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Correlations between health-promoting lifestyle and health-related quality of life among elderly people with hypertension in Hengyang, Hunan, China

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Abstract

Hypertension is considered as an important public health problem in developed and developing countries. The disease is closely associated with health-promoting lifestyle (HPL), and it seems that HPL plays an important role in improving health-related quality of life (HRQOL). This cross-sectional study is to investigate the effects of health-promoting lifestyle (HPL) on health-related quality of life in elderly people with hypertension from a community health service center in Hengyang, Hunan, PR China.

Totally 530 elderly patients with hypertension from the community health service center were included in this study, who were asked to fill in a questionnaire (504 patients responded). HPL was assessed by the health-promoting lifestyle profile II (HPLP-II), and HRQOL was measured by the Short Form Health Survey Questionnaire (SF-36).

HPL among these elderly people with hypertension was at moderate level (125.02 ± 21), with the highest score for nutrition and the lowest score for health responsibility. Moreover, HRQOL among these elderly hypertensive people was at moderate level (54.36 ± 21.18). Role-emotional domain score was far below average, vitality domain was a little below average, social functioning and general health domains were a little above average, and other domains were far above average. Furthermore, HPL and HRQOL were positively correlated ($P < .01$). According to the standardized regression coefficients, the influencing factors for HRQOL included (in a descending order) the health responsibility, physical activity, interpersonal relationships, stress management, spiritual growth, and nutrition.

HPL and HRQOL were both relatively poor in the elderly people with hypertension from the community health service center. HPL represents an important factor affecting HRQOL of elderly people with hypertension. HRQOL could be improved through promoting HPL (such as health responsibility and physical activity).

Abbreviations: BP = bodily pain, GH = general health, HPL = health-promoting lifestyle, HPLP-II = health-promoting lifestyle profile II, HR = health responsibility, HRQOL = health-related quality of life, IR = interpersonal relationships, MCS = mental component health, MH = mental health, N = nutrition, PA = physical activity, PCS = physical component summary, PF = physical functioning, RE = role-emotional, RP = role-physical, SBP = systolic blood pressure, SF = social functioning, SF-36 = Short Form Health Survey Questionnaire, SG = spiritual growth, SM = stress management, VT = vitality.

Keywords: aged people, health promotion, hypertension, quality of life

1. Introduction

Hypertension (HTN) is a cardiovascular syndrome characterized by continuous elevation of arterial blood pressure, which is one of the major risk factors and main death causes of cardiovascular diseases.[1] Cardiovascular Disease Report in China has shown that the mortality rate of cardiovascular diseases ranks the first among all kinds of diseases, higher than cancers and other diseases. Hypertension is considered as an important public health problem in developed and developing countries. The prevalence rates of HTN are 36.5% in American,[2] 36.9% in Lebanon,[3] 34% in Australian, and 32% in Poland.[4] In China, 270 million people (at least 1 of every 5 adults) suffer from hypertension.[5] Moreover, 59.4% of Chinese elderly people have high blood pressure.[6] A survey in 2012–2015 has found that the awareness, treatment, and control (< 140/90 mm Hg) rates for the disease are 46.9%, 40.7%, and 15.3%, respectively. In fact, 41.3% of the Chinese adult population aged ≥18 years have pre-HTN, according to the Chinese guideline.[7] In China, there is a high prevalence of HTN and pre-HTN; while the awareness, treatment, and control of HTN are relatively low. Management of medical therapy for HTN needs to improve.

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Health-related quality of life (HRQOL) assesses the health status of patients, which reflects the physical, psychological, social, and emotional conditions.[8] In clinic, mortality and clinical parameters cannot fully and precisely reflect the patients' health status. Therefore, HRQOL could serve as an important indicator for the treatment outcomes, particularly for the patients with chronic diseases such as hypertension.[9] Studies have found that people with hypertension would have poorer quality of life than those without hypertension.[10–13] Moreover, HRQOL for elderly patients with hypertension would always be worse than those without hypertension.[14]

Health-promoting lifestyle (HPL) is a model for individuals to take control of, maintain, and/or enhance their own health.[15,16] As a kind of behavior-related disease, the occurrence of hypertension is closely associated with poor HPL. Due to the sedentary lifestyle, increased prevalence of mental and physical disorders, nursing shortage, low income, and social isolation, the elderly people with hypertension would often feel lonely and depressive, which might lead to lower probability of health-promoting behavior.[17] Hypertension Guideline in China[18] has reflected that the lifestyle adjustment represents the basis for disease treatment, and should be combined with healthy lifestyle throughout the treatment course.

Previous studies have reported the positive correlation between health behavior and quality of life in older people.[19,20] However, there are few studies aiming at elderly patients with hypertension. In particular, the correlation between HPL and HRQOL in the elderly with hypertension remains unclear. In this cross-sectional study, the actual status of HPL and HRQOL in elderly patients with hypertension in Hengyang, Hunan, China was investigated. Moreover, the correlation HPL and HRQOL in these patients was also explored.

2. Materials and methods

2.1. Study participants

This survey was conducted in the Zhengxiang District Zhengxiang Street Community Health Service Center (Hengyang, Hunan, China), which was an integrated community health service center where the free physical examination, health education, health care, rehabilitation, family-planning technical service, and basic medical service were provided. A total of 789 elderly hypertensive patients were registered in the center. According to the sample size estimation method of the Kendan's sample estimation method of the multifactor analysis, the sample size should be 5 to 10 times of the maximum item number in the questionnaire.[21] The maximum item number in the questionnaire herein in this study was 52, considering the sample loss rate of 20%, the sample size were 312 to 624 cases. Taking into account the limitations due to the loss of follow-up, human resources, and sample size, there were finally 530 elderly hypertensive participants herein. Random sampling was performed to select the participants from the Community Health Service Center. Totally530 elderly hypertensive participants were recruited from October 2014 to January 2015. Inclusion criteria were as follows: systolic blood pressure (SBP) $\geq$ 140 mm Hg and/or diastolic BP $\geq$ 90 mm Hg, or on antihypertensive medication; age $\geq$ 60 years; living in Hengyang, Hunan, China; and having no cognitive impairment, based on the Montreal Cognitive Assessment (MoCA).[22] Exclusion criteria included secondary hypertension; serious end-stage diseases (cancer or serious liver, respiratory, heart, or renal insufficiency); and not verbally agreeing to participate. Prior written and informed consent were obtained from every patient and the study was approved by the Medical Ethics Committee of University of South China (No. 4304079008946). All patients filled up self-reported questionnaire, in which the participants' names were replaced by personally unidentified code. Sociodemographics characteristics (e.g., age, gender, education level, marital status, occupation, monthly income, and BP) were collected.

2.2. Blood pressure measurement

Blood pressure was measured on the upper limb using the mercury sphygmomanometer after 15-min rest, which was classified as normal ($<$ 140/90 mm Hg), grade 1 hypertension (140–159/90–99 mm Hg), grade 2 hypertension (160–179/100–109 mm Hg), and grade 3 hypertension ($\geq$ 180/110 mm Hg), according to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7).[23]

2.3. HPL assessment

HPL was assessed by the health-promoting lifestyle profile II (HPLP-II). The Chinese version of the Health-Promoting Lifestyle Profile II (HPLPII) was developed by Meihan and Chung-Ngok.[24] The HPLP-II questionnaire consisted of 52 items, which were answered according to the 4-point Likert scale (1 = never; 2 = sometimes; 3 = often; and 4 = routinely). The scale consisted of 6 subscales, including the health responsibility (HR), physical activity (PA), nutrition (N), spiritual growth (SG), interpersonal relationships (IR), and stress management (SM). HPL total scores ranged from 52 to 208 points, and the mean item score ranged from 1 to 4 points. Higher score indicated better health behavior. Participant categorization was performed as follows: 52 to 104 points, inappropriate healthy lifestyle; 104 to 156 points, intermediate healthy lifestyle; and 156 to 208 points, proper healthy lifestyle. Cronbach's alpha for the total HPLP-II had been reported as 0 surpassed 0.7, with the subscales ranging from 0.71 to 0.91.[24]

2.4. HRQOL evaluation

HRQOL for the elderly hypertensive patients was evaluated by the Short Form Health Survey Questionnaire (SF-36). The test–retest reliability coefficients were higher than 0.80, with a range of 0.83 to 0.96, while the internal consistency (alpha) was higher than 0.70.[25] The concise health survey questionnaire included 36 items,[26,27] which measured participant health status in 8 dimensions, that is, the physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). Moreover, the instrument had a 1-item scale on health transition. Total HRQOL scores ranged from 0 to 100 (average = 50), which could be categorized as very good (80–100 points), good (60–79 points), moderate (40–59 points), poor (20–39 points), and very poor (0–19 points).[28] The operation formula was as follows: $SS = (RS - Min)/(Max - Min) \times 100$, where SS, RS, Min, and Max represent the standardized score, raw score, minimum score, and maximum score, respectively. The SF-36 score was obtained from the average of the 8 dimensions, that is, SF-36 = (PF+ RP+ BP+ GH+ VT+ SF+ RE+ MH)/8. Higher scores indicated better HRQOL. These 8 dimensions could be roughly divided into the 2 categories, that is, the physical component summary (PCS) and the mental component health (MCS).

Table 1

Sociodemographics characteristics of participants.

	N (%)
Age, years	65.18 ± 5.60 (ranging 60–81)
Age groups, years	
<75	407 (80.8%)
≥75	97 (19.2%)
Gender	
Male	315 (62.5%)
Female	189 (37.5%)
Education level	
Primary school or lower	189 (37.5%)
Middle school	225 (44.6%)
High school or higher	90 (17.9%)
Marital status	
Married	339 (67.3%)
Single/widowed/divorced	165 (32.7%)
Occupation	
Cadre	159 (31.5%)
Worker	225 (44.6%)
Farmer	120 (23.9%)
Monthly income	
below 1000 Yuan	150 (29.8%)
1000–2000 Yuan	279 (55.3%)
2000 Yuan or above	75 (14.9%)
Blood pressure (BP)	
Normal	69 (13.7%)
Grade 1 hypertension	261 (51.8%)
Grade 2 hypertension	129 (25.6%)
Grade 3 hypertension	45 (8.9%)

Normal BP, BP<140/90 mm Hg; Grade 1 hypertension, systolic blood pressure (SBP) 140–159 mm Hg and diastolic blood pressure (DBP) 90–99 mm Hg; Grade 2 hypertension, SBP 160–179 mm Hg and DBP 100–109 mm Hg; and Grade 3 hypertension, SBP ≥180 mm Hg and DBP ≥110 mm Hg.

Calculation formula were as follows: PCS = (PF + RP + BP + GH)/4, while MCS = (RE + SF + VT + MH)/4.

2.5. Study procedures

There were totally 8 investigators in this study, including one nursing teacher, 2 community nurses, and 5 nursing undergraduates. The investigation team had accepted the 2-day training on the investigation plan and questionnaire items before the survey. These investigators explained the study purpose and related concepts for the participants. All questionnaires were completed anonymously. The participants were given 30 to 40 minutes to complete the questionnaires.

2.6. Statistical analysis

Data were expressed as mean ± SD. SPSS 17.0 software (SPSS Inc., Chicago, IL) was used for statistical analysis. Pearson's correlation coefficients were used to analyze the associations between HPL subscales and HRQOL. Hierarchical regression analysis with stepwise method was used to assess the predictors for HRQOL. $P < .05$ was considered statistically significant.

3. Results

3.1. Sociodemographics data of participants

Questionnaires were distributed to totally 530 elderly hypertensive patients, and 520 cases (98.11%) actually responded, in which 16 cases were eliminated due to invalid response, resulting in a final response rate of 95.09% (504/530). Sociodemographics characteristics of these participants were shown in Table 1. The mean age of these participants was 65.18 ± 5.60 years. Among the participants, 62.5% were male, 82.1% finished middle school or lower, 67.3% were married, 44.6% were workers, 55.3% earned 1000 to 2000 Yuan monthly, and 51.8% had grade 1 hypertension. These participants were subjected to the following investigation.

3.2. HPL assessment using HPLP-II

To evaluate health behavior among these elderly hypertensive patients, the HPLP-II was used. The possible range, total scores, and mean item score of HPLP-II and its subscales were shown in Table 2. Our results showed that, the total scores were 125.02 ± 21.44, and the mean item score was 2.40 ± 0.41. Moreover, for the HPLP-II subscales, nutrition had the highest score (2.73 ± 0.42), followed by stress management, spiritual growth, interpersonal relationships, physical activity, while health responsibility had the lowest score (1.99 ± 0.56). Taken together, these results suggest that, HPL of elderly hypertensive patients in the community is mainly at the intermediate level. These subjects achieve the high scores of the N and SM subscales, moderate scores of the SG, PA, and IR subscales, and low scores of the HR subscale.

3.3. HRQOL assessment using SF-36

To evaluate the HRQOL among these elderly hypertensive patients, SF-36 was used. The possible range and total score of HRQOL and its subscales were shown in Table 3. Our results showed that the HRQOL total score was 54.36 ± 21.18. For the analysis of its subscales, role-emotional domain mean score was far below average, vitality domain was a little below average, social functioning and general health domains were little above average, while other domains were far above average. Moreover, the PCS score (60.29 ± 25.84) was higher than MCS (48.43 ± 17.03) ($P < .05$). Taken together, these results suggest that, the HRQOL total scores of the participants are moderate. PCS is higher than MCS, and RE has the lowest score.

Table 2

Scores of HPLP-II and subscales of participants.

Scale and subscales	Question number	Score range	Minimum	Maximum	Total scores	Mean item score
Total HPLP-II score	52	52–208	68	171	125.02 ± 21.44	2.40 ± 0.41
N	9	09–36	14	33	24.58 ± 3.82	2.73 ± 0.42
SM	8	08–32	14	30	21.63 ± 3.84	2.70 ± 0.48
SG	9	09–36	9	30	21.35 ± 4.20	2.37 ± 0.47
IR	9	09–36	12	29	20.77 ± 4.22	2.31 ± 0.47
PA	8	08–32	9	26	16.78 ± 4.51	2.15 ± 0.56
HR	9	09–36	10	27	17.91 ± 5.00	1.99 ± 0.56

HPLP-II = health-promoting lifestyle profile II, HR = health responsibility, IR = interpersonal relationships, N = nutrition, PA = physical activity, SG = spiritual growth, SM = stress management.

Table 3

Scores of SF-36 and subscales of participants.

Scale and subscales	Question number	Score range	Minimum	Maximum	Total scores
Total SF-36 Score	36	0–100	5.63	88.25	54.36 ± 21.18
PF	10	0–100	0	100	65.98 ± 23.60
BP	2	0–100	0	90	61.89 ± 23.30
RP	4	0–100	0	100	60.71 ± 45.74
MH	5	0–100	20	96	60.05 ± 15.32
SF	2	0–100	0	100	55.06 ± 24.88
GH	5	0–100	5	95	52.57 ± 19.66
VT	4	0–100	5	90	47.62 ± 20.09
RE	3	0–100	10	40	31.01 ± 11.12
PCS	–	0–100	–	–	60.29 ± 25.84
MCS	–	0–100	–	–	48.43 ± 17.03

BP = bodily pain, GH = general health, MCS = mental component summary, MH = mental health, PCS = physical component summary, PF = physical functioning, RE = role-emotional, RP = role-physical, SF = social functioning, SF-36 = Short Form Health Survey Questionnaire, VT = vitality.

3.4. Single factor analysis of HRQOL

Table 4 showed the distribution of average HRQOL from the SF-36 for the participants, according to the features. No significant correlation was found between HRQOL and sex. The total score of HRQOL was lower for individuals aged greater than or equal to 75 years, receiving lower education, single/widowed/divorced, with worse occupation, lower monthly income, and higher blood pressure ($P < .05$).

3.5. Association between social demographic variables, HPL, and HRQOL

Pearson correlation coefficient was used to describe the correlations between the variables. As shown in Table 5, higher age, receiving lower education, single/widowed/divorced, worse occupation, lower monthly income, being farmer, higher blood pressure, and lower HPL were significantly correlated with poorer HRQOL ($P < .05$). Moreover, there was a statistically significant positive correlation between HRQOL and HPLP-II and its subscales in the elderly hypertensive patients ($P < .01$). On the other hand, sex was not significantly associated with HRQOL in the Pearson correlation analysis ($P > .05$). These results suggest that, higher age, lower education level, single/widowed/divorced status, lower monthly income, being farmer, higher blood pressure, and lower HPL are significantly correlated with poor QOL.

Table 4

Results of single factor analysis for HRQOL among the participants.

	Mean ± SD	*T* or *F* statistics	*P*
Sex			
Male	54.53 ± 20.15	0.23	.82
Female	54.09 ± 22.85		
Age			
< 75 years	60.22 ± 15.76	15.74	.00
≥ 75 years	29.30 ± 23.07		
Marital status			
Married	70.09 ± 17.12	13.59	.00
Single/widowed/divorced	46.70 ± 18.60		
Monthly income			
below ¥1000	28.66 ± 13.33	555.78	.00
¥1000–2000	61.93 ± 10.63		
¥2000 or above	77.59 ± 12.84		
Education level			
Illiterate/literate	33.91 ± 16.01	493.19	.00
Primary or secondary school	61.20 ± 9.89		
At least high school	80.20 ± 8.14		
Occupation			
Cadre	60.36 ± 21.33	9.81	.00
Worker	51.14 ± 20.16		
Farmer	52.45 ± 21.47		
BP			
Normal	70.08 ± 10.46	360.59	.00
Hypertension Stage 1	64.93 ± 13.22		
Hypertension Stage 2	39.06 ± 11.19		
Hypertension Stage 3	12.75 ± 7.29		

BP = bodily pain , HRQOL = health related quality of life. Independent-sample *t*-test ($P < .05$) and one-way ANOVA ($P < .05$) were used.

3.6. Hierarchical regression analysis of HRQOL influencing factors

In order to analyze the influencing factors of HRQOL among the elderly hypertensive patients, hierarchical regression with stepwise method was performed. In step 1, demographic variables with statistical significance in the correlation analysis (e.g., age, marital status, monthly income, education level, occupation, and BP) were entered as independent variables. In step 2, 6 dimensions of HPLP-II were entered into the regression model. The final model explained 68.5% of the variance. In step 1, age, education, monthly income, marital status, and BP were significant correlates of HRQOL ($P = .000$), which explained 32.0% of the total variance of HRQOL. In step 2, 6 subscales of HPLP-II, including health responsibility, physical activity, interpersonal relationships, stress management, spiritual growth, and nutrition, were significant predictive factors of HRQOL in these elderly hypertensive patients, which explained 36.5% of the HRQOL variance (adjusted $R^2 = 0.685$, R^2 change = 0.365, and $P = .00$). According to the standardized regression coefficients, the influencing factors of HRQOL included (in a descending order) the health responsibility, physical activity, interpersonal relationships, stress management, spiritual growth and nutrition ($\beta = 0.149$, 0.137, 0.112, 0.103, 0.101, and 0.093, respectively) (Table 6). Taken together, these results suggest that, age, health responsibility, and physical activity represent the most important predictors for HRQOL.

4. Discussion

In this study, for the elderly people with hypertension in a community in Hengyang, Hunan, China, the total scores of HPL were 125.02 ± 21.44, and the mean item score was 2.40 ± 0.41,

Table 5

Correlation analyses of variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Gender	1	−0.066	−0.006	−0.050	0.057	−0.019	0.110*	0.004	0.127**	−0.073	−0.060	−0.011	0.008	−0.005	−0.010
2 Age	−0.066	1	−0.201**	−0.383**	−0.317**	0.010	0.378**	−0.519**	−0.488**	−0.447**	−0.345**	−0.541**	−0.376**	−0.388**	−0.578**
3 Marital Status	−0.006	−0.201**	1	0.312**	0.100*	−0.085	−0.390**	0.483**	0.253**	0.343**	0.492**	0.454**	0.483**	0.429**	0.484**
4 Monthly income	−0.050	−0.383**	0.312**	1	0.676**	−0.024	−0.714**	0.794**	0.601**	0.787**	0.675**	0.556**	0.794**	0.611**	0.806**
5 Education level	0.057	−0.317**	0.100*	0.676**	1	−0.015	−0.575**	0.706**	0.616**	0.593**	0.534**	0.488**	0.627**	0.690**	0.682**
6 Occupation	−0.019	0.010	−0.085	−0.024	−0.015	1	−0.031	−0.196**	−0.280**	−0.119**	−0.157**	−0.039	−0.116**	−0.258**	−0.150**
7 BP	0.110*	0.378**	−0.390**	−0.714**	−0.575**	−0.031	1	−0.753**	−0.462**	−0.599**	−0.630**	−0.659**	−0.775**	−0.686**	−0.784**
8 HPL	0.004	−0.519**	0.483**	0.794**	0.706**	−0.196**	−0.753**	1	0.850**	0.867**	0.848**	0.800**	0.853**	0.812**	0.955**
9 HR	0.127**	−0.488**	0.253**	0.601**	0.616**	−0.280**	−0.462**	0.850**	1	0.735**	0.616**	0.621**	0.649**	0.599**	0.781**
10 N	−0.073	−0.447**	0.343**	0.787**	0.593**	−0.119**	−0.599**	0.867**	0.735**	1	0.729**	0.614**	0.658**	0.654**	0.820**
11 SM	−0.060	−0.345**	0.492**	0.675**	0.534**	−0.157**	−0.630**	0.848**	0.616**	0.729**	1	0.679**	0.690**	0.598**	0.802**
12 PA	−0.011	−0.541**	0.454**	0.556**	0.488**	−0.039	−0.659**	0.800**	0.621**	0.614**	0.679**	1	0.573**	0.516**	0.771**
13 IR	0.008	−0.376**	0.483**	0.794**	0.627**	−0.116**	−0.775**	0.853**	0.649**	0.658**	0.690**	0.573**	1	0.733**	0.841**
14 SG	−0.005	−0.388**	0.429**	0.611**	0.690**	−0.258**	−0.686**	0.812**	0.599**	0.654**	0.598**	0.516**	0.733**	1	0.793**
15 HRQOL	−0.010	−0.578**	0.484**	0.806**	0.682**	−0.150**	−0.784**	0.955**	0.781**	0.820**	0.802**	0.771**	0.841**	0.793**	1

BP = bodily pain, HPL = health-promoting lifestyle, HR = health responsibility, HRQOL = health related quality of life, IR = interpersonal relationships, N = nutrition, PA = physical activity, SG = spiritual growth, SM = stress management.

* $P < .05$.

** $P < .01$.

which were at the intermediate level and comparable to hypertensive elderly people in Xi'an, Shaanxi, China.[29] Among the HPL subscales, the nutrition scores were the highest, and the physical activity scores were lower, whereas the health responsibility scores were the lowest, consistent with previous results.[30] The highest nutrition scores may be due to the fact that elderly people have more time and pay more attention to nutrition than young people. These elderly people eat more fresh vegetables and fruits, and have low-salt, low-fat, low-sugar, and low-cholesterol diets. Moreover, they have breakfast every day. The physical activities of these elderly people were associated with fairly lower scores, which was in line with previous studies.[20,31–33] Actually, the 2 items of physical activity (i.e., checking my pulse rate when exercising and reaching my target heart rate when exercising) exhibited the lowest scores. This phenomenon might be caused by lacking certain medical knowledge. Hypertensive elderly patients might not know how to measure pulse, or they may not think it is necessary to measure their pulse. Moreover, many of these elderly people had arthritis, who dared not to do even moderate intensive physical activities. In addition, the body functions were also declined with aging.

Our results showed that the elderly hypertensive patients from community health service center had low scores on the health responsibility subscale, with the lowest score (1.58 ± 0.58) for item 33 (i.e., inspecting my body at least monthly for physical changes/danger signs), and the second lowest (1.76 ± 0.72) for item 21 (i.e., getting a second opinion when I question my health careprovider's advice). These findings suggest that they had relatively poor awareness and less initiative for help from the community health service centers in Hengyang. The low income might be the first possible reason (85.1% had monthly income below 2000 Yuan), and some of these elderly people were too poor to afford the physical examination once a month. The second reason might be associated with the low education level (82.1% received middle school education or lower). Therefore, the health education and promotion needed to be further strengthened in the community health service centers to improve the health behavior of elderly people. Moreover, aerobic exercise should be designed which could be tolerated by these patients,

Table 6

Influence factors of HRQOL among the participants by hierarchical regression analysis.

	Unstandardized coefficients		Standardized coefficients						
Influences	**b**	**Std. Error**	β	**t**	***P***	**Adjusted R^2**	**R^2 change**	***F***	***P***
Step 1	–	–	–	–	–	0.320	0.320	570.82	.000
Age	−8.238	0.815	−0.153	−10.105	.000	–	–	–	–
Education level	3.256	0.820	0.110	3.969	.000	–	–	–	–
Marital Status	1.744	0.661	0.038	2.639	.009	–	–	–	–
Monthly income	2.644	0.876	0.081	3.018	.003	–	–	–	–
BP	−2.635	0.604	−0.009	−4.365	.000	–	–	–	–
Step 2						0.685	0.365	630.03	.000
HR	5.688	0.836	0.149	6.801	.000	–	–	–	–
PA	4.757	0.757	0.137	6.287	.000	–	–	–	–
IR	5.053	1.199	0.112	4.216	.000	–	–	–	–
SM	5.869	0.881	0.103	6.660	.000	–	–	–	–
SG	5.950	1.006	0.101	5.916	.000	–	–	–	–
N	4.631	1.214	0.093	3.814	.000	–	–	–	–

HRQOL = health related quality of life, HR = health responsibility, PA = physical activity. IR = interpersonal relationships, SM = stress management, SG = spiritual growth, N = nutrition. Variable coding: age (≥75 years = 1, and <75 years = 0); Gender (male = 1, and female = 0); Education level (primary school or lower = 1, middle school = 2, and high school or higher = 3); marital status (Married = 1, and single/widowed/divorced = 0); Monthly income (below 1000 Yuan = 1, 1000–2000 Yuan = 2, and 2000 Yuan or above = 3); BP (normal BP = 1, Grade 1hypertension = 2, Grade 2 hypertension = 3, and Grade 3 hypertension = 4).

such as walking, jogging, square dancing, and tai chi. Movement frequency, time, and intensity can be summarized as *One, Three, Five, and Seven*: One, exercising at least once daily; 3, exercising for more than 30 minutes each time; 5, exercising at least 5 times a week; and 7, exercising at moderate intensity (reaching the heart rate of 170—age). On the other hand, through enhancing the educational programs and propaganda, health responsibility must be taken into consideration to improve the elderly hypertensive patients' health behavior.

In this study, the participants had moderate HRQOL total scores (54.36 ± 21.18), which was consistent with previous studies in Iran.[33,34] Among the HRQOL subscales, for these elderly people with hypertension, role-emotional domain mean score was far below average, vitality domain was a little below average, social functioning and general health domains were a little above average, while other domains were far above average. Moreover, the PCS score was higher than MCS ($P < .05$). The role-emotional scores for these participants were the lowest, which was in consistent with other studies.[35,36] An interpretation might be related to the clinical symptoms of hypertension or the side effects of antihypertensive drugs. Hypertensive patients often feel headache, dizziness, palpitation, anxiety, and depression, which cut down the amount of time they spent on work or other activities, accomplished less than they would like, and did not do work or other activities as carefully as usual.

In this study, Pearson correlation analysis showed that HPLP-II and its subscales were positively correlated with HRQOL in the elderly hypertensive patients, which indicated the better HPL lead to higher quality of life in these elderly patients with hypertension. There was little evidence about the influence of HPL on HRQOL among elderly hypertensive patients in the past. However, the effects had been verified in other diseases. Previous studies have shown that health behavior and quality of life are positively correlated in the elderly people, undergraduate students, and stroke patients.[20,33,37,38] Considering different correlation degrees of HPL with HRQOL, the hierarchical regression analysis with stepwise method was further performed. The results showed that 6 subscales of HPLP-II represented significant influencing factors for HRQOL in the elderly patients with hypertension, including health responsibility, physical activity, interpersonal relationships, stress management, spiritual growth, and nutrition, which explained for 36.5% of the HRQOL variance (adjusted $R^2 = 0.685$, R^2 change $= 0.365$; $P = .00$). According to the standardized regression coefficients, the influencing factors of HRQOL were present in the following order: health responsibility, physical activity, interpersonal relationships, stress management, spiritual growth, and nutrition. Hence, health responsibility and physical activity were found to be the most important influencing factor for HRQOL. A previous cross-sectional survey of 343 Chinese retired workers has revealed that health responsibility, physical activity, and spiritual growth represent stronger predictors of HRQOL.[20] A study in Iran has demonstrated that physical activity represents the significant predicting factors for HRQOL in the elderly people. Moreover, other proofs have suggested that community-based health education and physical activity could enhance the HRQOL in the elderly.[39,40] Therefore, HPL managements (such as health responsibility and physical activity) should be taken into consideration as community-based interventions in future, to improve HRQOL among the elderly with hypertension.

There were also some limitations of this study. First, this was a cross-sectional study with relatively small sample size. Further in-depth studies with large sample size are still needed in the future to determine the effectiveness of HRQOL. Secondly, the survey was conducted in a single community, and selection bias might be present, which may strict the application of the results to broader populations.

In conclusion, HPL and HRQOL were both relatively poor in the elderly people with hypertension from a community health service center in Hengyang, Hunan, China. Better HPL in the elderly hypertensive patients was associated with higher HRQOL. Moreover, health responsibility and physical activity were significant predicting factors for HRQOL. Our findings suggest that, HPL managements should be taken into consideration as essential components in the community-based intervention. Health responsibility and physical activity must be included as HPL interventions to improve HRQOL among the elderly people with hypertension.

Author contributions

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