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발 간 사

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안녕하십니까?

고려대학교 간호대학은 1997년 개소한 이래 '만성질환 관리와 건강증진'을 주제로 국내외 학술대회, 교육프로그램, 새로운 연구 분야에 대한 모색 등 다양한 활동을 하였고, 이를 통해 간호학 지식체 발전에 기여해 왔습니다. 특히 2016년에는 최근 국내외 건강관리의 주요 이슈가 되고 있는 만성질환관리에 대한 다각적인 접근을 모색하고자 "State of Science & Future Perspectives: Chronic Illness"를 주제로 제 10차 국제학술대회를 개최하여 새로운 연구 분야에 대한 국내외 간호학자간 논의의 장을 마련한 바 있습니다.

또한 2016년에도 간호학연구소 연구위원들은 한국연구재단, 건강증진재단 및 서울시와 지방자치단체 등으로부터 연구비를 지원받아 내실 있는 연구 성과를 도출하고 있으며, 이를 통해 간호학에서의 만성질환관리 및 건강증진에 대한 지식발전에 기여하고 있고, 간호학연구소 역시 연구위원의 연구 활동을 적극적으로 지원하고 있습니다.

이러한 지속적인 지원활동과 연구위원의 적극적인 연구 활동의 결실로 간호학연구소는 연구소 개소 후 논문집을 꾸준히 발간해 왔으며, 2016년에도 논문집을 발간하게 되었습니다.

2017년에도 본 연구소는 연구기관으로서의 소임을 다 할 것이며, 지속적인 관심과 격려를 부탁드립니다. 끝으로 본 논문집이 나오기까지 수고하신 연구소 연구위원들과 임원들께 감사의 마음을 전합니다. 2017년 새해를 맞아 여러분들의 행운과 학문적 성취를 기원 드립니다.

감사합니다.

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The Seoul Metropolitan Lifestyle Intervention Program and Metabolic Syndrome Risk: A Retrospective Database Study

Choo, Jina* · Yoon, Seok-Jun · Ryu, Hosihn · Park, Mi-Suk
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Introduction

Metabolic syndrome is a public health concern in countries across all economic strata. The overall prevalence of metabolic syndrome among adults has increased from 32.9% to 36.1% in the United States [1], and from 29.2% to 31.3% in Korea [2] during the period 2001–2008. Metabolic syndrome is associated with an increased risk of cardiovascular disease (CVD), which is the global leading causes of death with a high economic burden [3,4]. Increasing medical expenditure on CVD has resulted in large social and economic burdens for most countries, including Korea. This is partly due to increases in populations vulnerable to unhealthy behavioral/lifestyle factors [5] and increasing elderly populations [6]. Hence, identification and management of metabolic syndrome may play a critical role in reducing the risk of and medical expenditure on CVD at population level.

Population-based strategies for CVD prevention have been consistently urged [7]. The World Health Organization (WHO) recommends population-based CVD prevention strategies by utilizing the concept of metabolic syndrome, from the standpoint that metabolic syndrome is a pre-morbid state of CVD and diabetes rather than a clinical diagnosis [8]. In this context, a community-wide program on the identification and management of metabolic syndrome—The Seoul Metabolic Syndrome Management [SMESY] program—was officially implemented in 2011. In this community-wide model, standardized lifestyle interventions were instituted at public health centers across 25 municipal districts in Seoul [9]. The SMESY program is a free healthcare service for Seoul citizens aged 30–64 years, funded and supervised by the Seoul Metropolitan Government. Before launching the program, the prevalence of metabolic syndrome in the Korean population group aged 20–29 years (10.9%) was approximately half that of the population group aged 30–39 years (21.6%) [10]. Targeting the general population aged 30–64 years, the SMESY program focuses on risk-stratified, nurse-coordinated, comprehensive lifestyle modifications including diet, physical activity, and weight loss interventions with periodic follow-ups over 12 months. The rationale and preliminary results of the SMESY program were reported using the 2011–2012 data after the project was initially launched [9].

Lifestyle modifications may form an integral part of cardiovascular risk reduction programs. Two systematic reviews have reported that lifestyle interventions, such as either combined diet-plus-exercise interventions or

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diet-only interventions, had beneficial effects on the reduction of some risk factors of metabolic syndrome, including waist circumference (WC) and triglyceride levels, when conducted for either 6 or 12 months [11,12]. Moreover, a 12-month comprehensive lifestyle intervention covering diet, exercise, and behavioral modifications, significantly reduced the prevalence of metabolic syndrome with 31% absolute risk reduction [13]. However, given the current evidence concerning the efficacy of lifestyle interventions on the risk for metabolic syndrome, whether a community-wide lifestyle intervention would have significant benefits for risk reduction of metabolic syndrome needs to be evaluated in real community settings, rather than in research-based, controlled settings.

Therefore, the present study aimed to determine if a 12-month SMESY lifestyle intervention was significantly associated with improvements in risk factors of metabolic syndrome (WC, high blood pressure, dyslipidemia, and glucose intolerance) and in behavioral lifestyle factors (smoking, physical activity, healthy diet, and body weight).

Materials and Methods

Study Design and Setting

This is a retrospective database study, which included the 2013 data of the SMESY program [9]. The study had a longitudinal pre- and post-test design to investigate time effects of the SMESY intervention on metabolic risk. It was retrospectively conducted with a cohort recruited from 25 public health centers in Seoul.

Seoul is the capital and largest metropolis of Korea. It has a population of 10,369,000 people and covers a metropolitan area of 605 km^2 [2,14]. Seoul is divided into 25 municipal districts (called “Gu” in Korean), which range in size from 136,000 to 672,000 people. Each municipal district has a public health center that is responsible for providing primary health care to district residents.

Study Participants

Participants registered in the SMESY program during the year 2013 were 176,321 citizens; the eligibility criteria of the participant of the SMESY program were to be men and women residents of each municipal district, voluntarily attending the program, and being 30 - 64 years old. Of those registered during the year 2013 (N = 176,321), we recruited 89,997 who were registered from 1 January 2013 to 30 June, 2013. Of these 89,997 participants, we excluded those who violated the frequencies of designated follow up (n = 48), had clinical diseases such as cardiovascular disease, cancer, or kidney diseases (n = 1610), followed up less than twice (n = 50,983), and had coding errors (n = 4188). In the SMESY program, participants are divided into four risk stratified groups [9]. We excluded one of these risk-groups: the disease group (i.e., the Motivational-B group [9]). This group comprises those with either hypertension or diabetes, or those taking any medication for hypertension, diabetes, or dyslipidemia (n=7719). After all exclusions, 25,449 participants were included in the present study. These participants were categorized into three risk-stratified groups: high-risk (n=7116), moderate-risk (n=14,762), and low-risk (n=3571), determined by the number of metabolic syndrome risk factors present. In the SMESY program, metabolic syndrome and its risk factors are defined using the revised criteria of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel [ATP] III) [15]: Abdominal obesity (determined by increased WC), raised triglyceride levels, reduced high density lipoprotein cholesterol (HDL-C) levels, high blood pressure, and high fasting glucose levels. Increased WC was defined as $>$ 90 cm for men and $>$ 85 cm for women, according to the criteria defined by the Korean Society for the Study of Obesity [16]. The high-risk group was defined as those with $\geq$ 3 risk factors (i.e., those with metabolic syndrome). The moderate-risk group was defined as those with 1 or 2 risk factors. The low-risk group included participants with no risk factors.

All participants were explained that their clinical data might be used for academic purposes, and informed consent was taken from each participant. Participants were asked to complete routine questionnaire packages,

including sociodemographic and health-related lifestyle variables. The study was approved by the Institutional Review Board at Korea University (KU-IRB-15-EX-253-A-1).

SMESY Intervention

The SMESY intervention focuses on the screening and management of metabolic syndrome by trained health professionals (i.e., nurse coordinators, dieticians, exercise specialists, and doctors if needed). With regard to the screening, five risk factors of metabolic syndrome were measured after participants completed their questionnaire packages. Nurse coordinators reviewed the clinical results, and determined which risk-stratified group the participants would be allocated to, based on the standardized manual of the SMESY program [9]. The management of metabolic syndrome was achieved through different intensity and timeframe of intervention by risk-stratified groups; detailed information is described elsewhere [9]. Intervention components of the SMESY program include face-to-face counseling on healthy diet and exercise, and cell-phone text messaging about behavioral modifications. All risk-stratified groups are planned to be followed up for up to 12 months. The specific follow-up timeframes were 0, 3, 6, 9, and 12 months for the high-risk group (face-to-face counseling every 3 months and weekly text messaging); 0, 6, and 12 months for the moderate-risk group (face-to-face counseling every 6 months and text messaging once every two weeks); and 0 and 12 months for the low-risk group (face-to-face counseling at baseline and monthly text messaging). For example, a citizen with metabolic syndrome undergoes screening for risk factors of metabolic syndrome and receives initial face-to-face counseling. This counseling includes comprehensive risk reduction provided by nurse coordinators, dietary modification by dieticians, and exercise coaching by exercise specialists. A further four follow-up visits are recommended over the next 12months. At the month 3, 6, 9, and 12 visit, the participant undergoes screening and receives further face-to-face counseling. Using an inventory of text messages developed according to the risk-stratification category, text messaging is set up by nurse coordinators and sent via cell phones over 12 months .The text-messages include advice on healthy diet, regular exercise, smoking cessation, moderation in drinking alcohol, and stress management techniques.

Outcome Measures

In the present study, the outcome measures were: (1) the levels of risk factors of metabolic syndrome as used by continuous variables (i.e., WC, systolic and diastolic blood pressures [BP], HDL-C, triglycerides, and fasting glucose); (2) integrated risk scores of metabolic syndrome as measured by z-scores (i.e., risk scores of metabolic syndrome); (3) behavioral lifestyle factors such as current smoking (%), physical activity (%), healthy diet behaviors (scores), and body weight (kg); and (4) the prevalence of metabolic syndrome (%). Risk scores for metabolic syndrome were obtained as the sum of standardized scores of WC, mean arterial pressure, HDL-C, triglycerides, and fasting glucose, calculated by subtracting the individual risk factor from the NCEP ATP III criteria and dividing that by the sample standard deviation [17]. Mean arterial pressure was obtained from the values of systolic and diastolic BPs based on the formula:

$$\text{mean BP} = (1/3) \times (\text{systolic BP} - \text{diastolic BP}) + \text{diastolic BP} \quad (1)$$

The prevalence of metabolic syndrome at each time point was obtained as the percentage of participants with metabolic syndrome of those who completed follow-up at each time point. Physical activity was defined as adequate levels of physical activity, assessed as participating in moderate-intensity exercise for ≥30 minutes per session on ≥ 5 days per week (yes=1,no=0). Healthy diet behaviors (i.e., healthy diet scores) were assessed by a 10 item-scale with two response options; 0 = to fulfill on less than 5 days per week vs. 1 = to fulfill on five or greater days per week (e.g., I have a serving of colorful vegetables two times per day). The total score range is 0 - 10.

All blood samples for measures of metabolic risk factors were obtained at 25 public health centers in the morning after a 10-h overnight fast, prior to taking current medication(s).

Either venipuncture (two centers) or point of care testing (23 centers) were used for the measurements of triglycerides and HDL-C. The point of care testing systems included LipidPro [18], LABGEO PT10 [19], and LDX® system [20] which had <7% of inter-assay and intra-assay coefficients of variation. Body weight (kg) was measured after an overnight fast, using the bioelectrical impedance scale. Height (cm) was measured using a wall-mounted stadiometer. Body mass index (BMI) was computed as weight (kg)/height $(m)^2$. WC (cm) was measured twice using a measuring tape at the midpoint between the lowest rib and the iliac crest; the average of two measurements was used. Blood pressure was measured on the right arm in the sitting position after a 10-minute rest with the bladder emptied, by using an automated sphygmomanometer.

Data Analysis

All data were analyzed using SPSS 23.0 (SPSS Inc., Chicago, IL, USA). A p-value < 0.05 was considered statistically significant. Participants' general characteristics were expressed as either means (standard deviations, SD) or numbers (%) for total participants as well as for risk-stratified groups. Group differences in all participants' sociodemographic and health-related characteristics were analyzed with the analysis of variance (ANOVA) or Chi-square test, as appropriate.

To examine the main effects of time on the repeated measures of the risk factors and risk scores of metabolic syndrome, behavioral lifestyle factors (i.e., healthy diet scores and body weight) were periodically followed up for 12 months; the linear mixed model with fixed effects for intercepts and time was performed. Additionally, to account for the non-linear trend in time, the fixed effects for time were included using categorical variables of time. Moreover, in order to examine the main effects of time on behavioral lifestyle factors (i.e., current smoking and physical activity) over the periodic follow-up of 12 months and on changes in the prevalence of metabolic syndrome for a pooled group (i.e., the combination of three risk-stratified groups) from baseline time point to 12-month time point, the generalized estimating equation (GEE) was performed. The linear mixed and GEE models used in these analyses were all adjusted for age, sex, education, income, marital status, current smoking status, physical activity, alcohol drinking, BMI at baseline, and medication status (i.e., taking medications for

Table 1. General characteristics of participants, stratified by group (N = 25449).

Characteristics	N	n (%) or Mean (SD) Total	High-Risk Group (n = 7116)	Moderate-Risk Group (n = 14,762)	Low-Risk Group (n = 3571)	*p* *
Sociodemographic characteristics:						
Age, years	25449	50.0 (9.40)	50.5 (9.17)[b]	50.2 (9.32)[c]	48.2 (9.97)	<0.001
Female, yes	25449	15937 (62.6)	3556 (50.0)	9595 (65.0)	2786 (78.0)	<0.001
Education, yes	23611					
Some college or greater		19747 (83.6)	5345 (80.6)	11507 (84.0)	2895 (88.0)	<0.001
High school degree or lower		3864 (16.4)	1283 (19.4)	2185 (16.0)	396 (12.0)	
Monthly household income, yes	24319					<0.001
< 2,000,000won		4886 (20.1)	1485 (21.9)	2827 (20.1)	574 (16.6)	
> 2,000,000won		19433 (79.9)	5288 (78.1)	11252 (79.9)	2893 (83.4)	
Marital status, yes	25,178					0.002
Married		22,097 (87.8)	6,264 (88.5)	12,797 (87.8)	3,036 (86.1)	
Widow/Divorced/Separated/Single		3,081 (12.2)	816 (11.5)	1,776 (12.2)	486 (13.9)	
Coverage of health security, yes	25137					<0.001
Health insurance		24401 (97.1)	6823 (96.5)	14125 (97.1)	3453 (98.0)	
Medical aid		736 (2.9)	247 (3.5)	417 (2.9)	72 (2.0)	
Health-related characteristics:						
Current smoking, yes	25180	2872 (11.4)	1226 (17.3)	1466 (10.1)	180 (5.1)	<0.001
Physical activity, yes	25329	2299 (9.1)	555 (7.8)	1389 (9.5)	335 (10.0)	<0.001
Alcohol drinking, yes	14802	4257 (28.8)	1581 (36.9)	2266 (26.9)	410 (19.7)	<0.001
Healthy diet score	25246	6.8 (2.33)	6.4 (2.36) [a,b]	6.9 (2.30) [c]	7.0 (2.32)	<0.001
BMI, kg/m^2	25449	23.8 (3.15)	25.9 (3.20) [a,b]	23.4 (2.76) [c]	21.7 (2.25)	<0.001

BMI: Body mass index; SD: Standard deviation; Physical activity: Moderate intensity activity ≥5 days per week; Alcohol drinking: Drinking ≥2 times per week; * Significance for between-group difference using either ANOVA or Chi-square test; ap < 0.05 Scheffe post hoc test for mean difference between high-risk and moderate-risk groups; bp < 0.05 Scheffe post hoc test for mean difference between high-risk and low-risk groups; cp < 0.05 Scheffe post hoc test for mean difference between moderate-risk and low-risk groups.

hypertension, diabetes, or dyslipidemia) over 12 months.

Results

Participants' Characteristics

Participants (N = 25,449) had a mean age of 50.0 years, with a higher proportion of women (62.6%) (Table 1). Overall, 83.6% of participants had college education or higher, 20.1% had a monthly household income of <2,000,000 won (approximately $1818), and 2.9% had medical aid cover (i.e., a public medical assistance program targeted at those of low socioeconomic status). The high- and moderate-risk groups had a greater mean age than the low-risk group ($p < 0.001$) and were more likely to be socioeconomically vulnerable, specifically having a greater proportion of participants with a monthly household income of <2,000,000 won and with medical aid cover ($p < 0.001$).

The cut-off value of 2,000,000 won was based on the minimum cost of living, as defined by the Ministry of Health and Welfare in Korea (1,630,820 won) [21]. Korean currency indicates that a million won is approximately equal to 900 US dollars [22]. Of the total participants,

Table 2. Changes in risk factors of metabolic syndrome over the SMESY intervention (N = 25,449).

Time (Month)	High-Risk Group (n = 7116)		Moderate-Risk Group (n = 14,762)		Low-Risk Group (n = 3571)	
	Mean (SD)	p *	Mean (SD)	p *	Mean (SD)	p *
WC, cm		<0.001		<0.001		0.006
0M	88.9 (7.78)		81.2 (7.61)		75.6 (6.29)	
3M	87.6 (7.58)[a]		-		-	
6M	87.2 (7.36)[b]		80.8 (7.27)[b]		-	
9M	87.2 (7.56)[c]		-		-	
12M	86.9 (7.38)[d]		80.9 (7.31)[d]		76.2 (6.77)[d]	
SBP, mmHg		<0.001		<0.001		<0.001
0M	132.7 (15.52)		122.3 (14.80)		112.2 (9.90)	
3M	125.9 (13.74)[a]		-		-	
6M	126.2 (13.35)[b]		120.1 (13.34)[b]		-	
9M	127.2 (13.87)[c]		-		-	
12M	126.9 (13.38)[d]		120.7 (13.34)[d]		113.5 (11.22)[d]	
DBP, mmHg		<0.001		<0.001		<0.001
0M	84.1 (11.12)		77.2 (10.60)		71.0 (7.37)	
3M	79.7 (9.87)[a]		-		-	
6M	80.0 (9.68)[b]		75.9 (9.65)[b]		-	
9M	80.3 (9.88)[c]		-		-	
12M	80.2 (9.61)[d]		76.1 (9.47)[d]		71.8 (8.10)[d]	
HDL-C, mg/dL		<0.001		0.002		<0.001
0M	41.2 (11.96)		51.5 (14.48)		62.8 (12.51)	
3M	42.4 (11.39)[a]		-		-	
6M	43.8 (11.83)[b]		51.0 (13.87)[b]		-	
9M	44.8 (12.10)[c]		-		-	
12M	45.2 (12.12)[d]		52.6 (14.07)[d]		60.5 (14.52)[d]	
Triglycerides, mg/dL		<0.001		0.495		<0.001
0M	208.4 (116.04)		122.9 (70.05)		84.6 (26.38)	
3M	174.4 (98.77)[a]		-			
6M	172.8 (95.06)[b]		123.8 (68.13)			
9M	177.4 (102.43)[c]		-			
12M	172.4 (96.62)[d]		122.6 (66.06)		95.7 (46.34)[d]	
Glucose, mg/dL		<0.001		0.016		<0.001
0M	106.1 (24.00)		95.7 (14.75)		88.9 (6.80)	
3M	101.1 (17.77)[a]		-		-	
6M	100.2 (16.75)[b]		94.0 (11.54)[b]		-	
9M	101.3 (18.84)[c]		-		-	
12M	101.2 (16.51)[d]		94.9 (11.72)[d]		90.5 (9.15)[d]	

SBP: Systolic blood pressure; DBP: Diastolic blood pressure; SD: Standard deviation; SMESY: Seoul Metabolic Syndrome Management; *p for linear trend using the linear mixed model after adjusting for age, gender, education, income, marital status, current smoking, physical activity, alcohol drinking, body mass index at baseline, and medications over 12 months; [a]$p < 0.05$: Significant difference between baseline and 3 months; [b]$p < 0.05$: Significant difference between baseline and 6 months; [c]$p < 0.05$: Significant difference between baseline and 9 months; [d]$p < 0.05$: significant difference between baseline and 12 months.

Table 3. Changes in the risk scores of metabolic syndrome over the SMESY intervention (N = 25449).

Time (Month)	High-Risk Group (n=7116)		Moderate-Risk Group (n=14762)		Low-Risk Group (n=3571)	
	Mean (SD)	p *	Mean (SD)	p *	Mean (SD)	p *
Risk Score+		<0.001		<0.001		<0.001
0M	0.63 (2.33)		-1.79 (0.28)		-6.72 (2.40)	
3M	-0.40 (2.39)[a]		-		-	
6M	-0.34 (2.43)[b]		-2.37 (2.36)[b]		-	
9M	-0.14 (2.35)[c]		-		-	
12M	-0.19 (2.30)[d]		-2.15 (2.29)[d]		-4.58 (2.37)[d]	

SD: Standard deviation; SMESY: Seoul Metabolic Syndrome Management; +Risk score indicates sum of standardized scores of mean arterial pressure, high-density lipoprotein cholesterol, triglycerides, waist circumference and fasting glucose created from subtracting the individual risk factor from the NHLBI/AHA criteria and dividing by the sample standard deviation; *p for linear trend using the linear mixed model after adjusting for age, gender, education, income, marital status, current smoking, physical activity, alcohol drinking, body mass index at baseline, and medications over 12 months; [a]$p < 0.05$: Significant difference between baseline and 3 months; [b]$p < 0.05$: significant difference between baseline and 6 months; [c]$p < 0.05$: Significant difference between baseline and 9 months; [d]$p < 0.05$: Significant difference between baseline and 12 months.

11.1% were current smokers, 9.5% reported doing physical activity, and 29.8% reported drinking alcohol ≥ 2 times per week (Table 1). The participants had a mean BMI of 24.1 kg/m^2 and a mean diet score of 6.8 points (range 0 - 10 points).

Changes in the Risk Factors of Metabolic Syndrome: Time Effects by Group

Among the high-risk group, all the risk factors of metabolic syndrome significantly improved over the 12 months (Table 2) (all $p < 0.001$).

Among the moderate-risk group, WC, systolic and diastolic BPs, and fasting glucose levels significantly decreased and HDL-C significantly increased over the 12 months (all $p < 0.05$); however, triglyceride levels did not show any significant changes over 12 months. Meanwhile, among the low-risk groups, all the risk factors of metabolic syndrome significantly aggravated over the 12 months (all $p < 0.001$).

Changes in the Risk Scores of Metabolic Syndrome: Time Effects by Group

Finally, the risk scores of metabolic syndrome, as measured by z-scores, decreased significantly among the high- and moderate-risk groups (all $p < 0.001$), but increased significantly among the low-risk group over 12 months ($p < 0.001$) (Table 3). Among the high-risk group, the risk scores for metabolic syndrome decreased most at 3 months and showed a gradual increasing trend over the subsequent 6 months. Among the moderate-risk group, these scores decreased most at 6 months, and appeared to increase over the next 6 months.

Changes in Behavioral Lifestyle Factors

The proportion of current smokers decreased significantly over 12 months among the high- and moderate-risk groups (all $p < 0.001$), but not among the low-risk group (Table 4). Among each group, the proportion of participants who engaged in adequate levels of physical activity increased significantly (all $p < 0.001$), and healthy diet scores increased significantly over 12 months (all $p < 0.001$). Among the high-risk group, the healthy diet scores increased significantly from 6.42 points to 7.58 points between baseline and 12 months. Finally, body weight (kg) decreased significantly among the high- and moderate-risk groups (all $p < 0.001$), but increased significantly among the low-risk group over 12 months ($p < 0.001$).

Changes in the Prevalence of Metabolic Syndrome

Figure 1 shows the changes in the prevalence of metabolic syndrome by group over the 12-month SMESY intervention. Among the high-risk group, the prevalence of metabolic syndrome decreased gradually over 12 months, that is, from 100% to 44.1% (Figure 1A). However, the prevalence increased among the moderate- and low-risk groups by 12.5% and by 3.3%, respectively (Figure 1B, C). When the three risk-stratified groups were pooled into a group, the prevalence decreased significantly from 28.0% to 10.7% between baseline and

Table 4. Changes in behavioral lifestyle factors over the SMESY intervention (N = 25449).

Time (Month)	High-Risk Group (n = 7116)		Moderate-Risk Group (n = 14762)		Low-Risk Group (n = 3571)	
	n (%) or Mean (SD)	p *	n (%) or Mean (SD)	p *	n (%) or Mean (SD)	p *
Current smokers		<0.001		<0.001		0.506
0M	1226/7072 (17.2)		1466/14577 (10.1)		180/3531 (5.1)	
3M	642/4680 (13.7)[a]		-		-	
6M	591/4529 (13.0)[b]		944/11949 (7.9)[b]		-	
9M	281/2437 (11.5)[c]		-		-	
12M	380/3279 (11.6)[d]		704/8816 (8.0)[d]		171/3407 (5.0)	
Physical activity		<0.001		<0.001		0.001
0M	1232/7097 (17.4)		2995/14682 (20.4)		752/3550 (21.2)	
3M	972/4109 (23.7)[a]		-		-	
6M	898/3972 (22.6)[b]		2425/10541 (23.0)[b]		-	
9M	477/2140 (22.3)[c]		-		-	
12M	633/2911 (21.7)[d]		1837/7746 (23.7)[d]		699/2967 (23.6)[d]	
Healthy diet score+		<0.001		<0.001		<0.001
0M	6.42 (2.36)		6.85 (2.30)		7.00 (2.32)	
3M	7.29 (2.21)[a]		-		-	
6M	7.49 (2.18)[b]		7.53 (2.21)[b]		-	
9M	7.37 (2.10)[c]		-		-	
12M	7.58 (2.17)[d]		7.57 (2.15)[d]		7.41 (2.22)[d]	
Body weight, kg+		<0.001		<0.001		0.011
0M	70.28 (12.26)		61.64 (10.19)		56.19 (7.96)	
3M	68.82 (11.99)[a]		-		-	
6M	68.44 (11.80)[b]		61.00 (9.93)[b]			
9M	68.02 (11.77)[c]		-		-	
12M	68.08 (11.51)[d]		60.82 (9.86)[d]		56.28 (8.09)[d]	

SD: Standard deviation; SMESY: Seoul Metabolic Syndrome Management; Physical activity: moderate intensity activity ≥5 days per week; Alcohol drinking: Drinking ≥2 times per week; +Mean(SD);*p for linear trend using the linear mixed model after adjusting for age, gender, education, income, marital status, current smoking, physical activity, alcohol drinking, body mass index at baseline, and medications over 12 months; [a]$p < 0.05$: Significant difference between baseline and 3 months; [b]$p < 0.05$: Significant difference between baseline and 6 months; [c]$p < 0.05$: Significant difference between baseline and 9 months; [d]$p < 0.05$: Significant difference between baseline and 12 months.

12 months (odds ratio = 0.51, confidence interval = 0.476 - 0.547, p < 0.001) (Table 5).

Discussion

We observed temporal associations between the implementation of the SMESY program and improvements in the metabolic syndrome risk. Substantial improvements were observed for favorable changes in mean values of the risk factors and z-scores of metabolic syndrome, the prevalence of metabolic syndrome, and behavioral lifestyle factors. However, such improvements differed by risk-stratified group, being most robust for the high-risk group, modest for the moderate-risk group, and aggravated for the low-risk group.

We found significant improvements in mean values of all the risk factors for metabolic syndrome among the high-risk group (participants with metabolic syndrome), which is the main target of the SMESY program. For example, the SMESY intervention in a real-world setting led to a 2.0 cm reduction in mean waist circumference among individuals with metabolic syndrome, only slightly less than that (−2.7 cm) in a controlled setting, as reported by Yamaoka et al. in a systematic review of the effects of lifestyle modification for individuals with metabolic syndrome [11].

These improvements in the mean values of the risk factors may have an implication, according to the notion of Rose, that shifting the risk distribution in a population may have a beneficial effect on preventing morbidity and mortality [23,24], and may, moreover, result from the beneficial effects of intensive lifestyle modifications, such as favorable changes in current smoking, physical activity, healthy diet behaviors, and weight loss. The 12-month lifestyle modification in the high-risk group may have been achieved through the use of behavioral strategies such as weekly mobile phone messaging as well as face-to-face counseling at intervals of 3 months. Previously, a systematic review revealed that technology was a useful adjunct in improving patient motivation

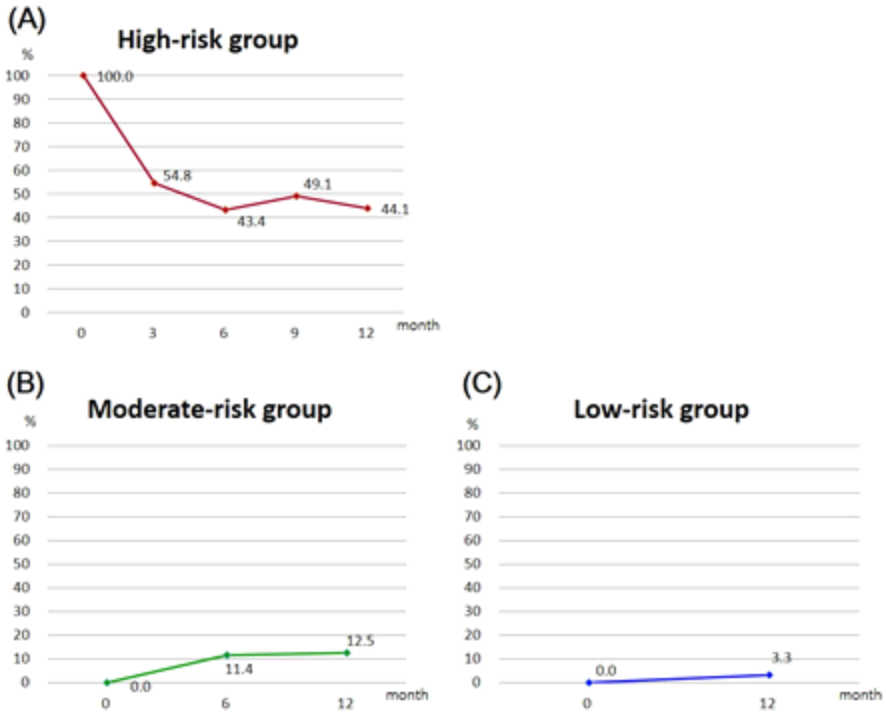

Figure 1. Changes in the prevalence of metabolic syndrome by group, over the SMESY intervention.

Table 5. Changes in prevalence of metabolic syndrome over the SMESY intervention (N = 25449).

Time (Month)	Prevalence		β (SE)	OR	95% CI	p *
	n	%				
0M	7116/25449	28.0	-	1.00	-	-
12M	2722/15948	10.7	–0.673 (0.035)	0.51	0.476–0.547	<0.001

β = unstandardized coefficient; CI: Confidence interval; OR: Odds ratio; SE: Standard error; SMESY: Seoul Metabolic Syndrome Management; p * obtained from generalized estimating equation (GEE) after adjusting for age, gender, education, income, marital status, current smoking, physical activity, alcohol drinking, body mass index, and medications over 12 months.

when combined with a face-to-face relationship [25].

Furthermore, we discuss two points based on the findings of the high- and moderate-risk groups. First, significant improvements in behavioral lifestyle factors showed the most prominent improvement at 3 months that slowly changed or re-bounded slightly over the next 9 months; such a time trend was comparable with that for the risk scores of metabolic syndrome over the entire period of 12 months. This trend was similarly shown in the moderate-risk group (prominent improvements in the risk scores of metabolic syndrome at 6 months with subsequent slowdown). Second, despite favorable outcomes of the SMESY interventions in the high-risk group, the control of triglycerides and fasting glucose levels was sub-optimal at the final follow-up visit, at which point they were higher than 150 mg/dL and 100 mg/dL, respectively. These two points suggest the need for more intensive interventions after the first 3 months of the program. Based on the premise of the relationship between motivation and behavior, a decrease in motivation for maintaining healthy lifestyle habits may partially explain the slowdown in improvements in behavioral lifestyle factors and metabolic risk scores observed after the first 3 months. Teixeira et al. elicited from a systematic review that intrinsic motivation was predictive of long-term exercise adherence [26]. One effective strategy to increase intrinsic motivation addressed in the literature was motivational interviewing [27]. Rubak et al. reported from a meta-analysis that motivational interviewing has beneficial effects on BMI, total cholesterol, and systolic blood pressure [28]. Thus, motivational interviewing should be adopted as an

integral part of the face-to-face counseling sessions after the first 3 months of the SMESY program. Moreover, Liu et al. reported that four interactive group discussion sessions with weekly phone contact over 6 months had beneficial effects on body weight reduction and metabolic syndrome prevalence [29]. Adding interactive interventions to the overall SMESY program may help to prolong its benefits. Finally, motivational interviewing and interactive discussions may be interventional components to be considered for increasing long-term effects of the SMESY intervention; their beneficial effects on the metabolic risk should be examined in future studies.

We found significant improvements in all the factors of metabolic syndrome, except triglycerides, among the moderate-risk group. The non-significant changes in triglycerides levels could be attributed to two possibilities: one may be a ceiling effect due to relatively desirable levels of triglycerides at baseline (122.9 mg/dL). The other may be a delaying effect resulting from delayed aggravations, as observed in the low-risk group.

Notably, the low-risk group—who received a single follow-up at 12 months after enrollment—showed significantly aggravated levels in all factors of metabolic syndrome. For example, the systolic and diastolic blood pressure measurements were significantly elevated by an average of 1.30 mmHg and 0.80 mmHg, respectively. Although these changes are small, and the values remain within desirable limits, the aggravated changes may have significant long-term clinical implications. This finding indicates that favorable impact of baseline interventions may not last up to one year, and the aggravated progress of natural diversity may be on the secular trend. Hence, implementation of stronger preventive strategies via more frequent interactive contacts and counseling is critical. In addition, future studies are needed to identify this trend.

This study has several strengths. First, to the best of our knowledge, this is the first study to report the temporal associations between a community-wide (i.e., metropolitan-wide) lifestyle intervention program and the risk for metabolic syndrome in a real-world setting. Second, the results of changes in self-reported behavioral factors (current smoking, physical activity, and healthy diet) were assessed concomitantly with risk factors of metabolic syndrome. Third, one-year patterns of time effects of risk- and behavioral lifestyle factors of metabolic syndrome were assessed by using repeated measures over a 12-month period. In this context, our findings may provide a basis for the sustainability and dissemination of the SMESY program.

Several limitations must be considered. First, the study design—A retrospective, non-experimental study without a control group—cannot guarantee a causal connection between the SMESY interventions and cardiometabolic outcomes, because of the diffusion possibility that participants might have had additional access to other interventions. However, since no other community-wide, lifestyle intervention programs comparable with the SMESY program were available contemporarily in Seoul, other interventions accessible to citizens would likely be rare. A randomized controlled trial is needed to test the effects of the SMESY program. Second, we excluded individuals who did not visit the SMESY program after the baseline visit (dropouts, 52.6% of total participants). This may have led to biased results regarding changes in metabolic syndrome risk. Therefore, community-based strategies for increasing adherence rates are needed in the SMESY program. Third, the present study used the NCEP-ATP III criteria to diagnose metabolic syndrome. Organizations, including the International Diabetes Federation (IDF), use different criteria [30]. The prevalence of metabolic syndrome assessed using the NCEP-ATP III criteria may be different from that assessed by using other organizations' criteria [10]. In this regard, our results of the prevalence of metabolic syndrome should be carefully interpreted. Finally, 83.6% of the study participants had college education or higher, which resulted in selection bias. Lower levels of education may be a predictor of adherence to long-term therapies [31,32]. Based on this, the study participants might have had positive benefits of the reductions in metabolic risk that may be associated with adherence.

Conclusions

The community-wide SMESY program was associated with improvements in risk factors and behavioral lifestyle factors of metabolic syndrome. These findings will provide underlying data for not only optimizing the model of the SMESY program on prevention and management

of metabolic syndrome, but also for sustaining and expanding the SMESY program nationwide in Korea.

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Author Contributions

Jina Choo developed the study hypothesis, performed data analysis, and prepared the manuscript draft. Do-Sun Lim, Seok-Jun Yoon and Hosihn Ryu provided expert consultation on data interpretation, and critically revised the manuscript for intellectual content. Mi-Suk Park, Yoo Mi Park and Hyang Sook Lee contributed to data interpretation and the writing of the manuscript. All authors were involved in the manuscript review, revision, and final approval process.

Conflict of interest

The authors declare no conflict of interest

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The Seoul Metropolitan Lifestyle Intervention Program and Metabolic Syndrome Risk: A Retrospective Database Study

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Abstract: Since 2011, the Seoul Metabolic Syndrome Management (SMESY) program has been employed as a community-wide, lifestyle modification intervention in Seoul, Korea. We aimed to determine if the SMESY intervention would be significantly associated with improvements in metabolic syndrome (MetS) risk factors. This retrospective database study included data from 25,449 participants aged 30 - 64 years between 1 January 2013 and 30 June 2013. In the SMESY program, 3 risk-stratified groups by the number of MetS factors were followed for 12 months with different intensity and timeframe of intervention. Among the high-(n = 7116) and moderate-risk groups (n = 14,762), all MetS factors (except triglycerides among the moderate-risk group) as well as MetS z-scores significantly improved over 12 months (all $p < 0.05$). Among the low-risk group (n = 3571), all factors aggravated significantly over 12 months (all $p < 0.05$). We observed temporal associations between the implementation of the SMESY program and improvements in MetS risk factors. However, such improvements differed by risk-stratified group, being most robust for the high-risk group, modest for the moderate-risk group, and aggravated for the low-risk group. Thus, more intensive interventions targeting different risk-stratified groups are needed, given a better understanding of the increase in risk factors observed in the low-risk group.

Key words: metabolic syndrome; lifestyle; cardiovascular diseases; community health service; prevention

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A Pilot Study of APN-led Self-management Program to Improve Cardiovascular Health Status among Korean Women with Risk Factors

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INTRODUCTION

Due to Koreans' rapid adaptation to westernization and urbanization in their lifestyles, fast growing incidence and prevalence of cardiovascular disease (CVD) became a major public health concern in Korea. Specifically, the incidence of coronary heart disease (CHD) continued to increase and its mortality rate increased more than ten times during the last two decades[1]. Furthermore, recent reports found increased rate of CVD among women, particularly post menopausal women[2], challenging health care providers and researchers to give more attention to women for better CVD prevention and management. Considering the fact that Korean women's life expectancy is 84 years old and about 7 years longer than men's[3], programs aiming at heart healthy lifestyle and risk factor management should be developed for those women at risk of developing CVD. Yet the significant determinants of health require hard work by health care consumers since health behaviors account for 50% of the causes of illness while environment, genetics, and access to health care account for 20%, 20%, and 10% of the causes of illness, respectively[4]. Therefore, helping individuals to become aware of their modifiable risk factors and engaged in their personal health can be the best way to promote healthy behavior change. Healthy behaviors require health education that can be best done by individual counseling[5] and by nurses, especially advanced practice nurses (APNs) because one of the APN's competencies is to provide patient-centered care that recognizes the patient as the source of control and full partner in providing compassionate and coordinated care based on respect for the patient's preferences, values, and needs[6].

Of well-known modifiable risk factors of CVD, physical inactivity and unhealthy eating behaviors are often found in women[7]. Various exercise programs including walking, sport dance, and Tai Chi were, in general, found to have positive effects on cardiovascular health, serum lipids, or blood glucose although there were some mixed or insignificant findings among Korean women[8-12]. A traditional Korean dance program consisting of nutrition education was reported as effective in improving dietary behaviors and some of the serum lipid profiles after the

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10-weeks program in elderly women living in residential homes[13]. However, all of the above exercise programs and nutrition education were delivered through group teaching. In addition, recent study of meta-analysis about people with metabolic syndrome (MS) found that combined interventions of both dietary and physical activity (PA) management reduced abdominal obesity[14].

Lifestyle changes such as increasing PA and healthy diet requires strategies to help participants maintain newly learned healthy behaviors. This study examined effects of APN-led intervention tailored to meet the educational needs of individual women at risk of CVD and to encourage self-management of health behaviors including fast walking and healthy eating. Also, the self-management program, designed to help women in transition to change health behaviors, offered weekly follow-up calls and self-monitoring diary after an hour of individual counseling regarding risk factors, fast walking, and healthy eating tailored to the woman's needs. Therefore, it was hypothesized that educating participants about their risk factors and supporting them in self-management behaviors of fast walking and healthy eating will significantly improve their PA, dietary behavior, and cardiovascular health status.

Method

Design

This experimental study used one-group pretest and posttest design to examine effects of an APN-led intervention supporting self-management on women's cardiovascular health status over a one month period. Data were collected at two time points, one month apart.

Sample

Participants were community residing Korean women who agreed to participate in a self-management supporting intervention designed to improve cardiovascular health status. Eligibility criteria for the study were adult women, age of 20 or older, who had one or more risk factors for MS. Of possible candidates for participation, women who did not follow the instruction to fast at least ten hours for blood tests were excluded. Women with cancer, a history of stroke or heart attack, mental or cognitive disorders, or physical limitations that would preclude walking, were excluded. 30 women were recruited and analyses were limited to 25 women who completed posttest.

Instrument

General characteristics

Sociodemographic background and menopausal status were collected by self-report. Illness information including family history, past medical history, and current medications were collected. Smoking status was assessed, too.

Physical activity and dietary behaviors

The amount of PA for the past seven days was measured by frequency and duration based on the two items from the World Health Organization International Physical Activity Questionnaire (WHO IPAQ)[15], days of continued walking at least for ten minutes and duration of average walking per day. Also, items regarding frequency and duration of being inactive per day were also assessed. In addition, the amount of fast walking was measured by a pedometer in terms of steps per day, duration per day, and days per week.

The Food Habit Questionnaire (FHQ)[16] was translated using a back-translation method. A bilingual and bicultural nurse with a PhD degree translated the questionnaire from English into Korean, and a bilingual and bicultural psychologist with a PhD degree translated the Korea version of the questionnaire into English. The original FHQ and the back-translated English version of the FHQ were compared by these translators, and any discrepancies were discussed and revised. The translators agreed on an integrated version of the translation. The FHQ with 20 items measured fat intake based on frequency over the past month. The score for each question ranges from 0 to 4 and average scores 2.0 and above were interpreted as high fat intake representing more than 29% of fat in the diet.

In this study, Cronbach's coefficient α was .65 and the test and retest reliability Pearson correlation coefficient

was .48 (p =.014) with one month interval. Sodium intake was estimated by intake frequency of sodium containing foods over the past month, which was developed by one of the authors for this study based on the information available at the National Hypertension Center[17]. The range of response choice for the 17 items was from 0 to 4, and total scores above 2.0 were regarded as high sodium intake. Cronbach's coefficient α was .92 and the test and retest reliability Pearson correlation coefficient was .85 (p =.010) with one month interval.

Cardiovascular health status

Blood pressure. According to the seventh report of the joint national committee (JNC 7)[18] in the United States on prevention, detection, evaluation, and treatment of high blood pressure (BP), participants rested in a chair at least ten minute before taking their BP twice, at least five minutes apart. If one of their BP measures was higher than 120/80mmHg, an additional BP was taken. Only when BP measures were equal to or higher than 120/80mmHg twice was it determined as prehypertensive; BP equal to or higher than 140/90mmHg was determined as hypertensive; and BP equal to or higher than 160/100mmHg was determined as severe hypertension. Automatic BPmachine (FT 500R, Jawon medical., Incheon, Korea) was used to minimize inter-rater errors.

Obesity. In order to determine obesity, body mass index (BMI) and waist circumference (WC) were measured. According to the guideline of the BMI interpretation by the Korean Society for the Study of Obesity, values greater than 23kg/m^2 was classified as overweight; values greater than 25kg/m^2, as obese. Korean women's WC greater than 85cm were interpreted as abdominal obese[19].

Fasting blood tests. Blood cholesterol profile (Total cholesterol [TC], triglyceride, high density lipoprotein [HDL], low density lipoprotein [LDL]) and fasting blood glucose (FBG) were measured. Interpretation of each test result is summarized in Table 2 and values of HDL, triglyceride, and FBG were based on the cut off points for the MS. For example, a FBG value greater than 126 mg/dL indicates diabetes, but a value higher than 100mg/dL regarded abnormal as a MS risk factor[20].

Metabolic syndrome. In 1998, World Health Organization defined MS as a cluster of three or more (of five) risk factors that are associated with an increased risk of development of CHD or diabetes[19]. The cut-off point of the risk factors of MS for women is suggested as triglycerides higher than 150mg/dL; HDL lower than 50mg/dL; BP higher than 130/85mmHg; FBG higher than 100 mg/dL; and WC greater than 85cm.

Estimate of 10-year risk of hard coronary event. This tool developed from the Framingham Heart Study estimates the probability of coronary events such as heart attack or CHD death within 10 years. This tool is available on-line at the National Heart, Lung, and Blood Institute[http://www.nhlbi.nih.gov/health/dci/Diseases/cscan/cscan_links.html]. Six factors needed for risk assessment include age, systolic BP, TC and HDL values, smoking, and taking BP medication.

Procedures

Recruitment and pretest

Women were recruited at the free health fair events held on Saturdays in June 2009. Health screening and health education were offered and BP, obesity indicators, and fasting blood tests were obtained. On the site, the investigator invited women to participate in the intervention if they had one or more risk factors of MS based on the tests results and their responses to screening questions. After participants understood the purpose of the study and signed the consent form, they completed questionnaires for collecting further information.

Intervention

Tailored counseling. Based on the test results and questionnaires answered, the APN analyzed each participant's risk factors and unhealthy lifestyles. Then participants were contacted to set up an appointment for an hour-long individual counseling tailored to each participant's educational needs and risk factors. In the beginning of the counseling, each participant's test results and risk factors were reviewed. The APN encouraged to maintain healthy lifestyle and discouraged identified unhealthy behaviors. Then, she introduced self-managed lifestyle modification of fast walking exercise and healthy eating to reduce risk of developing CVD or progressing

in CVD, and offered tailored teaching and demonstration.

Fast walking exercise and DASH diet. Fast walking has been known to be beneficial for cardiovascular health, low risk for injury, easy to perform, and free of cost[8,12]. Recommendations for the healthy eating are based on the guideline of dietary approach to stop hypertension (DASH); a diet that limits salt and fat intake and encourages fiber intake[22]. The APN introduced fast walking exercise and DASH diet to the participants and educated them on what to do and how. Especially, education about food choice from the DASH guideline has been modified to Korean foods choice and Korean ways of cooking. Educational booklet and refrigerator magnets developed for this study were given to them so that they could use them as easy references and daily reminders. Also, supportive materials such as a pedometer and a diary for self-monitoring were provided to each participant. Instructions and demonstrations for the fast walking exercise including warm-up and cool-down, the use of the pedometer, and the use of the diary for accurate record were given.

Weekly follow-up calls and self-monitoring diary. Following the individual counseling done by the APN, weekly follow-up calls from a nurse was continued for four weeks. A nurse-led telephone follow-up intervention has been reported to improve the physical dimension of health-related quality of life in patients after myocardial infarction[23]. During the calls, nurses checked the participants' compliance and barriers to behavior modifications and answered their questions. This was an opportunity to motivate them and provide reinforcement for their compliance. Each follow-up call also reminded them of keeping the diary for accurate recording and self-monitoring.

Posttest

Of 30 women who had at least one MS risk factor, 25 women (83.3%) remained in the study after four weeks of intervention and returned their diaries to the investigator. All tests done at pretest were repeated. Main reasons for dropping-out they reported include lack of motivation to change lifestyle, overload of housework, and lack of time for exercise.

Ethical Consideration and Data Analysis

This intervention study is done as a part of original study published elsewhere[21] that was approved by the institutional review board (KU-IRB-09-16-R-2). Collected data were analyzed by descriptive statistics to describe the participants' general characteristics and health behaviors. Effects of APN-led self-management program on participants' cardiovascular health status and health behaviors were demonstrated by using paired t-test.

Results

General Characteristics

The participants' mean age was 63.8±7.5 years ranged from 48 to 76 years. About two third of them were married. Only 28.0% reported having either a full-time or part-time job. 48% of them completed less than high school and 72.0% of them had a monthly household income of less than 2 million Korean won (≈$1,700.00). They reported son (72.0%), husband (52.0%), and daughter (40.0%) as their supportive persons when they were in need. Most of them (84.0%) were post-menopausal. The proportions of participants who were taking antihypertensive agents and lipid lowering agents were 20.0% and 8.0%, respectively. Significant associations were found between age and past medical histories of hypertension (x^2 =3.950, p =.047) and hypercholesterolemia (x^2 =5.00, p =.025). Other common conditions they had were knee arthritis (32.0%), osteoporosis (28.0%), low back pain (24.0%), obesity (16.0%) and depression (8.0%). Although musculoskeletal problems were common, none reported difficulty with walking(Table 1).

Health Behaviors

More than a half (56.0%) of participants were sedentary and 20% reported at least 15 minutes of PA per day more than three days a week at pretest. However, the most common type of their regular PA was stroll (40.0%). The most common barrier to regular PA was having too many "priority things" to do (40.0%). Self-monitoring diary was analyzed if completed more than 21 days out of 28 days; 19 of 25 diaries (76.0%)

Table 1. Participants' Characteristics (N=25)

Characteristics	Categories	n (%)
Age (year)	41~50	1(4.0)
	51~60	7(28.0)
	61~70	11(44.0)
	71~80	6(24.0)
Marital status	Married	16(64.0)
	Widowed	6(24.0)
	Divorced or separated	3(12.0)
Job	Full time homemaker	16(64.0)
	Retired	2(8.0)
	Part time (hourly)	3(12.0)
	Part time or full time	4(16.0)
Highest education completed	Elementary	6(24.0)
	Junior high	6(24.0)
	High school	7(28.0)
	≥Community college	6(24.0)
Monthly household income (10,000 won)	<200 (<$1,700.00)	18(72.0)
	≥200 (≥$1,700.00)	7(28.0)
Post-menopause	Yes	21(84.0)
	No	4(16.0)
Family history of CVD	Yes	9(36.0)
	No	16(64.0)
Past medical history	Hypertension	6(24.0)
	Hypercholesterolemia	9(36.0)
	Diabetes Mellitus	1(4.0)
Smoking	Yes	3(12.0)
	Never	22(88.0)
Regular exercise	Yes (3 days/week)	5(20.0)
	Irregular (1~2 days/week)	6(24.0)
	No	14(56.0)

CVD=cardiovascular disease.

were included for analysis. According to the diary, 80.0% of women performed fast walking exercise more than three days a week for a month, with average of 5.40±1.24 days per week ranged from 3.97 to 7 days. Their average amount of fast walking was 6,624.80±2,564.20 steps per day range from 2,765.1 to 10,961.1 steps based on their records using the pedometer. The duration of fast walking per day ranged from 29.8 to 125.3 minutes (M=51.10, SD=25.69).

According to the two items from the WHO IPAQ, the amount of walking determined by duration and frequency was improved, and the amount of being inactive for the past seven days was significantly diminished in a month of fast walking intervention. That is, 48% of women who walked more than 30 minutes a day on average at pretest increased to 68.0% at posttest. The proportion of the women who spent more than four hours a day sitting dropped from 60.0% to 48.0%. Days of being active by walking for more than 10 minutes continuously was increased significantly from about 4 days to 6 days (t=-3.73, p=.001) along with increase in duration of walking from about 63 to 100 minutes per day on average. Conversely, the average minutes of being sedentary per day was reduced from 328 to 230 minutes (t=2.09, p=.048) following the one-month intervention as summarized in Table 2.

The majority of participants (92.0%) reported that they prepared the meals for themselves and their families, and 84% answered they never had diet counseling in the past. The most common barriers to diet modification reported included lack of awareness (28.0%), being too busy (28.0%), and financial burden (24.0%). A month later, the participants who reported having irregular mealtime reduced from 24% to 12% as the proportion of high fat intake (32.0%) and high sodium intake (28.0%) decreased to 20.0% and 16%, respectively. Most (92.0%) reported that they were compliant to the low fat, low sodium diet more than 50.0% of time during the four weeks. The proportion of women who preferred salty taste was also changed from 36.0% to 20.0% over the one month. However, only the change in sodium intake was statistically significant (t=2.22. p=.036) as shown in Table 2.

Cardiovascular Health Status

The proportion of women with hypertension decreased to 8.0% from 20.0% after a month of self-management program. As shown in Table 2, systolic BP significantly decreased from 126.76±17.16mmHg to 118.76±13.14 mmHg (t(24)=2.52, p=.019) as well as diastolic BP in a month (t(24)=2.82, p=.009). Although 16.0% of the participants reported that they had been diagnosed with obesity in past, 44.0% of the participants were found obese. The participants' mean BMI, 25.14±3.52kg/m^2 indicating obesity significantly changed to 24.85±3.44kg/m^2 interpreted as overweight one month later (t=3.63, p=.001). The mean values of WC remained less than 85 cm and the proportion of women with WC was greater than 85cm was reduced from 32% to 8.0% in one month.

Although 64% of participants' TC values were higher than the normal range at pretest and 60.0% of women remained abnormal at posttest, the mean value was reduced significantly to 201.35±36.09mg/dL over the one month. Also, 56.0% of participants' triglyceride values were greater than 150mg/dL at pretest and 24% at

Table 2. Cardiovascular Health Status, Physical Activity, and Diet at Time 1 and Time 2 (*N*=25)

Variables	Categories (normal range)	Time 1	Time 2	t	p
		M±SD	M±SD		
Blood pressure (mmHg)	Systolic (<140)	126.76±17.16	118.76±13.14	2.52	.019
	Diastolic (<90)	75.20±11.54	69.80±6.34	2.82	.009
Obesity indicators	Body mass index (<25 kg/m²)	25.14±3.52†	24.85±3.44†	3.63	.001
	Waist circumference (<85 cm)	82.12±7.66	81.54±7.70	1.61	.120
Blood cholesterol profile (mg/dL)	Total cholesterol (<200)	212.10±34.01†	201.35±36.09†	2.51	.021
	High-density lipoprotein (>50)	54.40±13.67	54.96±12.05	0.35	.727
	Low-density lipoprotein (<130)	108.25±24.93	101.20±24.39	2.22	.039
	Triglycerides (<150)	171.68±71.85†	138.92±60.02	2.45	.022
Fasting blood glucose (<100 mg/dL)		101.44±18.56†	100.84±15.21†	0.17	.870
Number of metabolic syndrome factors (<3)		2.20±1.35	1.32±1.11	3.38	.002
Probability of 10-year risk estimate (%)		3.84±2.82	2.80±2.08	2.36	.027
Dietary habit	Level of fat intake	2.15±0.54	2.11±0.47	0.32	.750
	Level of sodium intake	2.17±0.37	2.07±0.39	2.22	.036
Physical activity (WHO IPAQ)	Days of walking for≥10 minutes	4.33±2.33	6.17±1.40	-3.73	.001
	Minutes of walking per day	62.86±39.17	100.00±134.56	-1.31	.205
	Minutes of physical inactivity per day	327.67±190.10	229.60±150.40	2.09	.048

† Means higher than normal range.

posttest as the abnormal mean value of triglyceride significantly decreased to 138.92±60.02mg/dL, which is within the normal range. Although values of HDL less than 50mg/dL were found in 44% of the participants at pretest and 32% at posttest, its mean values remained within the normal range. A reduction in the mean values of LDL was significant (t=2.22, *p*=.039). Although reduction in the mean values of FBG was not significant, the values remained around 100mg/dL and the proportion of women within normal range increased to 60.0%.

The proportion of women found to have MS in the beginning of this study (44.0%) decreased to 12.0% at posttest. Changes in the mean number of MS risk factors was statistically significant (t=3.38, *p*=.002). The estimated probability of 10-year risk of having hard coronary events showed a significant reduction (t=2.36, *p*=.027) from 3.84±2.82% (1.02~6.66%) to 2.80±2.08% (0.72~4.88%) over the one month.

Discussion

Considering that the participants' mean age was in their early 60s, one third lived alone and three quarters had low household income, it is suggested that aged women might be more vulnerable and marginalized in accessing health care services for disease prevention and health promotion. Thus, the APN-led health services which is available, accessible, affordable, accountable, and acceptable community-based health programs might be a promising approach to serve the population in need. Unlike Unites States where 55% of APNs were engaged in primary care practice[24] making them visible to public and health care consumers, a limited numbers of APNs in Korea works mainly in tertiary care settings. In the United States, the most common chronic illnesses for which APN primary care has been studied include diabetes, hypertension, and dyslipidemia[25].

Hypertension, hypercholesterolemia, and obesity, the three major risk factors of CVD in Koreans can be corrected by prompt treatment and interventions[26]. Findings from this study, associations of aging with hypertension and hypercholesterolemia and low compliance in taking medications for the most common chronic illnesses, call for better follow-up management for aged women to prevent CVD related complications. Similar to the report that the obesity rate in Korean women was highest in their 50s and 60s and the incidence of obesity in women increases with age[27], almost a half of this study participants was obese and one third had abdominal obesity. Considering the mean age of the participants indicating post-menopause which increases the risk of developing CVD and well-known relationship of obesity to hypertension and hypercholesterolemia, women at advanced age deserve attention from health professionals.

It is important to note that only 8% of women with hypercholesterolemia take lipid lowering agents as prescribed. Reasons of low compliance rate of taking lipid lowering agents were not explored since they are beyond

the scope of this study. Furthermore, every other woman's triglyceride values which is associated with obesity, was greater than the normal, and two thirds of the women's TC values remained higher than normal. Since hypercholesterolemia was associated with high fat intake[28], elevated values might be explained, in part, by dietary habits. However, it was surprising that there was no woman who had followed low fat diet or received diet counseling from dietitians in the past. Thus, diet counseling tailored to one's educational needs and risk factors should be available.

As a result of one month of self-monitoring after the tailored counseling including diet behaviors review with the APN, unhealthy diet behaviors were improved and TC and triglyceride values were improved significantly. Diet interventions to modify hypertension, hypercholesterolemia, and obesity utilizing diverse resources and concentrated individual counseling might be more effective in leading to desirable eating attitude and healthy eating behavior than a group teaching emphasizing just informational gain[29]. Since most of the participants prepared meals for themselves and their families, support for diet modification for women may improve not only their own health but also their families' health.

A reason why knee arthritis, osteoporosis, and low back pain were common in the participants can be explained by their mean age. Thus, exercise interventions should be age-sensitive and easy and safe to perform so that they can maximize the benefit of exercise while minimize potential risk or bodily harm. The proportion of women who performed regular exercise increased from one fifth to four fifths. This was a remarkable change since more than a half of the participants were sedentary and what most of them did was stroll originally. Therefore, fast walking appeared easy and low risk to those women who were physically inactive or have limited physical conditions due to age or illness. On average, they walked 6,625 steps for 51minutes per day and five days a week for four weeks. With this high compliance to fast walking for a month as well as to low fat and low sodium diet, they showed a significant improvement in the BMI and values of BP, TC, triglycerides, and LDL. Eventually, numbers of MS risk factors and 10-year risk estimate of coronary event showed a significant reduction since they were influenced by their assessment factors such as BP, TC, triglycerides although changes in WC, HDL, and FBG values were not significant. From these findings, targeting a couple of risk factors with priority might be strategic to improve cardiovascular health status and reduce risk of developing CVD.

Evidence of high compliance to diet and exercise modifications as recorded in their daily diary was supported by changes in diet behaviors and PA evaluated by questionnaires measured at pre- and post-intervention. They were also linked to significant improvements in cardiovascular health indicators of BP, BMI, TC, triglycerides, and LDL values and eventually reduced the prevalence of MS and the probability of 10-year risk estimate of coronary event. Using diary with the purpose of accurate data collection and self-monitoring appeared helpful in raising participants' awareness of their performance level of healthy behaviors in daily routine and in offering a chance for self-reflection.

Changing one's lifelong habits over one month period may not be easy. Furthermore, comprehensive information regarding heart healthy lifestyle modification might be overwhelming by nature for lay persons to apply to their daily routines. Therefore, impact of individual teaching tailored to a person's need on behavior change might be significant. An interesting finding from this study that the most reliable person Korean women reported was their sons, may imply their traditional family orientation which remained dominant in expecting their grown-up sons to support them when they get old. Thus, family involvement in teaching for women, especially son's encouragement needs to be considered to support healthy behavior modifications in this generation of Korean women. Also, weekly follow-up calls from their nurses during the transition of behavior modification appeared to provide consistent support including reinforcement, encouragement, repetitive teaching as needed, and emotional support. Even though time given for self-management with healthy behaviors was relatively short, concentrated approaches showed beneficial impact on lowering participants' CVD risk factors and improving cardiovascular health status.

Conclusion

This pilot study examined effects of APN-led self-management program promoting healthy behaviors of fast walking exercise and healthy diet on Korean women with one or more MS risk factors. Significant improvements were found in BPs, BMI, triglyceride, TC, and LDL levels, and the number of MS factors, and the 10-year risk estimate of coronary event after a one-month of concentrated intervention. That is, APN's strategies of tailored counseling and support used in this community-based program appeared effective to modify cardiovascular risk factors. Suggestions for future study include cost-effectiveness analysis of the intervention and satisfaction with the quality of service. Limitations of this pilot study include absence of control group for comparison, limited generalizability with small sample size, and relatively short-term intervention period for newly learned healthy behaviors. However, the study findings suggest promising implications for women at risk of developing CVD and for APNs who are competent to perform evidence-based practice and in-depth teaching with effective communication skills.

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A Pilot Study of APN-led Self-management Program to Improve Cardiovascular Health Status among Korean Women with Risk Factors

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Purpose: The aim of this study was to examine the effects of an Advanced Practice Nurse (APN)-led self-management program on cardiovascular health status among Korean women at risk of developing or progressing cardiovascular disease. ***Methods***: This pilot study used one-group pre- and post- test experimental design. At health fairs in a community, 30 women who had one or more risk factors for metabolic syndrome were recruited and agreed to participate in the study. A total of 25 women completed the study. The intervention consisted of weekly follow-up calls and self-monitoring diary after an hour of individual counseling regarding risk factors, fast walking, and healthy diet tailored to the participants' needs. Physical activity was assessed with the World Health Organization International Physical Activity Questionnaire and a pedometer. ***Results***: Participants showed statistically significant improvements in blood pressure, body mass index, levels of triglyceride, total cholesterol and low density lipoprotein, numbers of metabolic syndrome factors, and the 10-year CV risk estimate after one month of concentrated intervention. In addition, their physical activity behavior significantly improved after the intervention. ***Conclusion***: This APN-led self-management program targeting modifiable risk factors by offering tailored counseling and concentrated support during the transition might be effective in preventing progression to the cardiovascular disease.

Key words: Cardiovascular disease; Diet; Physical activity; APN; Metabolic syndrome

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Self-portrait of Obese and Overweight Korean Women based on Lifetime Phase

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Introduction

Obesity, caused by changes in dietary habits and lifestyle from rapid westernization, urbanization, and modernization, has been identified as a global non-communicable disease [1]. The prevalence of obesity and overweight in the United States (68%) is the highest in the world, and the situations of Canada or European countries are no different from that of the United States [2,3]. The prevalence of obesity among Korean adults increased from 26% in 1998 to 31.9% in 2011; 28.6% of adult Korean women are obese [4]. Because Korean women may get pregnant and give birth in their 30s [5], they experience weight problems related to pregnancy and childbirth, which are earlier than that of men. The proportion of obese Korean women in 30s and 40s was 34.7%; the rate is even greater among women in their 50s and 60s, and is higher than that of men [4].

Obesity and overweight are common risk factors of lifestyle disorders such as coronary artery diseases, stroke, diabetes mellitus, hyperlipidemia, and hypertension [2]. Therefore, more active management of obesity and overweight is necessary for preventing these diseases. However, a number of interventions for weight loss tend to be ineffectively standardized and thus are insufficient to meeting women's diverse needs. In reality, programs based on understanding women's perception about, or satisfaction with, her own body weight or motivation and influencing factors for weight loss are lacking [6,7]. Moreover, although there have been studies on obesity to improve physiological indicators of weight loss [8], understanding individuals' health perceptions about being obese and how these individuals are influenced by sociocultural factors may be crucial for healthy weight management [6]. Because health is a multi-dimensional concept, subjective evaluation of one's own health is as important as objective indicators of health. That is, one's own subjective health evaluation and body image may be critical as determining factors of healthy behaviors [9]. Therefore, qualitative study on obese and overweight women's body image and health perception may eventually contribute to the development of effective intervention with individualized strategies to meet these women's unique needs [10]. The purpose of this study

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was to explore obese and overweight Korean women's self-perception and how they perceive their health problems related to their excessive weight.

Method

Design

This was a qualitative study to explore obese and overweight women's health needs, perceptions of their body image, and their own experiences of being fat by using focus group interviews (FGIs) as the data collection method. The FGIs involved interactions with participants who were interested in a certain topic and obtained a range of responses [11].

Participant Eligibility

Korean women whose body mass index (BMI) were 23kg/m2 or greater were recruited. Of these candidates, women younger than 30 years and those older than 69 years were excluded. In addition, those with communication problems or those who have participated in any other studies related to obesity or overweight for the last one year were excluded.

Questions for the Focus Group Interviews

The researchers, with the assistance of two women's health experts, developed the open-ended questions to be used in the FGIs. These questions were relevant for all age groups of women who are obese or overweight for assessing their experiences and perspectives. The primary questions included the following: "How do you think or feel about your body?"; "If you ever have decided to lose weight, what was the motive?'; "What were the changes you felt in your health after gaining weight?"; "How much do you want to lose your current body weight?"; "What kind of exercise do you dislike the most, and why?"

Data Collection

In order to find similarities and differences between women who are obese or overweight, the primary investigator (PI) organized four groups in their 30s, 40s, 50s and 60s, respectively. Each group had six to eight women to increase the chance of participation in interactions and improve the quality of the conversation within the group. Four to eight participants are considered as an appropriate size per group [12]. Each FGI was conducted once from March to April, 2013. The discussion took place under a pressure-free atmosphere. Wide open conversation with acceptance facilitated by the PI helped participants share their own experiences, thoughts, and feelings with others in the group. While the PI was leading in-depth dialogues and interactions, two researchers carefully observed the participants' non-verbal communications such as facial expressions, vocal tone, and hand gestures and documented them in detail. To maximize fidelity and reliability of data, all FGIs were audiotaped and transcribed based on the recordings and field notes within two weeks following each FGI. Discussion continued until each group discussed all the questions. Each FGI took about 90 to 150 minutes. Right after each FGI, research team meetings were held to review observations during the interviews such as repetitive statements and unique expressions.

Data Analysis

Two researchers, who had reviewed the transcribed data independently, examined the analyzed results and confirmed that the concepts and categories were consistent with the significant findings. Discrepancies among researchers were discussed in-depth until a consensus was reached. Inductive thematic analysis is a useful method to understand specific meanings from the data [13]. First, each researcher read the transcribed data multiple times and recorded his/her first impressions or thoughts from the transcript review as a whole. Second, the researchers then created initial codes of interesting characteristics. Third, they found potential themes by collecting and analyzing each code and its related data. Fourth, using thematic map, themes were reviewed by comparing coded data and the whole data. Fifth, analysis was continued to refine the identification of subordinate themes and their contents, and the comprehensive theme

reflecting the meaning of the whole data was defined and named. Lastly, meaningful quotations, which were representative of each theme, were chosen.

Rigor and Trustworthiness

Credibility, fittingness, auditability, and confirmability were confirmed, in order to assure the validity and reliability of the data analysis [14]. For the credibility, the PI maintained neutral position during the FGIs, and tape-recorded data and filed notes were transcribed and analyzed right after each FGI. Additionally, two researchers identified the main themes independently until they reached consensus; they had regular meetings to discuss their analyses. To ensure fittingness, the PI confirmed contents of conversations by summarizing the answers from the participants. In order to keep auditability, each FGI was tape recorded, and field notes and memos were documented throughout the FGI process. Lastly, confirmability was achieved by satisfying the above three criteria.

Ethical consideration

This study recruited participants after approval from the Institutional Review Board (KU-IRB-13-13-A-2) was obtained. For voluntary participation, posters and flyers were used for recruitment. After the study purpose and procedure of FGIs were explained, a signed consent form was obtained from each participant. Then, they answered sociodemographic questionnaires and joined FGIs. After the first transcript was completed, identifying information was coded for confidentiality before the data analysis.

Results

The focus group consisted of 27 participants with an average age of 48.7±10.8 years, ranging from 31 to 62 years. The mean BMI was 27.45±3.52 kg/m2, indicating obesity. The specific demographics are shown in Table 1. Data analysis from the interviews revealed two common themesregarding participants' own self and body image and prevalent concerns observed in each age group.

Common Themes across Age Groups

1) Heavy heart, heavy body

Most participants expressed negative feelings about their physical appearances. Many believed that their weight made them look clumsy and awkward, with feelings of low self-worth and depression. When these feelings were intensified, bouts of anger and loss of self-confidence often occurred, leading to dangers of social isolation and avoidance.

> Being fat makes a person look clumsy and awkward; I am one of them and it's really frustrating. (FGI 50s-participant [P] 6)
>
> I have no confidence; I don't think I can do anything well. Everything seem so burdensome. (FGI 60s-P4)

Due to negative body image, participants expressed fear, anxiety, and heavy-heartedness. Overwhelmed by their weight, many reported experiencing a sense of loss, low self-confidence, bouts with depression, social withdrawal, and isolation.

> (On the verge of tears) there's a lot of shame (being fat). Most importantly, there is an endless sense of self-loss (voice shaking)... and that shame is always constant. (In tears and blushing) I get really mad at myself for no particular reason. Lack of self-confidence always leads to anxiousness. Then I turn to food again to console my feelings. The vicious cycle continues and my heart hardens deeper. I've somehow let myself be cornered and left myself there all alone. (FGI 60s-P2)

2) Resigned acceptance and compromise

Participants were accepting of their problem because of a sense of helplessness and inability to control their current weight. Furthermore, some displayed a lack of objectiveness when considering their own weight problem; they compromised and were inclined to put less effort into weight loss. Although most participants acknowledged the need for weight control, very few participants took further steps to change their diet or to develop an exercise routine.

I don't think I see my weaknesses well. I often assume that I look like the women I pass by each day, lean and fit. Maybe that is the reason why I fail at dieting. It's difficult to look at my own self and see that I too am obese. (FGI 40s-P2)

Putting family and other priorities first, most women claimed that lack of personal time and money kept them from exercising. On the other hand, older participants were more prone to accepting obesity as a part of their nature. Unlike the younger women, older women had more generous attitude about their physical appearances. This often led to a lack of effort and control over one's weight, resulting in a steady weight gain over time.

I feel as though I've given up everything. In terms of keeping my health, I don't even have time to eat. I can't even think about exercising. How can I do anything for myself when I need to constantly be in care of our two kids? (FGI 30s-P6)

What can I do but admit it has being a natural phenomenon and come to terms with what is given. (FGI 60s-P7)

I would say to myself that since I worked hard each day, I deserved to treat myself to food. This is how I became fat - by overindulging in generosity and forgiveness. (FGI 40s-P5)

Perceptions in Different Age Groups

1) The thirties: concerning others' gaze on their obese appearances

Participants in their 30s were mostly concerned with the prevalent social bias, which placed a woman's physical attractiveness over all other attributes. Describing the social disadvantage and cultural disdain for fat women, they explained their reasons for having a heightened sensitivity towards how others might perceive them. Additionally, they desired to lose weight in order to improve their appearances, to put on prettier clothes, and to go about life with more confidence.

I should order 'Americano' (because of my size), but if order a drink with heapful of whip cream on the top (smiling), the person taking my order will think, 'Yeah, of course fat lady. I knew you would,' staring right at me. This is how I feel all the time; I feel as though I'm being mocked by people who think that I'm like this now (fat) because of what I eat (fattening foods). (FGI 30s-P3)

Specifically, their family members' direct and derogatory comments such as "you're like a pig" or "you'd better lose weight" have scarred their egos. Unmarried singles feared how their physical appearances would negatively influence their chances of getting married, while the married believed that they were no longer physically attractive to their spouses. Consequently, they reported having depression and lower self-esteem.

My shape has changed after giving birth. I feel as though my feminine attractiveness is diminishing. My husband now tells me that I don't know a thing about self-maintenance. This gets me really depressed. My ego is crushed. (FGI 30s-P6)

Participants preferred exercising alone in order to escape situations that might reveal their body shape in public. They also explained that it was difficult to stay focused because doing so made them self-conscious and forced them to compare themselves with others in the group.

I never really liked the wild and vigorous aerobics routines with other people (laughing). I don't like the way how my bare skin under the suit shows during the moves, nor how the outfit fits against my body showing my shape. It's embarrassing to see women in shape wearing the same tight suits showing off their body when I look like this. (FGI 30s-P1)

2) The forties: realizing their aging obese appearances

Women in the 40s had feelings of self-pity and shame regarding their overweight, and disliked looking at themselves in the mirror. However, unlike the younger group, they were less concerned about how others perceived them, but were more sensitive to the existent cultural stereotypes assumptions regarding obese women as being lazy and lacking self-control.

I hate looking at myself in the mirror (upset). I'm immediately overcome by self-pity knowing that I could never measure up. I feel as though I'm the only one missing the mark (voice louder). (FGI 40s-P1)

In particular, most women mentioned knee pain as the signs of aging. Distinct from those in the 30s, any physical changes were taken significantly and psychologically as a part of the individual's aging process.

When my knees hurt now, my immediate thoughts are, 'Oh, no. I'm aging. What's going on?' and I begin worrying. Even with the same symptoms, I see how we react differently in our 30s and 40s. (FGI 40s-P2)

Furthermore, despite the desire to look young and to put on appealing clothes, they often cannot find the right size in ready-mades. As a result, wearing a bigger size outfit with a traditional design adds to the appearance of aging.

I wasn't always like this but I really look like a real 'mama' now. How quickly we add the age and take on the look. Only a while ago, I had a look of a professional, but with a sudden change in weight, my image has changed too. I'm coming to grips with how aging impacts the way I look and feel, and I'm literally shocked by it. (FGI 40s- P2)

3) The fifties: recognizing red flags of their health with obesity

Women in their 50s were particularly anxious about their health conditions. Following menopause, symptoms of obesity and overweight caused other health complications such as musculoskeletal disorders, diabetes, and cardiovascular diseases. Jokingly, they referred themselves as a "walking hospital," but still anxious and worried about the complications caused by obesity thus sensing the presence of life-threatening symptoms. This group shared their deep regrets for not being more proactive in weight control for both the aesthetic and health reasons.

When I heard that my thyroids have worsened and there was something in my breast, my body reacted immediately to pain. When I came to terms with my problems, the immediate thoughts were that I've been ignorant to all the advice to lose weight. What regrets. Obese people are that way because they really never got to know themselves well. (FGI 50s-P1)

There is a slight clogging in my blood vessels, and this has me worried a lot. So I've made constant visits to the hospital., but to no avail. My heart was down and broken as people told me that the diabetes is a chronic illness that I would have to live with. I utterly lost hope. (FGI 50s-P3)

4) The sixties: becoming ambivalent about their obese appearances

Women in their 60s agreed that a weight loss plan was necessary, yet showed a negative perception to an excessive weight control. They reasoned that an extreme weight loss could result in more visible wrinkle lines that would make them look poor and needy, thus professing their negative perception of thinner people. Although they shared a negative belief that viewed obese people as having a lower willpower and lack of self-control, they were very generous and forgiving when it came to describing themselves. Some believed that being overweight was socially acceptable as long as the person was healthy. Unlike the younger generation, the older, post-war generation women believed that being overweight was a sign of virtue and of being successful in life, whereas being thin made them look irritable and poor.

Now that we've experienced it all, we see why we shouldn't be overweight. But in trying to lose weight now, we realize that such an effort would have been better if it happened at a more appropriate age. (FGI 60s-all participants)

Participants preferred to exercise in groups and considered it as a way to promote social companionship. However, they chose their exercises selectively, attentively minding their health conditions and safety issues of the workout.

It would've been boring if I had to do it all by

myself. But at the gym, I could watch and observe young people and receive their good vibes too (pausing to laugh). It felt good to be able to talk to people here and there. (FGI 60s-P5)

I can't afford to do any exercise that requires running or jumping like jump-roping because doing so hurt my knees. Anything that requires a lot of strain in short periods of time such as sit-ups is an overstrain for me. They all hurt my back. (FGI 60s-P1)

Discussion

This study explored how obese and overweight women of different ages perceive their body image. Considering that awareness of their own body weight influences their behaviors to lose weight and also that a number of obese and overweight women underestimate their own body weight [6], knowing how they perceive their health and own body image can be important in planning effective weight loss program for them.

Regarding common themes from the obese and overweight women's stories, first of all, participants showed self-perception as 'heavy heart, heavy body.' This can be interpreted as negative psychosocial responses to a negative body image. Today, women living under modern sociocultural environment and overwhelming influence of mass media feel pressure to be slim [15] and this may affect their self-worth and eventually their perception of own body weight [7]. Due to the negative biases from others toward being obese, they may be more dissatisfied with themselves [8]. The psychosocial consequences of obesity, such as dissatisfaction with life, interpersonal problems, or belittlement of one's own body image, can serve as a positive motivation to lose weight, but it can cause depression, linked to the vicious cycle of chronic diseases [16]. These women in Korea who have a greater possibility of internalizing the negative message from the social environment showed negative psychosocial responses and were more dissatisfied with their looks or avoided social circumstances where they could be compared with non-obese women [16,17]. In particular, younger participants in this study experienced drop-outs from exercise programs in the situations compared with slim or fit women. Because high drop-out rate due to low self-esteem, depression, and negative body image, results in failure of weight loss in obese women [16,18], considering their psychosocial status is needed for intervention programs for women with excessive weight. Thus, in order for the programs to be successful for healthy weight loss or for lifestyle modification, an integrative approach is necessary that can offer tailored motivation based on individual health needs and that can correct the negative psychological status and contorted perception.

However, a resigned acceptance and a compromising attitude can be inhibiting factors in weight management behaviors. Older women showed generous attitude perceiving their fat appearance as a natural aging process, which underestimated their weight and could fail to motivate them for weight reduction [6,19-21]. Accordingly, accurate perception about body weight is important in weight management and nurses need to provide obese and overweight women with accurate information about healthy weight a d health consequences of obesity [7,19,22]. In contrast, younger participants often blamed circumstances that restrict their time to take care themselves due to their busy schedules. This kind of attitude observed was consistent with the finding that modern working women often excuse themselves from weight management by convincing them and others to have to keep healthy and stoic body to perform their jobs [23]. In this regard, women in this age group can be more vulnerable since they are obligated to their social roles; the more psychosocial stress, the harder successful weight loss [22]. Barriers in weight management such as psychosocial stress should be first identified and resolved when the weight reduction program is designed.

The theme from women in their 30s was 'concerning others' gaze on their obese appearances.' Similar to modern western society, modern Korea also prefers slim body as an ideal image of woman. Negative atmospheres that view the obese as lazy and emotionally unstable cause stigma and discrimination [16,24]. These unpleasant experiences in daily life can be risk factors increasing dissatisfaction with their body [17,25]. In today's appearance emphasizing society, women are in a vulnerable environment that makes them sensitive to

body weight and looks. Especially, Korean women think slim body as physically attractive and an asset for getting married [19].

The theme from women in their 40s was 'realizing their aging obese appearances.' Participants in their 40s found themselves less sensitive to others' eyes but more frustrated by their own aging appearance. It eventually makes them have lower self-esteem and worried about being called "ah-joom-mah," the abasing label for middle-aged women in Korean society. They often expressed their frustration in having limited choices for wearing attractive clothes with a feminine shape. These findings support that women with high BMI and dissatisfaction are prone to select clothes to cover up their body and have negative experiences with clothing purchase [26]. Clothes mean a lot to women regardless of age since they are tools of enhancing self-confidence as well as improving looks and images [26].

'Recognizing red flags of their health with obesity,' emerged as the theme from women in their 50s. This suggests that current health status plays an important role in perceiving risk factors related to body weight [20]. Participants with knee arthritis pointed out weight excess as a cause and expressed more concerns about health than younger ones who did not recognize any symptoms associated with obesity. Women in their 30s were inclined to focus on appearance in terms of aesthetics while women in their 50s gave importance to health management rather than outer beauty. This difference suggests assumed that well-being perceived in middle-aged or older women is related to satisfaction with physical functioning rather than appearance [27]. Likewise, different motives to weight loss per age group can be interpreted as different sociocultural expectations according to age.

The last theme, 'becoming ambivalent about their obese appearances,' is related to contradictory attitude demonstrated in women in their 60s who despite acknowledging the need for weight reduction for health or outer beauty, still viewed the thin appearance negatively. This finding supports results of the previous research that the older the women, the better the satisfaction with their body weight [27]. This can be interpreted as acceptance of reality in women rather than insisting on ideal weight as ratio of obesity increases with aging [28]. They value physical functioning more than appearance with aging [27]. Women who have experienced the era of post-Korean war, considered being big and fat as symbols of being rich and successful while they viewed being thin as the opposite and negatively.

In this way, obese and overweight Korean women had distinctly different perceptions of obesity based on lifetime phase. Although all generations had a common interest in physical appearance, younger generation was relatively high in Korea [29]. Such differences from generation to generation are more likely to be definite in Korea because of its collectivistic culture, which places importance on the group over he individual., than in the Western society [30]. The limitation of this study is that most of the participants were from Seoul, the capital city of Korea. Thus, findings from this study may be difficult to generalize all obese and overweight Korean women. Variations in women's socioeconomic status and educational levels according to their residential districts in Korea may influence their experiences and self-perceptions as well as their psychosocial environments.

Conclusion

Based on the understanding of obese and overweight Korean women's self-perceptions based on lifetime phase, this study suggests the necessity of diversity in intervention programs that suits individuals' perception, attitude, and motives toward weight reduction as well as their psychosocial health issues based on their ages. In addition, this study suggest a survey on weight-related health-seeking behaviors among obese and overweight women based on lifetime phase. It would lead to successful and effective interventions for healthy weight reduction among Korean women with weight problems.

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Self-portrait of Obese and Overweight Korean Women based on Lifetime Phase

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Purpose: This study investigated Korean women in between age 30 to 60 who were obese or overweight in order to explore their self-perception based on lifetime phase. **Methods:** Focus group interviews were performed four times with six to eight participants in each group (a total of 27). Data were analyzed using inductive thematic analysis. **Results:** The data analysis from the interviews revealed recurring common themes: heavy heart, heavy body, resigned acceptance of their own condition, and compromise. The study also found that each age group had different concerns: concerning others' gaze on their obese appearances (30s), realizing their aging obese appearances (40s), recognizing red flags of their health with obesity (50s), and becoming ambivalent about their obese appearances (60s). Overall, their perceptions of being overweight were negative and stressful. Women in their 30s and 40s were more interested in their appearances, and thus were more obsessive about weight gain. In contrast, women in their 50s and 60s were more accepting of their physical appearances, and thus were more concerned about living healthy than losing weight. **Conclusion:** These results may be useful to consider when developing tailored weight-control programs for obese and overweight Korean women. Additionally, strategic approaches for successful and effective programs targeting healthy weight should be based on better understanding about women's self-perceptions and motivations.

Key Words: Overweight; Obesity; Women; Health; Perception

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