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Assessment and stratification of self-care profile in patients with essential hypertension

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INTRODUCTION

Essential hypertension (EH) in adults is prevalent.⁽¹⁾ Optimising blood pressure (BP) control is associated with good health outcomes but requires regular multi-faceted management.⁽²⁾ The 7th Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC) recommends that patients with EH engage in self-care activities: medication adherence, weight reduction, DASH (Dietary Approaches to Stop Hypertension) diet, regular BP monitoring and physical activity (PA), moderate alcohol consumption and smoking cessation.⁽³⁾ Commitment to performing these tasks requires motivation and behaviour change, and is challenging for many individuals.

Adherence to self-care measures have been shown to result in improvement in chronic disease outcomes e.g. asthma, diabetes mellitus and arthritis.⁽⁴⁾ The capability to adhere to these self-care measures can be reflected in self-efficacy, or the belief in one's ability to succeed in tasks. The level of self-efficacy can determine the ability, capacity and sustainability of the efforts to modify one's behaviour to reach a goal.⁽⁵⁾ For patients with chronic conditions like EH, adherence to regular self-care measures, are therefore influenced by motivation and behaviour adjustments.

Assessing the self-care profile of patients with EH is essential to understand their level of self-efficacy, motivation and behaviour modifications in controlling their BP. This assessment can be conducted using questionnaire-based instruments.⁽⁶⁾

In Singapore, the prevalence of EH in Asian adults was 23.5% in 2010.⁽⁷⁾ EH was the second commonest reason for attendances at the local polyclinics in 2016.⁽⁸⁾ We postulated that these patients had variable self-care profiles, which were influenced by their demographic factors, self-efficacy, motivation and behaviour change. Our study aimed to determine the self-care profile of community-dwelling patients with EH, demographic factors, key self-care measures and BP control. Evaluation of their self-care profile will enable us to identify those

with lower self-care profile, whose deficiencies in their self-care behaviour can potentially be mitigated by targeted interventions.

METHODS

This was a cross-sectional study conducted in a public primary care clinic (polyclinic) serving the population of 152,790 residents in the area (2017).⁽⁹⁾ Patients diagnosed with EH, aged 40 years and above, who were on regular reviews by a doctor or nurse every 3-to-6 months at the study site were included. Patients were excluded if they were younger than 40 years old, had secondary causes of hypertension, or disabilities which rendered them incapable of providing written consent.

With no prior literature on self-care profile of local patients with EH, the value of 0.5 was adopted as the proportion of patients with low self-care profile to compute a maximum sample size. To ensure that the 95% confidence interval estimate of the proportion of patients with higher level of self-care profile would be within 5% of the true proportion, a sample size of 385 was needed, with inflation to 450 to account for 15% possible variance.

The study questionnaire collated data on socio-demography, Body Mass Index (BMI), blood pressure (BP), self-care activities, scores from the International Physical Activity Questionnaire⁽¹⁰⁾ (IPAQ to determine the intensity of physical activity), Medication Adherence Report Scale(MARS-5 to assess medication adherence), diet and the Hypertension Self-Care Profile(HTN-SCP).⁽¹¹⁾

The HTN-SCP is a locally validated disease-specific instrument that assesses 3 domains - Behaviour, Motivation and Self-efficacy, in the self-care profile of a patient with EH.⁽¹¹⁻¹⁴⁾ It reviews the patient's perceptions, willingness and confidence in adhering to a self-care activity to achieve optimal BP control.

From April to June 2017, potential participants were screened and recruited at the waiting area outside the consultation rooms. They were provided information on the study and given time for clarification before giving informed consent. Upon enrolment, the participant was investigator-assisted through the questionnaire. Study participants received SGD 5 supermarket vouchers each upon completion of the questionnaire.

The total HTN-SCP scores for each patient were computed using sum of 60 items in the HTN-SCP instrument. Descriptive statistics were performed and reported as median (interquartile range[IQR]) and percentages. Univariate analyses were conducted to determine the associations between continuous HTN-SCP scores and the outcomes (medication adherence, IPAQ, BP and diet habits) using Mann-Whitney U, Kruskal Wallis and Spearman's correlation. The scores were also analysed in their 3 domains: Behaviour, Motivation and Self-efficacy. All factors in the univariable analysis with $p \leq 0.1$ were included in multivariable linear regression for each score. A p-value of < 0.05 was considered statistically significant. All data analyses were conducted using SPSS version 24.0.

RESULTS

A total of 450 patients were recruited, of which 20 did not fit the eligibility criteria, 2 had duplicate data and 7 had incomplete data. The remaining 421 patients were included in the analysis.

Table I presents the associations between the demographic and self-care profiles of the study population: 53% of the patients' age were below 65 years, 70.6% were Chinese, 37.3% had up to primary education, 67% were married and half lived in a rental or small-medium sized apartment. The majority (77.2%) were overweight (BMI > 23).⁽¹⁵⁾

Higher HTN-SCP scores were associated with minority ethnic groups, education, alcohol abstinence, moderate-to-high level of PA, medication adherence, regular monitoring

of weight and home BP (Table I). With the HTN-SCP scores divided arbitrarily into tertiles, 65.1% of the patients had high self-care profile.

In the respective domains, higher median scores in the “Behaviour” domain were associated with older age group (≥ 65 years), higher education, unemployment, non-smoking, lower quantum of alcohol intake, medication adherence and frequent home BP and weight monitoring. Minority ethnicity, higher education, moderate/high PA, regular weight monitoring and medication adherence were associated with higher median scores in the “Self-efficacy” and “Motivation” domains. Unemployment and frequent home BP monitoring were separately associated with higher score in the “Self-Efficacy” and “Motivation” domains respectively.

Awareness of healthy diet, willingness to modify diet to control BP and avoidance of food perceived to be bad for BP were associated with higher HTN-SCP scores. Appendix I summarises the association between HTN-SCP scores and dietary habits. Table II shows the association between HTN-SCP scores and levels of education, PA (IPAQ scores), willingness to change the diet to control BP and weight, selection of low-salt products and healthier food options using linear regression analysis. Higher HTN-SCP scores were associated with lower BMI, median SBP and DBP compared to those with medium and lower HTN-SCP scores (Table III).

DISCUSSION

The study revealed self-care profiles in a multi-ethnic Asian population with EH. Higher HTN-SCP scores were associated with home BP monitoring (Table I). Glynn et al reported self-monitoring of BP was associated with moderate reduction of SBP and DBP.⁽¹⁶⁾ Our results revealed that patients with higher HTN-SCP scores had lower median SBP and DBP (Table III) and were more likely to attain the goal of hypertension treatment.

Those with higher level of education seemed to have higher self-care profile. Better educated patients have better access to health-related information, which can raise their level of awareness of relevant self-care measures to support their BP control.⁽¹⁷⁾ In contrast, there was no association between length of education (cut-off at six years) and self-care behaviour in a study on rural Chinese patients with EH in China.⁽¹⁸⁾ The urban setting and multi-ethnicity of the population, curriculum and quality of education, could have contributed to the difference in educational background of the two study populations.

Health literacy alone is unlikely to significantly transform self-care behaviour. The awareness of health-promoting measures in Iranian patients with EH did not translate to better lifestyle behaviour.⁽¹⁹⁾ Self-care is influenced by beliefs, motivation and self-efficacy, which underpin the architecture of the instrument used in this study. This provides a conceptual framework to assess the willingness, confidence and practice of self-care measures by patients with EH.

The HTN-SCP scores stratify the study population in their execution of self-care measures. Higher HTN-SCP scores were associated with alcohol abstinence, moderate-to-high level of PA, medication adherence, not smoking and proactive dietary measures to control weight and BP. This is reflected in the dietary control and monitoring of weight at home.

Dividing the HTN-SCP scores into tertiles revealed that about one-third (34.9%) of the study population was stratified in the low-to-moderate self-care profile categories. The scores seemed to be able to discriminate the JNC-recommended self-care measures for patients with EH. This provides an opportunity to identify deficiencies in self-care behaviour, which may potentially be mitigated by targeted interventions.

This study has strengths and limitations. The HTN-SCP scores have shown significant correlations with key self-management measures and BP measurements. It is a feasible method to provide healthcare providers with insight into the key constructs of self-care profile of their

patient with EH. It also provides a potential platform for comparison of self-care profiles across different populations.

The results allude to a more efficient utility of healthcare resources in managing patients with EH. The self-care profile can be used to develop personalised care plan based on their behaviour. Those with high self-care profile can be co-managed with other professionals, such as nurse practitioners or via telehealth consultations, in between face-to-face reviews by physicians. This approach frees up physician time and resources to manage and motivate patients with lower self-care profile. A multidisciplinary care team can work together to raise their level of self-efficacy and self-care capacity. The HTN-SCP scores can potentially be used by the healthcare team to re-assess the progress of their self-care profiles.

There are several limitations in this study. Random sampling would have averted selection bias of potential subjects, but implementation was not feasible due to the large number of daily attendances at the study site. Self-reporting of medication adherence and levels of PA using instruments is subjected to recall bias, but alternative data-capture is unavailable to the investigators. The HTN-SCP tool was also not designed to cater to ethnicity-related differences in self-care profile of the study population. The DASH diet adapted for Asians has yet to be validated in local setting.

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Table I. Self-care scores and its association with demographics

	Frequency (%)	HTN-SCP scores	p-value	Behaviour Median(IQR)	p-value	Motivation Median(IQR)	p-value	Self-efficacy Median(IQR)	p-value
	421(100.0)	192(172-212.5)	-	59(52-65)		68(60-76)		65(58-74)	
Age			0.237		0.026		0.886		0.178
65 and above	198(47)	194(172-214)		60(53-66)		69(60-76.3)		66(58-74.3)	
Below 65	223(53)	190(171-211)		58(51-63)		68(60-76)		65(57-73)	
Gender			0.208		0.249		0.125		0.398
Male	208(49.4)	189.5(170-211.8)		59(51-64.8)		67(60-75)		65(56-74)	
Female	213(50.6)	194(175.5-213)		59(53-65)		69(61-77)		65(59-74)	
Ethnic Group			0.017		0.076		0.010		0.015
Chinese	293(70.6)	188(170-208.5)		58(51-64.5)		67(60-75)		64(57-71)	
Malay/ Indian/ Others	122(29.4)	200(173-216.3)		61(53.8-65)		71(62-78)		68(59.8-75.3)	
BMI			0.701		0.316		0.638		0.630
<23	95(22.8)	190(172-213)		59(53-65)		67(60-76)		65(59-74)	
23 and above	322(77.2)	192(171-212)		59(51-64)		69(60-76)		65(56.8-74)	
Education			<0.001		0.002		<0.001		<0.001
No formal education/ Primary	157(37.3)	180(165.5-202.5)		56(50.5-62)		64(57-72)		61(54-70)	
Secondary	170(40.4)	199.5(176.8-216)		60.5(53-65)		72(63-78)		67(60-75)	
Pre-U/ Diploma/ University	94(22.3)	193(178.8-216.3)		60(52.8-66.3)		71(60.8-77)		67(59-74)	
Employment status			0.128		0.026		0.702		0.009
Employed	209(49.9)	190(172-210)		58(51-63.5)		69(61.5-75.5)		64(56-71.5)	
Unemployed	210(50.1)	194(171.8-214)		59.5(53-66)		67(60-77)		68(59-74)	
Marital Status			0.312		0.120		0.654		0.409
Married	282(67)	194(172-213)		59(53-65)		69(60-76)		66(57.8-74)	
Single/ Divorced/ Separated/ Widowed	139(33)	190(169-210)		57(50-65)		68(60-76)		64(58-72)	

	Frequency (%)	HTN-SCP scores	p-value	Behaviour Median(IQR)	p-value	Motivation Median(IQR)	p-value	Self-efficacy Median(IQR)	p-value
Housing Type			0.189		0.099		0.183		0.440
Rental apartment /Small to medium public apartment	211(50.1)	191(168-211)		58(51-64)		67(59-75)		65(56-74)	
Large public apartment	184(43.7)	194(176-213.8)		60(53-66)		70(60.3-77)		66(58-74)	
Private/landed house	26(6.2)	196(177.8-210)		59(52.5-63.3)		71(59.8-78.3)		65.5(62.5-71.3)	
Current Smoker			0.064		0.003		0.369		0.152
Yes	50(11.9)	185(156.8-210.3)		54(47-62.3)		66(58.8-75.3)		63(50-74)	
No	370(88.1)	193(172.8-213)		59(53-65)		69(60-76)		65(58-74)	
Consume Alcohol			0.032		0.009		0.208		0.054
Yes	54(12.8)	184(171.8-199.5)		56(49.8-61.3)		66(61-74)		63.5(55-68.3)	
No	367(87.2)	194(172-214)		59(53-65)		69(60-77)		66(58-74)	
Consume Alcohol			0.099		0.031		0.450		0.143
> 7 units per week	12(2.9)	186(172-206.5)		55.5(49.3-64.3)		66(58.8-73.8)		65.5(58-70.3)	
Social Drinker	42(10.0)	184(171-199.5)		56(49.5-61)		66(61.8-74.3)		63(54.8-68.3)	
Non drinker	367(87.2)	194(172-214)		59(53-65)		69(60-77)		66(58-74)	
IPAQ categorical score			0.003		0.078		<0.001		0.015
Low	71(17.3)	180(163-203)		56(51-63)		63(57-69)		61(55-70)	
Moderate/High	339(82.7)	195(175-213)		59(53-65)		70(61-77)		66(59-74)	
Medication adherence¹			0.009		0.005		0.030		0.018
Poor adherence	194(46.9)	188.5(170-209)		58(50-63)		67(60-75)		64(56-71.3)	
Adherence	220(53.1)	195.5(173-216.8)		59(53-66)		69(60.3-78)		66(59-75)	

	Frequency (%)	HTN-SCP scores	p-value	Behaviour Median(IQR)	p-value	Motivation Median(IQR)	p-value	Self-efficacy Median(IQR)	p-value
Levels of self-care behaviour									
Low/Medium(60-<180)	147(34.9)	-	-	-	-	-	-	-	-
High(180-<240)	274(65.1)	-	-	-	-	-	-	-	-

¹ Poor medication adherence based on MARS-5 score <25

² According to Clinical Practice Guidelines 1/2017. Hypertension. Ministry of Health, Singapore

Table II. Factors associating HTN-SCP scores using linear regression

	Beta(95% CI)	p-value
Ethnic Group		
Chinese	Reference	-
Malay/ Indian/Others	2(-3.1-7.1)	0.434
Education		
Pre-U/Diploma/University	Reference	-
No formal education/Primary	-6.5(-12.6--0.4)	0.036
Secondary	1.9(-3.9-7.8)	0.518
Current Smoker		
No	Reference	-
Yes	3(-4.1-10.1)	0.409
Consume Alcohol		
Yes	Reference	-
No	5.6(-1-12.1)	0.094
IPAQ categorial score		
Moderate/High	Reference	-
Low	-7.3(-13.1--1.5)	0.014
Medication adherence		
Poor adherence	Reference	-
Adherence	2.4(-1.9-6.8)	0.274
Monitor your weight regularly		
No	Reference	-
Yes	1.1(-3.6-5.8)	0.655
Use your BP machine at home		
No	Reference	-
Yes	2.6(-2-7.2)	0.271
Perception of healthy diet		
Do you know how your diet should be like?		
No	Reference	-
Yes	0.8(-5.7-7.3)	0.812
I am willing to change my diet to control my BP		
No/Not Sure	Reference	-
Yes	7.2(1.1-13.3)	0.021
I avoid food that I know is bad for my BP		
No/Not Sure	Reference	-
Yes	5.1(-2.4-12.6)	0.182
Modification of dietary habit		
Do you manage your diet to try to keep your weight at an optimal level?		
No	Reference	-
Yes	13.6(8.8-18.5)	<0.001
Do you actively ask for less salt in your meals?		
No	Reference	-
Yes	1.2(-3.5-5.9)	0.607
I take supper frequently		
No	Reference	-
Yes	-0.4(-5.9-5)	0.873
Choice of food option		
Do you choose baked, steamed or grilled options when available rather than fried foods?		
No	Reference	-

Yes	2.6(-1.9-7.1)	0.265
Do you regularly eat processed meats such as ham, bacon or smoked/salted fish		
No	Reference	-
Yes	-5.5(-13.5-2.4)	0.169
Are you likely to choose a product that has low sodium content on the label?		
No	Reference	-
Yes	12.2(7.3-17)	<0.001
Do you actively choose a healthier option when you eat?		
No/ Not Sure	Reference	-
Yes	16.8(8.9-24.7)	<0.001

Table III. Subgroup of scores with association with BMI and BP

	Categories of score			P-value
	Low(60-<120)	Medium(120-<180)	High(180-<240)	
BMI	32.8(31.7-34.3)	26.1(23.1-28.9)	27(23.6-29.6)	0.005
Median SBP	144(138.5-158)	129(120.5-139)	132(124-140)	0.010
Median DBP	84(74-93.5)	66(61-76.5)	68(62-76)	0.018
Ethnic Group				0.077
Chinese	2(0.7)	108(36.9)	183(62.5)	
Malay/Indian/ Others	3(2.5)	34(27.9)	85(69.7)	

APPENDIX

Association between HTNSCP scores and dietary habits

Diet	Total HTNSCP Score, Median (IQR)	p-value	Behaviour, Median (IQR)	p-value	Motivation, Median (IQR)	p-value	Self-efficacy, Median (IQR)	p-value
Perception of healthy diet								
Awareness of healthy diet		<0.001		0.002		<0.001		<0.001
Yes	195 (176-214)		59 (53-65)		69 (61-77)		66 (59-74)	
No	177 (158.3-193.8)		54 (49.8-61.3)		62 (56-71)		59 (52.8-67)	
I am willing to change my diet to control my blood pressure		<0.001		<0.001		<0.001		<0.001
Yes	195 (176-214)		60 (53-65)		70 (62-77)		66 (59-74)	
No/ Not Sure	176 (150-196.8)		53 (46.3-60)		60.5 (52-71)		59 (50-68)	
I avoid food that I know is bad for my blood pressure		<0.001		<0.001		<0.001		<0.001
Yes	197 (177-214)		60 (54-65.3)		71 (62-77)		67 (59-75)	
No/ Not Sure	166 (145-183)		49 (46-55)		60 (50-68)		54 (48-64)	
Modification of dietary habit								
Do you keep a food diary?		0.163		0.093		0.173		0.208
Yes	206 (174.5-230.3)		64.5 (52-72.3)		72 (63.8-78.5)		68.5 (61.3-79.3)	
No	192 (171.8-212.3)		59 (52-65)		68 (60-76)		65 (58-74)	
Do you manage your diet to try to keep your weight at an optimal level?		<0.001		<0.001		<0.001		<0.001
Yes	200 (180-218)		61 (55-66)		72 (63-78)		68 (60-76)	
No	176 (155.5-197)		54 (48-60.5)		63 (56-71)		60 (51.5-66.5)	

Diet	Total HTNSCP Score, Median (IQR)	p-value	Behaviour, Median (IQR)	p-value	Motivation, Median (IQR)	p-value	Self-efficacy, Median (IQR)	p-value
Do you regularly eat prepacked meals? For example, ready meals or canned soups		0.213		0.484		0.506		0.043
Yes	183.5 (162.3-213.8)		56.5 (50.3-65)		64.5 (60-78.8)		61.5 (52.3-71.8)	
No	194 (172-212)		59 (52.5-65)		69 (60-76)		66 (58-74)	
Do you skip meals frequently?		0.486		0.009		0.504		0.737
Yes	191 (172-209.5)		57 (50-63)		71 (61.5-75.5)		65 (59-72.5)	
No	194 (171-213.8)		60 (53-65)		67 (60-77)		65 (57-74)	
Do you actively ask for less salt in your meals?		<0.001		<0.001		0.007		<0.001
Yes	199 (177-220)		61.5 (54.3-67)		70 (62-77)		67 (60-76)	
No	188 (166-208)		57 (50-62)		67 (59-75)		64 (55-70)	
Do You Snack?		0.958		0.293		0.242		0.856
Yes	194 (173.5-211)		59 (51-64)		70 (62-75.5)		65 (59-73)	
No	188 (171-216.8)		59 (53-66.8)		65.5 (60-76.8)		65 (56-74)	
I take supper frequently		0.025		0.001		0.238		0.034
No	194 (173-213)		60 (53-65)		69 (60-76)		66 (58.8-74)	
Yes	185 (164-203)		55 (48-62)		68 (58-75)		63 (53-71)	
Choice of food option								
Do you choose baked, steamed or grilled options when available rather than fried foods?		0.036		0.869		0.001		0.034
Yes	194.5 (177-213)		59 (53-65)		71 (63-77)		66 (59-74)	
No	188 (168-211)		59 (51-65)		65 (59-75)		64 (55.5-73)	
Do you base your main meals around starchy food? For example, potatoes, pasta, rice or bread		0.819		0.706		0.833		0.744

Diet	Total HTNSCP Score, Median (IQR)	p-value	Behaviour, Median (IQR)	p-value	Motivation, Median (IQR)	p-value	Self-efficacy, Median (IQR)	p-value
Yes	192.5 (172-212.8)		59 (53-65)		69 (60-76)		65 (58-74)	
No	191 (175-213)		59 (51-65)		67 (61-76)		66 (59-73)	
Do you regularly include legumes in your diet? For example, beans and lentils		0.139		0.055		0.276		0.182
Yes	194 (175-214)		59 (54-65)		68.5 (61-77)		66 (59-74)	
No	190 (168-210)		58 (50.5-64)		68 (60-75.5)		65 (56-73)	
Do you regularly eat processed meats such as ham, bacon or smoked/salted fish		0.008		0.034		0.099		0.001
Yes	178 (160-188)		54 (48-62)		65 (60-70)		59 (52-66)	
No	194 (172-213)		59 (53-65)		69 (60-76)		66 (58-74)	
Are you likely to choose a product that has low sodium content on the label?		<0.001		<0.001		<0.001		<0.001
Yes	202 (180-220)		62 (57-68)		72 (63-78)		69 (62-76)	
No	180 (160-196)		54 (48-60)		64 (56-73)		60 (53-68)	
Do you actively choose a healthier option when you eat?		<0.001		<0.001		<0.001		<0.001
Yes	196 (177-214)		60 (54-65)		71 (62-77)		66 (60-75)	
No/ Not Sure	156 (143-179)		49 (44-54)		56 (50-64)		53 (46-61)	