Cardiovascular-Related Death Risk Factors in Hypertensive Patients: Indonesia Family Life Survey 2000–2014

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Abstract

Objective: To determine the characteristics of the risk factors of cardiovascular death in hypertensive patients in Indonesia based on the Indonesian Family Life Survey (IFLS) longitudinal data.

Methods: This was a retrospective descriptive study on secondary data from the IFLS population starting from 2000 and was followed up in 2007 and 2014. The inclusion criteria for participation were 15 years old or older, had hypertension, had cardiovascular events as the cause of death, and had complete data in both IFLS 3 (2000) and IFLS 4 (2007).

Results: The IFLS 5 (2014) reported 918 deaths among eligible subjects with complete data, both in IFLS 3 (2000) and IFLS 4 (2007). Of those, a total of 608 subjects experienced hypertension started from 2000 and/or 2007. Of these deaths, 112 were due to cardiovascular events. Cardiovascular death was more common in males (58.9%), age of >65 years old when died (47.3%), had poor socioeconomic status (24.1%), and with normal body mass index (54.9%).

Conclusion: Male, late adulthood, low level of education, normal BMI, and poor socioeconomic status represented the greater risks of cardiovascular death among hypertensive patients in Indonesia.

Keywords: Cardiovascular death, hypertension, IFLS, risk factor

Introduction

Cardiovascular disease is the leading cause of death worldwide.[1, 2] There were 422,7 million cardiovascular cases and 17.92 million deaths in 2015.[2] Cardiovascular events in patients with hypertension are influenced by modifiable and non-modifiable risk factors.[3, 4] The global prevalence of hypertension is 1,13 billion in 2015.[5] The overall prevalence of hypertension in adults is estimated to be 30-45%, with higher proportion in males (24%) than females (20%).[5] Data from basic health research in 2018 showed the prevalence of hypertension in Indonesia was 34.1% (increased from 25.8% in 2013).[6]

Indonesia Family Life Survey is a large-scale series of cross-sectional study conducted by RAND Corporation in Indonesia.[7, 8] It has been conducted five times (1993, 1997, 2000, 2007, 2014) with re-contact rates higher compared to the similar survey in the United States and Europe.[7,8] The IFLS represented of 83% of the Indonesia population, provinces in west and central part of Indonesia were included. Individual and household factors such as age, gender, education, income, household composition, subjective and objective health measurements and biomarkers, health risk behaviors, healthcare utilisation, cognitive health, and subjective wellbeing were included in the IFLS. Thus, it can provide an opportunity to obtain secondary data on risk factors of cardiovascular death from hypertensive

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patients in Indonesia.[7, 8] This study aimed to determine the risk factors of cardiovascular death in hypertensive patients in Indonesia based on IFLS longitudinal data.[7, 8]

Methods

This was a retrospective descriptive study based on secondary data from IFLS 3 (2000), IFLS 4 (2007) and IFLS 5 (2014). The study population was all subjects who were reported died in IFLS 5. The inclusion criteria were age over 15 years old, had hypertension in 2000 and/or 2014 data, and death due to cardiovascular events. Subjects with type 2 diabetes mellitus (T2DM) and chronic kidney disease (CKD) were excluded from this study. T2DM and CKD were diagnosed through self reported. Data were extracted using STATACause of death were taken from IFLS 5 exit form file, blood pressure measurement report on IFLS 3 (hh00_all_dta, table bus1_1. dta) and IFLS 4 (hh07_all_dta, table bus1_1. dta) was calculated as average for systolic and diastolic blood pressure and defined as hypertension if systolic ≥140 and/or diastolic ≥90 mmhg were taken from (hh00_all_dta table us07,hh07_all_dta table us07 and hh14_all_dta table us07), age of death were taken from (hh14_all_dta table fe1_1.dta), gender were taken from (hh00_all_dta table ar07, hh07_all_dta table ar07 and hh14_all_dta table ar07), education were taken from b3a_dl1.dta file, body mass index were taken from (hh00_all_dta table bus_us.dta, hh07_all_dta table bus_us.dta, hh14_all_dta table bus_us.dta), assessment of socioeconomic status based on the quintile of asset ownership using the Principal Component Analysis (PCA) method were taken from table hrtype, measurement body mass index is calculating weight and height, were taken from bus_us.dta, cigarette smoking were taken from table b3b_km.

Blood pressure and BMI calculation of IFLS participants were measured by trained nurses. Blood pressure were measured using an Omron meter, HEM-7203, three times on alternate arms in a seated position.[8] The BMI was classified according to Asian criteria: normal (18.5 to <23.0 kg/m^2), overweight (23.0 to <25.0 kg/m^2), and obese (25+ kg/m^2). The smoking status was determined on the questionnaire response to 'Do you still have the habit or have you totally quit?'. The complete details of IFLS study design and methods have been described elsewhere.[7, 8] This study had received approval from the Research Ethics Committee Dr. Hasan Sadikin General Hospital

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Results

There are 918 subjects reported as died in IFLS 5 (2014) which can be tracked back to data in IFLS 3 (2000) and IFLS 4 (2007), leaving a total of 608 subjects with hypertension in the data of year 2000 and 2007, and only 112 died.

Among 112 subjects who died due to cardiovascular events with the history of hypertension, most of them were males (58.9%) aged >65 years old (47.3%), Elementary school graduates (49,1%), poor socioeconomic status (24.1%), non-smoker (67%), and normal BMI (54.9%; Table)

Cardiovascular death in both gender was more common in primary school graduates. In males (31.3%) and females (17.9%; Fig. 1).

Cardiovascular death in both gender was more common in the age of >65 years old (Fig. 2).

Table Subjects Characteristic

Variables	n (%)
Sex	
Male	66 (58,9)
Level of Education	
No School	30 (26,8)
Elementary school	55 (49,1)
Junior high school	9 (8,0)
Senior high school	16 (14,3)
University	2 (1,8)
Age of death	
25 to 45	5 (4,5)
46 to 55	23 (20,5)
56 to 65	31 (27,7)
>65	53 (47,3)
Socioeconomic status	
Very poor	24 (21,4)
Poor	27 (24,1)
Middle	25 (22,3)
High	21 (18,8)
Very high	15 (13,4)
Cigarette Smoking	
Yes	37 (33,0)
No	75 (67,0)
BMI*	n=102
Underweight	10 (9,8)
Normal	56 (54,9)
Overweight	26 (25,5)
Obese	10 (9,8)

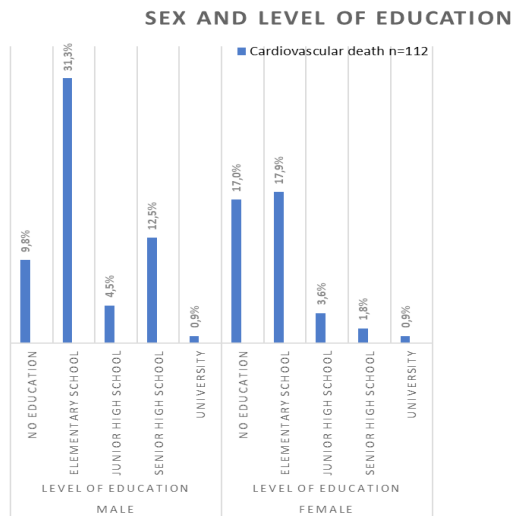*Data not complete; BMI=Body mass index

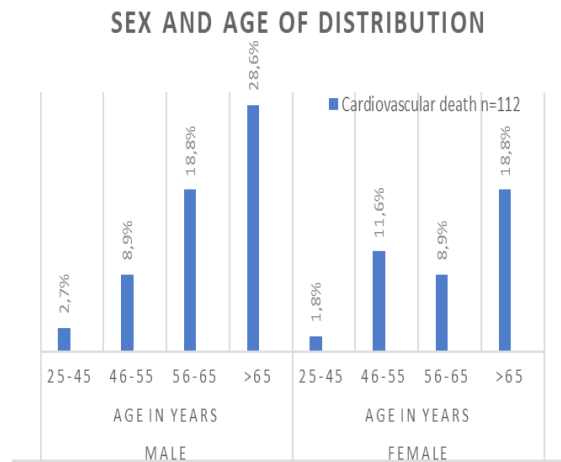Fig 1. Sex and Level of Education Distribution

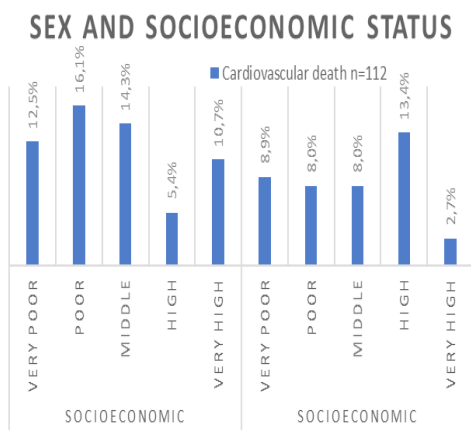Fig 2. Sex and Age Distribution
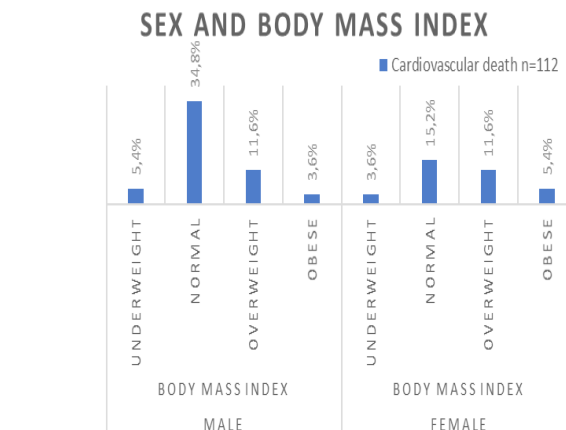

Fig 3. Sex and Socioeconomic Status

Fig 4. Sex and BMI distribution

Cardiovascular death in males was more common in poor income (16.1%). In females, cardiovascular death was more common in high income (13.4%; Fig. 3).

Cardiovascular death in both gender was more common in normal BMI, In males 34,8% and females 15,2%. The distribution of BMI status amongst gender were shown in Fig. 4.

Discussion

This study found that males had a higher distribution of cardiovascular death compared to females. These results are consistent with data from the European Society of Cardiology (ESC), and the American Heart Association (AHA) that stated a male had a higher risk of cardiovascular disease compared to females.[4,5] A study conducted based on Indonesia Basic Health Research 2013 by Ghani *et al* [9] stated that women had 1.22 times greater risk of coronary heart disease.There is an increase in number of death in patients aged over 46 years old with the highest rate in subjects >65 years old. This result is similar to those obtained by Ghani et al. in 2016, which found that the risk of stroke increased with age, and patients aged >55 years old had 10.23 times higher risk compared to those aged 15–44 years old.[10] There is an increase in the cardiovascular

death profile and atherosclerotic process in males as age increases.[11] While females of childbearing age have a high level of estrogen, which can protect against cardiovascular risk factors, the risk of cardiovascular disease increases two to fourfold after menopause.[11, 12] Men were more likely to have heavy plaques associated with impaired blood flow. This plaque has characteristics of thin and rich in fat or necrotic nuclei that are rich in lipids and have a high risk of cardiovascular death.[13] In addition, endothelial dysfunction and arterial stiffness are more common in men than women in the age spectrum up to the sixth decade. Before menopause, women are relatively protected from cardiovascular disease. In menopausal women, the risk of cardiovascular disease increases. This is related to a decrease in sex hormones that have been shown to play an important role in cardiovascular disease development at the onset of older age.[12]

This study showed that deaths due to cardiovascular events are more common in poor education level. In addition, poor education level subjects have limited access to health services. These results are consistent with a study conducted by Ghani et al. that identified dominant risk factors for stroke based on Indonesia Basic Health Research 2013. Ghani *et al.*[9] found that stroke was more common in poor education. This is due to lack of knowledge related to the impact of bad lifestyle behavior such as high-fat diet which will lead to degenerative disease.[10]

Another study based on IFLS conducted by Gumilang et. showed hypertension incidence was lower in subjects who attended school (17.3%) compared to subjects who didn't attend school. There was a decrease in incidence as subjects had higher education.[14] In addition, a study conducted by Chiara et al. showed that level of education were independently associated with increased cardiovascular risk factors globally.[15]

Cardiovascular death is more frequent in poor socioeconomic subjects. Other study based on IFLS 2007 and 2017 conducted by Sudharsanan et al. showed that duration of socioeconomic status and cardiovascular risk factors (obesity, hypertension, and cigarette smoking) play an important role in the association between individual characteristics and mortality.[16]

Cardiovascular death among hypertensive patients was more prevalent in non-smokers. While this finding seemed contrary with the current evidence, there were several concerns with the result. Firstly, our data only showed

current smoking status. We did not define the duration, quantity of cigarrete smoking, and history of previous smoking which could affected the result of our findings. Secondly, we did not know whether the non-smokers had more comorbidities that we did not include in the studies, such as dyslipidemia, history of premature vascular disease, history of cerebrovascular disease.

More subjects who died due to cardiovascular disease having normal body mass index (54,9%), while the lowest was underweight (9.8%). Data from ESC and AHA showed that people with higher BMI are at risk of having cardiovascular disease.[4, 5] A study based on IFLS 5 conducted by Kasyani et al. showed that there was a significant association between nutritional status with hypertension, higher BMI will increase the risk of developing hypertension.[19] Ghani et al. stated low body mass index has a risk of coronary heart disease 1.31 times for the incidence of coronary heart disease.[4, 5, 13] Until lately, metabolically healthy obesity (MHO) has drawn increasing attention and has been reported to have better outcome than the obesity with metabolic abnormalities.[20] The definition of MHO is not uniform, but it is commonly described as obesity without or less than two of the five metabolic abnormalities (high plasma triglyceride concentration, high fasting blood glucose, low high-density lipoprotein cholesterol concentration, and large waist circumference, and high blood pressure).[20] In this study, we did not include any other parameters of metabolic dysfunction other than hypertension, therefore we did not know whether the overweight and obesity group had any other metabolic abnormalities. Furthermore, we did not know whether the hypertensive population were using any anti-hypertensive drugs and whether the blood pressure was under control. These factors might largely affected the result of the study.

Some limitations should be noted. The data collections were separated by 7 years, many subjects from previous survey were not contactable on the following surveys; smoking history, and passive smoking status were also limited. Moreover, the descriptive nature of the study design without including numerous cardiovascular risk factors in the baseline characteristics sample should be taken into account as major limitations of this study. Further analytical study with multivariate analysis might be necessary to confirm any findings from this study. It is concluded that cardiovascular death among hypertensive

patients in Indonesia is more prevalent in male, late adulthood, low level of education, normal BMI, and poor socioeconomic status.

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