertension remains a global burden. Complications of unrecognized hypertension might increase mortality as shown by a WHO 2013 report that hypertension caused 9.4 million deaths worldwide. There is no prior data in Indonesia on blood pressure status in young adults with similar education levels. Medical students are at high risk of developing early hypertension due to modern lifestyle habits. This study aimed to determine the blood pressure profile of medical students as representative of the young adult population. **Methods:** we measured the prevalence of hypertension in medical students. All medical students who agreed to participate completed a questionnaire. Afterwards, we conducted a physical examination and obtained blood and urine samples to screen for blood pressure, estimated glomerular filtration rate, and the lipid profile. **Results:** the prevalence of students with prehypertension or hypertension was 29.6%. The mean eGFR was 105.45 ml/min/m². The mean total cholesterol was within normal limits. **Conclusion:** the prevalence of hypertension in medical students was high. This study shows that early detection of hypertension is key to treating it early and therefore to reducing morbidity and mortality.

Keywords: profile, medical students, hypertension, chronic kidney disease, dyslipidemia.

INTRODUCTION

Based on a World Health Organization (WHO) brief report in 2013, hypertension (HTN) caused 9.4 million deaths globally, due to hypertension complications. HTN was responsible for 45% of deaths due to ischemic heart disease and 51% of deaths due to cerebrovascular disease.¹ A report by Zhang et al.² revealed that by using the NHANES database, between 2013 and 2014 the prevalence of hypertension in individuals aged between 18–39 years old was 7.3%. Medical students are among those young adults accounted for in the prevalence of hypertension based on the NHANES database. A report by Nyombi KV et al.³ in Uganda stated that the prevalence of elevated systolic blood pressure among pre-clinical year medical students was 14% and was associated with age, overweight, and a family history of cardiovascular disease. In India, a study by Patnaik et al.⁴ reported an even higher percentage (67%) of medical students with both prehypertension and hypertension. The number of hypertensive young adults, in particular medical students, might increase even further due to a recently lowered blood pressure threshold released by the American Heart Association (AHA) 2017 as compared to the Joint National Committee (JNC) VII guideline.^{5,6}

Studies on factors associated with the occurrence of HTN, especially among young adults in Indonesia, are scarce. A study in China by Liu et al.⁷ revealed that HTN was associated with the male sex, overweight/obesity, and low cardiorespiratory fitness (CRF).⁵ Similar results were also observed in a young Afro-Caribbean population in which HTN was associated with obesity, hyperglycemia, and hypertriglyceridemia.⁸ A report in China specifically on the working population stated that high body mass index (BMI), tobacco use, and alcohol consumption were factors associated with HTN.⁹ Our study aimed to outline the blood pressure profile of young adults at the Faculty of Medicine, Universitas Indonesia.

METHODS

This was a cross-sectional study conducted at the Faculty of Medicine Universitas Indonesia,

from April 23rd to May 11th, 2018. The inclusion criteria were: all pre-clinical year medical students and agreement to participate in this study. Medical students who did not continue their studies for any reason were excluded. The sampling method used for this study was consecutive sampling and all pre-clinical year medical students were given brief information about the study and were invited to participate. All students interested in participating were asked to visit the test center anytime between 8 AM and 5 PM, where we obtained their history, conducted a physical examination, and obtained blood and urine samples. Information about the procedure and a consent document were provided. The study protocol has been approved by the Health Research Ethics Committee, Faculty of Medicine Universitas Indonesia–Cipto Mangunkusumo Hospital no. 299/UN2.F1/ETIK/2017.

Medical History, Physical Examination, and Laboratory Examination

A questionnaire was employed to collect information on their identity, previous and latest blood pressure measurements, first- and second-degree relatives, smoking history, family history of chronic diseases (hypertension, diabetes, coronary heart disease, dyslipidemia, and stroke). The physical examination consisted of weight and height measurements and a determination of body mass index (BMI). Height was measured using a plastic measuring tape embedded on the wall and a calibrated digital weight scale was used for weight measurement. Blood pressure (BP) was measured twice using a mercury sphygmomanometer and digital device. A venous blood sample was taken via antecubital vein access. A total of 5 ml of venous blood was drawn and was placed directly inside a low-temperature blood container and sent to the laboratory for analysis. Data on complete blood count (hemoglobin, hematocrit, leucocyte, platelets), kidney function (ureum, creatinine, cystatin-C, eGFR with both CKD-EPI creatinine based and cystatin-C based formula), lipid profile (total cholesterol, LDL, HDL, triglyceride), and random blood glucose were collected. A urine sample was also obtained from all participants for urinalysis (specific gravity, pH, white blood

cells, red blood cells, nitrite, ketone, bilirubin, urobilinogen, protein, and glucose).

Outcome

The primary outcome of this study was to determine the proportion of medical students with hypertension.

Statistical Analysis

Participant characteristics are described as frequency and proportion (student grade, self-reported highest blood pressure, smoking history, history of chronic disease, BMI, current blood pressure) and were analyzed with the chi-squared test. Data on age, lipid profile (total cholesterol, LDL-cholesterol, HDL-cholesterol, triglyceride), kidney function (ureum, creatinine, eGFR), blood glucose, uric acid, routine blood count (hemoglobin, hematocrit, leukocytes, platelets), differential blood count (basophils, eosinophils, neutrophils, lymphocytes, monocytes), and urinalysis results were presented as mean and standard deviation (mean SD). All statistical analyses were conducted using SPSS Statistics 23.0 (IBM Corp., Armonk, NY).

RESULTS

Table 1 presents the blood pressure and risk factor profiles of medical students in this study. There were 250 medical students who came to the test center and agreed to participate. Their mean age was 19.19 years, with most study participants from grade 1 (39.6%). The self-reported highest blood pressure data revealed that 61.2% of students were pre-hypertensive. Most of the students were non-smokers (98%) and most had family history of hypertension (64.4%) and diabetes mellitus (56.4%). The BMI of most students corresponded with overweight or obese (56.8%). The on-site measured blood pressure revealed that 70.4% were normotensive. On the other hand, measurements with a digital device showed that the percentage of students with normal BP and pre-hypertensive BP were relatively similar (45.6% and 45.2%). The mean of the lipid profile data were within normal limits except for LDL cholesterol, which was slightly elevated. The mean of blood glucose, uric acid level, routine blood count, and differential blood count data were mostly within normal limits.

Table 1. Blood pressure and cardiometabolic risk factors profile of medical students

Variables	Values
Age, mean (SD)	19.19 (1.06)
Self-reported Highest BP (JNC 7), n (%)	
- Normotensive	44 (17.6)
- Prehypertension	153 (61.2)
- Hypertension	30 (12)
Family history of chronic disease, n (%)	
- Hypertension	161 (64.4)
- Dyslipidemia	159 (63.6)
- Heart disease	68 (27.2)
- Diabetes mellitus	141 (56.4)
- Stroke	108 (43.2)
Body mass index, n (%)	
- Underweight (<18.5 kg/m ²)	15 (6)
- Normoweight (18.5–22.9 kg/m ²)	93 (37.2)
- Overweight/Obese (≥23 kg/m ²)	142 (56.8)
Current students blood pressure (Mercury)	
- JNC7, n (%)	
- Normotensive	176 (70.4)
- Prehypertension	65 (26)
- Hypertension	9 (3.6)
Current students blood pressure (Mercury)	
-AHA 2017, n (%)	
- Normotensive	176 (70.4)
- Elevated	34 (13.6)
- Hypertension	40 (16)
Lipid profile, mean (SD)	
- Total cholesterol	180.56 (32.97)
- HDL-cholesterol	56.74 (11.75)
- LDL-cholesterol	101.51 (25.68)
- Triglyceride	105.48 (62.21)
Kidney function test, mean (SD)	
- Ureum	23.24 (5.66)
- Creatinine	0.94 (0.41)
- eGFR (CKD-EPI method)	105.45 (16.14)
- Random blood glucose	96.12 (55.68)
- Uric acid level	5.82 (3.12)

DISCUSSION

Studies on university students, in particular on medical students, as representative of the young adult population in Indonesia are rare. To the best of our knowledge, this is the first study on medical students regarding their current blood pressure status and other cardiovascular risk factors. We found that the prevalence of

prehypertension and hypertension based on JNC VII criteria combined was 29.6%, with a prevalence of hypertension itself at 3.6%. We also found that the prevalence of hypertension based on the new AHA 2017 criteria increased 12.4% to become 16%. This result is not surprising, given the hypertension criteria are stricter in current AHA 2017 guideline.⁵ A similar increase in the prevalence in the population aged 45–75 years with hypertension was reported in the US (13.3%) and China (17%).¹⁰ In terms of medical students, this finding is similar to that of previous studies in Uganda, Saudi Arabia, and Ethiopia.^{3,11,12} However, a study in Pakistan involving students from various faculties reported a lower prevalence of hypertension.⁸ This finding might be due to the higher stress level experienced by medical students, as has been previously reported.¹⁴ Our study showed that total cholesterol level, LDL-cholesterol, HDL-cholesterol and triglyceride were all within normal limits. Similar results were obtained in a study of university students in Brazil.¹⁵ We also evaluated the kidney function by measuring ureum, creatinine, and estimated glomerular filtration rate using the CKD-EPI method. To the best of our knowledge, this is the first study to measure kidney function in young adults. The mean eGFR of all participants was 105.45 ml/min/m², which represents normal renal function. Several studies have reported that the average eGFR of people aged 20–30 years was around 110–120 ml/min/m².^{16–18} The slightly lower eGFR than average is of concern, because some of the students in our study had eGFR <90 ml/min/m². Studies have reported increased cardiometabolic risk in patients with a low eGFR.¹⁹ Among all cardiometabolic diseases, a lower eGFR is associated with an elevated Framingham risk score for coronary heart disease.^{20,21} This fact is concerning given coronary heart disease develop earlier than in students who are not at risk, and could impact the productivity of students after they graduate from university. The mean random blood glucose levels in this study were within normal limits, which is line with a previous study.³ Our study found that serum uric acid levels were within normal limits. This result is comparable with a previous study on Mexican

young adults.²² In terms of the urinalysis, white blood cell and red blood cell counts were only performed on women. The finding of white blood cells might be due to the method of urine collection in which mid-stream urine method was not used. Furthermore, the finding of red blood cells in the women's samples was due to the fact that some students had their period during urine collection. A pooled analysis of east and south Asians found that a higher BMI is a risk factor for death from cardiovascular diseases, especially coronary heart disease and stroke.¹⁹ This fact is concerning because the prevalence of students in our study with overweight or obesity was 56.8%, and these did not know they were at risk and were not treated early.

CONCLUSION

Our study found that 3.6% of participating medical students had hypertension based on the JNC VII criteria and the number increased 4 times according to AHA 2017. A limitation of this study was the sample size. The size would have been larger if all invited medical students participated, which would better represent the general young adult population. We are following all currently active medical students for the next 3–5 years. Given the prevalence of hypertension in this study, we suggest a similar study on a larger sample of university students with the aim of early detection and treatment.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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