TOWARDS REDUCING THE PREVALENCE OF HYPERTENSION AND CARDIOVASCULAR DISEASE: PREDICTORS OF HYPERTENSION AMONG FILIPINOS FROM THE LIFECARE PHILIPPINE COHORT

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SUMMARY

Cardiovascular disease is prevalent worldwide and is the most common cause of morbidity and mortality in the Philippines. In serial surveys done every five years by the Department of Science and Technology Food and Nutrition Research Institute, hypertension is a common cardiovascular risk factor in the country. Knowing the predictors for the development of hypertension will be crucial in reducing its prevalence and preventing the complications that come with it.

The LIFE course study in CARdiovascular disease Epidemiology (LIFECARE) enrolled 3,072 apparently healthy participants from 4 provinces in Luzon from 2009 to 2011 to comprise its study base. Personal history, anthropometric measurements, and biochemical parameters were obtained while psychosocial questionnaires were administered at baseline. A second visit to available participants was done after 4-5 years from baseline. From the initial non-hypertensive group who had blood pressure measured on follow-up, a total of 2,089 participants qualified for this analysis.

The incidence rate for hypertension was 38.1 per 1,000 person-years. The cumulative incidence of hypertension over a mean follow-up time of four years was 15.4%. The risk of incident hypertension was higher among males, those who are at least 40 years old, with family history of hypertension, those with abdominal obesity, and those who have baseline SBP of at least 130 mmHg or DBP of at least 80 mmHg.

Increasing age, male sex, family history of hypertension, abdominal obesity, low HDL-C, and high normal blood pressure were significantly associated with development of hypertension among Filipinos in a span of 4 years. Aside from age, sex, and family history, the other factors are controllable. Attention to these remediable factors may go a long way in reducing the prevalence of hypertension and the eventual development of cardiovascular disease and its complications.

ABBREVIATIONS

aHR, Adjusted Hazard Ratio; BMI, Body Mass Index; CI, Confidence Interval; DBP, Diastolic Blood Pressure; FNRI, Food and Nutrition Research Institute; HDL-C, High-Density Lipoprotein-Cholesterol; HR, Hazard Ratio; LDL-C, Low-Density Lipoprotein-Cholesterol; LIFECARE, LIFE Course study in CARdiovascular disease Epidemiology; NNHeS, National Nutrition and Health Surveys; SBP, Systolic Blood Pressure.

BACKGROUND

Cardiovascular disease is prevalent worldwide and is the most common cause of morbidity and mortality in the Philippines. Serial National Nutrition and Health Surveys (NNHeS) conducted every five years from 1998 to 2018 by the Department of Science and Technology Food and Nutrition Research Institute showed that hypertension is a common cardiovascular risk factor in the country. Its prevalence varied from 19 to 25% in the different cross-sectional survey periods. A study done by Ursua et al. which examined the predictors of hypertension among Filipino immigrants in the United States, older age, male sex, migration to the US for over 5 years, a BMI greater than 23.0 kg/m2, an elevated glucose reading, a family history of hypertension, and fair to poor self-reported health status predicted the development of hypertension later in life. Similar studies have been reported in other countries. We now have a cohort population locally to help us look into predictors for hypertension.

STUDY POPULATION

The LIFE course study in CARdiovascular disease Epidemiology (LIFECARE) was initiated in 2009 as a regional epidemiologic study in Southeast Asia (Indonesia, Malaysia, Philippines, and Thailand). In the Philippines, we enrolled 3,072 apparently healthy participants with age ranges from 20-50 years old from 4 provinces in Luzon (Rizal, Batangas, Quezon, and Bulacan) and Metro Manila in 2009 to 2011 to comprise its study base. Only 1 member of a selected family based on the *Kish method* (a method of selecting members within a household) was enrolled. Personal and family history, anthropometric measurements, and biochemical parameters were obtained while psychosocial questionnaires were administered to the participants at baseline. In the initial visit, 15.2% of participants were hypertensive [systolic blood pressure (SBP) of at least 140 mmHg and /or diastolic blood pressure (DBP) of at least 90 mmHg]. A second visit to available participants was done 4-5 years after the first visit. From the initial normotensive group of 2,604 participants, 2,089 participants with follow-up data including repeat BP measurements qualified for this analysis.

ANALYSIS

Frequencies and percentages were presented for categorical variables, while mean and standard deviation were calculated for continuous variables. Chi-square and Mann-Whitney tests were used to compare the baseline characteristics of those with and without incident hypertension after follow-up. Time at risk was computed as the time elapsed between the baseline and follow-up visits. Incidence rate was expressed per 1,000 person-years, and was calculated as the number of incident cases of hypertension divided by the total number of person-years at risk. Bivariate test resulting in a *p-value* ≤ 0.20 was considered a candidate for the multivariable model. The full model included age, sex, civil status, employment status, family history of hypertension, BMI, waist circumference, total cholesterol, triglyceride, LDL-c, HDL-c, baseline BP, and fasting blood glucose. Multivariable Cox regression was done to determine the risk factors associated with incident hypertension. Unadjusted and adjusted hazard ratios (HR), 95% confidence intervals, and *p-values* were presented. Schoenfeld test was used to test for violation of proportional hazards. All statistical analyses were performed using Stata version 16 for Windows®.

RESULTS

Of the 2,089 normotensive participants included in this analysis, the mean age was 35 years old, while 59% were women. Incidence rate of hypertension was 38.1 per 1,000 person-years, and a cumulative incidence of 15.4% over a mean follow-up time of 4 years among this Filipino cohort (Table 1).

Multivariate logistic regression results employed multiple logistic regression using the backward selection strategy. The final model includes socio-demographic factors such as age and sex, adjusted for family history of hypertension, baseline blood pressure, and waist circumference. Males were 1.27 times more likely to develop hypertension compared to females (p=0.007), and participants at least 40 years old were 3.13 times more likely to have hypertension compared to participants aged 20-29 years old. Furthermore, participants with a family history of hypertension were 1.34 times more likely to have the disease and those who have baseline SBP of at least 130 mmHg or DBP of at least 80 mmHg tend to increase the odds of having hypertension by more than 5 times. Obese individuals were found to be 1.41 times more likely to have hypertension compared to individuals with normal waist circumference (Table 2).

COMMENTS

This is the first study in the Philippines that provided an incidence of hypertension based on a longitudinal cohort population. Increasing age, male sex, family history of hypertension, abdominal obesity, low HDL-C, and high normal blood pressure were significantly associated with development of hypertension among Filipinos in a span of 4 years. As this was done in only a few provinces in Luzon, the results may not be generalizable to the whole country. Selection bias of recruited participants and lack of follow-up of some participants in the second visit and BP determinations made in a single visit were limiting factors to be taken into consideration. Nevertheless, the results provided us with an overview of the problem of hypertension in our country.

RECOMMENDATIONS

1. A healthy lifestyle must be strongly recommended to prevent or at least delay the development of hypertension. Although advancing age, sex, and family history are fixed, other factors are controllable, such as maintaining an ideal body weight to avoid overweight and obesity.

2. Regular physical activity (exercise for 150 minutes per week), proper balanced diet (using the "Pinggang Pinoy" dietary food

Table 1. Baseline blood pressure and hypertension status after follow-up.

	N	Hypertensive after follow-up		
	N	Frequency	%	*p value*
Baseline blood pressure				
SBP <120 and DBP<80	1,297	74	5.7	<0.001
SBP (120-129) and DBP <80	404	82	20.3	
SBP (130-139) or DBP (80-89)	388	166	42.8	
Total	2,089	322	15.4	

SBP, systolic blood pressure; DBP, diastolic blood pressure

Table 2. Risk factors of incident hypertension among the Philippine LIFECARE cohort.

	Crude HR (95%CI)	*p value*	Adjusted HR (95% CI)	*p value*
Age groups				
20-29	1.0 (Ref)		1.00 (ref)	
30-39	2.6 (1.8 – 3.8)	<0.001	2.3 (1.6 – 3.4)	<0.001
40-50	4.8 (3.4 – 6.9)	<0.001	3.9 (2.6 – 5.8)	<0.001
Sex				
Female	1.0 (Ref)		1.00 (ref)	
Male	1.5 (1.2 – 1.9)	<0.001	1.3 (1.0 – 1.8)	0.044
Civil status				
Single/widow/separated	1.0 (Ref)		1.00 (ref)	
Married/live-in	1.5 (1.1 – 2.1)	0.004	1.0 (0.7 – 1.3)	0.839
Employment status				
Unemployed/student/retired	1.0 (Ref)		1.00 (ref)	
Employed	1.5 (1.2 – 2.0)	0.001	1.0 (0.7 – 1.3)	0.894
Family history of hypertension				
No	1.0 (Ref)		1.00 (ref)	
Yes	1.4 (1.2 – 1.8)	0.001	1.4 (1.1 – 1.7)	0.007
BMI (Asia Pacific)				
Normal	1.0 (Ref)		1.00 (ref)	
Underweight	0.5 (0.3 – 0.9)	0.027	0.6 (0.3 – 1.2)	0.150
Overweight	2.0 (1.5 – 2.7)	<0.001	1.1 (0.8 – 1.6)	0.413
Obese	2.4 (1.9 – 3.1)	<0.001	1.0 (0.7 – 1.4)	0.996
Waist circumference				
<90 cm (M), <80 cm (F)	1.0 (Ref)		1.00 (ref)	
≥90 cm (M), ≥80 cm (F)	2.1 (1.7 – 2.6)	<0.001	1.4 (1.0 – 2.0)	0.027
Total cholesterol				
Normal	1.0 (Ref)		1.00 (ref)	
Borderline high	1.4 (1.2 – 1.8)	0.005	0.8 (0.6 – 1.1)	0.240
High	1.4 (1.0 – 2.0)	0.072	0.7 (0.4 – 1.2)	0.174
Triglyceride				
Normal	1.0 (Ref)		1.00 (ref)	
Borderline high	1.9 (1.4 – 2.5)	<0.001	1.2 (0.9 – 1.6)	0.306
High	2.2 (1.6 – 2.9)	<0.001	1.1 (0.8 – 1.5)	0.557
LDL-c				
Normal	1.0 (Ref)		1.00 (ref)	
Near or above optimal	1.2 (0.9 – 1.6)	0.190	1.0 (0.7 – 1.3)	0.872
Borderline high	1.8 (1.4 – 2.4)	<0.001	1.4 (1.0 – 1.9)	0.072

	Crude HR (95%CI)	*p value*	Adjusted HR (95% CI)	*p value*
High	2.1 (1.4 – 3.0)	<0.001	1.2 (0.7 – 2.0)	0.442
HDL-C				
Low	1.0 (Ref)		1.00 (ref)	
Normal	0.8 (0.6 – 1.0)	0.109	0.9 (0.7 – 1.1)	0.322
High	0.5 (0.3 – 0.7)	<0.001	0.6 (0.4 – 0.9)	0.012
Baseline blood pressure				
SBP<120 and DBP<80	1.0 (Ref)		1.00 (ref)	
SBP (120-129) and DBP <80	3.4 (2.5 – 4.6)	<0.001	2.9 (2.1 – 4.0)	<0.001
SBP (130-139) or DBP (80-89)	7.0 (5.3 – 9.2)	<0.001	5.1 (3.8 – 6.8)	<0.001
Diabetes				
No	1.0 (Ref)		1.00 (ref)	
Yes	2.1 (1.4 – 3.3)	<0.001	1.0 (0.7 – 1.6)	0.840

HR, Hazard Ratios; SBP, systolic blood pressure; DBP, diastolic blood pressure

plate model by FNRI), and reduction of salt intake are proven measures to reduce blood pressure.

3. Provide communities with open spaces and facilities for people to exercise. Improve, increase, and safeguard our bicycle lanes to encourage more people to use it.

4. Secure financial support for a third visit of this cohort hopefully to generate data for a cardiovascular risk scoring system for our population.

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