ORIGINAL ARTICLE

Assessment of the Cardiovascular Risk of Persons with Hypertension and Diabetes Attending Clinics and Hypertension/Health Club Meetings in the AMIGA Municipalities of Cavite, Philippines using WHO/ISH Risk Prediction Charts

Elizabeth R. Paterno

Department of Family and Community Medicine, College of Medicine and Philippine General Hospital, University of the Philippines Manila

ABSTRACT

Objectives. This study aims to (1) determine the cardiovascular risk of persons with hypertension and diabetes attending hypertension/diabetic clinics or hypertension/health club meetings in the AMIGA (Alfonso, Mendez, Indang, General Emilio Aguinaldo and Amadeo) municipalities of Cavite; (2) suggest measures to improve the cardiovascular disease (CVD) program in these municipalities using the results of the study.

Methods. A cross-sectional study was performed on patients diagnosed with hypertension and/or diabetes who are attending clinics or club meetings in the barangays of the five AMIGA municipalities of Cavite. Participants were interviewed using an abbreviated version of the World Health Organization (WHO) STEPS questionnaire on risk factors. The participants' anthropometric measurements were obtained and their total blood cholesterol levels determined. CVD risk was then estimated using the WHO / International Society of Hypertension (ISH) risk prediction chart for the Western Pacific Region B.

Results. 1,032 participants from 27 barangays qualified for the study. Participants were predominantly female (74%); over-all mean age was 58.43 years. Majority of the participants (79.17%) were found to be in the low-risk group; 11.34% were in the moderate risk group; 4.46% were in the high-risk group; while 5.05% were in the very high-risk group. Majority of the participants were also found to be obese. Mean total cholesterol was 207.02 mg/dl.

Conclusion. Majority of participants were stratified in the low-risk category (<10% chance to have cardiovascular events in the next 10 years), while 9.5% were in the high-risk category (≥20% risk). Obesity is a major risk factor that could be addressed in this population.

Key Words: Cardiovascular disease (CVD); CVD risk stratification; WHO/ISH risk prediction charts

Corresponding author: Elizabeth R. Paterno, MD, MPH
Department of Family and Community Medicine
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Manila 1000, Philippines
Email: bebolrp@gmail.com

INTRODUCTION

Noncommunicable diseases (NCDs) have overtaken infectious diseases as the most common causes of mortality worldwide. The World Health Organization (WHO) reported that 38 million or 68% of the 56 million deaths in 2012 were due to NCDs, 16 million or 40% of which were premature deaths under 70 years of age. Majority of premature deaths (82%) occur in low and middle-income countries.[1] Since the majority of deaths occur in the working-age population, the economic implications of this problem are important for the sustainability of developing countries.[2] NCDs are major public health issues in almost all countries of the Western Pacific Region of the WHO, where the poor have the worst outcomes from these diseases.[3] In the Philippines, cardiovascular diseases (CVD) account for 33% of all deaths, while another 6% is due to diabetes. The probability of dying between the ages of 30 and 70 years from NCDs in the country is 28%.[4]

Use of total CVD risk approaches have proven to be superior over vertical approaches in developed countries where a decline of 42-60% in CVD deaths were reported to be due to changes in risk factors including reduction in smoking, systolic blood pressure, and total cholesterol, while only 23-47% in the reduction was attributed to the treatment of individual risk factors or the vertical approach.[1,2,5] In total CVD risk approaches, treatment decisions are based on the assessment of an individual's total predicted risk of developing a cardiovascular event like a stroke or myocardial infarction over a period of five to 10 years.[1,5] Developed countries have been using risk prediction charts like the Framingham Risk Scoring System for decades but these were developed for Caucasian populations.[5,6,7] As such, the World Health Organization (WHO) and the International Society of Hypertension (ISH) developed risk prediction charts that are population-specific using the best available mortality and risk factor data. These charts are tools that enable integrated risk assessment and risk prediction in non-Western populations.[6,8]

Studies have shown that the total CVD risk approach using risk prediction charts can help reduce treatment costs as opposed to single risk factor management which often leads to over-prescription of medications. Using this approach will enable low and middle-income countries with limited health care resources to prioritize those who are at high risk and will benefit most. The risk prediction charts are also intended to guide primary care clinicians in their choice of appropriate interventions to improve the life expectancy of high-risk groups and reduce the burden on health systems.[5,6,8,9]

This study was conducted to determine the 10-year total CVD risk of persons with hypertension and diabetes attending clinics and/or hypertension/health club meetings in five rural municipalities of Cavite using the WHO/ISH risk prediction charts. As most of these patients are already on treatment for individual risk factors especially hypertension, the results of the study may provide guidance in the proper implementation of the CVD program.

Study Context

The University of the Philippines - Manila through its Community Health and Development Program (UP-CHDP) forged a partnership with five municipalities of Cavite, collectively called the AMIGA Inter-LGU Health Collaboration Council to initiate the implementation of the Philippine adaptation of the WHO Package of Essential Noncommunicable Disease Interventions (PhilPEN) in 2013, and this partnership is currently ongoing. AMIGA is an acronym that stands for the first letters of these five municipalities: Alfonso, Mendez, Indang, General Emilio Aguinaldo and Amadeo. Registries of patients with hypertension and diabetes have been created in these municipalities and most barangays conduct monthly clinics for these patients. These persons with hypertension and/or diabetes in several barangays have also organized hypertension/diabetes or health clubs. This study was conceptualized to assist the AMIGA-UP-CHDP partnership to improve its ongoing program, especially in its estimation of the cardiovascular risk of the population as the municipal health offices are required to do by the Department of Health (DOH). The study also aims to identify measures or activities that could improve the CVD program in these municipalities to attain better results.

MATERIALS AND METHODS

Study design and setting

This study is a descriptive, community-based cross-sectional study conducted in the five municipalities of AMIGA in Cavite from September – November 2017. The University of the Philippines Manila Research Ethics Board (UPMREB) approved the study protocol (UPMREB 2017-256-01).

Recruitment and screening

All adult patients diagnosed with hypertension and/or diabetes mellitus attending hypertension/diabetes clinics or hypertension/health club meetings in the AMIGA barangays and willing to sign an informed consent form were invited to participate in the study. Exclusion criteria included: age of ≥80 years; had documented atherosclerotic heart disease or had a history of stroke or myocardial infarction; and with cognitive deficit (e.g. aphasia, dementia, mental disorders like retardation and psychosis) that would inhibit him/her from providing accurate information about his/her condition. A total sample size of 1,290 was computed using epi info stat calc. (Figure 1)

Study Tools and Data Collection

At the beginning of each session, the nature and implications of the study were explained to the assembly of a clinic or club meeting attendees. After signing an informed consent form, participants were interviewed face-to-face using the WHO Steps questionnaire[10] abbreviated to include only the risk factors used in the WHO/ISH risk prediction chart. The questionnaire was translated to Filipino, and this translated version had been tested in a related study conducted in the same municipalities. After the interview, anthropometric measurements (weight, height, waist, and hip circumferences) were taken using the following equipment: (1) dial type clinic weighing scale; (2) height board; and (3) non-stretch measuring tapes. Height was measured in centimeters in the standing position with

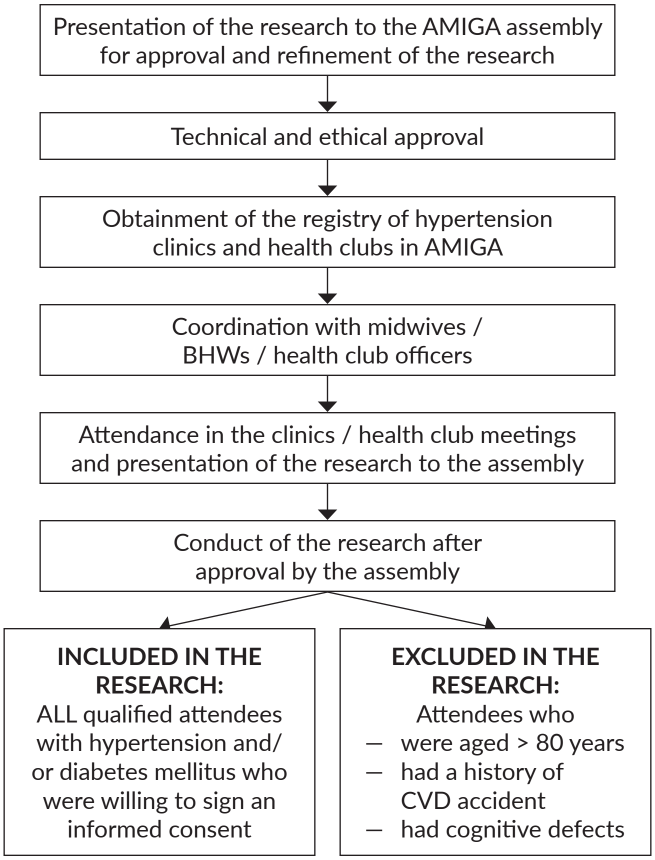

Figure 1. Research flow diagram.

footwear and headwear (hats, ribbons, etc) removed, making sure that the shoulders, buttocks, and back of the feet were touching the board and the head in a position where the angle of the eye was at a level with the top of the ear. Weight was measured in kilograms, with footwear removed and pockets emptied. Waist circumference (WC) was measured at the end of normal respiration with both hands at the side, at a level midway between the lowest rib and the iliac crest. Hip circumference was taken at the widest diameter around the buttocks. Blood pressure (BP) was taken in the seated position with both feet flat on the floor with an automated BP measuring device (Omron 7203). Researchers made sure that participants had been resting for 15 minutes before the BP was taken three times with three minutes interval. The first measurement was discarded and the mean value of the last two readings was used for analysis.[11] Capillary blood cholesterol was measured with a dry biochemistry device (Accutrend Plus).[12] Non-fasting capillary blood samples were used to determine total cholesterol measurements.[13,14]

Hypercholesterolemia was defined as cholesterol level ≥240 mg/dl.[15] Body mass index (BMI) was calculated in kg (weight)/m^2 (height) and participants were classified as underweight (<18.5 kg/m^2), normal (18.6-22.9 kg/m^2), overweight (23-24.9 kg/m^2) and obese (≥25 kg/m^2).[15,16] Central or abdominal obesity was defined as follows: for women WC≥80cm, waist to hip ratio (WHR)≥0.85; for men WC≥90cm, WHR≥1. Smoking was defined as the use of any tobacco product within a year prior to assessment.[16] Finally, risk stratification was determined using the WHO/ ISH risk prediction chart for the Western Pacific Region B (WPR B).[16,17] Risk estimate parameters for the 40-year-old group were used for participants who were less than 40 years of age. Stratification of overall risk was as follows: Low (<10% risk of developing stroke or myocardial infarction in the next 10 years); Moderate (10-<20% risk); High (20-<30% risk); and Very High (≥30% risk).[16,17]

Statistics

Variables were expressed as means and frequencies with standard deviation unless otherwise stated. Continuous and categorical variables were compared using Independent samples t-test, Chi-square test or Fisher's exact test, respectively. The confidence interval was set at 95%. Other descriptive statistical analyses were performed using SPSS ver 23.

RESULTS

Socio-demographic characteristics

1,214 attendees of the clinics or club meetings in 27 barangays of the AMIGA municipalities participated in the study but only 1,032 qualified for analysis. One hundred twenty-six had a history of stroke or myocardial infarction, or had an established cardiovascular disease while 56 were 80 years old or older. Qualified participants in the study were predominantly female (74%). The youngest participant, already diagnosed to have hypertension, was 27 years old; the oldest was 79, with a mean age at 58.43 for all sexes (58.39 for women, 58.59 for men). 60% of the qualified participants were in the 50-69 age group. Most were married (67%). Only 12% acquired a college education; the majority were high school graduates (54%) and elementary school graduates (25%). 39% were homemakers, while 21% were self-employed. 88% claimed to have annual earnings of less than Php40,000. The socio-demographic data are shown in Table 1.

Risk factors

Seventy-two percent of the qualified participants were previously diagnosed to have hypertension, 7% were diagnosed to have diabetes, and 21% had been diagnosed to be both hypertensive and diabetic. 11% of the participants admitted to smoking and most of these were men. Only 4% of the women participants smoked, as opposed to 30% of the men, and most smokers were in the less than 40-year-old age group. 71.65% of the participants were classified as obese (BMI ≥25 kg/m^2), with almost the same distribution among men and women (72.41% among women, 69.57% among men). The proportion of participants with obesity progressively decreased with increasing age, from 85% in

Table 1. Socio-demographics of AMIGA participants

Variables	Total	Women	Men	P
n, (%)	1032	756 (73.26)	276 (26.74)	
Age, yrs (Mean±S.E.)	58.43±0.33	58.34±0.39	58.67±0.60	0.661
Age bracket, n (%)				0.200
<40	45 (4.36)	34 (4.50)	11 (3.99)	
40-49	174 (16.86)	127 (16.80)	47 (17.03)	
50-59	315 (30.52)	234 (30.95)	81 (29.35)	
60-69	327 (31.69)	226 (29.89)	101 (36.59)	
70-79	171 (16.57)	135 (17.86)	36 (13.04)	
[a] Marital Status, n (%)				<0.001
Single	55 (5.35)	45 (5.98)	10 (3.62)	
Married	689 (66.96)	457 (60.69)	232 (84.06)	
Separated	39 (3.79)	32 (4.25)	7 (2.54)	
Widow/er	216 (20.99)	195 (25.90)	21 (7.61)	
Common Law	30 (2.92)	24 (3.19)	6 (2.17)	
[b] Education, n (%)				0.016
None	3 (0.29)	2 (0.26)	1 (0.36)	
Less than Primary	10 (0.97)	8 (1.06)	2 (0.73)	
Primary	69 (6.69)	58 (7.67)	11 (4.00)	
Secondary	262 (25.41)	205 (27.12)	57 (20.73)	
High School completed	559 (54.22)	385 (50.93)	174 (63.27)	
College	128 (12.42)	98 (12.96)	30 (10.91)	
[c] Employment, n (%)				<0.001
Gov't	78 (7.60)	44 (5.86)	34 (12.36)	
Non-gov't	59 (5.75)	37 (4.93)	22 (8.00)	
Self-employed	292 (28.46)	175 (23.30)	117 (42.55)	
Non-paid	3 (0.29)	2 (0.27)	1 (0.36)	
Student	3 (0.29)	3 (0.40)	0 (0)	
Homemaker	398 (38.79)	388 (51.66)	10 (3.64)	
Retired	143 (13.94)	80 (10.65)	63 (22.91)	
Unemployed (able to work)	17 (1.66)	5 (0.67)	12 (4.36)	
Unemployed (unable to work)	33 (3.22)	17 (2.26)	16 (5.82)	
[d] Income (PhP), n (%)				0.137
<40,000/yr (< Q1)	911 (88.36)	660 (87.42)	251 (90.94)	
40,000-80,000/yr (Q1)	46 (4.46)	31 (4.106)	15 (5.44)	
81,000-121, 000/yr (Q2)	5 (0.48)	4 (0.53)	1 (0.36)	
122,000-188,000/yr (Q3)	2 (0.19)	1 (0.13)	1 (0.36)	
189,000/yr < (Q4)	5 (0.48)	4 (0.53)	1 (0.36)	
Don't know	58 (5.63)	51 (6.76)	7 (2.54)	
Refused to answer	4 (0.39)	4 (0.53)	0 (0)	

** Comparison between women and men was done using Chi-Square or Fisher's Exact test for categorical variables and Independent samples t-test for continuous variables.*
[a] Missing data: 3; [b] Missing data: 1; [c] Missing data: 6; [d] Missing data: 1

those less than 40 years of age to 52% among those in the 70-79 age group. Mean BMI was 25.55 kg/m^2. More than 60% of the participants also had central or abdominal obesity both by waist circumference (66.76%) and waist-to-hip ratio (69.71%), but this was more prevalent among the women (74.74% and 86.09% respectively) compared to the men (44.93% and 24.73%). Mean waist circumference among women was 86.28 cm, and 88.28 cm among men. Mean waist-to-hip ratio among women was 0.92, and 0.96 among men. 19.63% of the participants had hypercholesterolemia, and this was seen more in the women, 22.58% of whom had the condition, compared to men (11.59%). Mean cholesterol was 207 mg/dl, with women showing a slightly higher mean value (210.07 mg/dl) compared to men (198.78 mg/dl). Mean values of the different risk factors according to age and sex are shown in Table 2, while the distribution of the risk factors according to age and sex are shown in Tables 3 and 4.

Table 2. Clinical characteristics of AMIGA participants

		Overall						Women						Men						P
	Age	<40	40-49	50-59	60-69	70-79	Total	<40	40-49	50-59	60-69	70-79	Total	<40	40-49	50-59	60-69	70-79	Total	
Systolic BP	Mean	126.78	130.95	132.53	132.56	133.60	132.20	124.33	128.95	131.18	132.14	132.29	130.98	134.36	136.35	136.41	133.53	138.52	135.54	0.002
	S.E.	2.8	1.46	1.14	1.17	1.67	0.64	2.64	1.72	1.33	1.45	1.95	0.76	7.95	2.59	2.13	1.99	3.02	1.17	
Diastolic BP	Mean	85.22	85.05	81.22	77.54	71.82	79.32	83.27	83.37	80.18	77.36	71.02	78.38	91.23	89.57	84.24	77.94	74.8	81.89	<0.001
	S.E.	1.89	0.88	0.61	0.65	0.82	0.38	1.87	0.98	0.71	0.75	0.94	0.43	4.87	1.74	1.12	1.31	1.66	0.77	
CHOL (mg/dL)	Mean	212.06	199	213	206.4	203.9	207.0[a]	214.1	196.9	216.0	211.9	207.6	210.1	206.1	204	204.1	193.8	190.1	198.8	<0.001
	S.E.	5.46	2.6	1.98	1.98	2.6	1.1	6.42	2.91	2.39	2.37	3.08	1.32	10.61	5.42	3.2	3.25	3.66	1.91	
BMI (kg/m^2)	Mean	26.89	26.92	26.12	25.11	23.59	25.55[b]	26.85	26.95	26.36	25.27	23.96	25.73	27.03	26.85	25.45	24.77	22.22	25.08	0.034
	S.E.	0.58	0.36	0.25	0.22	0.29	0.14	0.73	0.46	0.3	0.27	0.32	0.16	0.8	0.52	0.44	0.36	0.57	0.23	
WC (cm)	Mean	86.75	88.22	88.21	87.07	82.82	86.89	85.47	86.58	87.84	86.61	82.92	86.28	90.73	92.66	89.29	88.08	82.44	88.58	0.002
	S.E.	1.32	0.8	0.58	0.59	0.8	0.33	1.54	0.93	0.69	0.72	0.89	0.39	2.29	1.36	1.04	1.03	1.86	0.62	
W/H Ratio	Mean	0.92	0.92	0.94	0.93	0.91	0.93[c]	0.91	0.9	0.93	0.93	0.91	0.92	0.94	0.96	0.96	0.95	0.94	0.96	<0.001
	S.E.	0.0095	0.005	0.004	0.004	0.006	0.002	0.01	0.005	0.004	0.005	0.006	0.003	0.024	0.009	0.007	0.006	0.013	0.004	

[a]69 excluded data; [b]2 missing data; [c]2 missing data. Comparison between women and men was done using independent samples t-test.
Systolic BP: Systolic blood pressure; Diastolic BP: Diastolic blood pressure; CHOL: Total blood cholesterol level;
BMI: Body mass index; WC: Waist circumference; W/H ratio: Waist/Hip ratio

Table 3. Risk factors prevalent among AMIGA participants

		Overall					
	Age	<40	40-49	50-59	60-69	70-79	Total
	N	45	174	315	327	171	1032
HPN only	n (%)	37 (82.22)	135 (77.59)	227 (72.06)	222 (67.89)	118 (69.01)	739 (71.61)
	95% CI	71.05-93.39	71.39-83.78	67.11-77.02	62.83-72.95	62.07-75.94	68.86-74.36
DM only	n (%)	5 (11.11)	13 (7.47)	23 (7.30)	24 (7.34)	8 (4.68)	73 (7.07)
	95% CI	1.93-20.29	3.56-11.38	4.43-10.17	4.51-10.17	1.51-7.84	5.51-8.64
HPN + DM	n (%)	3 (6.67)	26 (14.94)	65 (20.63)	81 (24.77)	45 (26.32)	220 (21.32)
	95% CI	-0.62-13.95	9.65-20.24	16.17-25.10	20.09-29.45	19.72-32.92	18.82-23.82
Smoking[a]	n (%)	10 (22.22)	12 (6.90)	44 (13.97)	34 (10.43)	14 (8.19)	114 (11.06)
	95% CI	10.08-34.37	3.13-10.66	10.14-17.80	7.11-13.75	4.08-12.30	9.14-12.97
Obese (BMI-WHO)[b]	n (%)	10 (22.22)	34 (19.54)	49 (15.56)	36 (11.08)	9 (5.26)	138 (13.40)
	95% CI	10.07-34.37	13.65-25.43	11.55-19.56	7.66-14.49	1.92-8.61	11.32-15.48
Obese (BMI-AP)[b]	n (%)	31 (68.89)	112 (64.37)	179 (56.83)	161 (49.54)	58 (33.92)	541 (52.52)
	95% CI	55.36-82.41	57.25-71.48	51.35-62.29	44.10-54.97	26.82-41.01	49.47-55.57
Obese (W/H Ratio)[c]	n (%)	32 (71.11)	117 (67.24)	232 (73.88)	221 (67.79)	116 (67.84)	718 (69.71)
	95% CI	57.87-84.35	60.27-74.21	69.03-78.74	62.72-72.86	60.84-74.84	66.90-72.52
Obese (WC)	n (%)	30 (66.67)	131 (75.29)	227 (72.06)	208 (63.61)	93 (54.39)	689 (66.76)
	95% CI	52.89-80.44	68.88-81.70	67.11-77.02	58.39-68.82	46.92-61.85	63.89-69.64
High Cholesterol[d]	n (%)	11 (24.44)	27 (15.52)	76 (24.20)	62 (18.96)	26 (15.20)	202 (19.59)
	95% CI	11.89-37.00	10.14-20.90	19.47-28.94	14.71-23.21	9.82-20.59	17.17-22.02

[a]1 missing data; [b]2 missing data; [c]2 missing data; [d]1 missing data. HPN: Hypertension; DM : Diabetes mellitus; BMI-WHO: Body mass index-World Health Organization; BMI-AP: Body mass index-Asia Pacific; W/H ratio: Waist/Hip Ratio; WC ratio: Waist circumference ratio

Risk Stratification

Tables 5 and 6 show the distribution of the overall CVD risk according to age and sex. Almost 80% of the participants were in the low-risk group (79.17%), though the proportion among women was higher (82.54%) than men (69.93%). The distribution of participants in the moderate, high and very high-risk groups was 11.34%, 4.46%, and 5.05% respectively. More men tended to be in the higher risk groups than women.

DISCUSSION

The Philippine Department of Health has committed to the use of the total CVD risk approach, particularly the Philippine adaption of the WHO Package of Essential NCD Interventions (PhilPEN) which includes using the WHO/ISH risk prediction chart as its main strategy in the reduction of mortality from CVD in the country. The same program is presently being implemented in the AMIGA municipalities and it is in this context that the present study was conducted.

The researchers aim to determine the CVD risk of patients with hypertension and/or diabetes attending hypertension and/or diabetes clinics or hypertension/health club meetings in the barangays of the AMIGA municipalities using the WHO/ISH risk prediction chart for the WPR B. Since all of the participants already had diagnosed disease, the overall CVD risk of the participants was expected to be high. However, there is no published data on CVD risk estimates in the Philippines, whether these are risk estimates of the general population or of the population with hypertension and/or diabetes. We, therefore, compared our data with those of other Asian countries that have published CVD risk estimates of their general population or segments thereof. Indeed the proportion of the participants in our study who were considered at high risk (≥20% or a summation of those at high and very high risk) was higher at 9.5% compared to that of India (4.9%), China (1.1%), Iran (1.7%), Sri Lanka (2.2%), Cambodia (1.3%), Malaysia (2.3%) and Mongolia (6%).[5,6,18] The finding that a larger proportion of the male participants were in the high-risk group than the women was consistent with the findings in other studies[6] since men tended to indulge in more risky behavior than women, e.g. smoking as shown in this study.

Although the majority (79.17%) of the participants were in the low-risk group, more than half of them was classified as obese according to the BMI (71.65%). This figure is very high compared to the national prevalence rate of obesity which is 31.1%.[19] Women accounted for most of the 66.76% and 68.71% who were found to have central obesity by waist circumference and waist-to-hip ratio respectively since most men were found to have normal measurements. Hypercholesterolemia (≥ 240 mg/dl) was found to be present in 19.63% of the participants, which is comparable to the national prevalence (18.6%),[19] though much higher than that reported in similar studies done in Sri Lanka (6.2%)[20] and Bangladesh (10.7%).[21] The mean total cholesterol level was high at 207.02 mg/dl, a little higher than the national mean (201.8 mg/dl).[19] The high prevalence of obesity and a high mean total cholesterol level emphasize the need for lifestyle changes among the participants in the study. Thorough documentation of the diet and physical activity of these participants need to be done and a program organized especially among the members of the health clubs to address these factors.

Non-fasting blood samples were used in the determination of total cholesterol in this study. Though traditionally cholesterol levels are determined after 10-12 hours of fasting, the European Atherosclerosis Society and the European Federation of Clinical Chemistry and Laboratory Medicine stated in a joint consensus statement published in July 2016 that evidence is lacking that proves that fasting is superior to non-fasting when evaluating the lipid profile for cardiovascular risk assessment. With extensive observational data, they compared random non-fasting (1-6 hours after meals) lipid profiles to those obtained under fasting conditions and found no clinically significant difference between the two. They have therefore recommended the use of non-fasting blood samples for routine assessment of plasma lipid profiles.[13] Similar statements were issued in the UK NICE (National Clinical Guidance Center) and the Joint British Societies Guidelines (2013), as well as the Canadian Cardiovascular Society Guidelines (2012).[14] In our study, we chose to use the non-fasting sample based on the above recommendation because the need for participants to fast proved to be an important obstacle in the implementation of a similar study that this researcher conducted in the same municipalities.

A limitation of this study is the exclusion of other risk factors not included in the WHO/ISH risk prediction chart in the questionnaire (diet, physical activity, and alcohol intake). The WHO Steps questionnaire has a complete set of questions that cover these risk factors but because of the

Cardiovascular Risk of Persons with Hypertension and Diabetes

Table 4. Risk factors prevalent among AMIGA participants based on sex

		Women						Men					
	Age	<40	40-49	50-59	60-69	70-79	Total	<40	40-49	50-59	60-69	70-79	Total
	N	34	127	234	226	135	756	11	47	81	101	36	276
HPN only	n (%)	28 (82.35)	102 (80.31)	173 (73.93)	161 (71.24)	93 (68.89)	557 (73.68)	9 (81.82)	33 (70.21)	54 (66.67)	61 (60.40)	25(69.44)	182 (65.94)
	95% CI	69.54-95.17	73.40-87.23	68.31-79.56	65.34-77.14	61.08-76.70	70.54-76.82	59.03-104.61	57.14-83.29	56.40-76.93	50.86-69.93	54.40-84.49	60.35-71.53
DM only	n (%)	3 (8.82)	8 (6.30)	15 (6.41)	14 (6.19)	7 (5.18)	47 (6.22)	2 (18.18)	5 (10.64)	8 (9.88)	10 (9.90)	1 (2.78)	26 (9.42)
	95% CI	-0.71-18.36	2.07-10.52	3.27-9.55	3.05-9.34	1.44-8.93	4.50-7.94	-4.61-40.97	1.82-19.45	3.38-16.37	4.08-15.73	-2.59-8.15	5.97-12.87
HPN + DM	n (%)	3 (8.82)	17 (13.39)	46 (19.66)	51 (22.57)	35 (25.93)	152 (20.11)	0 (0)	9 (19.15)	19 (23.46)	30 (29.70)	10 (27.78)	68 (24.64)
	95% CI	-0.71-18.36	7.46-19.31	14.57-24.75	17.12-28.02	18.53-33.32	17.25-22.96	0	7.90-30.40	14.23-32.68	20.79-38.61	13.15-42.41	19.55-29.72
Smoking[a]	n (%)	3 (8.82)	2 (1.57)	8 (3.42)	9 (4.00)	8 (5.93)	30 (3.97)	7 (63.64)	10 (21.28)	36 (44.44)	25 (24.75)	6 (16.67)	84 (30.43)
	95% CI	-0.71-18.36	-0.59-3.74	1.09-5.75	1.44-6.56	1.94-9.91	2.58-5.37	35.21-92.06	9.58-32.98	33.62-55.27	16.34-33.17	4.49-28.84	25.01-35.86
Obese (BMI-WHO)[b]	n (%)	8 (23.53)	25 (19.68)	38 (16.24)	29 (12.95)	9 (6.67)	109 (14.46)	2 (18.18)	9 (19.15)	11 (13.58)	7 (6.93)	0 (0)	29 (10.51)
	95% CI	9.27-37.79	12.77-26.60	11.51-20.96	8.55-17.34	2.46-10.87	11.95-16.97	-4.61-40.97	7.90-30.40	6.12-21.04	1.98-11.88	0	6.89-14.12
Obese (BMI-AP)[b]	n (%)	23 (67.65)	79 (62.20)	132 (56.41)	118 (52.68)	50 (37.04)	402 (53.32)	8 (72.73)	33 (70.21)	47 (58.02)	43 (42.57)	8 (22.22)	139 (50.36)
	95% CI	51.92-83.37	53.77-70.64	50.06-62.76	46.14-59.22	28.89-45.18	49.75-56.88	46.41-99.05	57.14-83.29	47.28-68.77	32.93-52.22	8.64-35.80	44.46-56.26
Obese (W/H Ratio)[c]	n (%)	30 (88.23)	104 (81.89)	208 (89.27)	200 (88.49)	108 (80.00)	650 (86.09)	2 (18.18)	13 (27.66)	24 (29.63)	21 (21.00)	8 (22.22)	68 (24.73)
	95% CI	77.41-99.06	75.19-88.59	85.30-93.24	84.34-92.66	73.25-86.75	83.62-88.56	-4.61-40.97	14.87-40.45	19.69-39.57	13.02-28.98	8.64-35.80	19.63-29.83
Obese (WC)	n (%)	24 (70.59)	98 (77.16)	188 (80.34)	171 (75.66)	84 (62.22)	565 (74.73)	6 (54.54)	33 (70.21)	39 (48.15)	37 (36.63)	9 (25.00)	124 (44.93)
	95% CI	55.27-85.90	69.86-84.47	75.25-85.43	70.07-81.26	54.04-70.40	71.64-77.83	25.12-83.97	57.14-83.29	37.27-59.03	27.24-46.03	10.85-39.15	39.06-50.80
High Cholesterol[d]	n (%)	9 (26.47)	18 (14.29)	67 (28.75)	51 (22.57)	25 (18.52)	170 (22.55)	9 (81.82)	9 (19.15)	9 (11.11)	11 (10.89)	1 (2.78)	39 (14.13)
	95% CI	11.64-41.30	8.18-20.40	22.94-34.57	17.12-28.02	11.97-25.07	19.56-25.53	59.02-104.6	7.90-30.40	4.27-17.95	4.82-16.97	-2.59-8.15	10.02-18.24

[a]1 missing data; [b]2 missing data; [c]2 missing data; [d]1 missing data. HPN: Hypertension; DM: Diabetes mellitus; BMI-WHO: Body mass index-World Health Organization; BMI-AP: Body mass index-Asia Pacific; W/H ratio: Waist/Hip Ratio; WC ratio: Waist circumference ratio

Table 5. NCD risk prediction among AMIGA participants

		Overall					
	Age	<40	40-49	50-59	60-69	70-79	Total
	N	45	174	315	327	171	1032
Low Risk	n (%)	44 (97.78)	161 (92.53)	276 (87.62)	233 (71.25)	103 (60.23)	817 (79.17)
	95% CI	93.47-102.1	88.62-96.43	83.98-91.26	66.35-76.16	52.90-67.57	76.69-81.64
Moderate Risk	n (%)	0	6 (3.45)	21 (6.67)	54 (16.51)	36 (21.05)	117 (11.34)
	95% CI	0	0.74-6.16	3.91-9.42	12.49-20.54	14.94-27.16	9.40-13.27
High Risk	n (%)	1 (2.22)	5 (2.87)	6 (1.90)	20 (6.12)	14 (8.19)	46 (4.46)
	95% CI	-2.08-6.53	0.39-5.36	0.39-3.41	3.52-8.71	4.08-12.30	3.20-5.72
Very High Risk	n (%)	0 (0)	2 (1.15)	12 (3.81)	20 (6.12)	18 (10.53)	52 (5.04)
	95% CI	0	-0.43-2.73	1.69-5.92	3.52-8.71	5.93-15.13	3.70-6.37

limited time and personnel and the volume of participants in each session, the researchers limited the questions to the risk factors included in the WHO/ISH risk prediction chart. Our data gatherers also noted that the participants were hesitant to reveal their true income. The income estimates reported in this study may, therefore, be unreliable. Another limitation that may bias the results of the study is the large female majority (74%) of the participants.

The use of the WHO/ISH risk prediction charts may also present as a major limitation. When using the WHO/ISH risk prediction charts, it should be noted that 'practice notes' were added to aid clinicians in the interpretation and adjustment of an individual's risk in the presence of other risk factors not included in the chart. According to these 'practice points,' the presence of a list of risk factors including obesity, already being in an antihypertensive therapy and socio-economic deprivation may render the CVD risk higher than the charts indicate.[17] As reported in the section on results, 88% of the participants claimed to be in the lowest Philippine income quintile (<Php 40000 per annum) and most were already on medication. Other risk factors listed in the WHO/ISH 'practice points' may likewise be present in some of the participants. The finding therefore that the majority of the participants belonged to the low-risk category should be taken with precaution because the true risk may be much higher. According to the PhilPEN protocol, pharmaceutical intervention for hypertension and hypercholesterolemia is indicated only at the very high-risk

Table 6. NCD risk prediction among AMIGA participants based on sex

		Women						Men					
	Age	<40	40-49	50-59	60-69	70-79	Total	<40	40-49	50-59	60-69	70-79	Total
	N	34	127	234	226	135	756	11	47	81	101	36	276
Low Risk	n (%)	34 (100)	119 (93.70)	213 (91.03)	169 (74.78)	89 (65.93)	624 (82.54)	10 (90.91)	42 (89.36)	63 (77.78)	64 (63.37)	14 (38.89)	193 (69.93)
	95% CI	100	89.47-97.93	87.36-94.69	69.12-80.44	57.93-73.92	79.83-85.25	73.92-107.90	80.55-98.18	68.72-86.83	53.97-72.76	22.96-54.81	64.52-75.34
Moderate Risk	n (%)	0	5 (3.94)	11 (4.70)	33 (14.60)	25 (18.52)	74 (9.79)	0	1 (2.13)	10 (12.35)	21 (20.79)	11 (30.56)	43 (15.58)
	95% CI	0	0.55-7.32	1.99-7.41	10.0-19.21	11.97-25.07	7.67-11.91	0	-2.00-6.25	5.18-19.51	12.88-28.71	15.51-45.60	11.30-19.86
High Risk	n (%)	0	1 (0.79)	3 (1.28)	15 (6.64)	9 (6.67)	28 (3.70)	1 (9.09)	4 (8.51)	3 (3.70)	5 (4.95)	5 (13.89)	18 (6.52)
	95% CI	0	-0.75-2.32	-0.16-2.72	3.39-9.88	2.46-10.87	2.36-5.05	-7.90-26.08	0.53-16.49	-0.41-7.82	0.72-9.18	2.59-25.19	3.61-9.43
Very High Risk	n (%)	0	2 (1.57)	7 (2.99)	9 (3.98)	12 (8.89)	30 (3.97)	0 (0)	0 (0)	5 (6.17)	11 (10.89)	6 (16.67)	22 (7.97)
	95% CI	0	-0.59-3.74	0.81-5.17	1.43-6.53	4.09-13.69	2.58-5.36	0	0	0.93-11.41	4.81-16.97	4.49-28.84	4.78-11.17

level (≥30% risk), three levels above the low risk category, unless BP was persistent at ≥160/100 or the cholesterol level ≥320mg/dl, in which cases medication should also be started. If the protocol is strictly followed, only 20% of the participants should be receiving medications.[a] The 'practice notes' did not specify how much higher the risk would be in the presence of these additional risk factors so it is unclear if medication should be maintained especially in the moderate and high-risk groups when these other risk factors are present, and most clinicians presently supervising the management of these patients rely on current clinical guidelines for single risk factors especially hypertension and hypercholesterolemia.

This brings forth questions in the use of the WHO/ISH risk prediction chart in determining the appropriate management choice for populations like that in this study. Many researchers have noted that the use of the WHO/ISH risk prediction chart has not been validated in most Asian countries.[5,6,7,18,20] A large retrospective study conducted in Malaysia comparing the use of several risk prediction charts found the Framingham Risk Score and the SCORE (Systematic Coronary Risk Evaluation) to be the most applicable in the Malaysian population for the identification of patients at high CVD risk, while the WHO/ISH risk prediction chart was the least applicable.[22] Researchers have noted that since only a few risk factors are taken into consideration in the WHO/ISH risk prediction charts the proportion of those with high CVD risk could be underestimated in a given population especially if the 'practice notes' were ignored.[5,6,7,18,20] Therefore, there is a need to develop more comprehensive CVD risk prediction charts,[5] and these charts must be validated for each population.[22]

That being said, the total CVD risk approach still offers the best strategy option for low and middle-income countries like the Philippines, where financial resources for health leaves much to be desired. In the absence of studies validating which CVD risk prediction model is the most applicable in the country, the WHO/ISH risk prediction chart and the PhilPEN may be the only choice for now. Clearer guidelines for populations like the participants in this study, however, need to be developed. It is therefore recommended that the participants in this study be followed up on a long term basis as a way of validating the WHO/ISH risk prediction charts or for the development of a more specific CVD risk prediction chart for Filipinos with hypertension and/or diabetes.

CONCLUSION

Majority of patients with hypertension and/or diabetes attending clinics or hypertension/health club meetings in the AMIGA municipalities of Cavite were found to be in the low-risk group (with <10% risk of developing a CVD accident in the next 10 years), while 9.5% were in the high-risk category (≥20% risk). However, majority of the participants in this study were found to be obese which is still a risk factor for CVD. Future and ongoing programs must then focus on improving the lifestyle choices of their target audience with regards to obesity and other diet-related diseases.

Acknowledgment

The support and assistance of the Municipal Health Officers, Rural Health Unit staff, and Barangay Health Workers of the AMIGA municipalities were vital in the implementation of this study. The help provided by the students, Family and Community Medicine residents, and the faculty and staff of the University of the Philippines Manila Community Health and Development Program (UP CHDP) was likewise invaluable. Sample size computation was done by Dr. Sheila Laviña of the Department of Family and Community Medicine, UP College of Medicine-Philippine General Hospital. Statistical analysis was done by Ms. Clarisse Julian Pangilinan of the UP NIH Institute of Pharmaceutical Sciences.

Statement of Authorship

The author participated in all aspects of the research - data collection and analysis, and completion of the final version submitted.

Author Disclosure

The author declared no conflicts of interest.

Funding Source

This paper was funded by the Research and Implementation Development Office (RIDO) of the UP College of Medicine under Dean Agnes Mejia.

REFERENCES

1. World Health Organization. Global status report on noncommunicable diseases 2014. Geneva, World Health Organization; 2014. p. xi
2. Graziano TA. Reducing the growing burden of cardiovascular diseases in the developing world. Health Aff (Millwood). 2007 Jan-Feb; 26(1):13-24.
3. World Health Organization. Noncommunicable disease and poverty: the need for pro-poor strategies in the Western Pacific Region: a review. Geneva: World Health Organization; 2006. p.vii.
4. World Health Organization. Noncommunicable diseases (NCD) country profiles [Internet]. 2014 [cited 2017 May 1]. Available from: http://www.who.int/nmh/countries/phl_en.pdf
5. Otgontuya D, Oum S, Buckley BS, Bonita R. Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low and middle income countries in Asia. BMC Public Health. 2013 Jun; 13:539.
6. Ghorpade AG, Shrivastava SRBL, Kar SS, Sarkar S, Majgi SM, Roy G. Estimation of the cardiovascular risk using World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts in a rural population of South India. Int J Health Policy Manag. 2015 Apr; 4(8): 531-6.
7. Norhayati MN, Amirah SAHS, Husniati YL. Cardiovascular risk: associated factors, assessment and agreement between WHO/ISH

a Those at ≥30% risk + those with BP≥160/100 + those with cholesterol ≥320 mg/dl (204 participants).

risk prediction chart and Framingham Scoring System among Primary Care Patients in Kelantan, Malaysia. Int J Collab Res Intern Med Public Health. 2013; 5(12):652-63.
8. World Health Organization. Package of essential noncommunicable (PEN) interventions for primary health care in low-resource settings. Geneva: World Health Organization; 2010. pp. 39-41.
9. Mendis S, Lindholm LH, Anderson SG, Alwan A, Koju R, Onwubere BJC, et al. Total cardiovascular risk approach to improve efficiency of cardiovascular prevention in resource contrain settings. J Clin Epidemiol. 2011 Dec; 64(12):1451-62.
10. World Health Organization. The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS) Part 5. Geneva: World Health Organization; 2008. pp. 5-1-1 to 5-1-12.
11. World Health Organization. The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS) Part 4. Geneva: World Health Organization; 2008. p.3-3-5 to 3-3-14; p. 4-4-6.
12. World Health Organization. The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS) Part 2. Geneva: World Health Organization; 2008. p.2-1-9
13. Nordestgaard BG, Langsted A, Mora S, Kolovou G, Baum H, Bruckert E, et al. Fasting is not routinely required for determination of a lipid profile: clinical and laboratory implications including flagging at desirable concentration cut-points – a joint consensus statement from the European Atherosclerosis Society and European Federation of Clinical Chemistry and Laboratory Medicine. Eur Heart J. 2016 Jul; 37(25):1944-58.
14. Mora S. Nonfasting for routine lipid testing, from evidence to action. JAMA Intern Med. 2016 Jul; 176(7):1005-6.
15. Department of Health, Republic of the Philippines. Operations manual on the Philippine Package of Essential NCD Interventions (PHIL PEN) on the integrated management of hypertension and diabetes for primary health care facilities. Manila: DOH; 2012. pp. 20-33.
16. WHO Western Pacific Region, International Association for the Study of Obesity, International Obesity Taskforce. The Asia-Pacific perspective: redefining obesity and its treatment. Australia: WHO Western Pacific Regional Office; 2000. p. 18.
17. World Health Organization. WHO/ISH risk prediction charts for 14 WHO epidemiological sub-regions. Geneva: World Health Organization; 2007. pp. 5,37.
18. Khanal MK, Ahmed MSA, Moniruzzaman M, Banik PC, Dhungana RR, Bhandari P, et al. Total cardiovascular risk for next 10 years among rural population of Nepal using WHO/ISH risk prediction chart. BMC Res Notes. 2017 Mar; 10(1):120.
19. Food and Nutrition Research Institute – Department of Science and Technology (FNRI-DOST). Philippine Nutrition Facts and Figures 2013. Manila: FNRI-DOST. pp. 35-55.
20. Ranawaka UK, Wijekoon CN, Pathmeswaran A, Kasturiratne A, Gunasekera D, Chackrewarthy S, et al. Risk estimates of cardiovascular diseases in a Sri Lankan community. Ceylon Med J. 2016 Mar; 61(1):11-7.
21. Fatema K, Rahman B, Zwar NA, Milton AH, Ali L. Short term predictive ability of selected cardiovascular risk prediction models in a rural Bangladeshi population: a case-cohort study. BMC Cardiovasc Disord. 2016 May; 16(1):105.
22. Selvarajah S, Kaur G, Haniff J, Cheong KC, Hiong TG, van der Graaf Y, et al. Comparison of the Framingham Risk Score, SCORE and WHO/ISH cardiovascular risk prediction models in an Asian population. Int J Cardiol. 2014 Sep; 176(1):211-8.