Overweight/obesity as the dominant factors associated with hypertension in the elderly in Indonesia

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Abstract

Background: Increasing age causes a physiological decline, and the occurrence of diseases cannot be avoided. One of the most common comorbidity is hypertension, which increases the risk of cardiovascular disease, particularly in the elderly. This study aimed to determine the dominant factors associated with hypertension in the elderly in Indonesia.

Material and methods: The research design was a cross-sectional study using secondary data from the Indonesia Family Life Survey wave 5 in 2014. Hypertension category was determined based on the Joint National Committee 8 Hypertension Guidelines for individuals aged 60 years or older. Data of 1255 elderly individuals were analyzed using univariate analysis as well as bivariate analysis with chi-squared test and multivariate analysis with multiple logistic regression.

Results: Results showed that the proportion of hypertension in the elderly was 55% (3% and 52% controlled and uncontrolled hypertension, respectively). Bivariate analysis results showed that body mass index, physical activity, current smoking, employment, and marital status were the factors related to hypertension ($p < 0.05$). Multivariate analysis results showed that factors related to hypertension were body mass index ($OR_{adj} = 2.4$; 95% CI = 1.812–3.186), employment ($OR_{adj} = 1.6$; 95% CI = 1.248–2.047), marital status ($OR_{adj} = 1.3$; 95% CI = 1.035–1.710) and current smoking ($OR_{adj} = 0.7$; 95% CI = 0.599–0.998).

Conclusions: The dominant factor related to hypertension was BMI after controlling for employment, marital status, and current smoking.

Key words: current smoking; elderly; employment; hypertension; marital status; obesity

Arterial Hypertens. 2021, vol. 25, no. 4, pages: 152–158
DOI: 10.5603/AH.a2021.0017

Introduction

The physiological decline and incident diseases cannot be avoided with increasing age. One of the accompanying diseases is hypertension, a risk factor for cardiovascular morbidity and mortality, particularly in the elderly [1, 2].

Hypertension is defined as a systolic blood pressure (SBP) ≥ 140 mm Hg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg. However optimal BP in adults is defined as SBP and DBP of 120 and 80 mmHg, respectively [3].

Based on the Joint National Committee (JNC) 8 Hypertension Guidelines for the general popu-

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lation aged ≥ 60 years, prescribed pharmacological therapy to reduce blood pressure starts if SBP or DBP is 150 or 90 mmHg, respectively (4–6). In elderly individuals without diabetes or chronic kidney disease (CKD), blood pressure level goal is SBP < 150 mm Hg and DBP < 90 mm Hg, and in elderly individuals with diabetes or CKD, the blood pressure level goal is SBP < 140 mm Hg and DBP < 90 mm Hg [7].

Hypertension is a preventable risk factor for several life-threatening conditions, including stroke. It is estimated that hypertension increases the risk of stroke 3–4 times compared with individuals without hypertension [8].

An estimated 1.56 billion adults will live with hypertension by 2025. Approximately 8 million people die worldwide annually because of hypertension, and approximately 1.5 million people die annually in the Southeast Asian region [9].

The incidence of hypertension increases with age. Hypertension affects approximately 10%, 40%, and > 65% of individuals aged 18–39 years, 40–59 years, and 60–79 years [2]. In Indonesia, based on data from the Basic Health Research in 2013, hypertension was the most common disease of elderly individuals (57.6%) [10]. Hypertension is the third leading cause of death after stroke and tuberculosis in Indonesia with a proportional mortality rate reaching 6.7% of deaths at all ages [8].

Some risk factors for hypertension are modifiable risk factors, including health conditions (overweight/obese, unhealthy diet, stress, sleep apnea, diabetes), lifestyle (sedentary lifestyle/lack of physical activity, tobacco usage, excessive alcohol usage), and risk factors that cannot be controlled are age, race, and family history [5]. This study aimed to determine the dominant factors associated with hypertension in the elderly in Indonesia.

Material and methods

Study design

This study used secondary data from the Indonesia Family Life Survey (IFLS). IFLS was a longitudinal survey of sustainable socio-economic factors and health. This was based on a sample of households representing approximately 83% of Indonesia's population living in 13 of 27 provinces in Indonesia in 1993: four provinces in Sumatra (North Sumatra, West Sumatra, South Sumatra, and Lampung), five provinces in Java (DKI Jakarta, West Java, Central Java, DI Yogyakarta, and East Java), and four provinces covering the remaining large islands (Bali, West Nusa Tenggara, South Kalimantan and South Sulawesi). IFLS has been conducted for five waves: IFLS1 in 1993, IFLS2 in 1997, IFLS3 in 2000, IFLS3 in 2007, and IFLS5 in 2014 [11]. In this study, data collected in IFLS5 were analyzed only. Thus, the research design was cross-sectional, where risk factors and outcomes were seen at the same time.

Population and subjects

The population in this study was all elderly (≥ 60 years) who were registered as samples in the IFLS5 and had complete measurement data for all variables. The IFLS5 included 3976 elderly individuals, in which 1255 elderly respondents had blood pressure measurements and complete data for all variables.

Measurements

Blood pressure was measured three times on both arms using a sphygmomanometer (Omron, HEM-7203), by regular trained interviewers on household members at home in a seated position. The mean blood pressure value from three measurements was included in the analysis [11, 12]. In this study, the mean blood pressure level was obtained and categorized using the JNC 8 Hypertension Guidelines standard. Hypertension category was defined as a history of hypertension or SBP ≥ 150 mm Hg and DBP ≥ 90 mm Hg without diabetes and CKD, or a history of diabetes or CKD with mean SBP ≥ 140 mm Hg and DBP ≥ 90 mm Hg. The normotension was defined as SBP < 150 mm Hg and DBP < 90 mm Hg without diabetes and CKD, or a history of diabetes or CKD with mean SBP < 140 mm Hg and DBP < 90 mm Hg. Hypertension was divided into controlled and uncontrolled hypertension. Controlled hypertension was defined as hypertensive patients with mean SBP < 150 mm Hg and DBP < 90 mm Hg without diabetes or CKD or mean SBP < 140 mm Hg and DBP < 90 mm Hg with diabetes or CKD. Uncontrolled hypertension was defined as hypertensive patients with mean SBP ≥ 150 mm Hg and DBP ≥ 90 mm Hg without diabetes or CKD or mean SBP ≥ 140 mmHg and DBP ≥ 90 mm Hg with diabetes or CKD.

Body weight was categorized depending on the body mass index (BMI) value, according to the WHO criteria for the Asian population: normal weight < 25 kg/m^2 and overweight/obesity ≥ 25 kg/m^2 [13, 14]. The BMI value was obtained by dividing weight by height square (weight/$height^2$). The weight was measured using the Camry scale, EB1003 model. Weight was measured to the nearest tenth of a kilogram. The plastic high-board Seca, 213 model was used to

measure height. Height was measured to the nearest millimeter [11].

Smoking behavior was determined by current smoking as "smoking" and "not smoking." If the respondent stated that he has stopped smoking less than 1 year, then the status of smoking was still categorized as "smoking"

In the global recommendations of physical activity for health, routine activities are moderate-to vigorous-intensity activity performed 3–5 days per week, 30–60 minutes per session or should be at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or equivalent combination of moderate- and vigorous-intensity activity [16]. In this study, the elderly was categorized to be "active" if doing at least 30 minutes of moderate activities 5 days per week or heavy activities 3 days per week or equivalent combination of moderate- and vigorous-intensity activity and was said to be "inactive" if the activity was less than that of "active" category.

Mental health was measured using Center for Epidemiologic Studies Depression (CES-D short) scale with 10 questions [11]. The categories were based on median values, namely the category "depression" and "healthy."

Employment status was defined as elderly individuals with current jobs or who were still getting income from their jobs. The employment category was "unemployed" or "employed."

Income was defined as the amount of annual income categorized in the percentile 1–5. Percentile 1–5 was categorized as "low income" and "high income" if annual income was ≤ percentile 3 and > percentile 3, respectively.

Marital status was categorized into "not married" if the respondent had never been married, separated from their partner, divorced, and "still married" if respondent still had a partner and lived together.

Elderly was defined as individuals aged ≥ 60 years [17, 18]. Age was categorized into "60–69 years" and "≥ 70 years" referred to as elderly and high-risk elderly, respectively [18].

Statistical analysis

Data analysis was performed by univariate analysis, bivariate analysis, with χ^2 test, as well as multivariate analysis with multiple regression logistic test. Significance was defined as $p < 0.05$. The results of the analysis were included in tables and figures. All statistical methods were applied using Stata IC 16.

Ethical clearance

The procedures of the IFLS survey have been reviewed and approved by the Institutional Review Boards in the United States (Rand Corporation, Santa Monica, California) and in Indonesia (Ethics Committee of Universitas Gadjah Mada in Yogyakarta for IFLS3-IFLS5, and Universitas Indonesia in Jakarta for IFLS1–IFLS2). Written informed consent was obtained from all the participants. Written informed consent was also obtained from the immediate family, caregiver, or guardian for children enrolled in the survey (https://www.rand.org). The study was conducted in accordance with the Declaration of Helsinki Ethical Principles and Good Clinical Practices.

Results

One thousand and fifty five elderly individuals were recruited to the study. The prevalence of hypertension was 691 (55%; 52% were uncontrolled and 3% controlled hypertension) (Figure 1).

Women comprised 52.8% of respondents. The age of the elderly in this study ranged from 60–101 years, which was categorized further into 60–69 years (elderly) and ≥ 70 years (high-risk elderly). Most of respondents were in the 60–69 years age group, which was at 67.7%. Of the total elderly individuals, 66.4% were married with living husband/wife.

The percentage of professionally active participants in the study was 63.3%, 68.7% had the lowest income. All variables included in the clinical characteristic of the study group are tabulated in Table 1.

Six of nine independent variables (BMI, current smoking, physical activity, mental health, employment, income, marital status, age, and sex) were sig-

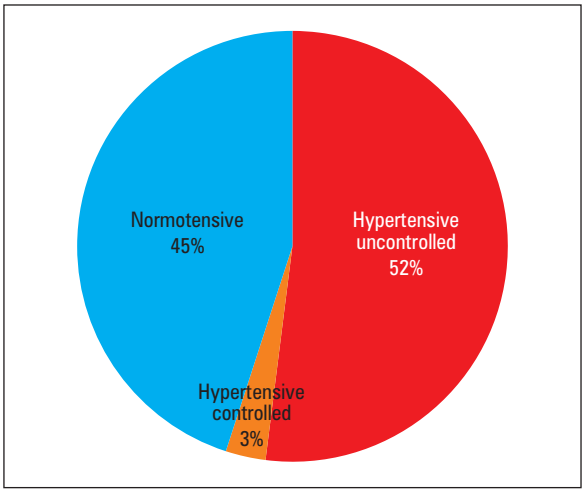

Figure 1. Blood pressure status in elderly people of Indonesia

Table 1. Factors associated with hypertension in the elderly

Variables	Hypertension (n = 691) (55%)	Normotension (n = 564) (45%)	Total (n = 1255)	p value	OR (95% CI)
Obesity					
Overweight/obese	233 (71.9%)	91 (28.1%)	324 (25.8%)	< 0.001	2.644
Non overweight/non-obese	458 (49.2%)	473 (50.8%)	931 (74.2%)		(2.010–3.479)
Current smoking					
Smoking	187 (45.6%)	223 (54.4%)	410 (32.7%)	< 0.001	0.567
Not smoking	504 (59.6%)	341 (40.4%)	845 (67.3%)		(0.447–0.720)
Physical activity:					
Not active	235 (59.3%)	161 (40.7%)	396 (31.6%)	0.038	1.290
Active	456 (53.1%)	403 (46.9%)	859 (68.4%)		(1.014–1.642)
Mental health					
Depressive symptoms	109 (51.9%)	101 (48.1%)	210 (16.7%)	0.314	0.859
Healthy	582 (55.7%)	463 (44.3%)	1045 (83.3%)		(0.463–1.813)
Employment					
Unemployed	297 (64.4%)	164 (35.6%)	461 (36.7%)	< 0.001	1.839
Employed	394 (49.6%)	400 (50.4%)	794 (63.3%)		(1.452–2.328)
Income					
Low income	489 (56.7%)	373 (43.3%)	862 (68.7%)	0.078	1.240
High income	202 (51.4%)	191 (48.6%)	393 (31.3%)		(0.976–1.575)
Marital status					
Not married	261 (61.8%)	161 (38.2%)	422 (33.6%)	0.001*	1.519
Still married	430 (51.6%)	403 (48.4%)	833 (66.4%)		(1.197–1.929)
Age:					
≥ 70 years old	236 (58.3%)	169 (41.7%)	405 (32.3%)	0.114	1.212
60–69	455 (53.5%)	395 (46.5%)	850 (67.7%)		(0.954–1.540)
Sex					
Female	403 (60.8%)	260 (39.2%)	663 (52.8%)	< 0.001*	1.636
Male	288 (48.6%)	304 (51.4%)	592 (47.2%)		(1.307–2.047)

*χ^2 test ($p < 0.05$); OR — odds ratio; CI — confidence interval

Table 2. The association of obesity, employment, marital status, and current smoking with hypertension

Variables	OR_{adj}	SE	p value*	95% CI
Obesity	2.403	0.346	< 0.001	1.812–3.186
Employment	1.599	0.202	< 0.001	1.248–2.047
Marital Status	1.330	0.170	0.026	1.035–1.710
Current smoking	0.773	0.101	0.048	0.599–0.998
Constant	0.830	0.089	0.083	0.673–1.024

*multiple regression logistic test ($p < 0.05$); OR_{adj} — adjusted odds ratio; SE — standard error; CI — confidence interval

nificantly associated with hypertension ($p < 0.05$), i.e., BMI, current smoking, physical activity, employment, marital status, and sex. Based on the multiple regression logistic analysis, eight variables entered as candidates: BMI, current smoking, physical activity, employment, income, marital status, age, and sex ($p < 0.25$). The final multivariate model is shown in Table 2.

The variables associated with presence of hypertension were BMI, employment and marital status, and current smoking ($p < 0.05$). The elderly with a BMI ≥ 25 kg/m^2 has a 2.4 times the risk of hypertension compared with the elderly with a BMI < 25 kg/m^2. The elderly people who were already retired had 1.6 times the risk of being diagnosed with hypertension compared with their professionally active counterparts. Noteworthy, elderly people who were active smokers had 0.7 times the risk of experiencing hypertension compared with the elderly individuals who are not smoking.

Discussion

This study outlines the cardiovascular risk profile of older patients with hypertension residing in Indonesia. Noteworthy, massive majority of hypertensive older patients were uncontrolled. The prevalence of hypertension in elderly women was higher (60.8%) compared with males (48.6%). Other studies in the elderly in Kolkata India also found that more (64%) of the elderly had hypertension, with 64.9% and 62.8% in the female and male elderly individuals, respectively [19]. The research in Pakistan also found that the incidence of hypertension was higher in the female elderly (78%) [20]. In the elderly people of Singapore, the prevalence of hypertension was comparable in both females and males which was 73.7% and 74.6%, respectively. But among them, the presence of uncontrolled hypertension was slightly higher in females (52.3%) compared to males (49.4%) [21]. From 15 million people with hypertension, barely 4% had controlled hypertension [8].

One of the most potent epidemiological risk factor for development of hypertension is overweight/obesity [22]. Both, increased BMI and advancing age were associated with higher blood pressure thus facilitating development of hypertension. Greater BMI has been also linked to higher cholesterol, heart disease, and stroke [23].

The elderly individuals with a BMI ≥ 25 kg/m^2 or elderly individuals with overweight/obesity in our study were in 25.8%. This is, however, lower than the prevalence of obesity in the elderly ≥ 60 years in the United States, where obesity is estimated at 37% [23]. Our study also showed the relationship between BMI and hypertension. A study in the Chinese elderly with relation to hypertension also documented a strong relationship between BMI and prevalent hypertension. However, the relationship between BMI and hypertension was attenuated when age was included as covariate in the analyses [24].

The elderly individuals with obesity had higher blood pressure as compared with the elderly individuals with normal BMI, which strongly points at the role of body mass control as an effective preventive measure [9]. This should be achieved by introduction of healthy diet, with high fiber consumption [25] along with increased physical activity, as recommended by expert documents [26].

The elderly individuals generally are less physically active; hence, they tend to spend less energy. Physical activity was the most tangible component of energy expenditure and the most controlled component. It is widely recommended that adults should engage in moderate physical activity for 30 min on most week days (a total of 150 min. over a week) [9, 16]. To increase physical activity, local communities and government agencies need to provide long-term health care programs designed specifically to prevent activity limitation in the elderly [27].

This study suggests that unemployment status confers risk for hypertension in elderly. Approximately two-thirds of the unemployed elder individuals were diagnosed with hypertension. Alternative studies from Pakistan confirm such relationship. Ishtiaq et al. documented that approximately 70% of those who were unemployed had poor control of hypertension [20]. Additionally, a study from Singapore showed that unemployment status was also related to uncontrolled hypertension. Unemployment status together with low income had a negative impact on the ability to buy anti-hypertensive drugs, which leads to non-adherence with treatment [21]. However such relationship is not evident, in part of European countries where no association between work status and hypertension was found [28].

Having a partner was a protective factor against high blood pressure. In our study, 62% of elderly people with hypertension were single. Several studies showed that individuals who were single (widowed, divorced etc.) were at higher risk of developing cardiovascular events [21, 22, 30]. People who always interact with their partners tend to control their partner's health through direct social control, such as encouraging, monitoring, reminding, and even threatening; hence, they adopt mutual healthy behaviors [21]. However, a study in Pakistan found that 78% of the population who were married or who had family had hypertension. Alternative explanation for this phenomenon was e.g., stress originated from household problems [20].

Cardiovascular disease is facilitated by smoking habits [3]. Smoking affects blood pressure, reduces exercise tolerance, promotes prothrombotic status, and endothelial dysfunction which altogether leads to chronic coronary syndromes or strokes cerebrovascular disease [9, 15]. Smokers have 2 to 4 times the risk of coronary heart disease as compared to their non-smoking counterparts [15, 31].

The results of this study showed that smoking was a common habit affecting one-third of elderly people. The prevalence of smoking in the elderly was higher than in Malaysia (15.2%), Lebanon (28.1%), and Europe (11.5%) [31]. The results of this study analysis showed that there was a relationship between current smoking status and prevalent hypertension is perplexed.

Smoking cessation is accompanied by substantial cardiovascular risk reduction, which underscores

necessity to broadly address this problem, also in elderly community of Indonesia where every third older person continues to smoke. This may translate to wide range of health benefit as one year after smoking cessation, the risk of heart attack is reduced by half which may be further decreased to the one observed in non-smokers after another 15 years. Additionally, the risk of lung cancer decreases by 50–60 percent after a decade without smoking which makes smoking cessation one of the most potent preventive measure [15].

Conclusion

Our study showed that large majority of elderly population of Indonesia is characterized by high blood pressure. Noteworthy, hypertension is accompanied by other potent cardiovascular risk factors such as overweight/obesity and surprisingly high percentage of current smoking. Our study identified most prevalent CV risk factors in elderly which should help to build an effective preventive strategies on a large scale.

Acknowledgements

This work is supported by Hibah PITTA 2018 funded by DRPM Universitas Indonesia No. 5000/UN2.R3/HKP.05.00/2018. We would like to thank RAND and SurveyMETER for providing IFLS data for public access.

References

1. Lionakis N, Mendrinos D, Sanidas E, et al. Hypertension in the elderly. World J Cardiol. 2012; 4(5): 135–147, doi: 10.4330/wjc.v4.i5.135, indexed in Pubmed: 22655162.
2. Tykarski A, Mastalerz-Migas A, Wieczorowska-Tobis K, et al. REcomMEndations for DIAgnostics and MaNagemenT of Arterial Hypertension in Adults Aged 65 Years and Older for General Practitioners — REMEDIA NT 65+ GP. Arterial Hypertension. 2018; 22(4): 163–171, doi: 10.5603/ah.a2018.0023.
3. World Health Organization. A global brief on hypertension: Silent killer, global public health crisis. World Health Day — Hypertension. WHO, Geneva 2013.
4. Hernandez-Vila E. A review of the JNC 8 Blood Pressure Guideline. Tex Heart Inst J. 2015; 42(3): 226–228, doi: 10.14503/THIJ-15-5067, indexed in Pubmed: 26175633.
5. Bell K, Twiggs J, Olin BR. Hypertension: The silent killer: Updated JNC-8 guideline recommendations. Continuing Education. USA: Alabama Pharmacy Association; 2015. p. 1–8. https://cdn.ymaws.com/www.aparx.org/resource/resmgr/CEs/CE_Hypertension_The_Silent_K.pdf.
6. James PA, Oparil S, Carter BL, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014; 311(5): 507–520, doi: 10.1001/jama.2013.284427, indexed in Pubmed: 24352797.
7. Page MR. The JNC 8 hypertension guidelines: an in-depth guide. Am J Manag Care. 2014; 20(1): E8, indexed in Pubmed: 25618230.
8. Riyadina W, Kodim N, Bantas K, et al. Triglyceride as prognostics factor of uncontrolled hypertension in post menopausal women in Bogor City 2014. Bul Penelit Kesehat. 2017; 45(2): 89–96, doi: 10.22435/bpk.v45i2.6273.
9. WHO. Hypertension What is high blood pressure or hypertension? Hypertension Fact Sheet [Internet]. 2011. http://www.searo.who.int/entity/noncommunicable_diseases/media/non_communicable_diseases_hypertension_fs.pdf.
10. Kemenkes RI. Riset Kesehatan Dasar (Riskesdas) 2013. Badan Penelitian dan Pengembangan Kementerian Kesehatan RI 2013: 226.
11. Strauss J, Witoelar F, Bondan S. The fifth wave of the Indonesia Family Life Survey: Overview and field report. RAND Corporation, Santa Monica 2016: 5.
12. Peltzer K, Pengpid S. The Prevalence and Social Determinants of Hypertension among Adults in Indonesia: A Cross-Sectional Population-Based National Survey. Int J Hypertens. 2018; 2018: 5610725, doi: 10.1155/2018/5610725, indexed in Pubmed: 30174948.
13. Bombak A. Obesity, health at every size, and public health policy. Am J Public Health. 2014; 104(2): e60–e67, doi: 10.2105/AJPH.2013.301486, indexed in Pubmed: 24328657.
14. WHO expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004; 363(9403): 157–163, doi: 10.1016/s0140-6736(03)15268-3, indexed in Pubmed: 1472617.
15. Gometz ED. Health effects of smoking and the benefits of quitting. Virtual Mentor. 2011; 13(1): 31–35, doi: 10.1001/virtualmentor.2011.13.1.cprl1-1101, indexed in Pubmed: 23121814.
16. World Health Organization. Global recommendations of physical activity for health. WHO, Geneva 2010: 1–55.
17. World Health Organization. South-East Asia Region. Elderly Population. WHO, Geneva 2018.
18. Kemenkes RI.. PMK No. 25 tentang Rencana Aksi Nasional Kesehatan Lanjut Usia Tahun 2016–2019. 2016.
19. Biswas D, Gupta A, Kumar A, et al. A study on hypertension in geriatric population in a slum of Kolkata. Int J Med Sci Public Heal. 2015; 4(11): 1527, doi: 10.5455/ijmsph.2015.01052015305.
20. Ishtiaq S, Ilyas U, Naz S, et al. Assessment of the risk factors of hypertension among adult & elderly group in twin cities of Pakistan. J Pak Med Assoc. 2017; 67(11): 1664–1669, indexed in Pubmed: 29171556.
21. Seow L, Subramaniam M, Abdin E, et al. Hypertension and its associated risks among Singapore elderly residential population. J Clin Gerontol Geriatr. 2015; 6(4): 125–132, doi: 10.1016/j.jcgg.2015.05.002.
22. Fauziana R, Jeyagurunathan A, Abdin E, et al. Body mass index, waist-hip ratio and risk of chronic medical condition in the elderly population: results from the Well-being of the Singapore Elderly (WiSE) Study. BMC Geriatr. 2016; 16: 125, doi: 10.1186/s12877-016-0297-z, indexed in Pubmed: 27315800.
23. Writes S. Common Causes of Hypertension in Senior Adults. Health Sci J. 2017; 11(4), doi: 10.21767/1791-809x.1000523.
24. Wang Q, Xu L, Li J, et al. Association of Anthropometric Indices of Obesity with Hypertension in Chinese Elderly: An Analysis of Age and Gender Differences. Int J Environ Res Public Health. 2018; 15(4), doi: 10.3390/ijerph15040801, indexed in Pubmed: 29671813.
25. Monteiro JCV, Pimentel GD, Sousa MV. Relationship between body mass index with dietary fiber intake and skinfolds-differences among bodybuilders who train during morning and nocturne period. Nutr Hosp. 2012; 27(3): 929–935, doi: 10.3305/nh.2012.27.3.5578, indexed in Pubmed: 23114956.
26. Ghaffari S, Pourafkari L, Tajlil A, et al. The prevalence, awareness and control rate of hypertension among elderly in northwest of Iran. J Cardiovasc Thorac Res. 2016; 8(4): 176–182, doi: 10.15171/jcvtr.2016.35, indexed in Pubmed: 28210474.

27. Moon JH. Factors Affecting Activity Limitation in the Elderly: Data Processed from the Korea National Health and Nutrition Examination Survey, 2016. Osong Public Health Res Perspect. 2019; 10(3): 117–122, doi: 10.24171/j.phrp.2019.10.3.02, indexed in Pubmed: 31263660.
28. Rumball-Smith J, Nandi A, Kaufman JS. Working and hypertension: gaps in employment not associated with increased risk in 13 European countries, a retrospective cohort study. BMC Public Health. 2014; 14: 536, doi: 10.1186/1471-2458-14-536, indexed in Pubmed: 24885853.
29. Rashid Ak, Azizah Am. Prevalence of hypertension among the elderly Malays living in rural Malaysia. Australas Med J. 2011; 4(6): 283–290, doi: 10.4066/AMJ.2011.660, indexed in Pubmed: 23386889.
30. de Oliveira C, Marmot MG, Demakakos P, et al. Mortality risk attributable to smoking, hypertension and diabetes among English and Brazilian older adults (The ELSA and Bambui cohort ageing studies). Eur J Public Health. 2016; 26(5): 831–835, doi: 10.1093/eurpub/ckv225, indexed in Pubmed: 26666869.
31. Lim KH, Jasvindar K, Cheong SM, et al. Prevalence of smoking and its associated factors with smoking among elderly smokers in Malaysia: findings from a nationwide population-based study. Tob Induc Dis. 2016; 14: 8, doi: 10.1186/s12971-016-0073-z, indexed in Pubmed: 27006650.