

## Past antihypertensive drugs, obesity, daily light working load and risk of hypertension: An Indonesian 2001 rural study

Bastaman Basuki\*, Dewi Sumaryani Soemarmo\*, Zarni Amri\*, Ermita Isfandiary Ibrahim†

### Abstrak

Penelitian mengenai faktor risiko yang berkaitan dengan hipertensi di daerah pedesaan masih belum banyak dilakukan, dan penelitian ini bertujuan untuk mengidentifikasi lebih lanjut faktor risiko yang berkaitan dengan hipertensi di antara penduduk pedesaan. Data berasal dari data hasil pengalaman lapangan mahasiswa tingkat 2 Fakultas Kedokteran Universitas Indonesia tanggal 27 Juni 2001 di pedesaan yang berbukit-bukit di Kecamatan Cijeruk, Bogor. Subjek dipilih secara random dengan memakai klaster rukun tetangga yang berbeda dengan sampel penelitian tahun lalu. Wawancara dan pengukuran tekanan darah dilakukan di rumah subjek penelitian pada pukul 1:00 sampai 4:00 petang. Hasil penelitian menunjukkan bahwa penduduk berumur 40 tahun atau lebih mempunyai risiko yang lebih tinggi untuk menderita hipertensi dibandingkan dengan penduduk yang berumur 18-39 tahun. Peningkatan risiko sangat mencolok di antara penduduk yang berumur 55-59 tahun [rasio odds (OR) suaian= 17,73; 95% interval kepercayaan (CI) = 6,26-50,27]. Jika dibandingkan dengan orang berpostur tubuh normal, orang yang gemuk mempunyai risiko hipertensi lebih dari hampir dua kali lipat (OR suaian= 0,87; 95% CI= 0,87-4,17; P= 0,109). Menurut putus minum obat antihipertensi, subjek yang putus obat hipertensi mempunyai risiko hampir 14 kali lipat untuk menderita hipertensi. Akan tetapi, orang dengan beban kerja harian yang berat lebih terlidung terhadap hipertensi. Dapat disimpulkan bahwa hasil penelitian ini pada umumnya sama dengan hasil penelitian tahun lalu di tempat yang sama dengan subjek penelitian yang berbeda. Orang berumur lebih dari 40 tahun, yang putus pengobatan antihipertensi, dan orang yang tidak mempunyai beban kerja berat perlu mendapat perhatian terhadap kemungkinan menderita hipertensi. (*Med J Indones 2001; 10: 224-9*)

### Abstract

This study aims to identify some risk factors related to hypertension in rural areas. The data for this study is a part of the result of the field study done by the second year medical students of the Faculty of Medicine, University of Indonesia, Jakarta, on June 27<sup>th</sup>, 2001, at Cijeruk subdistrict in Bogor regency. The subjects were selected randomly using neighborhood cluster which was different from the previous study in 2000. Interviews and blood pressure were taken at the houses of the subjects from 1:00 PM to 4:00 PM. The results of this study showed that people aged 40 years or over had an increase risk to suffer hypertension compared to the 18-39 year old group, and the risk was most prominent among the 55-59 year group [adjusted odds ratio (OR)= 17.73; 95% confidence intervals (CI)= 6.26-50.27]. Compared to the subjects with normal body posture, those who were obese had more than two-fold increase in the risk to be hypertensive (adjusted OR= 0.87; 95% CI= 0.87-4.17; P= 0.109). In addition, those who discontinued antihypertensive drugs had almost 14-fold increase in the risk to be hypertensive relative to subjects who never take antihypertensive drugs (adjusted OR= 14.16; 95% CI= 7.14-28.05). In general, the results of this study is similar with our last year study which used different subjects. This study concluded that special attention should be taken to the elderly aged 40 years and over, to some one who discontinued antihypertensive drugs, and whom had light daily working load to prevent hypertension. (*Med J Indones 2001; 10: 224-9*)

**Keywords:** hypertensive, risk factor, adjusted odds ratio, elderly.

Hypertension is increasing in urban as well as in rural areas. However, governmental programs are still focusing on infectious diseases, and there is no comprehensive community programs to prevent degenerative diseases such as hypertension.<sup>1</sup>

The estimated prevalence of hypertension ranges from 5% to 15% among population aged 20 years or over.<sup>2,3</sup> The recent study in Jakarta in 2000 revealed that the prevalence of hypertension was 30% (personal communication, MONICA report).

At present, Indonesia has about 215 million population and 70% of them live in rural area,<sup>1</sup> it is estimated that in Indonesian rural community a big number of hypertensive people can be found. Some of

\* Department of Community Medicine, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia

† Department of Physiology, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia

them have stage 2 or 3 hypertension. On the other hand, few rural community-based hypertensive studies have been conducted to identify the risk factors related to hypertension in rural area.

Our previous report based on 490 subjects revealed some risk factors that were related to hypertension, i.e. age, body postures, daily working load, and past hypertensive medication.<sup>4</sup> Since every year the second year medical students have to participate in a rural study, we conducted a study to reveal risk factors related to hypertension, in order to gain an additional information on some risk factors related to hypertension in a rural community.

## METHODS

This study used a part of the data collected in the field study of the second year medical students of the Faculty of Medicine, University of Indonesia, Jakarta. The field study was conducted among the Sundanese ethnic group in a rural area, in Cijeruk subdistrict of Bogor regency, about 90 km southern of Jakarta, on June 27<sup>th</sup>, 2001.

We selected randomly 7 out of 18 villages. For each selected village, afterward we selected 1 hamlet and for each hamlet we selected 2 neighborhoods which were different from the year 2000 hypertensive study. People aged 18 years or above in each selected neighborhood were invited to participate in this study. For each neighborhoods, we listed the first 50 subjects who were willing to participate in this study.

Interviews and blood pressure measurements were conducted at the houses of the subjects by the 188 specially trained second year medical students. Each students interviewed and took the blood pressure of 3-4 subjects. The medical students were under close supervision of faculty members of the Faculty of Medicine, University of Indonesia. Each faculty member supervised 6-8 medical students.

The interview used a special questionnaire form. The information collected was demographic characteristics (gender, age, education, job, housing condition, and working load). Furthermore, additional data about the last six month habits in drinking coffee, eating, eating traditional vegetables and fruits to control hypertension, smoking, and sport. In addition, data about the current and past history of subject's illness (hyper-

tension, kidney disease, diabetes mellitus, thyroid disease), hormonal contraceptive use, antihypertensive drugs consumption, and body posture were collected.

The time for measuring blood pressure was from 1:00 PM to 4:00 PM. Blood pressure measurements were done using mercury sphygmomanometer by the following techniques:<sup>5</sup> the subject was seated in a chair with his/her back supported and his/her arms supported at heart level. Subjects were refrained from smoking and ingesting caffeine during the 30 minutes preceding the measurement. Measurement began after at least 5 minutes of rest. Both arms' systolic blood pressures (SBP) and diastolic blood pressure (DBP) were recorded. The SBP was recorded at the first appearance of sound (phase 1), and the disappearance of sound (phase 5) was used to define diastolic blood pressure (DBP). If the SBP was 140 mm Hg or more, the measurement was repeated after about 5 minutes.

In this analysis we only analyzed the subjects having normal blood pressure, and stage 2 and 3 hypertension in order to identify some risk factors related to stage 2 or 3 hypertension. Therefore, the subjects who were taking antihypertensive drugs were excluded from this study.

The criteria for blood pressure classification were as follows.<sup>5</sup> Blood pressure was regarded normal or optimal when systolic blood pressure was less than 130 mm Hg and diastolic blood pressure was less than 85 mm Hg. In this analysis we regarded the normal and optimal blood pressure as normal blood pressure. High normal pressure and stage 1 hypertension was diagnosed when systolic blood pressure was 130-139 mmHg and 140-159 mmHg or diastolic blood pressure was 85-89 mmHg and 90-99 mmHg, respectively. Stage 2 hypertension was diagnosed when systolic blood pressure was 160-179 mmHg, or diastolic blood pressure was 100-109 mmHg, while stage 3 hypertension was diagnosed when systolic blood pressure was 180 mmHg or more, or diastolic blood pressure was 110 mmHg or more.

The criteria for daily working loads were as follows: light daily working load if in general the tasks could be done in sitting or standing position, such as in clerks, house hold activities; moderate daily working load if the tasks resulted in an increase in breathing frequencies or sweating, such as in barbers; and heavy working load if the tasks needed muscles' activity

which always resulted in the increase in both breathing frequencies and sweating, such as in blue color labor.<sup>5</sup> Body postures (normal, skinny, and obese) were judged based on perception of the students who examined the subjects.

Statistical analyses were done using STATA 6.0 software.<sup>6</sup> A number of risk factors were examined whether they were potential confounders and/or effect modifiers. Unconditional logistic regression analysis<sup>8</sup> was used in order to determine the confounding effects and to determine the risk factors for hypertension. A risk factor was considered to be a potential confounder if in the univariate test it had a *P*-value < 0.25 which would be considered as a candidate for the multivariate model along with all known risk factors for hypertension.<sup>7</sup> Confounders were estimated by the method of maximum likelihood. Ninety-five percent confidence intervals were based on the standard error of coefficient estimates. Relative

risks represented by odds ratios (OR) were estimated by the methods of maximum likelihood.

## RESULTS

A number of 635 subjects participated in this study. For this study, 38 subjects who were taking anti-hypertensive drugs, 86 subjects with high normal hypertension, and 133 subjects with stage 1 hypertension were excluded. There were 269 subjects with normal blood pressure and 109 subjects with stage 2 or 3 hypertension who were included in this analysis.

Table 1 shows that hypertensive and normal blood pressure subjects were similarly distributed with respect to gender, profession, and housing condition. However, hypertensive subjects were more likely to be older compared to normal blood pressure subjects.

Table 1. Some demographic characteristic of subjects and risk of hypertension

	Normal (N=269)		Hypertension (N= 109)		Crude odds ratio	95 % confidence intervals
	n	%	n	%		
<b>Gender</b>						
Male	83	30.9	34	31.2	1.00	Reference
Female	186	69.1	75	68.8	0.98	0.61 - 1.59
<b>Age group (years)</b>						
18 - 39	156	58.0	21	19.3	1.00	Reference
40 - 49	49	18.2	16	14.7	2.43	1.17 - 5.01
50 - 54	15	5.6	15	13.8	2.43	3.18 - 17.35
55 - 59	14	5.2	16	14.7	8.49	3.63 - 19.86
60 - 64	16	5.9	20	18.3	9.29	4.17 - 20.66
65 - 84	19	7.1	21	19.3	8.21	3.80 - 17.73
<b>Marital status</b>						
Married	229	85.1	82	75.2	1.00	Reference
Unmarried	14	5.2	2	1.8	0.40	0.09 - 1.79
Divorced	3	1.1	0	0	N/A	
Widow	21	7.8	22	20.2	2.93	1.53 - 5.60
Widower	2	0.7	3	2.8	4.19	0.69 - 25.52
<b>Education</b>						
Illiterate/read only	82	30.5	51	46.8	1.00	Reference
Primary school	124	46.1	39	35.8	0.51	0.31 - 0.84
Junior high school	28	10.4	9	8.3	0.51	0.23 - 1.18
Senior high school	26	9.7	9	8.3	0.56	0.24 - 1.28
College/university	9	3.3	1	0.9	0.18	0.02 - 1.45
<b>Profession</b>						
None	150	55.8	65	59.6	1.00	Reference
Laborer	43	16.0	13	11.9	0.69	0.35 - 1.38
Vendor/self employment	37	13.8	16	14.7	0.99	0.52 - 1.92
Employee	14	5.2	5	4.6	0.82	0.29 - 2.38
Others	25	9.3	10	9.2	0.92	0.42 - 2.03
<b>Housing condition</b>						
Emergency	11	4.1	3	2.8	1.00	Reference
Semi permanent	47	17.5	14	12.8	1.09	0.27 - 4.47
Permanent	211	78.4	92	84.4	1.60	0.44 - 5.87

N/A = not applicable

Hypertensive subjects were more likely to be widows or widowers compared to normal blood pressure subjects. On the other hands, hypertensive subjects were less likely to be married and unmarried.

In this analysis we could not prove that smoking habit increased the risk of hypertension. In addition, there was no evidence that those who for the last 6 months had the habit to have regular sport, or to drink coffee, had a lower risk of hypertension compared with those who had not (Table 2).

Table 2. Smoking, daily habits and risk of hypertension

	Normal (N=269)		Hypertension (N=109)		Crude odds ratio	95 % confidence intervals
	n	%	n	%		
<b>Smoking</b>						
Never	174	64.7	70	64.2	1.00	Reference
Past	15	5.6	11	10.1	1.82	0.80 - 4.16
Current	80	29.7	28	25.7	0.87	0.52 - 1.45
<b>Sport</b>						
Never	160	59.5	61	56.0	1.00	Reference
Past	37	13.8	15	13.8	1.06	0.54 - 2.07
Current	72	26.8	33	30.3	1.20	0.72 - 2.00
<b>Daily working load</b>						
Light	61	22.7	37	33.9	1.00	Reference
Moderate	155	57.6	60	55.0	0.64	0.38 - 1.06
Heavy	53	19.7	12	11.0	0.37	0.18 - 0.79
<b>Drinking coffee per week</b>						
Almost never	122	45.4	46	42.2	1.00	Reference
Less than one time	18	6.7	10	9.2	1.47	0.63 - 3.43
1 - 2 times	22	8.2	14	12.8	1.69	0.80 - 3.58
3 - 4 times	14	5.2	4	3.7	0.76	0.24 - 2.42
Almost everyday	93	34.6	35	32.1	1.00	0.60 - 1.67
<b>Salty fish per week</b>						
Almost never	13	4.8	13	11.9	1.00	Reference
Less than one time	7	2.6	4	3.7	0.57	0.13 - 2.43
1 - 2 times	25	9.3	16	14.7	0.64	0.24 - 1.73
3 - 4 times	22	8.2	6	5.5	0.27	0.08 - 0.89
Almost everyday	202	75.1	70	64.2	0.34	0.15 - 0.78

Table 3 shows that hypertensive subjects were more likely to be those who were taking cucumber everyday, or less than one time per week consumed morinda (Table 3). Relative to those who were almost never consumed cucumber, subject who were taking cucumber 1-2 and 3-4 time a week had an increase risk to be hypertensive 2.7 and 3 folds respectively. In addition, compared to those who almost never took star fruit, subject who consumed 1-2 times a week had almost a 2 fold increase in the risk of hypertension.

Table 3. Traditional medicine intake, eating habits, and risk of hypertension

	Normal (N=269)		Hypertension (N=109)		Crude odds ratio	95 % confidence intervals
	n	%	n	%		
<b>Garlic per week</b>						
Almost never	16	5.9	7	6.4	1.00	Reference
Less than one time	11	4.1	3	2.8	0.62	0.13 - 2.95
1 - 2 times	12	4.5	9	8.3	1.71	0.50 - 5.92
3 - 4 times	9	3.3	7	6.4	1.78	0.47 - 6.91
Almost everyday	221	82.2	83	76.1	0.88	0.34 - 2.16
<b>Cucumber per week</b>						
Almost never	41	15.2	7	6.4	1.00	Reference
Less than one time	45	16.7	14	12.8	1.82	0.66 - 4.96
1 - 2 times	76	28.3	35	32.1	2.70	1.10 - 6.61
3 - 4 times	51	19.0	26	23.9	2.99	1.18 - 7.57
Almost everyday	56	20.8	27	24.8	2.82	1.12 - 7.11
<b>Star fruit per week</b>						
Almost never	154	57.2	57	52.3	1.00	Reference
Less than one time	81	30.1	32	29.4	1.07	0.64 - 1.78
1 - 2 times	23	8.6	16	14.7	1.88	0.93 - 3.81
3 - 4 times	7	2.6	1	0.9	0.39	0.05 - 3.20
Almost everyday	4	1.5	3	2.8	2.03	0.44 - 9.33
<b>Morinda per week</b>						
Almost never	235	87.4	83	76.1	1.00	Reference
Less than one time	17	6.3	16	14.7	2.66	1.29 - 5.51
1 - 2 times	10	3.7	7	6.4	1.98	0.73 - 5.38
3 - 4 times	3	1.1	0	0.0	N/A	-
Almost everyday	4	1.5	3	2.8	2.12	0.47 - 9.69

N/A = not applicable

Furthermore, in this study there was no evidence that subject's history of diseases (kidney, diabetes mellitus, thyroid) increased the risk of hypertension (Table 4).

Table 4. History of some diseases and risk of hypertension

	Normal (N= 269)		Hypertension (N=109)		Crude odds ratio	95 % confidence intervals
	n	%	n	%		
<b>Kidney</b>						
Never	239	88.8	96	88.1	1.00	Reference
Past	7	2.6	4	3.7	1.42	0.41 - 4.97
Current	4	1.5	1	0.9	0.62	0.07 - 5.64
Unknown	19	7.1	8	7.3	1.04	0.44 - 2.47
<b>Diabetes mellitus</b>						
Never	259	96.3	105	96.3	1.00	Reference
Past	0	0	0	0	N/A	-
Current	0	0	0	0	N/A	-
Unknown	10	3.7	4	3.7	0.99	0.30 - 3.22
<b>Thyroid</b>						
Never	258	96.3	106	97.2	1.00	Reference
Past	3	3.7	1	0.9	0.81	0.08 - 7.89
Current	2	95.9	0	0	N/A	-
Unknown	6	2.2	2	1.8	0.81	0.16 - 4.08

N/A = not applicable

Our final model on the relationship between some risk factors and hypertension was shown on Table 5. This model indicates that subjects aged 40 years or over had an increased risk to be hypertensive compared with the subjects aged 18-39 years. The age group who had the most prominent hypertensive risk was the age group of 55-59 years. This age group had almost 18-folds increase in the risk to be hypertensive (adjusted odds ratio (OR)= 17.73; 95% confidence intervals (CI)= 6.26 - 50.27). The older sub-groups, 60-64 years and 65-84 years had a 9 folds and almost 11 folds increase in the risk to be hypertensive, respectively.

Compared to normal body posture subjects, those who were obese had a moderate increase in the risk to be hypertensive (adjusted OR= 1.90; 95% CI= 0.87 - 4.17; P= 0.109). However, the skinny subjects had a moderate increase in the risk to be hypertensive (adjusted OR= 0.62; P= 0.188). Compared to subjects who had light daily working load, those who had heavy daily working load had a 72% decrease in the risk to be hypertensive (adjusted OR= 0.28; 95% CI= 0.10 - 0.74).

Additionally, those who discontinued antihypertensive drugs had almost 14 folds increase in the risk to be hypertensive relative to subjects who never take antihypertensive drugs (adjusted OR = 14.16; 95% CI= 7.14 - 28.05).

Table 5. Relationship between age group, body posture, daily working load, past hypertension medication and risk of hypertension

	Normal (N=269)		Hypertension (N=109)		Adjusted odds ratio*	95 % confidence intervals
	n	%	n	%		
<b>Age group (years)</b>						
18 - 39	156	58.0	21	19.3	1.00	Reference
40 - 49	49	18.2	16	14.7	3.13	1.31 - 7.46
50 - 54	15	5.6	15	13.8	8.69	3.21 - 23.49
55 - 59	14	5.2	16	14.7	17.73	6.26 - 50.27
60 - 64	16	5.9	20	18.3	9.03	3.27 - 24.93
65 - 84	19	7.1	21	19.3	10.79	3.86 - 30.18
<b>Body posture</b>						
Normal	148	55.0	53	48.6	1.00	Reference
Skinny	86	32.0	32	29.4	0.62	0.31 - 1.26
Obese	35	13.0	24	22.0	1.90	0.87 - 4.17
<b>Daily working load</b>						
Light	61	22.7	37	33.9	1.00	Reference
Moderate	155	57.6	60	55.0	0.98	0.49 - 1.97
Heavy	53	19.7	12	11.0	0.28	0.10 - 0.74
<b>Past antihypertensive medication</b>						
Never	249	92.6	49	45.0	1.00	Reference
Ever	20	7.4	60	55.0	14.16	7.14 - 28.05

\* Adjusted each other for variables listed on this table.

## DISCUSSION

There are several limitations that must be considered in the interpretation of our findings. Our analysis is limited to several factors and no laboratory test was performed. This study was conducted in a rural area within three hours, and involving 188 medical students, therefore we did not able to provide enough weighting scales to measure body weight. In addition, the blood pressure were measured by second-year medical students who did not have enough experience in taking blood pressures in a community.

In spite of the these limitations, the second-year medical students had passed physiology class and had been specially trained for this study. In addition, they were supervised closely by the faculty members on sites when they measured blood pressures and interviewed the subjects.

The crude odds ratio analysis revealed that taking cucumber 1-4 times and and/or star fruit 1-2 times a week increases the risk of hypertension (Table 3). These traditional medications were strong enough to be included in the final model. However, this risk factors were not included on the final model. Most likely, afterward diagnosed to have hypertension the hypertensive subjects began to take cucumber and/or star fruits to control their hypertension. These conditions (taking cucumber 1-4 times and/or star fruit 1-2 times a week) were seen more in hypertensive subjects than normal blood pressure subjects.

Our final model showed that obesity were one of the risk factors for hypertension (Table 5). This finding is similar with our previous study<sup>4</sup> and other studies in Indonesia,<sup>2,3</sup> as well as in developed countries.<sup>5,9</sup> However, at the same area where the study was conducted, some people considered that one of the benefit of being a family planning acceptors was gaining body weight.<sup>10</sup> The poor rural people wanted to have an appearance of wealthy people, such as obesity. This misleading opinion need to be corrected in order to prevent hypertension.

In addition, the final results show that compared with those who had light daily working load, those with heavy daily working load had a better protection against hypertension. This finding is similar with the other<sup>2,5,9</sup> and our previous studies.<sup>4</sup>

Our data also reveals that discontinuation of anti-hypertensive drugs increased the risk of hypertension 14 folds relative to those who never had any antihypertensive medication. These results is consistent with our previous study<sup>4</sup> which indicated 12 folds increase in the risk to be hypertensive. Furthermore, this finding is similar with the findings of other studies.<sup>2,5,9</sup> Therefore, hypertensive people need to be given counseling on hypertensive treatment to prevent discontinuation of medication in hypertensive subjects.

In term of gender and education level, there was no difference in the risk to be hypertensive, and these findings are in accordance with the findings of other studies in Indonesia.<sup>2,4,11</sup>

Our final model reveals that compared with the subjects aged 18-39 years, subjects aged 40 years or over had an increase risk to be hypertensive, and the risk was most prominent among the subjects aged 55-59 years. The older age groups (60-64 years and 65-84 years) had relatively decreased risk to be hypertensive. The present finding is in accordance with our previous study.<sup>4</sup> This phenomena is analog to the healthy worker survivor effect.<sup>12</sup> Those who have a better physical, mental, and other conditions had the ability to survive. In addition, some elder people (60 years or older) had been passed away of other diseases. Therefore, the older people who had better health condition were less likely to be hypertensive.

In conclusion, to prevent hypertension special attention should be paid to obese persons, elderly aged 40 years and over, and to whom discontinued antihypertensive drugs, or had light daily working load.

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