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博 士 論 文

The cognition and behavior of lifestyle-related diseases prevention in middle-aged women and their association with physical assessment

（中高年女性における生活習慣病予防に関する認識・行動と身体評価との関連）

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<center>Abstract</center>

Backgrounds: Lifestyle-related diseases have been increasing through rapid changes in lifestyle, which might be contributable to disturbance of the QOL (Quality of Life) and the high prevalence of three major illnesses. Healthcare during and after menopause may be an important priority for healthy life in middle-aged women. We conducted the present study to examine the cognition and behavior of lifestyle-related disease prevention, and physical determinants in middle-aged women, and compared the results along for each life stage.

Methods: The subjects comprised women aged between 40 to 74 years who had received a specific health checkup (n=522). The survey was conducted using an anonymous self-reporting questionnaire. The questionnaire consisted of four components (subject characteristics, lifestyle, knowledge of metabolic syndrome, and menopausal features and evaluation of menopause). We also asked each of the respondents to transfer the results of their specific health checkups, (height, weight, BMI, abdominal circumference, blood pressure, lipids (TG, LDL-C and HDL-C), blood glucose). The survey was conducted between May and December 2016.

Results: The mean age was 64.1 ± 8.9 years (mean ± SD). The percentages of subjects in their 40s and 50s who suffered from strong or moderate stress was more than 60%. Sleep satisfaction was greater among the higher age brackets. There were some differences in lifestyle such as work, sleep and exercise among each age bracket. The higher the age bracket, the higher the knowledge and cognition of lifestyle-related diseases. Preventive behavior was also more prevalent among the higher age brackets. There was some correlation between the cognition and behavior of lifestyle-related disease prevention and physical assessment in each age bracket among middle-aged women.

Conclusion: It was suggested that the information on lifestyle-related diseases should be provided from the younger generation and along with each age bracket among middle-aged women.

Keywords:
post-menopause, each age bracket, lifestyle, physical and laboratory examination

1. Introduction

Recently, the average life expectancy of Japanese women has reached 87 years, while the unhealthy period, defined as being in a dependent living situation, has risen to over 12 years [1,2]. It is well known that, in Japan, lifestyle-related diseases such as diabetes or hypertension have been increasing due to rapid changes in lifestyle, which might be contributable to the disturbance of QOL and the high prevalence of three major illnesses (malignant neoplasms, heart disease and cerebrovascular disease) in middle-aged women [3,4]. Healthcare during and after menopause may be an important priority for healthy life in middle-aged women. Recent studies have indicated the effects of education programs on dietary habits and exercise on the prevention of lifestyle-related diseases [5-9]. As for knowledge and recognition of lifestyle-related disease prevention, these were enhanced through medical checkups and health education. Specific health checkups for the prevention of lifestyle-related diseases began in 2008 in Japan [10]. It is possible that there are great differences in lifestyle and metabolic and endocrine status, as well as cognitive behavior among women in each life stage.

However, there are no reports demonstrating whether cognitive behavior on the prevention of lifestyle-related diseases affects physical determinants or measurements in each life stage among middle aged women.

Thus, we conducted the present study to examine the cognition and behavior of lifestyle-related disease prevention, and physical determinants (height, weight, BMI, waist circumference, blood pressure, lipids, blood glucose) in middle-aged women, and compared the results for each life stage.

2. Materials and Methods

2.1 Subjects

The subjects were women aged 40 to 74 years who had received specific health checkups at Hyogo Prefecture Prevention Medicine Association. A total of 1,748 questionnaires were handed out; 585 were collected (a collection ratio of 33.5%), among which 522 were analyzed (a ratio of valid responses of 29.9%). These included responses from 63 women whose ages were unknown. Oophorectomy and hormone therapy were excluded from the study.

2.2 Method of survey

The survey was conducted using an anonymous self-reporting questionnaire. Questionnaires were directly distributed to the subjects during waiting times for their health checkups and were collected by regular postal mail. The questionnaire concerned the patients' health conditions. The survey was conducted between May and December 2016.

2.3 Details of survey

Questionnaire survey

The questionnaire comprised four components:

(1) Subject characteristics (age, occupation, marriage, family members, nursing care, parity, menstrual cycle, illnesses, family illnesses, weight gain after 20 years, recent weight gain, stress, stress coping);

(2) Present lifestyle (sleep behavior (satisfaction, staying awake, falling sleep), exercise behavior (more than 30 minutes at a time), eating behavior (skipping breakfast, dinner two hours before going to bed, late-night snacks, 11-item Food Diversity Score Kyoto: FDSK-11[11]));

(3) Knowledge of metabolic syndrome menopausal features, and

(4) Evaluation of menopause using the Simple Menopausal Index (SMI) [12].

The subjects were asked about their stress levels on a scale of 1 to 10, with 1–3 being "weak," 4–6 being "moderate," and 7 or more being "strong," The subjects' ability to cope with stress was asked about with a "Yes" or "No" answer. The SMI is a simple scale with demonstrated validity for measuring general menopausal symptoms in consideration of the peculiarities of Japanese people. The scale consists of the following 10 items: items (1) to (4) mainly assess physical symptoms (hot flushes, perspiration, cold feeling and palpitations); items (5) to (8) chiefly evaluate mental symptoms (insomnia, irritation, depression and headaches); and items (9) and (10) assess general symptoms, including shoulder/joint pain and fatigue. The answer to each question was described using a 4-point scale as "absent," "mild," "moderate" or "severe."   Scores of 0 to 14 were then assigned to each answer. The SMI score was calculated as the sum of these scores, ranging from 0 to 100. In the present study, on the basis of the SMI score and the severity of climacteric disturbance, women with scores of 0–25 points were classified as "low," and those with scores of 51–100 points were classified as "high," and analysis was conducted.

Physical and laboratory examination

We asked each of the respondents to transfer the results of their specific health checkups (height, weight, BMI, abdominal circumference, blood pressure, lipids (TG, LDL-C and HDL-C), blood sugar).

2.4 Statistics

SPSS23.0J software was used for statistical analysis. The subjects were divided to four age brackets—40s, 50s, 60s and 70s—and compared in terms of their cognition and behavior of lifestyle-related disease prevention, and the physical determinants of the four groups. In the analyses, independence was tested using the chi-square test, while differences in the mean between the four groups were

determined using the t-test.　In all cases, P values of > 0.05 were considered statistically significant.

2.5 Ethical consideration

This study was approved by the Ethical Review Committee of Kobe University Graduate School of Health Sciences in March 2016.

3.　Results

3.1 Subject characteristics

Table 1 shows the characteristics of the subjects.　The mean age was 64.1 ± 8.9 years (mean ± SD).　Of the total of 522 subjects, the percentages of those in the 40s, 50s, 60s and 70s age brackets were 11.1% (n=58), 11.7% (n=61), 46.7% (n=244) and 30.5% (n=159), respectively.

With regard to occupation, the percentages of part-time workers in their 40s and 50s were 59.6% (n=33) and 59.0% (n=36), respectively, while the percentages of housewives in their 60s and 70s were 67.2% (n=164) and 76.1% (n=121), respectively.　The mean age for menopause was 51.1 ± 3.5 years.　53 subjects (91.4%) in their 40s were pre-menopause, while 51 subjects (83.7%) in their 50s were post-menopause.　With regard to stress, the percentages of subjects who felt strong stress were 39.7% (n=23), 34.5% (n=21), 16.8% (n=41) and 11.3% (n=18) for those in their 40s, 50s, 60s and 70s, respectively.　The percentages of subjects who could cope with their stress were 82.8% (n=43), 77.0% (n=47), 76.6% (n=187) and 83.0% (n=132) for those in their 40s, 50s, 60s and 70s, respectively.　The total SMI scores of the subjects in their 40s, 50s, 60s and 70's were 37.2 ± 18.5, 35.9 ± 19.2, 33.0 ± 20.3 and 29.4 ± 18.9, respectively.

Table 1　Characteristics of subjects (N=522)

n(%)

Subject		40s n=58(11.1%)		50s n=61(11.7%)		60s n=244(46.7%)		70s n=159(30.5%)	
Occupation	Housewife	13	(22.4)	18	(29.5)	164	(67.2)	121	(76.1)
	Part time	33	(56.9)	36	(59.0)	47	(19.3)	13	(8.2)
	Regular employment	5	(8.6)	0	0.0	3	(1.2)	0	0.0
	Self-employment	2	(3.4)	4	(6.6)	9	(3.7)	8	(5.0)
	Other	3	(5.3)	3	(4.9)	17	(7.0)	12	(7.5)
Marriage	Married	43	(74.2)	45	(73.8)	188	(77.1)	106	(66.7)
	Divorced	7	(12.1)	3	(4.9)	14	(5.7)	7	(4.4)
	Never married	6	(10.3)	7	(11.5)	19	(7.8)	12	(7.5)
	Widowed	2	(3.4)	5	(8.2)	22	(9.0)	34	(21.4)
Parity	No	12	(20.7)	16	(26.2)	36	(14.8)	20	(12.6)
	Yes	46	(79.3)	45	(73.8)	204	(83.6)	133	(83.6)
Menopause	No	53	(91.4)	6	(9.8)	0	0.0	0	0.0
	Yes	1	(1.7)	51	(83.7)	229	(93.8)	150	(94.3)
	By surgery	3	(5.2)	3	(4.9)	15	(6.2)	9	(5.7)
Nursing care	No	56	(96.6)	52	(85.3)	201	(82.4)	143	(89.8)
	Yes	2	(3.4)	8	(13.1)	40	(16.4)	11	(7.0)
Stress	None	2	(3.4)	0	0.0	14	(5.7)	10	(6.3)
	Weak　(1～3)	15	(25.9)	18	(29.6)	93	(38.1)	61	(38.4)
	Moderate (4～6)	16	(27.6)	19	(31.0)	70	(28.7)	49	(30.8)
	Strong (over 7)	23	(39.7)	21	(34.5)	41	(16.8)	18	(11.3)
Stress coping	No	9	(15.5)	13	(21.4)	46	(18.9)	22	(13.8)
	Yes	48	(82.8)	47	(77.0)	187	(76.6)	132	(83.0)
Menopause symptoms (SMI scores)/points		58	37.2±18.5	60	35.9±19.2	242	33.0±20.3	156	29.4±18.9

3.2 Lifestyles of subjects

Table 2 shows the lifestyle of the subjects. The mean hours of sleep per day in 40's, 50's 60's and 70's were 6.6 ± 1.2 hours, 6.6 ± 1.1 hours, 6.4 ± 1.0 hours and 6.3 ± 0.9 hours, respectively (mean ± SD). The percentages of subjects who were not satisfied with sleep were 39.7% (n=23) and 36.1% (n=22) in 40's and 50's, while the percentages of subjects who were satisfied with sleep were 44.7% (n=109) and 37.7% (n=60) in 60's and 70's. The percentages of subjects who awaked at night more than twice were 17.2% (n=10), 13.1% (n=8), 21.9% (n=53) and 27.0% (n=43) in 40's, 50's, 60's and 70's, respectively. The percentages of subjects who took 1 hour more before falling in sleep were 15.5% (n=9), 19.7% (n=12), 19.0% (n=46) and 27.1% (n=43) in 40's, 50's, 60's and 70's.

The percentages of subjects who didn't take exercise were 38.0% (n=22) and 36.1% (n=22) in 40's and 50's, while the percentages of subjects who took exercise more than 3 to 4 times a week were 52.5% (n=128) and 69.7% (n=111) in 60's and 70's.

The percentages of subjects who took breakfast every day were 86.3% (n=50), 95.1% (n=58), 95.2% (n=232) and 98.1% (n=156) in 40's, 50's, 60's and 70's, respectively. The percentages of subjects who had late-night snake more than 3 times per week were 22.4% (n=13), 32.8% (n=20), 15.2% (n=37) and 14.5% (n=23) in 40's, 50's, 60's and 70's, respectively.

Table 2 Lifestyle of subjects (Sleep, Exercise, Eating behavior) (N=522)

n(%)

	Subject		40s		50s		60s		70s	
Sleep	Time(hours/day)		48	6.6±1.2	55	6.0±1.1	206	6.4±1.0	135	6.3±0.9
	Satisfaction	No	23	(39.7)	22	(36.1)	76	(31.1)	42	(26.4)
		Yes	15	(25.9)	22	(36.1)	109	(44.7)	60	(37.7)
		Neither	17	(29.2)	13	(21.2)	48	(19.7)	44	(27.7)
	Waking during the night	No waking	22	(38.0)	21	(34.4)	56	(22.8)	26	(16.4)
		Once	21	(36.2)	27	(44.3)	127	(52.0)	86	(54.1)
		Twice	10	(17.2)	8	(13.1)	53	(21.9)	43	(27.0)
	Falling asleep	Soon	44	(75.9)	43	(70.5)	182	(74.5)	101	(63.6)
		Taking 1 hour or more	9	(15.5)	12	(19.7)	46	(19.0)	43	(27.1)
		Other	0	0.0	0	0.0	6	(2.4)	2	(1.2)
Exercise	Behavior	None	22	(38.0)	22	(36.1)	50	(20.5)	14	(8.8)
		Once/week	17	(29.3)	11	(18.0)	53	(21.7)	25	(15.8)
		2～3times/week	10	(17.2)	18	(29.5)	73	(30.0)	54	(34.0)
		Every day	9	(15.5)	10	(16.4)	55	(22.5)	57	(35.7)
Eating behavior	Breakfast	Don't eat breakfast	1	(1.7)	0	0.0	3	(1.2)	2	(1.3)
		1～2/week	1	(1.7)	1	(1.6)	5	(2.0)	0	0.0
		3～4 times/week	6	(10.3)	2	(3.3)	3	(1.2)	0	0.0
		Every day	50	(86.3)	58	(95.1)	232	(95.2)	156	(98.1)
	Dinner within 2 hours before going to bed	No	53	(91.4)	58	(95.1)	230	(94.3)	145	(91.2)
		Yes	5	(8.6)	3	(4.9)	13	(5.3)	13	(8.2)
	Late-night snacks	No	45	(77.6)	41	(67.2)	206	(84.4)	135	(84.9)
		Yes	13	(22.4)	20	(32.8)	37	(15.2)	23	(14.5)

3.3 The cognition and behavior of lifestyle-related diseases prevention

Table 3 shows the cognition and behavior of lifestyle-related diseases prevention of the subjects. The percentages of subjects who had knowledge on metabolic syndrome (Metabolic syndrome) were 72.4% (n=42), 68.8% (n=42), 71.4% (n=174) and 75.5% (n=120) in 40's, 50's, 60's and 70's, respectively. The percentages of subjects who had knowledge menopausal features were 48.3% (n=28), 65.6% (n=40), 78.7% (n=192) and 72.3% (n=115) for those in their 40s, 50s, 60s and 70s, respectively. The percentages of subjects who paid attention to lifestyle-related disease prevention were 50.8% (n=31), 58.2% (n=142) and 59.1% (n=94) for those in their 50s, 60s and 70s, respectively. The percentages of subjects who engaged in behavior of lifestyle-related disease prevention were 37.9% (n=22), 36.0% (n=22), 49.5% (n=121) and 58.5% (n=93) for those in their 40s, 50s, 60s and 70s, respectively.

Table 3 Cognition and behavior of lifestyle-related disease prevention

n（%）

Subject		40s		50s		60s		70s	
Knowledge of metabolic syndrome	No	16	(27.6)	19	(31.2)	65	(26.6)	31	(19.5)
	Yes	42	(72.4)	42	(68.8)	174	(71.4)	120	(75.5)
Knowledge of menopausal features	No	30	(51.7)	21	(34.4)	47	(19.3)	38	(23.9)
	Yes	28	(48.3)	40	(65.6)	192	(78.7)	115	(72.3)
Consciousness of lifestyle-related disease prevention (from 50s)	No			30	(49.2)	98	(40.2)	60	(37.7)
	Yes			31	(50.8)	142	(58.2)	94	(59.1)
Behavior of lifestyle-related disease prevention	No	36	(62.1)	39	(64.0)	115	(47.2)	58	(36.5)
	Yes	22	(37.9)	22	(36.0)	121	(49.5)	93	(58.5)

3.4 Physical and laboratory examination

Table 4 shows the physical assessments of the subjects. The mean heights of the subjects were 159.6 ± 3.8 cm, 157.9 ± 5.3 cm, 154.7 ± 5.3 cm and 152.1 ± 4.8 cm in for those their 40s, 50s, 60s, and 70s, respectively. The mean weights of the subjects were 52.9 ± 6.5 kg, 50.7±7.7 kg, 50.6±7.6 kg, and 49.6±6.6 kg for those in their 40s, 50s, 60s and 70s, respectively, with the highest mean weight recorded for those in their 40s, at 52.9±6.5 kg, and the highest BMI for those in their 70s, at 21.4 ± 2.6. The mean abdominal circumference was 74.4 cm for those in their 40s, and 79.2 cm for those in their 70s. Systolic blood pressure was 109.5 mmHg for those in their 40's, and 128.8 mmHg for those in their 70s. The percentages of subjects who experienced weight gain of 10 kg or more after the age of 20 was 19.7% (n=24) for those in their 60s. The percentages of subjects who had experienced recent weight gain were 58.6% (n=34) for those in their 40s, compared to 27.9% (n=17), 27.0% (n=66), and 20.8% (n=33) for those in their 50s, 60s and 70s, respectively.

Table 4 Physical and laboratory assessment of subjects

		40s		50s		60s		n(%) Mean value±SD 70s	
Subject									
		n		n		n		n	
Height (cm)		58	159.6±3.8	61	157.9±5.3	239	154.7±5.3	159	152.1±4.8
Weight (kg)		58	52.9±6.5	61	50.7±7.7	240	50.6±7.6	159	49.6±6.6
BMI		58	20.8±2.5	61	20.3±2.9	240	21.2±3.0	159	21.4±2.6
Abdominal circmference (cm)		57	74.4±6.7	60	75.6±8.1	239	78.1±8.8	159	79.2±8.1
	Normal　(less than 80 cm)	48	(84.2)	44	(73.4)	140	(58.6)	77	(50.7)
	Borderline (80〜89 cm)	8	(14.0)	11	(18.3)	80	(33.5)	59	(38.8)
	High-risk (more than 90 cm)	1	(1.8)	5	(8.3)	19	(7.9)	16	(10.5)
Blood pressure (mmHg)									
	Systolic	56	109.5±16.0	61	119.2±15.8	240	123.5±16.4	159	126.8±18.4
	Diastolic	56	66.4±11.2	61	71.8±11.7	240	72.5±11.0	159	72.6±10.1
	Normal　(less than 130/85 mmHg)	51	(91.1)	46	(74.2)	152	(63.3)	86	(54.1)
	Borderline (130 or 85 mmHg)	1	(1.8)	13	(21.0)	61	(25.4)	53	(33.3)
	High-risk (more than 130/85 mmHg)	4	(7.1)	3	(4.8)	27	(11.3)	20	(12.6)
Blood glucose (mg/dl)		56	87.3±7.4	60	90.8±8.3	239	95.7±23.9	158	92.4±14.8
	Normal　(less than 100 mg/dl)	54	(96.4)	53	(88.3)	191	(80.0)	128	(81.0)
	Borderline (100〜109 mg/dl)	1	(1.8)	6	(10.0)	29	(12.1)	20	(12.7)
	High-risk (more than 110 mg/dl)	1	(1.8)	1	(1.7)	19	(7.9)	10	(6.3)
HDL-C(mg/dl)		57	71.2±15.2	60	79.0±15.1	239	71.6±16.3	158	69.3±15.0
	Normal　(more than 50 mg/dl)	52	(91.2)	59	(98.3)	220	(92.1)	142	(89.9)
	Borderline (40〜50 mg/dl)	5	(8.8)	1	(1.7)	19	(7.9)	16	(10.1)
	High-risk (less than 40 mg/dl)	0	0.0	0	0.0	0	0.0	0	0.0
Triglyceride (mg/dl)		57	74.7±63.0	60	82.4±54.2	239	96.6±43.9	158	95.6±37.6
	Normal　(less than 150 mg/dl)	53	(93.0)	57	(95.0)	207	(86.6)	146	(92.4)
	High-risk (more than 150 mg/dl)	4	(7.0)	3	(5.0)	32	(13.4)	12	(7.6)
Weight gain of 10 kg from age 20	No	49	(84.5)	53	(86.9)	191	(78.3)	127	(79.9)
	Yes	9	(15.5)	7	(11.5)	48	(19.7)	24	(15.1)
Recent weight gain	Weight gain	34	(58.6)	17	(27.9)	66	(27.0)	33	(20.8)
	Weight loss	8	(13.8)	15	(24.6)	46	(19.0)	32	(20.1)
	No change	15	(25.9)	28	(45.9)	127	(52.0)	82	(51.6)

3.5 Factors related to cognition and behavior of lifestyle-related disease prevention

　　Table 5 shows the factors related to cognition and behavior of lifestyle-related disease prevention.　There was a correlation in cognition of lifestyle-related disease prevention between those who knew about metabolic syndrome and those who didn't know about metabolic syndrome in their 60s and 70s.　There was a correlation in cognition of lifestyle-related disease prevention between those who had knowledge of menopausal features and those who didn't have knowledge of menopausal features in

their 50s and 60s. There was a correlation in behavior of lifestyle-related disease prevention between those who could cope with stress, those who knew about metabolic syndrome, those who knew about menopausal features and couldn't cope with stress, those who didn't know about metabolic syndrome, and those who didn't know about menopausal features, in their 70s.

Table 5 Factors related to cognition and behavior of lifestyle-related disease prevention

n(%)

Factor		Consciousness of lifestyle-related disease prevention (from 50s)									Behavior of lifestyle-related disease prevention														
		50s			60s			70s			40s			50s			60s			70s					
		No	Yes	p-value	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value			
Occupation	House wife	7(38.9)	11(61.1)	0.298	65(39.9)	98(60.1)	0.625	46(39.0)	72(61.0)	0.765	7(53.8)	6(46.2)	0.370	9(50.0)	9(50.0)	0.143	75(47.2)	84(52.8)	0.325	43(36.8)	74(63.2)	0.423			
	Other	23(53.5)	20(46.5)		32(43.2)	42(56.8)		13(41.9)	18(58.1)		29(67.4)	14(32.6)		30(69.8)	13(30.2)		39(54.2)	33(45.8)		13(44.8)	16(55.2)				
SMI scores	Low	22(48.9)	23(51.1)	1.000	83(43.5)	108(56.5)	0.103	55(43.0)	73(57.0)	0.055	26(56.5)	20(43.5)	0.108	28(62.2)	17(37.8)	0.541	90(48.6)	95(51.4)	0.671	48(38.1)	78(61.9)	0.802			
	High	8(53.3)	7(46.7)		15(30.6)	34(69.4)		5(21.7)	18(78.3)		10(83.3)	2(16.7)		11(73.3)	4(26.7)		25(52.1)	23(47.9)		9(40.9)	13(59.1)				
Stress of housework and work	Weak	7(38.9)	11(61.1)	0.433	40(38.5)	64(61.5)	0.578	29(41.4)	41(58.6)	0.273	10(58.8)	7(41.2)	0.848	8(44.4)	10(55.6)	0.063	47(46.5)	54(53.5)	0.443	23(34.8)	43(65.2)	0.619			
	Strong	20(50.0)	20(50.0)		46(42.2)	63(57.8)		21(32.3)	44(67.7)		24(61.5)	15(38.5)		28(70.0)	12(30.0)		57(51.8)	53(48.2)		25(39.1)	39(60.9)				
Method of coping with stress	No	7(53.8)	6(46.2)	0.653	22(47.8)	24(52.2)	0.253	8(36.4)	14(63.6)	0.843	8(88.9)	1(11.1)	0.133	10(76.9)	3(23.1)	0.338	28(62.2)	17(37.8)	0.067	13(61.9)	8(38.1)	0.013 *			
	Yes	22(46.8)	25(53.2)		71(38.6)	113(61.4)		49(38.6)	78(61.4)		28(58.3)	20(41.7)		28(59.6)	19(40.4)		84(46.9)	95(53.1)		42(33.6)	83(66.4)				
Knowledge of metabolic	No	11(57.9)	8(42.1)	0.360	35(55.6)	28(44.4)	0.006 **	17(54.8)	14(45.2)	0.019 *	12(75.0)	4(25.0)	0.243	12(63.2)	7(36.8)	0.932	31(48.4)	33(51.6)	0.894	18(58.1)	13(41.9)	0.011 *			
	Yes	19(45.2)	23(54.8)		61(35.5)	111(64.5)		37(31.9)	79(68.1)		24(57.1)	19(42.9)		27(64.3)	15(35.7)		84(49.4)	86(50.6)		39(33.1)	79(66.9)				
Knowledge of menopausal features	No	14(66.7)	7(33.3)	0.048 *	27(60.0)	18(40.0)	0.004 **	18(48.6)	19(51.4)	0.109	18(60.0)	12(40.0)	0.737	13(61.9)	8(38.1)	0.811	26(55.3)	21(44.7)	0.328	22(59.5)	15(40.5)	0.002 **			
	Yes	16(40.0)	24(60.0)		69(36.3)	121(63.7)		38(33.9)	74(66.1)		18(64.3)	10(35.7)		26(65.0)	14(35.0)		89(47.3)	99(52.7)		36(31.6)	78(68.4)				

Chi-square　　　* p < 0.05　　** p < 0.01

3.6 Cognition and behavior of lifestyle-related disease prevention and their association with physical assessment

Table 6 shows the cognition and behavior of lifestyle-related disease prevention and their association with physical assessment. The weight of subjects who had knowledge of metabolic syndrome tended to be lower than that of subjects who didn't have knowledge of metabolic syndrome.   The HDL-C of subjects who had knowledge of menopausal features tended to be higher than that of subjects who didn't have knowledge of menopausal features.   The LDL-C of subjects who could pay attention to lifestyle-related disease prevention tended to be lower than that of subjects who couldn't pay attention to lifestyle-related disease prevention.   The weight of subjects who engaged in behavior of preventing lifestyle-related diseases tended to be lower than that of subjects who didn't engage in behavior of preventing lifestyle-related diseases.

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Table 6

Cognition and behavior of lifestyle-related disease prevention and their association with physical and laboratory assessment

mean±SD

		40s		50s		60s		70s	
Knowledge of metabolic syndrome and physical assessment									
Weight (kg)	No knowledge	16	53.1±9.4	19	53.3±7.8	65	50.7±7.1	31	48.3±7.4
					0.077				
	Have knowledge	42	52.8±5.2	42	49.5±7.5	170	50.6±7.8	120	50.0±6.5
Knowledge of menopausal features and physical assessment									
HDL-C (mg/dl)	No knowledge	30	73.3±16.4	30	79.7±16.5	46	71.0±15.4	38	65.6±13.6
									0.096
	Have knowledge	27	68.9±13.8	30	78.2±13.8	188	71.6±16.8	114	70.3±15.5
Consciousness of lifestyle-related disease prevention and physical assessment									
LDL-C (mg/dl)	Not conscious			30	138.6±31.1	96	130.3±28.7	60	137.0±34.3
									0.053
	conscious			30	139.9±28.1	140	133.1±29.6	93	127.0±23.9
Behavior of lifestyle-related disease prevention and physical assessment									
Weight (kg)	No behavior	36	52.8±7.0	39	51.9±8.6	113	50.2±7.3	58	50.3±7.6
					0.066				
	Engage in behavior	22	53.1±5.8	22	48.6±5.3	118	50.8±7.6	93	49.3±6.0

T-test　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　* p<0.05　＊＊ p<0.01

4. Discussion

　　Among middle-aged women, there were generation-specific characteristics or differences in lifestyles such as work, housewife status, sleep and exercise. It was indicated for the first time that, the higher the age bracket, the higher the levels of knowledge, cognition and practice of lifestyle-related disease prevention, and that the cognition and behavior of lifestyle-related disease prevention showed an association with physical assessments that showed some differences between the age brackets.

　　We demonstrated that there were some differences in lifestyle among the age brackets of the middle-aged women. Women in all the age brackets slept for at least six hours, but those in the higher age brackets were more satisfied with their sleep. On the other hand, the percentages of subjects who suffered from strong or moderate stress were more than 60% for those in their 40s and 50s, which might indicate that the younger age brackets were more prone to stress. The report by the Ministry of Health, Labour and Welfare demonstrated that the percentage of subjects whose duration of sleep was less than six hours a day had increased significantly since 2007 [13]. Subjects in their 40s to 50s cited "housewife" status (i.e., housework) and "work" as reasons for their shortened sleeping time, which might result in unsatisfactory sleep. Furthermore, it is reported that Japanese women in their 40s and 50s are burdened by work, housework and child care, and have difficulty securing the time to practice lifestyle-related disease prevention [14]. Therefore, it is essential that health

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professionals provide health advice in accordance with individual circumstances, which will lead to the actual practice of lifestyle-related disease prevention behaviors among the younger age brackets.

Although middle-age women of all age brackets knew the term "metabolic syndrome" well, higher percentages among the higher age brackets "knew" that metabolic syndrome (lifestyle-related disease) was likely to occur during the post-menopause period. The number of people who engaged in behaviors toward lifestyle-related disease prevention also increased the higher the age bracket. The endocrine and metabolic changes at the time of menopause and the manifestation of lifestyle-related diseases such as dyslipidemia, diabetes mellitus and osteoporosis after the age of 60 may be contributable to higher recognition of lifestyle-related disease prevention among the higher age brackets [15,16].

Next, with regard to preventive behavior related to lifestyle-related diseases, more than 90% of the subjects knew that exercise, regular eating habits and a well-balanced diet were important for the prevention of lifestyle-related disease. Regarding eating behavior, "daily" consumption of breakfast increased the higher the age bracket. The report by the Ministry of Health, Labour and Welfare demonstrated that the rate of eating a balanced diet containing staple foods, main vegetables, and side dishes decreased among the lower age brackets, and the rate of having breakfast decreased among the higher age brackets [13,17]. The rate of doing exercise more than two or three times a week increased among the higher age brackets. This suggests that, although the lower age brackets may recognize the importance of preventive behavior regarding lifestyle-related diseases, they find it difficult to put it into practice [17]. Interestingly, regarding the relationship between knowledge and preventive behavior, the knowledge of lifestyle disease prevention was significantly associated with preventive behavior for lifestyle related diseases for those in their 70s. It was suggested that those in their 70s might engage in preventive behavior through the accumulation of knowledge of lifestyle-related disease and their awareness thereof, whereas among those in their 50s and 60s, preventive behavior was constrained with work and nursing care [14].

Regarding the physical and laboratory examinations related to lifestyle-related diseases, the mean values of physique, blood pressure, triglyceride, HDL-C, and blood glucose were within the normal range for all the age brackets. Comparing the data among the age brackets, BMI increased with age, and both systolic and diastolic blood pressure among those in their 40s and 50s increased, while blood glucose and triglyceride levels among those in their 50s and 60s increased and HDL-C among those in their 60s and 70s decreased. In addition, the mean abdominal circumference was

77.3 cm, lying within the normal range. The mean abdominal circumference increased by about 5 cm among those in their 70s (79.2 cm) from the mean of 74.4 cm among those in their 40s. A previous study indicated that an abdominal circumference more than 80 cm in women increased the risk of overlooking lifestyle-related diseases and myocardial infarction; therefore, such a circumference among those in their 70s was a high risk level [18]. It is important for health professionals to be aware of age-dependent changes in physical determinations related to lifestyle-related diseases and prevent accelerated progression toward them.

Regarding the associations between knowledge and behavior, and physical assessment for lifestyle-related diseases, the weights of subjects who had knowledge of and engaged in preventive behavior regarding lifestyle-related diseases tended to be lower among the younger age brackets, while HDL-C in subjects who had knowledge of lifestyle-related disease prevention tended to be higher and LDL-C in such patients tended to be lower among those in their 70s. It was indicated that health education programs on lifestyle-related disease prevention should be provided among lower age brackets and be structured and based on age-specific characteristics, such as focusing on interest in physique among young people.

5. Conclusions

There were age-specific characteristics or differences in lifestyles in terms of work, housewife status, sleep and exercise. The higher the age bracket, the higher the levels of knowledge, cognition and practice of lifestyle-related disease prevention, and the cognition and behavior of lifestyle-related disease prevention showed an association with physical assessments, which showed some differences among the age brackets. It was suggested that knowledge of lifestyle-related disease prevention should be provided from a younger age and also based on age-specific characteristics.

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