

Hypertension and Diabetes Mellitus Among The Residents Of An Old Folks Home In North Malaysia.

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Citation

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Abstract

: Hypertension and diabetes are the major threats to the growing elderly population. The existence of either one or both of these conditions markedly increases multi-systemic complications. However, not much epidemiological research has been done concerning these diseases among the elderly in developing countries like Malaysia.

Aim: To determine the prevalence of hypertension and diabetes mellitus and their associated risk factors among older adults living in an old folks home in Penang, Malaysia. **Material and methods:** A cross sectional study was conducted among 155 residents who were 60 years old and above. Standard procedure of blood pressure measurement was used based on the American Heart Association guidelines. Fasting blood glucose was measured using a capillary glucometer. Besides the socio demographic information, Elderly Cognitive Assessment Questionnaire (ECAQ), Geriatric Depression Scale (GDS), and Barthel's Index were used to assess other co-morbidities among the elderly and their possible association with hypertension and diabetes. **Results:** Among the 155 participants, the prevalence of hypertension was 62.6% and 47.6% of them had uncontrolled blood pressure. The prevalence of diabetes mellitus was 25.8% of which 33% of them had uncontrolled blood glucose level. The diabetics were significantly at a higher risk to have hypertension and vice versa (OR=2.56). **Conclusion:** This study revealed a high prevalence and low awareness rates of both hypertension and diabetes mellitus among the elderly in this institution. At least one third of them had poor control of their blood pressure and blood glucose levels. Therefore a more vigilant screening program in this population is essential.

INTRODUCTION

The elderly population is expected to grow considerably in the near future.¹ This rise will especially be prominent in the developing countries where an increment of 140% is projected, compared to 51% in the developed countries.² As a result of this, a significant impact on the overall healthcare cost is inevitable. According to a study done in nine countries from the Organization for Economic Co-Operation and Development Countries (OECD) in the 1990s, health expenditure of people aged 65 and above ranged from 32% to 42%, which was far beyond their population share of 12% to 18%.³

Cardiovascular diseases especially hypertension and diabetes are a major public health concern especially in older adults. The reported prevalence of hypertension varies between countries and within communities in the same country depending upon the economic development and affluence. Prevalence of hypertension in the Asia-Pacific region ranges from five to 47% in men and from seven to 38% in women.⁴

Based on the National Health and Morbidity Survey (NHMS) III the national prevalence of hypertension in Malaysia in 2006 was 32.2% for residents aged 18 years and above.⁵ Most were unaware that they had hypertension, while those who were aware and on treatment, most did not have controlled blood pressure. The prevalence of hypertension among the elderly in north Malaysia has been reported as high as 58.3% in the community and ranging from 36 to 50.3% in old folks homes.⁶

The prevalence of diabetes mellitus is also increasing in Malaysia over the decades as shown in the First and Second National Health and Morbidity Survey^{7&8}. A rise of prevalence from 6.3% to 8.3% was observed in Malaysia between 1986 and 1996. This figure continued to increase tremendously to 14.9% in 2006 as revealed by the Third National Health and Morbidity Survey.⁵

Although hypertension and diabetes mellitus among the elderly are common and could lead to severe cardiovascular complications, local studies in this field are still limited. The

objective of this study was to determine the prevalence of hypertension and diabetes and their associated factors amongst the residents of a privately run home for the aged in Penang, Malaysia.

METHOD

Setting: This study was conducted in a 190-bed non-governmental charity elderly care residential home in Penang, Malaysia. The criteria for admission in this residential home is that an individual should be 60 years old and above, have no children, homeless or lack funds for self care.

Study Design: To achieve the objective of the study, a cross sectional study design was chosen. The study was conducted in May 2010.

Sampling: Participants were taken from amongst the residents of this institution. Only residents who consented and were not debilitated with an illness which rendered them unable to communicate effectively were recruited.

Instruments: The data was collected by trained research assistants using a questionnaire especially designed for this study. Besides the baseline demographic data cognitive impairment was screened using Elderly Cognitive Assessment Questionnaire (ECAQ) and geriatric depression was screened using Geriatric Depression Scale (GDS). In addition, Barthel's index, a well established and commonly used nursing tool, was used to assess the functional independence in activities of daily living (ADL) of the participants. Body mass index which is commonly used to determine a person's nutritional status was also calculated.

The procedure used for blood pressure (BP) measurement was based on the American Heart Association guidelines.⁹ Blood pressure was measured in the sitting position using a mercury sphygmomanometer. Diastolic BP was identified by the disappearance of phase V Korotkoff sounds. Blood pressure was measured on three different occasions and a diagnosis of hypertension was made when BP was equal to or above 140 mm Hg systolic or more than 90 mm Hg diastolic or when the participant volunteered history of being on anti-hypertensive medication.

Fasting blood glucose was measured using a capillary glucometer. A drop of capillary blood was obtained from the participant's finger which was cleaned with alcohol swab beforehand. The blood was placed on the glucometer strip. The glucometer was then turned on to obtain the blood sugar

reading. Diabetes mellitus was defined as measured fasting blood glucose equal to or above 7.0mmol/l or having a history of diabetes mellitus. This cut-off point was obtained from American Diabetes Association (ADA) diagnostic criteria.¹⁰

Analysis: Analysis was done using SPSS version 13. Chi square test was used to analyze the relationship between the variables. A "p" value of <0.05 was considered statistically significant. Odds ratio was used to estimate risk of hypertension and diabetes mellitus.

Ethics: The research was conducted ethically. All participants were asked to give an informed consent before starting the interview. The anonymity of the participants was assured. The study had received the approval of the institutional ethics committee before commencing.

RESULTS

There were 190 residents in the residential home, 155 participated giving a response rate of 81.6%. Table 1 shows the demographic profile of the residents. There were 73 male and 82 female participants in this study. Most were in the age group of 70-79 years old, followed by ≥80 years old and 60-69 years old. Majority of them were Chinese, Buddhist, unmarried and literate.

Figure 1

Table 1: Demographic profile of the participants

Variables		Frequency
Gender	Male	73 (47.1%)
	Female	82 (52.9%)
Age groups	60-69	27 (17.4%)
	70-79	72 (46.5%)
	Above 80	56 (36.1%)
Race	Chinese	152 (98.1%)
	Indian	2 (1.3%)
	Malay	1 (0.6%)
Marital status	Married	9 (5.8%)
	Divorced	6 (3.9%)
	Widow	36 (23.2%)
	Single	104 (67.1%)
Education level	Illiterate	44 (28.4%)
	Literate	111 (71.6%)
Occupation	Unemployed	15 (9.7%)
	Housewife	15 (9.7%)
	Self employed	40 (25.8%)
	Working for others	85 (54.8%)
Next of kin	Children	19 (12.3%)
	Siblings	98 (63.2%)
	Others	38 (24.5%)

HYPERTENSION

As shown in Table 2, the mean systolic pressure of the participants was 132.6 mmHg and the mean diastolic pressure was 74.0 mmHg. There was an increasing trend in the mean systolic blood pressure as age increased. The mean blood pressure of races other than Chinese was higher.

Figure 2

Table 2: Mean systolic and diastolic blood pressure

Variables	Mean systolic BP (132.6 mmHg)	Mean diastolic BP (74.0 mmHg)
Age group		
60-69	125.8	75.5
70-79	134.5	74.8
Above 80	133.4	72.4
Gender		
Male	132.1	73.3
Female	133.1	74.7
Race		
Chinese	132.4	74.0
Others	144.0	77.3
Religion		
Buddhist	132.1	74.0
Others	134.9	74.2
Marital status		
Married	133.3	81.8
Widow/Divorced	136.2	75.1
Single	131.0	72.9
Education level		
Illiterate	133.8	75.4
Literate	132.1	73.5
Occupation		
Unemployed	131.5	82.1
House wife	138.4	78.7
Self-employed	132.2	70.9
Working for others	132.0	73.3
Next of kin		
Children	135.9	78.8
Siblings	132.0	74.0
Others	132.5	71.8
Diabetes status		
Diabetic	134.2	74.8
Non-diabetic	132.0	73.8
Barthel score		
Independent	133.1	73.7
Dependent	128.5	76.8
Depression		
No	133.5	73.8
Yes	133.1	73.8
Cognitive impairment		
No	133.4	73.8
Yes	126.4	75.8
Nutrition status		
Well nourished	130.9	73.8
Malnourished	135.0	74.4
Hypertension status		
Hypertension	135.7	74.9
No hypertension	130.5	73.5

The prevalence of hypertension was 62.6% (97). There were 63 participants with known hypertension and another 34 were newly diagnosed with hypertension. Among the known hypertensive's, 47.6% (30) had uncontrolled blood pressure as shown in table 3.

Figure 3

Table 3: Prevalence of hypertension among the residents

	Blood pressure 140/90 and above; f (%)	Normotension f (%)	Total N = 155 f (%)
Known HPT	30 (47.6%)	33 (52.4%)	63 (100)
Not known HPT	34 (37.0%)	58 (63.0%)	92 (100)

As shown in table 4, there were more hypertensives among the females, those in the age group of 70-79, illiterates, those dependent on the activities of daily living and the depressed. Diabetics were almost three folds at risk of having hypertension.

Figure 4

Table 4: Factors associated with hypertension

Variables	Hypertension (n = 97)	No hypertension (n = 58)	Total (N=155)	χ^2 value	P value	Odds ratio (confidence interval)
Gender						
Male	46 (63.0%)	27 (37.0%)	73	0.01	1.00	1.04 (0.54, 1.99)
Female	51 (62.2%)	31(37.8%)	82			
Age						
60-69	15 (55.6%)	12 (44.4%)	27	1.17	0.56	-
70-79	48 (66.7%)	24 (33.3%)	72			
Above 80	34 (60.7%)	22 (39.3%)	56			
Race						
Chinese	95 (62.5%)	57(37.5%)	152	0.02	1.00	0.83 (0.07; 9.43)
Others	2 (66.7 %)	1 (33.3%)	3			
Religion						
Buddhist	77 (59.7%)	52 (40.3%)	129	2.74	0.12	0.44 (0.17; 1.18)
Others	20 (76.9%)	6 (23.1%)	26			
Marital status						
Married	6 (66.7%)	3 (33.3%)	9	0.54	0.76	-
Widow/Divorced	28 (66.7%)	14 (33.3 %)	42			
Single	63 (60.6%)	41 (39.4%)	104			
Education level						
Illiterate	32 (72.7%)	12 (27.3%)	44	2.70	0.14	1.89 (0.88; 4.05)
Literate	65 (58.6%)	46 (41.4%)	111			
Occupation						
Unemployed	12 (80.0%)	3 (20.0%)	15	4.84	0.18	-
House wife	12 (80.0%)	3 (20.0%)	15			
Self-employed	23 (57.5%)	17 (42.5%)	40			
Working for others	50 (58.8%)	35 (41.2%)	85			
Next of kin						
Children	14 (73.7%)	5 (26.3%)	19	3.40	0.18	-
Siblings	56 (57.1%)	42 (42.9%)	98			
Others	27 (71.1%)	11 (28.9%)	38			
Diabetes Mellitus status						
Diabetic	31 (77.5%)	9 (22.5%)	40	5.13	0.02	2.56 (1.12; 5.86)
Non-diabetic	66 (57.4%)	49 (42.6%)	115			
Barthel score						
Independent	84 (60.9%)	54 (39.1%)	138	1.57	0.29	0.48 (0.15; 1.55)
Dependent	13 (76.5%)	4 (23.5%)	17			
Depression						
No	68 (63.0%)	40 (37.0%)	108	0.02	1.00	0.944 (0.40; 2.25)
Yes	18 (64.3%)	10 (35.7%)	28			
Cognitive impairment						
No	86 (63.2%)	50 (36.8%)	136	0.20	0.80	1.25 (0.47; 3.32)
Yes	11 (57.9%)	8 (42.1%)	19			
Nutrition status						
Well nourished	59 (35.9%)	33 (64.1%)	92	0.23	0.74	1.18 (0.61; 2.28)
Malnourished	38 (60.3%)	25 (39.7%)	63			

DIABETES MELLITUS (DM)

The mean fasting blood glucose of the participants was 6.2 mmol/L. The prevalence of DM was 25.8% (40). A total of 18 participants were known diabetics on medication and 22 were newly diagnosed. Among the known cases of DM, the blood glucose level of 33.3% (6) were poorly controlled.

Figure 5

Table 5 – Prevalence of Diabetes mellitus

	Hyperglycemia F (%)	Normoglycemia F (%)	Total N=135 F (%)
Known Diabetic	6 (33.3%)	12 (66.7%)	18 (13.3%)
Not known Diabetic	22 (14.1%)	117 (85.9%)	139 (101.6%)

The mean fasting blood glucose of those with diabetes mellitus was 6.4 mmol/L. As shown in Table 6, mean fasting glucose was found to be highest in the 70-79 age group. Higher mean fasting blood glucose was found among the females, non-Chinese, non-Buddhists, widows/divorced, illiterates and housewives. Higher fasting blood sugar was also noted among those who were hypertensive and depressed. As shown in table 6, the mean blood glucose of those with DM was 6.4 mmol/L and those without DM 6.3 mmol/L.

Figure 6

Table 6: Mean blood glucose levels

Variables		Mean fasting blood glucose (mmol/L)
Age group	60-69	5.6
	70-79	6.4
	Above 80	6.4
Gender	Male	6.2
	Female	6.3
Race	Chinese	6.2
	Others	9.0
Religion	Buddhist	6.2
	Others	6.8
Marital status	Married	5.8
	Widow/Divorced	6.8
	Single	6.1
Education level	Illiterate	6.4
	Literate	6.2
Occupation	Unemployed	5.8
	House wife	6.8
	Self-employed	6.0
	Working for others	6.4
Next of kin	Children	6.9
	Siblings	6.2
	Others	6.1
Hypertension	Yes	6.3
	No	6.2
Barthel score	Independent	6.3
	Dependent	6.2
Depression	No	6.3
	Yes	6.5
Cognitive impairment	No	6.3
	Yes	5.9
Nutrition status	Well nourished	6.3
	Malnourished	6.3
Diabetes mellitus	Yes	6.4
	No	6.3

There were more diabetics among those aged 70-79 years old, among widow/divorced, illiterates, housewives, those with hypertension and among those dependent on the

activities of daily living. Those with hypertension were almost three folds at risk of being diabetic as seen shown table 7.

Figure 7

Table 7: Prevalence of Diabetes mellitus with its risk factors

Variables	Diabetic (n = 40)	No diabetes (n = 115)	Total (N=155)	χ^2 value	P value	Odds ratio (confidence interval)
Gender						
Male	20 (27.4%)	53 (72.6%)	73	0.72	0.40	1.17 (0.57;2.40)
Female	20 (24.4%)	62 (75.6%)	82			
Age						
60-69	6 (22.2%)	21 (77.8%)	27	1.59	0.45	-
70-79	22 (30.6%)	50 (69.4%)	72			
Above 80	12 (21.4%)	44 (78.6%)	56			
Race						
Chinese	38 (25.0%)	114 (75.0%)	152	0.16	0.16	0.17 (0.02;1.89)
Others	2 (66.7%)	1 (33.3%)	3			
Religion						
Buddhist	30 (23.3%)	99 (76.7%)	129	0.14	0.09	0.49 (0.20;1.18)
Others	10 (38.5%)	16 (61.5%)	26			
Marital status						
Married	2 (22.2%)	7 (77.8%)	9	1.71	0.43	-
Widow/Divorced	14 (33.3%)	28 (66.7%)	42			
Single	24 (23.1%)	80 (76.9%)	104			
Education level						
Illiterate	14 (31.8%)	30 (68.2%)	44	0.31	0.19	1.53 (0.71;3.30)
Literate	26 (23.4%)	85 (76.6%)	111			
Occupation						
Unemployed	2 (13.3%)	13 (86.7%)	15	2.94	0.40	-
House wife	5 (33.3%)	10 (66.7%)	15			
Self-employed	8 (20.0%)	32 (80.0%)	40			
Working for others	25 (29.4%)	60 (70.6%)	85			
Next of kin						
Children	7 (36.8%)	12 (63.2%)	19	1.39	0.50	-
Siblings	24 (24.5%)	74 (75.5%)	98			
Others	9 (23.7%)	29 (76.3%)	38			
Hypertension status						
Hypertension	31 (32.0%)	66 (68.0%)	97	0.02	0.02	2.56 (1.12,5.86)
Non-hypertension	9 (15.5%)	49 (84.5%)	58			
Barthel score						
Independent	34 (24.6%)	104 (75.4%)	138	0.38	0.25	0.60 (0.21,1.74)
Dependent	6 (35.3%)	11 (64.7%)	17			
Depression						
No	32 (29.6%)	76 (70.4%)	108	0.82	0.41	1.26 (0.49;3.27)
Yes	7 (25.0%)	21 (75.0%)	28			
Nutrition status						
Well nourished	25 (27.2%)	67 (72.8%)	92	0.71	0.39	1.19 (0.57;2.50)
Malnourished	15 (23.8%)	48 (76.2%)	63			

DISCUSSION

PREVALENCE OF HYPERTENSION

Elevated blood pressure particularly systolic BP, represents a pathophysiologic manifestation of altered cardiovascular physiology and structure morbidity, ultimately manifesting as increased cardiovascular morbidity and mortality. Generally the prevalence of hypertension increases with increasing age.¹¹ In central Malaysia the prevalence of hypertension among those aged 55 years and above living in a community was shown to be 25.6%^{12,13} and 51.1% among those living in an old folks home.¹⁴ The prevalence of hypertension among the elderly in this study is comparable with the findings of another study which was conducted in northern Malaysia.¹⁵ Similar higher prevalence was noted in studies conducted abroad. In Singapore, the prevalence of hypertension in the elderly was reported as 73.9%¹⁶, which was close to figures found in the United States (70.8%).¹⁷ In a study in France, 62.0% of the elderly population were found to be hypertensive.¹⁸ Similar higher prevalence rates were reported in other European countries like Portugal, England and Greece, with a prevalence of 78.9%¹⁹, 80.5%²⁰, and 89.0%²¹ respectively. Such high prevalence in the elderly may be attributed to age-related poor vascular compliance of the large arteries, which subsequently contribute to isolated systolic hypertension and widened pulse pressure.²²

It is important to detect and to treat hypertension. There is evidence that pharmacological treatment of hypertension in the elderly effectively reduces morbidity and mortality from cardiovascular disease and stroke.²³ Similarly in a meta-analysis of eight outcome trials evaluating the risks of treated and untreated isolated hypertension has demonstrated a 30% reduction in combined fatal and non fatal stroke, a 26% reduction in fatal and non fatal cardiovascular events, and a 13% reduction on total mortality.²⁴ A great number of the older population have diabetes and other comorbid conditions and prospective clinical treatment trials indicate that BP even lower than 140 mmHg should be the goal in these patients.²⁵

PREVALENCE OF DIABETES MELLITUS

Diabetes mellitus is increasingly becoming a disease of older adults; some of its complications include cognitive disorders and physical disability, falls and fractures, and other geriatric syndromes. Such outcomes, as well as having a direct impact on quality of life, loss of independence, and demands on caregivers, may ultimately be a great concern to older people

with diabetes than the more traditionally recognised vascular complications.²⁶

The prevalence of diabetes mellitus in this study (25.8%) is comparable to the findings of the Third National Health and Morbidity Survey among those 60 years and above.⁵ Similar high prevalence of DM was noted in findings from a national survey in Singapore, where 32.4% of Singaporeans aged 60-69 years had diabetes.²⁷ The prevalence of diabetes is even higher in some South Pacific populations.²⁸ Several factors have been identified to explain the high prevalence of diabetes mellitus among the elderly. Elderly patients are more prone to insulin deficiency and insulin resistant especially obese individuals.²⁹ Other extrinsic factors like stress, illness and drugs are also important precipitants to the disease.³⁰ Interestingly, it is also noted that as age advances, fasting blood glucose increases by 1-2 mg per dl per decade while post-prandial glucose increases by up to 15 mg per dl per decade increase in age.³¹

RISK OF HYPERTENSION AND DIABETES MELLITUS

This study revealed a significant relationship between diabetes mellitus and hypertension. It is well known that hypertension is about twice as common in diabetics compared to non-diabetics³² irrespective of age and sex³³. Hypertension is prevalent in 30 to 80% of patients with type 2 diabetes mellitus and 25% with type 1.³⁴ This close relationship may be related to insulin resistance which precipitates hypertension by stimulating the sympathetic nervous system and renin-angiotensin system, thus promoting sodium retention.^{35,36} Diabetes is also associated with increased proliferation of vascular smooth muscle cells and increased vascular reactivity³⁷, subsequently causing hypertension. A consistent association between these two conditions remains even after adjustment for obesity, implying that obesity can only partially explain the link between diabetes and hypertension.³³

Co-existence of hypertension and hyperglycaemia accelerates atherogenesis and progression of diabetic nephropathy and retinopathy³⁸, coronary artery disease, ischemic cerebrovascular disease and sexual dysfunction.³⁹ The interconnection between diabetes and hypertension is further proven when tight control of blood pressure prevents fatal or non-fatal diabetic complications. In the United Kingdom Prospective Diabetes Mellitus Study, stringent blood pressure control (144/82mm Hg) was associated with a significant reduction (24%) of diabetes related end points,

32% of diabetes-related deaths, 44% of strokes and 37% of microvascular end points, especially retinopathy.⁴⁰ This effect was best achieved with the combination of drug therapy⁴¹, lifestyle modification and weight loss.⁴²

CONCLUSION

This study revealed a high prevalence and low awareness rates of both hypertension and diabetes mellitus among the elderly in this institution. This reflects an essential need for a more vigilant screening program in this vulnerable population.

LIMITATION

The sample size in this study was much smaller in comparison to other well-established international studies. Furthermore, as the study was conducted in a private institution, which consisted of mainly Chinese, the results might not be representative of a multiracial country like Malaysia. This is clearly demonstrated when the non-Chinese participants were found to have significantly higher fasting blood glucose compared to the Chinese. It was tempting to attribute this to genetic variation and lifestyle differences among races. However, the finding of the association between hypertension and diabetes mellitus is very important.

Secondly, although fasting values for venous and capillary plasma glucose are identical, fasting plasma glucose alone fails to diagnose 33% of cases of previously undiagnosed diabetes.⁴³ This could subsequently lead to an underestimation of the prevalence of diabetes in this study. Unfortunately, a diagnostic oral glucose tolerance test had to be omitted due to limited resources.

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