Original Article

The effect of diet and exercise on climacteric symptomatology

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Background and Objectives: This study aimed to explore the effects of health education, diet and exercise interventions on the climacteric symptoms of perimenopausal women. **Methods and Study Design:** A total of 78 perimenopausal women in a gynaecological clinic from June 2018 to August 2018 were recruited and divided randomly into the following three groups: A (centralised education alone), B (health education + personalised diet guidance) and C (health education + personalised diet guidance + intensive resistance exercise). The changes in diet score, exercise habits and climacteric symptoms were observed after 3 months. **Results:** There was no difference between groups in food intake scores and total scores before the interventions. After the interventions, the total diet score of group C was higher than in groups A and B, and the red meat score decreased significantly ($p<0.05$). After the interventions, the number of resistance exercises per week in group B increased significantly. The number of aerobic exercises and resistance exercises per week in group C also increased significantly ($p<0.05$). The total score for climacteric symptoms in the three groups decreased significantly before and after the interventions ($p<0.05$), and the scores for insomnia and sexual disorders in group A decreased significantly ($p<0.01$). In group B, there was a significant effect on the improvement of moderate and severe climacteric symptoms ($p<0.01$), and the scores for seven other common symptoms (i.e. hot flushes, sweating, irritability, depression, suspicion, fatigue, joint pain, muscle pain, palpitations and sexual disorders) decreased significantly ($p<0.05$). **Conclusions:** Centralised health education, personalised dietary guidance and intensive resistance exercise improved the menopausal symptoms experienced by perimenopausal women; the most indicative changes of this improvement were obtained using combined health education and personalised dietary guidance.

Key Words: perimenopause, health education, dietary intervention, resistance movement, climacteric symptoms

INTRODUCTION

Perimenopause refers to the signs of ovarian decline until 1 year after a woman's last menstruation and occurs mostly between the ages of 45 and 55.[1] Due to ovarian decline, a marked decrease in oestrogen levels and disturbed neurological dysfunction, this phase can be characterised by menstrual cycle disorders, menopause, hot flushes, perspiration, palpitations, dizziness, mood swings or depression, insomnia, forgetfulness and other symptoms.[2] Perimenopause creates psychological burdens and problems both for those affected and for others, seriously impacting both work and daily life. This phase is also associated with an increased risk for diabetes, coronary heart disease, hypertension and insomnia. Chronic disease can be prevented through exercise and diet, which is one of the most effective approaches among all potential interventions.[2] Previous studies showed that exercise therapy provided clinical benefits for menopausal women in terms of symptom relief.[3,4] However, there are few studies on the effects of dietary intervention and combined diet–exercise intervention on menopausal symptoms in perimenopausal women. Therefore, this study explores

different intervention methods for the alleviation of menopausal symptoms and the healthcare of perimenopausal women.

METHODS

Participant recruitment

From June to August 2018, a total of 78 perimenopausal female patients in the gynaecological outpatient clinic of Beijing Pinggu District Hospital were recruited, with a mean age of 48.65±3.06 years. According to body mass index measurements, the patients were divided into two groups: a normal weight group and an overweight/obese group. All observers in the two groups were numbered

and divided randomly between groups A, B and C. Group A was a centralised education group, with 18 cases. Group B was a personalised diet group, with 28 cases. Group C was a personalised diet + resistance exercise group, with 32 cases. The study was reviewed by the ethics committee of the hospital, and all observers provided signed informed consent.

Ethics approval and consent to participate

This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Beijing Friendship Hospital, Capital Medical University. Written informed consent was obtained from all participants

Inclusion and exclusion criteria

The inclusion criteria were women (1) with a clear diagnosis of perimenopause, (2) without systematic nutrition education, (3) who could move unassisted and (4) with normal communication ability. The exclusion criteria were women (1) who had taken weight-loss drugs within the last 3 months, (2) with myocardial infarction, unstable cardiovascular disease or other diseases in the past 3 months, (3) with chronic renal insufficiency and renal failure, (4) with insulin-treated diabetes, (5) with upper or lower limb fractures or other exercise contraindications in the past 3 months and (6) with neuromuscular diseases or drugs affecting neuromuscular function.

Intervention methods

Group A underwent routine gynaecological diagnosis and treatment, with dietitians, pharmacists and nurses teaching the nutritional and metabolic characteristics of menopause, the significance and principles of dietary intervention, the selection of exercise methods and other matters, including drug selection and administration methods. Group B was required to participate in all centralised education, implement personalised diet plans according to the Dietary Approaches to Stop Hypertension (DASH) diet principle, keep a diet diary for 3 days a week, upload the diary to WeChat on time and modify unreasonable diets at any time. Additionally, patients were provided with a diet demonstration meal once a month. Group C also underwent centralised education and personalised dietary intervention, and they received on-site training and guidance from professional sports coaches.

Three months after the interventions, the changes in menopause symptoms were reviewed. Both patient information and the groups were blinded to the professional coaches and observers.

Menopause symptom score

Menopause-related symptoms include hot flushes and perspiration, sleep disturbances, paraesthesia, mood swings, depression, suspicion, fatigue; bone, joint, and muscle pain; headache, dizziness, palpitations, blood pressure fluctuations, skin sensations, dyspareunia and infections of the urinary tract and vagina. The severity of the menopause symptoms was classified using modified Kupperman scoring, which rated 6 as normal, 6~<15 as mild, 16~<30 as moderate and >30 as severe.[5]

Diet score

This study modified the DASH dietary scoring method to establish diet scores based on the 13 major food categories.[6] The main guidelines were to consume sufficient fruits, vegetables and low-fat milk products; ensure a moderate intake of nuts, beans, poultry, fish, shrimp, whole grains and potatoes; reduce the intake of fat and animal offal and control the intake of salt, red and processed meat, desserts and sweet drinks. For fruits, vegetables, nuts and legumes, low-fat dairy products and whole grains, the intake frequency was given as a minimum of 0 and a maximum of 4. The average was given 1–3 points, respectively. For sweet drinks, red meat, processed meat, meat fat and animal offal, those with the lowest intake frequency and salt intake scored 4 points. Those with the highest consumption frequency and salt intake scored 0 points, with 1~3 points as the average Finally, the diet score was obtained as the total score of the 13 food categories.

Sports mode guided by on-site sports coaches

Resistance exercises were conducted every Monday and Thursday for 30-40 minutes. The exercises were structured as follows: preparation for 5 minutes → upper limb dumbbell weight series for 15 minutes → leg squats/walking squats for 15 minutes → stretching for 5 minutes. Aerobic exercises were performed on more than 2 days a week; participants walked or jogged 8,000–10,000 steps every day and engaged with a daily WeChat group to record the type and frequency of exercise.

Observation indicators

General data included name, age, occupation, education background, education level, height, weight, production status, menopause status, dietary score and exercise status. The medical history of any hypertension, diabetes and hyperlipidaemia, and liver or kidney disease was sought, and medication was documented. Height (m) was measured using a height stadiometer (Jiangsu Suhong Medical Device Co., Ltd., license no. 00000600), without shoes and after strict calibration. The results were accurate to 0.1 cm. Weight was measured using a weight meter (Jiangsu Suhong Medical Equipment Co., Ltd., license no. 00000600), with underwear and without shoes, to measure the patient's fasting weight. The result was accurate at 0.05 kg.

Statistical methods

Data were processed using SPSS 17.0 statistical analysis software. All measurement data were expressed as mean ± standard deviation. Measurement-based data were compared using a one-way analysis of variance between multiple groups. A paired t-test was used for the measurement data before and after the interventions, and a Chi-squared test was used for count and classified data. A value of $p < 0.05$ was considered a statistically significant difference.

RESULTS
General information

There was no statistical difference in age, education background, occupation, number of combined cases, sur-

gical history, work pressure, number of pregnancies and medication in groups A, B and C before the interventions ($p>0.05$). The differences were statistically significant in terms of menstrual counts ($p<0.05$) (Table 1).

Comparison of different dietary scores before and after intervention

Before the interventions, there was no significant difference in categorical or total food intake scores. After the interventions, the total DASH diet score and the scores for the intake of nuts, soy products, low-fat milk, whole grains, poultry, fish and shrimp white meat, salt and desserts were significantly improved ($p<0.05$). Before and after the interventions, the fruit and processed meat food scores were not significantly different between the three groups ($p>0.05$). Compared with the pre-intervention scores, there were increases in the scores for vegetables in group C, processed meat and sweet drinks in groups B and C, and red meat in group A after the interventions. The red meat intake score was significantly reduced in group C. The fat and visceral scores increased in groups A and B, and the difference was statistically significant ($p<0.05$). Compared with group A, the total DASH diet and vegetable intake scores increased significantly in groups B and C. The low-fat milk intake score increased significantly in group B. In group C, the scores for nuts, whole grains and desserts were significantly improved. In Group C, the red meat score was significantly decreased, and the frequency of red meat consumption was increased. The difference was statistically significant ($p<0.05$). After the intervention, the total diet score in group C was higher than in groups A and B, with a statistically significant difference ($p<0.05$) (Table 2).

Comparison of the weekly number of aerobic and resistance exercises before and after different interventions
After the interventions, there was no significant increase in weekly aerobic exercise in groups A and B and no significant change in the number of resistance exercises in group A. However, there was significantly increased weekly aerobic exercise in group C and a significantly increased number of weekly resistance exercises in groups B and C, with a statistically significant difference ($p<0.05$). Comparing the three intervention methods, the number of aerobic and resistance exercises in group C was higher than in groups A and B, and the difference was significant ($p<0.05$) (Table 3).

Effect of intervention methods on different menopause symptom scores

In group A, the insomnia score decreased significantly after the intervention, with a significant difference ($p<0.01$). The intervention may have impacted the score for the reduction of formication ($p=0.059$). In group B, the scores for seven other common symptoms (i.e. hot flushes and perspiration, agonism, depression, suspicion, fatigue, muscle pain, palpitations and sexual disorders) were significantly decreased, and the difference was statistically significant ($p<0.05$). The intervention improved moderate to severe symptoms of menopause ($p<0.01$). In group C, the symptom scores for hot flushes, perspiration and sexual disorders were significantly reduced, and the

difference was significant ($p<0.05$). However, other symptoms did not improve significantly.

The total score for menopause symptoms was significantly reduced after the three methods of intervention, and the difference was statistically significant ($p<0.05$) (Table 4).

Effect of three different interventions on different types of menopause symptoms

As shown in Table 5, in group A, the numbers of cases of hot flushes and perspiration, insomnia, excitement, depression, fatigue and formication were decreased. In diet management group B, the number of cases of formication increased, while the number of instances of the other 12 common symptoms was reduced, among which, hot flushes and perspiration, depression, fatigue, palpitations and sexual disorders were reduced by 13, 5, 6, 7 and 7 instances, respectively. The number of cases of hot flushes and perspiration symptoms decreased most significantly. After the intensive resistance exercise intervention in group C, the number of hot flushes, perspiration, agonism, fatigue, myalgia, headache, palpitations and sexual disorders was reduced, although the number of cases of seven other symptoms was not.

All three interventions reduced the occurrence of hot flushes, perspiration, excitement and fatigue. Diet and resistance exercise interventions reduced the occurrence of bone, joint and muscle pain, headache, palpitations and sexual disorders. None of the interventions significantly improved vertigo.

DISCUSSION
Characteristics of menopause symptoms
According to a cross-sectional study in three communities in Shanghai, Li et al[7] reported a general prevalence of perimenopause syndrome of 10.92%. Suliga et al[8] found that the detection rate of metabolic syndrome was 42.2% in perimenopausal women. The results of this survey showed a higher detection rate of perimenopause syndrome, which may be related to the small number of study cases and the study population, which was based on gynaecological outpatient clinics. The study showed that the main perimenopause symptoms were fatigue, mood swings, insomnia, bone and joint pain, headache, dizziness and palpitations. Bone and joint pain and fatigue occurred more frequently.[9-11] The results of this survey study are different from those of previous research. Excitation, hot and damp sweating, joint and muscle pain, fatigue, sexual disorders and insomnia were the highest-incidence symptoms, which may be related to the different living environments, behaviours and health conditions of people in different regions. Several studies have shown that arthralgia is a common symptom in this population, and joint myalgia is one of the manifestations of osteoporosis; this suggests that the incidence of osteoporosis in perimenopausal women is higher, and sufficient attention should be given to this matter.

Personalised diet intervention improves menopause symptoms
Food plays a fundamental role in health and well-being. The DASH diet proposed in the United States in 1997

Table 1. Comparison of general data ($\bar{x}\pm SD$)

Group	Case	Age (mean±s)	Education (junior college or below/ Bachelor degree or above)	Occupation (medical/ non-medical)
A	18	49.17±3.22	9/19	4/14
B	28	48.93±3.04	12/16	11/17
C	32	48.13±3.00	18/14	14/18
F(X^2)		0.839	1.071[†]	2.369[†]
p value		0.436	0.585	0.306

Group	Case	Number of combined diseases	Surgical history (n)	High working pressure (n)	Whether menstruation is regular (n)	Number of pregnancies
A	18	11 (61.1)	5 (27.8)	5 (27.8)	7 (38.9)	2.61±1.539
B	28	17 (60.7)	9 (32.1)	13 (46.4)	20 (71.4)	2.57±1.136
C	32	17 (53.1)	10 (31.3)	18 (56.3)	25 (78.1)	2.31±1.176
X^2 price		0.464	0.104	3.759	8.426	0.457
p value		0.793	0.949	0.153	0.015	0.635

Investigation topic	Lipid lowering drugs		Blood pressure drugs (n=28)		Antidiabetic drugs (n=32)		Sex hormone	
	Before the observation (Yes / No)	After observation (Yes / No)	Before the observation (Yes / No)	After observation (Yes / No)	Before the observation (Yes / No)	After observation (Yes / No)	Before the observation (Yes / No)	After observation (Yes / No)
control group	3/15	0/18	3/15	4/14	1/17	1/17	1/17	2/16
Diet group	1/27	1/27	6/22	6/22	0/28	0/28	2/26	3/25
Comprehensive group	2/30	0/32	2/30	2/30	1/31	1/31	3/29	3/29
X^2	2.494	2.072	3.185	3.846	1.978	1.978	0.259	0.048
p value	0.287	0.355	0.203	0.146	0.372	0.372	0.878	0.976

[†]Chi-square value.

Table 2. Comparison of scores of different diet types in different intervention methods (($\bar{x}\pm$SD), score) [†]

Group	Example number	Low fat milk Before the intervention	Low fat milk After the intervention	Whole grain Before the intervention	Whole grain After the intervention	White meat such as poultry, fish and shrimp Before the intervention	White meat such as poultry, fish and shrimp After the intervention	Table salt Before the intervention	Table salt After the intervention
A	18	0.94±1.626	2.5±1.618[†]	1.33±1.283	2.11±1.183[†]	0.89±0.676	1.56±0.922[†]	2.22±1.166	2.94±0.802[†]
B	28	0.54±1.071	3.14±1.177[†‡]	1.39±0.916	2.71±0.976[†]	1.18±1.092	2.04±0.962[†]	1.57±0.879	2.96±0.508[†]
C	32	0.81±1.203	3.00±1.047[†]	1.25±0.950	3.06±0.840[†‡]	1.25±1.191	2.00±0.95[†]	1.94±1.216	3.31±0.896[†]
F/x^2		1.019	1.756	0.871	8.757	0.627	4.476	2.035[§]	7.552
P		0.601	0.416	0.647	0.013	0.731	0.107	0.139	0.023

Group	Example number	Sweet drink Before the intervention	Sweet drink After the intervention	Red meat Before the intervention	Red meat After the intervention	Processing meat Before the intervention	Processing meat After the intervention	Fat meat and animal internal organs Before the intervention	Fat meat and animal internal organs After the intervention
A	18	3.72±0.575	3.94±0.236	1.94±1.305	2.44±0.784[†]	3.83±0.514	4.0±0.000	3.56±0.511	3.94±0.236[†]
B	28	3.71±0.535	3.93±0.262[†]	2.04±0.999	2.21±0.787	3.71±0.659	4.0±0.000[†]	3.64±0.731	3.93±0.262[†]
C	32	3.59±0.615	3.68±0.336[†]	2.31±1.091	1.84±0.920[†‡]	3.44±0.982	4.0±0.000[†]	3.59±0.837	3.91±0.39
F/x^2		1.013	0.848	0.782[§]	5.015	3.628	-	1.434	0.044
P		0.603	0.654	0.461	0.081	0.163	-	0.488	0.978

Group	Example number	Fruit Before the intervention	Fruit After the intervention	Vegetables Before the intervention	Vegetables After the intervention	Nut Before the intervention	Nut After the intervention	Bean products Before the intervention	Bean products After the intervention
A	18	3.33±1.029	3.83±0.707	2.44±0.705	2.11±0.471	1.06±1.162	2.56±1.338[†]	1.06±1.11	2.17±1.098[†]
B	28	3.57±0.836	3.68±0.670	2.43±0.742	2.57±0.69[‡]	1.18±1.249	2.89±1.166[†]	1.36±0.951	2.96±1.036[†]
C	32	3.66±0.827	3.72±0.683	2.38±0.907	2.781±0.659[†‡]	1.50±1.368	2.59±1.241[†]	1.53±1.191	3.03±0.897[†‡]
F/x^2		1.502	1.844	0.324	11.778	0.836[§]	1.080	2.110[§]	8.458
P		0.472	0.398	0.851	0.003	0.437	0.583	0.348	0.015

Group	Example number	Mousse Before the intervention	Mousse After the intervention	Total points Before the intervention	Total points After the intervention
A	18	2.78±0.943	3.44±0.705[†]	29.11±5.969	37.56±4.355[†]
B	28	3.18±1.090	3.69±0.723[†]	29.5±5.699	40.71±3.43[†‡]
C	32	2.81±1.203	3.84±0.369[†‡]	29.66±7.182	40.97±3.177[†‡]
F/X^2		2.954	5.560	0.166[§]	5.951[§]
P		0.228	0.062	0.847	0.004

[†] $p<0.05$ compared with intervention.
[‡] $p<0.05$ compared with group A.
[§] F compared with intervention.

Table 3. Comparison of changes in the number of aerobic and resistance exercises per week before and after intervention ($\bar{x}\pm$SD, times)

Group	Example number	Number of aerobic exercise sessions / week		Number of anti-resistance exercises / week	
		Before the intervention	After the intervention	Before the intervention	After the intervention
A	18	3.61±3.20	3.89±3.18	0.44±1.25	1.28±2.19
B	28	3.07±2.79	3.50±2.46	0.00±0.000	1.21±1.75[‡]
C	32	3.72±2.54	5.66±3.03[§]	0.19±0.535	2.72±1.40[‡§]
F/X²		0.435[†]	4.685	4.536	18.748
p value		0.649	0.012	0.104	0.000

[†]F compared with the intervention; [‡]$p<0.05$ compared with intervention; [§]$p<0.05$ compared with groups A and B.

Table 4. Comparison of menopausal symptoms before and after different intervention methods ($\bar{x}\pm$ s)

Group	Example number	Hot and sweaty		Abnormal sensation		Lose sleep		Easy to excited	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
A	18	4±3.630	2±3.144	1.11±1.711	0.72±1.179	1.89±1.451	0.94±1.392[‡]	2.11±1.278	1.78±1.353
B	28	5.71±3.343	2±2.776[†]	1.00±1.587	0.57±0.920	1.57±1.665	1.07±1.386	2.07±1.676	1.39±1.315[†]
C	32	4.75±4.119	3.03±2.845[‡]	1.63±1.862	1.13±1.314	1.75±1.586	1.38±01.264	1.81±1.378	1.47±1.344
F		1.206	1.200	1.085	1.074	0.231	0.707	0.332	0.485

Group	Example number	Depression, suspicion		Circumgyration		Weary		Bone and joint pain, muscle pain	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
A	18	0.50±0.618	0.28±0.575	0.78±0.808	0.72±0.752	0.67±0.594	0.61±0.699	1.06±0.873	1.00±0.907
B	28	0.43±0.504	0.29±0.535	0.68±0.67	0.64±0.731	1.14±0.848	0.68±0.723[†]	1.14±0.848	0.82±0.723[†]
C	32	0.47±0.671	0.47±0.671	0.44±0.669	0.44±0.564	0.88±0.751	0.69±0.592	0.97±0.74	0.76±0.762
F		0.081	0.899	1.604	1.243	2.280	0.083	0.344	0.591

Group	Example number	Headache		Cardiopalmus		Formication		Sexual life disorder formication	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
A	18	0.67±0.840	0.56±0.616	0.50±0.707	0.39±0.502	0.28±0.575	0.00	1.78±1.927	3.44±2.812[‡]
B	28	0.39±0.567	0.25±0.518	0.68±0.723	0.29±0.460[†]	0.14±0.448	0.14±0.356	1.86±1.715	1.18±1.744[†]
C	32	0.59±0.665	0.56±0.759	0.53±0.567	0.50±0.672	0.28±0.634	0.28±0.581	2.06±1.933	1.84±2.157
F		1.076	2.050	0.532	1.074	0.539	2.526	0.163	9.314[†]

Group	Example number	Urinary infection		Total score of menopausal symptoms (score)		Moderate to severe menopause (n)	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
A	18	0.22±0.647	0.17±0.514	15.56±7.67	12.61±7.53[†]	8 (44.4)	7 (38.9)
B	28	0.71±1.243	0.46±0.999	17.54±8.17	9.79±7.11[†]	16 (57.1)	5 (17.9)[‡]
C	32	1.06±1.684	0.97±1.425[§]	17.22±10.10	13.5±8.78[†]	16 (50)	14 (43.8)
F/X²		2.242	6.297	0.295	1.716	0.743	4.830

[†]$p<0.05$ and [‡]$p<0.01$ compared with pre-treatment.
[§]$p<0.05$ compared with group A.

Table 5. Comparison of menopausal symptoms among the three different interventions: n (%)

Symptom	A group n (%)	B group n (%)	C group n (%)	Amount to n (%)
Hot and sweaty				
Before the observation	11 (61.1)	24 (85.7)	22 (68.8)	57 (73.1)
After observation	6 (33.3)	11 (39.3)	20 (62.5)	37 (47.4)
Abnormal sensation				
Before the observation	6 (33.3)	9 (32.1)	15 (46.9)	30 (38.5)
After observation	6 (33.3)	8 (28.6)	16 (50)	30 (38.5)
Lose sleep				
Before the observation	13 (72.2)	16 (57.1)	20 (62.5)	49 (62.8)
After observation	7 (38.9)	12 (42.9)	20 (62.5)	39 (50%)
Easy to excited				
Before the observation	15 (83.3)	20 (71.4)	23 (71.9)	58 (74.4)
After observation	13 (72.2)	17 (60.7)	20 (62.5)	50 (64.1)
Depression suspicion				
Before the observation	8 (44.4)	12 (42.9)	12 (37.5)	32 (41.0)
After observation	4 (22.2)	7 (25)	12 (37.5)	23 (29.5)
Circumgyration				
Before the observation	10 (55.6)	16 (57.1)	11 (34.4)	37 (47.4)
After observation	10 (55.6)	15 (53.6)	13 (40.6)	38 (48.7)
Weary				
Before the observation	11 (61.1)	21 (75)	21 (65.6)	53 (67.9)
After observation	9 (50)	15 (53.6)	20 (62.5)	44 (56.4)
Bone and joint pain, muscle pain				
Before the observation	12 (66.7)	20 (71.4)	23 (71.9)	55 (70.5)
After observation	12 (66.7)	18 (64.3)	18 (56.3)	48 (61.5)
Headache				
Before the observation	8 (44.4)	10 (35.7)	16 (50.0)	34 (43.6)
After observation	9 (50)	6 (21.4)	13 (40.6)	28 (35.9)
Cardiopalmus				
Before the observation	7 (38.9)	15 (53.6)	16 (50)	38 (48.7)
After observation	7 (38.9)	8 (28.6)	13 (40.6)	28 (35.9)
Formication				
Before the observation	4 (22.2)	3 (10.7)	6 (18.8)	13 (16.7)
After observation	0 (0)	4 (14.3)	7 (21.9)	11 (14.1)
Sexual life disorder				
Before the observation	11 (61.1)	19 (67.9)	22 (68.8)	52 (66.7)
After observation	14 (77.8)	12 (42.9)	18 (56.3)	44 (56.4)
Urinary infection				
Before the observation	2 (11.1)	8 (28.6)	12 (37.5)	22 (28.2)
After observation	2 (11.1)	6 (21.4)	13 (40.6)	21 (26.9)

was conceptualised to prevent and manage hypertension, emphasising the merits of dietary patterns in blood pressure regulation.[12,13] Nutrition intervention seeks to enhance dietary patterns, which has more outcome predictive capacity than any individual food or food component insofar as quality of life, physical and mental health and survival are concerned.[14]

The present study showed that the total DASH dietary score improved after using the combined strategy of health education, personalised diet guidance and intensive resistance exercises. The selection frequency of nuts, soy products, low-fat milk, whole grains, poultry, fish and shrimp, and white meat increased. The types of food being consumed also increased. Nutritional intake became more comprehensive and diverse, with relatively more nutrient-dense foods. After the personalised dietary interventions, the number of patients with the 12 most common symptoms was reduced, as were the scores for hot flushes, sweating, excitability, depression, fatigue, muscle pain, palpitations and sexual disorders. The personalised dietary interventions reduced moderate to severe menopause symptoms ($p<0.05$).

Dietary phytoestrogens play a role in the manifestation of menopause symptoms. Plant food isoflavonoids (i.e.

isoflavones and coumestans), lignans and resorcyclic acid lactones are oestrogenic.[15] Therefore, food intake patterns may mitigate menopausal oestrogen deficiency.[16] The cereal and legume consumption patterns of Chinese diets[17] may be relevant to menopausal symptomatology among women who do or do not consume such traditional diets. However, differences in the menopausal symptomatology for soy-based diets are inconsistent.[16-18] In this respect, larger studies among diverse food cultures that consider food cultural heterogeneity would be informative.

Effects of exercise on menopause symptoms
Menopausal women adhere to guidelines on outdoor exercise, sun exposure and appropriate exercise to regulate nerve function and promote body metabolism. This group should perform at least 150 minutes weekly of moderate-intensity aerobic exercises, such as walking, jogging, cycling, swimming and dancing, and they should perform muscle tension exercises at least 2 to 3 times a week to increase muscle mass and strength.[19] Hao et al,[20] Qiu et al[21] and Ma et al[22] observed the rehabilitation effect of Baduanjin exercise and its impact on people's quality of life. The results showed that the physical symptoms and

quality of life of perimenopausal women in the practice group were improved, suggesting that Baduanjin exercise can play an important role in improving the physical and mental status of menopausal women. Qiu[23] and Zhao et al[24] found that through yoga, women's lung capacity, sleep quality, degree of anxiety, autonomic nerve and mental psychology along with aspects of reproduction, bone, joints and cardiovascular health were all improved.

The present study showed that there was no increase in the number of aerobic exercises and resistance exercises per week in group A. There was an increase in resistance exercises and no increase in aerobic exercises in group B. In group C, the number of both aerobic exercises and resistance exercises increased every week, which was higher than in groups A and B. The improvement in menopause symptoms varied after the interventions in the three groups. Consistent with the results of Cao Min's study,[25] different exercise methods, intensities and frequencies have different effects on menopause symptoms, indicating that regular exercise may target an improvement in different symptoms of menopause since individuals respond differently to the same amount, frequency and form of exercise.

The effects of centralised education on menopause symptoms
Perimenopausal women can improve their awareness of prevention and healthcare (especially the relevant knowledge of perimenopause), maintain an optimistic attitude, develop good living habits, relax and participate in more social activities. Family members can understand and care for women during their transition through perimenopause. Community group information sessions about women's health, regular health checks and recreational and sporting activities may enable women to feel self-valued by participating in such activities.[26]

The present study found that the total DASH diet score improved with centralised education, although no particular exercise intervention was an identifiable contributor to reducing menopause symptoms. The number of cases of hot damp sweating, insomnia, excitement, suspicion, fatigue and formication decreased, among which, the score and number of sexual disorders increased. The number of cases of hot damp sweating, insomnia, excitement, suspicion, fatigue and the sensation of ants walking on the skin decreased, while the number of sexual disorders and sexual disorders increased. Systematic and comprehensive nutrition education would appear to improve women's understanding of perimenopause and encourage personal behavioural changes that might ameliorate menopause symptoms.

This study has some limitations. It calculated the DASH diet score according to different food intake frequencies, and no specific food intake was scored except for salt. No energy or nutrient intakes were recorded or analysed. Additionally, the scoring standard and the design scheme need to be improved further. In this study, the frequency, method and time of exercise were recorded via a WeChat punching form, and no information management system or special equipment was introduced to evaluate the compliance and effectiveness of the exercise interventions, which may have affected the accuracy of

the evaluation. A longer observation period and an increased sample size with wider representation would clarify the outstanding uncertainties evident in the present investigation.

Conclusion
In summary, centralised health education together with personalised dietary guidance and strength training have overall merit in the mitigation of perimenopausal symptomatology, although their synergistic potential requires further investigation.

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