Original Research

Examining the health-related quality of life of middle-aged men with metabolic syndrome based on their stress level

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Abstract

Background: This study was conducted to identify the factors that affect the health-related quality of life (HRQoL) of middle-aged men with metabolic syndrome (MetS) based on their stress level using data from the Korea National Health and Nutrition Examination Survey (KNHANES). **Methods**: The participants of this study were men aged between 40–64 with MetS who were included in the KNHANES. The main variables of this study were HRQoL, which was measured using the EuroQol-5 Dimension (EQ-5D); general characteristics, health-related characteristics, and dietary behaviors. **Results**: The subjective health of the group with less stress was significantly better. Compared to the unhealthy group, the groups perceived as healthy and normal had a higher HRQoL. The economic level, suicidal ideation, and dinner arrangement (presence of family) of the stressed group were significantly associated with their HRQoL. Compared to a low economic level, the high and middle economic levels were more associated with the subjects' HRQoL. Compared to the group without suicidal ideation, the group that experienced suicidal association had a lower HRQoL. Compared to the group that did not dine with their family, the group that dined with family had a higher HRQoL. **Conclusions**: The results of this study expand the scientific understanding of HRQoL based on stress among middle-aged men with metabolic syndrome. Since differences in the influence of the factors that affect HRQoL were identified based on the level of stress experienced, the stress level of middle-aged men should be considered when devising an intervention strategy to improve their HRQoL.

Keywords: quality of life; middle aged; men; metabolic syndrome; stress; mental health

1. Introduction

The elongation of people's lifespans and the improvement of their living standards have increased their desire for a better life after middle age and the interest in their health-related quality of life (HRQoL). Recent estimations indicated that the average life expectancy of Koreans increased to 79.3 years for men and 85.4 years for women, whereas the healthy life expectancy for Korean men and women is 65.2 years and 66.7 years, respectively [1]. Korea's population is expected to age at the fastest rate among those of all the member states of the Organization for Economic Cooperation and Development. Therefore, measures to improve the HRQoL in an aging society by minimizing the gap between the average and healthy life expectancy need to be developed urgently.

The median age of Korea is expected to rise from 43.6 years as of 2020 to 56.4 years by 2050, and the proportion of the nation's middle-aged population is increasing [2]. Middle-aged men experience a relatively higher level of perceived stress and anxiety than their female counterparts due to the drastic changes that occur in their social life, which include involuntary or unprepared retirement [3]. Particularly, the suicide rate of men aged 40–59 years is about three times higher than that of women at the same age [4]. Although previous studies have stated that men

have a higher quality of life than women [5–7], their quality of life sharply decreases in comparison to that of women in the transition from early to late old age [8]. There is thus a need for the re-examination of the HRQoL management measures for middle-aged men.

The WHO defined quality of life as an individual's perception of their position in life within the context of the culture and value systems that they inhabit, in relation to their goals, expectations, standards, and concerns [9]. HRQoL is expressed as the effect of one's health status and therapeutic function, and it is used as an indicator to assess an individual's health status, which includes their physical, psychological, social, and mental health, in addition to their subjective health status and type. In this study, a decline in HRQoL was confirmed as a predictive index for mortality [8,10]. As such, HRQoL has been utilized as a useful measure to understand the health and well-being of subjects [11,12] and is used as evidence for health promotion programs and the establishment of health policies [8,10].

Subsequently, metabolic syndrome (MetS) is a serious health condition in which an individual simultaneously suffers from three or more of the following five risk factors: abdominal obesity, high blood pressure, high fasting glucose, high triglyceride, and low high-density lipoprotein cholesterol [13]. According to the National Health

Statistics report, the prevalence of MetS among Koreans increased from 24.5% in 2008 to 28.1% as of 2017 [14]. Since the start of the Korean National Health and Nutrition Examination Survey (KNHANES), the prevalence of MetS in men and women increased rapidl from 22.4% and 27.9% in 1998 to 29.0% and 32.9% in 2007, respectively [15]. Another study reported that the prevalence of MetS among women remained stable at 26.4% from 2008 to 2013, whereas it increased from 27.9% to 30.8% during the same period among men [16].

MetS is associated with increased mortality as it increases the risk of cardiovascular diseases such as diabetes, chronic renal failure, hypertension, stroke, myocardial infarction, and angina [17]. Middle-aged men with MetS require special attention because the condition is accompanied by depression-inducing complications such as cognitive impairment and brain atrophy [18,19]. Furthermore, stress aggravates adverse health behaviors such as excessive caloric intake, smoking, drinking, and limited physical activity, which increases the risk of MetS [20,21] and negatively affects individuals' self-management of health [21,22].

Peggy A Thoits [23] reported a study of the mechanisms by which social relationships and support improve physical and psychological well-being either directly or as a stress buffer. Emotionally sustained behavior, instrumental support from important others, and empathy are very effective in alleviating the physical and emotional effects of stressors [23]. In Korean culture, dining with family is an important emotionally-lasting life behavior, and such social relationships and support can improve the quality of life as a stress buffer. Dining with their family may help buffer stress in men with MetS. As regards the quality of life according to the stress level of middle-aged men with Mets in Korea, dining with family is a necessary process.

Therefore, this study was conducted to identify the factors that affect the HRQoL of middle-aged men with MetS based on their stress level. To do so, it utilized data from the KNHANES, which constitutes domestic epidemiological data that represents the entire Korean population [24]. The results of this study are expected to be used as basic data for the development of intervention programs for improving the health promotion behavior of middle-aged men.

2. Materials and methods

2.1 Study design

This study is a secondary analysis of data from the first year (2019) of the eighth KNHANES (KNHANES VIII-1). This descriptive research study identified the factors that affect the HRQoL in middle-aged men based on their stress level.

2.2 Participants

The KNHANES was implemented by extracting representative samples from all citizens who live in Korea. The KNHANES involved a two-step stratified colony sampling method that used the survey district and household as the primary and secondary sampling units. In KNHANES VIII-1, the extraction frame was stratified based on region and housing type, and the ratio of single-person households or the age of the head of the household was used as the implicit stratification criterion. Within the sample households, all members older than a year who satisfied the requirements were selected as subjects for the survey. Out of the men aged 40–64 years who met the criteria for MetS from amongst the 8110 subjects of KNHANES VIII-1 [25], the 526 men who answered questions related to their stress level were included in this study.

2.3 Study variables

2.3.1 HRQoL

HRQoL was measured using the EuroQol-5 Dimension (EQ-5D). The EQ-5D assessed five dimensions of their lives: mobility, self-care, daily activity, pain/discomfort, and anxiety/depression. The EQ-5D index is a quantitative single value calculated for 243 health states after weighting the level of each of the five domains [26]. On this scale, a score of 1 signified that there was "no problem" with the respondent, whereas 2 signified that they were "somewhat disturbed" and 3 signified that they were "very troubled".

The Korea Centers for Disease Control and Prevention (KCDC) applied a weighting formula to calculate the EQ-5D values for Koreans and formulated it so that the closer the score is to 1, the better the quality of life [27]. The higher the EQ-5D utility value, the higher the HRQoL [28]. In this study, the EQ-5D index was divided into quintiles based on the study by Choi et al. [29]. Quality of life was classified as low if it was in the bottom 20% and high if it was in other quintiles.

2.3.2 General characteristics

The general characteristics queried included the participants' age (40–49, 50–59, 60–64), economic level (high, middle, low), education level (lower than middle school, high school, college or higher), marital status (yes or no), suicidal ideation (yes or no), and subjective health (healthy, normal, unhealthy).

2.3.3 Health-related characteristics

The health-related characteristics included health checkups in the past two years (yes, no), aerobic physical activity (yes, no), hospitalization in the past year (yes, no), alcohol consumption (yes, no), and smoking (yes, no).

Aerobic physical activity was defined as moderate physical activity for at least two hours and 30 minutes per week, high-intensity physical activity for at least one hour and 15 minutes per week, or a mixture of moderate and

high intensity physical activity (one minute of high intensity work = two minutes of medium intensity work). The participants' alcohol consumption was classified as "yes" if they consumed more than one drink per month and "no" if they did not drink or consumed less than one drink per month over the past year [30].

2.3.4 Dietary behavior

The participants' dietary behaviors were characterized based on the number of breakfast (0–7), lunch (0–7), and dinner (0–7) meals that they consumed per week (5–7, 1–4, 0), accompanying others at breakfast, lunch and dinner (eats alone, eats with others), and breakfast, lunch and dinner with family member (yes, no).

2.4 Ethical considerations

The publicly available statistical data was used only after the researchers agreed to comply with the statistical data and security pledge and received the approval of the National Health and Nutrition Examination Survey. Since the raw data were classified using virtual numbers and no personally identifiable information was provided, the subjects' anonymity and confidentiality were guaranteed.

2.5 Analysis

Since the National Health and Nutrition Examination Survey utilized the complex sample design method, a complex sample analysis that reflected strata, clusters, and weights was used to increase the accuracy of estimation. The collected data were analyzed using SPSS version 24 (IBM Corp., Armonk, NY, USA), and the statistical significance level was set at 0.05. Missing data was statistically excluded. Missing data are treated as a "system missing value" in the analysis according to KNHANES' analysis guide of raw data. All analyses were performed as per the recommendations of the KCDC. The differences and degrees of variables according to the subjects' stress level were analyzed using complex sample descriptive analysis and a chi-squared test. Factors related to their HRQoL were identified using complex sample logistic regression.

3. Results

3.1 General characteristics according to stress level

Significant stress-level-based differences were found in terms of age, economic level, suicidal ideation, and subjective health ($p < 0.05$). More people in their 40s and with low economic status were in the stressed group. Suicidal ideation was more common among those in the stressed group and this group was perceived as subjectively less healthy (Table 1).

3.2 Health-related characteristics according to stress level

Among the health-related characteristics, significant stress-level-based differences in stress levels were found in terms of smoking ($p < 0.05$). The number of smokers was

found to be higher in the stressed group (Table 2).

3.3 Dietary behavior according to stress level

Among dietary behaviors, significant stress-level-based differences were found based on whether the participants dined with family ($p < 0.05$). The group with less stress dined with their families more frequently (Table 3).

3.4 Factors related to HRQoL according to stress level

A complex sample logistic analysis was performed to identify factors related to HRQoL of middle-aged men with MetS based on their stress level. HRQoL was used as a dependent variable, and variables with significant results in the chi-squared test were input as independent variables.

Suicidal ideation and subjective health were significant in the less stressed group. The HRQoL of the group with suicidal ideation was 0.036 times (95% CI: 0.002–0.563) lower than that of the group without suicidal ideation. The group perceived as healthy and the group perceived as normal had 21.860 times (95% CI: 3.195–149.570) and 5.212 times (95% CI: 1.424–19.081) higher HRQoL than the unhealthy group.

In the stressful group, the economic level, suicidal ideation, and presence of family at dinner were significantly associated with their HRQoL. Compared to a low economic level, high and middle economic levels were 8.449 times (95% CI: 1.597–44.688) and 27.553 times (95% CI: 4.426–171.507) more associated with HRQoL, respectively. Compared to the group that did not experience suicidal ideation, the group that experienced suicidal ideation had a 0.087 times lower HRQoL (95% CI: 0.017–0.434). Compared to the group that did not dine with family, the group that dined with family had a 5.653 times (95% CI: 1.289–24.786) higher HRQoL (Table 4).

4. Discussion

This study confirmed whether certain factors have varying associations with the HRQoL of middle-aged men with MetS depending on the degree of stress that they experience. Only the middle-aged men with MetS who answered questions related to their level of stress in the KNHANES were included in this study. To the researchers' knowledge, this research is the first attempt to identify the factors that influence the HRQoL of middle-aged men with MetS. As the main result of this study, suicidal ideation and subjective health were significant in the group with less stress. In the stressful group, the economic level, suicidal ideation, and presence of family at dinner were significantly associated with their HRQoL. In particular, the stressful subjects had a high HRQoL when they had a high income; when they did not have suicidal thoughts, the HRQoL was high; and the subjects who had dinner with their family had a high HRQoL. The stressful group and the group with less stress differed not only in various variables but also in factors affecting HRQoL.

Table 1. Comparison of general characteristics according to stress level (n = 526).

Characteristics	Less stress (n = 370)	Stressful (n = 156)	x^2 (p)
	N (weight %)	N (weight %)	
Age (n = 526)			
40–49	106 (29.3)	76 (49.8)	
50–59	158 (47.2)	51 (36.5)	20.831 ($<$0.001)
60–64	106 (23.4)	29 (13.7)	
Economic level (n = 526)			
High	92 (24.4)	32 (20.0)	
Middle	196 (54.0)	65 (42.9)	13.279 (0.002)
Low	82 (21.6)	59 (37.1)	
Education level (n = 506)			
$\leq$Middle school	68 (17.7)	28 (15.6)	
High school	130 (37.3)	59 (38.5)	0.345 (0.866)
$\geq$College	160 (45.1)	61 (46.0)	
Marital status (n = 487)			
Yes	323 (94.1)	128 (92.4)	0.504 (0.526)
No	23 (5.9)	13 (7.6)	
Suicidal ideation (n = 526)			
Yes	8 (2.6)	22 (10.7)	13.78 (0.001)
No	362 (97.4)	134 (89.3)	
Subjective health (n = 507)			
Healthy	113 (30.1)	25 (17.1)	
Normal	206 (58.2)	75 (50.8)	30.791 ($<$0.001)
Unhealthy	40 (11.8)	48 (32.1)	

Table 2. Comparison of health-related characteristics according to stress level (n = 526).

Characteristics	Less stress (n = 370)	Stressful (n = 156)	x^2 (p)
	N (weight %)	N (weight %)	
Health checkups (n = 506)			
Yes	274 (75.9)	102 (71.1)	1.256 (0.296)
No	84 (24.1)	46 (28.9)	
Aerobic physical activity (n = 506)			
Yes	151 (39.2)	58 (37.4)	0.145 (0.721)
No	207 (60.8)	90 (62.6)	
Hospitalization (n = 506)			
Yes	34 (9.7)	13 (9.6)	0.002 (0.969)
No	324 (90.3)	135 (90.4)	
Alcohol consumption (n = 526)			
Yes	274 (73.8)	123 (76.6)	0.460 (0.554)
No	96 (26.2)	33 (23.4)	
Smoking (n = 449)			
Yes	126 (40.6)	79 (62.3)	18.095 (0.001)
No	187 (59.4)	57 (37.7)	

This study found that more people in their 40s were in the high stress group. This is consistent with the results of previous studies, which indicated that the psychological well-being of older men was higher [31].

Stress negatively affects the implementation of self-management health, which is essential for diabetic patients, and worsens blood sugar control [21]. Managing the stress of individuals with MetS is crucial because it has the potential to lower the incidence of more serious problems, and it is necessary to clarify the causal relationship between these variables through intervention studies. Particularly, men are more reluctant than women to divulge the stress that they experience. In a previous study, in female diabetic subjects, relationships with other people, interactions

Table 3. Comparison of dietary behavior characteristics according to stress level (n = 526).

Characteristics	Less stress (n = 370)	Stressful (n = 156)	x^2 (p)
	N (weight %)	N (weight %)	
Number of breakfast (/week) (n = 436)			
5–7	203 (62.3)	72 (57.4)	
1–4	66 (22.5)	33 (29.2)	2.138 (0.430)
0	45 (15.2)	17 (13.5)	
Number of lunch (/week) (n = 436)			
5–7	294 (93.7)	111 (91.9)	
1–4	15 (4.5)	9 (6.5)	0.721 (0.727)
0	5 (1.8)	2 (1.7)	
Number of dinner (/week) (n = 436)			
5–7	296 (93.9)	112 (92.1)	
1–4	16 (5.4)	9 (7.3)	0.550 (0.784)
0	2 (0.7)	1 (0.6)	
Accompanying others at breakfast (n = 325)			
Eats alone	94 (41.1)	44 (49.9)	2.078 (0.206)
Eats with others	142 (58.9)	45 (50.1)	
Accompanying others at lunch (n = 420)			
Eats alone	66 (21.7)	28 (24.8)	0.463 (0.580)
Eats with others	236 (78.3)	90 (75.2)	
Accompanying others at dinner (n = 428)			
Eats alone	51 (18.2)	20 (16.4)	0.206 (0.682)
Eats with others	256 (81.8)	101 (83.6)	
Breakfast with family member (n = 187)			
Yes	131 (90.4)	38 (83.1)	1.737 (0.307)
No	11 (9.6)	7 (16.9)	
Lunch with family member (n = 326)			
Yes	48 (20.9)	17 (14.8)	1.666 (0.216)
No	188 (79.1)	73 (85.2)	
Dinner with family member (n = 357)			
Yes	212 (83.1)	74 (71.5)	5.862 (0.024)
No	44 (16.9)	27 (28.5)	

with daily life and work, and fear of the future were reported as important factors of stress [32]. Even more serious is that there are differences between men and women in blood sugar management. In a previous study, 37% of men had poor glycemic control and 19% of women had poor glycemic control [33]. Moreover, despite men's active problem-solving efforts and the image of traditional identity, it was reported that women's ability to adapt to diabetes was better [34]. These results suggest that active support and education for men with diabetes are continuously needed as men's vulnerability to diabetes disease management is revealed in the gender comparison. However, the relationship between stress and glycemic control in diabetic subjects will differ according to individual characteristics as well as gender. This difference is considered to have a serious impact on the establishment of an intervention strategy to reduce the influence of stressors and the effectiveness of the intervention strategy. Therefore, in future research,

it is necessary to consider gender differences and individual characteristics, including physiological factors such as blood sugar test or HbA1C.

Additionally, stressed participants were found to smoke more, which suggests that they practiced worse health behaviors. A previous study [35] confirmed that stress was significantly related to smoking, by examining the relationship between smoking and stress across various dimensions, which included work stress, relationship stress, neighborhood stress, financial stress, and adult stressful events. Smoking is an oxidative stress that increases insulin resistance [36], is associated with metabolic abnormalities [37], and is a factor that influences the development and exacerbation of cardiovascular disease [38]. Therefore, smoking is a more dangerous and unhealthy behavior for individuals with MetS than those who do not suffer from this condition.

Table 4. Factors related to HRQoL according to stress level (n = 526).

Characteristics	Less stress (n = 370)		Stressful (n = 156)	
	OR	95% CI	OR	95% CI
Age				
40–49	11.125	0.851–145.351	2.579	0.295–22.549
50–49	0.526	0.129–2.143	1.168	0.115–11.850
60–64	1.000		1.000	
Economic level				
High	3.418	0.681–17.160	8.449	1.597–44.688
Middle	2.042	0.570–7.320	27.553	4.426–171.507
Low	1.000		1.000	
Suicidal ideation				
Yes	0.036	0.002–0.563	0.087	0.017–0.434
No	1.000		1.000	
Subjective health				
Healthy	21.860	3.195–149.570	4.616	0.601–35.430
Normal	5.212	1.424–19.081	1.545	0.388–6.145
Unhealthy	1.000		1.000	
Smoking				
Yes	0.828	0.235–2.916	0.921	0.222–3.821
No	1.000		1.000	
Dinner with family member				
Yes	2.020	0.400–10.106	5.653	1.289–24.786
No	1.000		1.000	

Interestingly, the results of this study showed that the subjects in the less stress group dined with their families more often. In other words, subjects who experienced a high level of stress dined with their families less frequently, which suggests that their stress could be related to their eating behavior. Unfortunately, no previous studies have confirmed the relationship between stress levels and the frequency of family meals among middle-aged men with MetS.

A previous study [39] found that the lower the income of individuals, the higher their frequency of eating breakfast and dinner alone, whereas the higher their income, the higher their frequency of eating with others. The frequency of eating lunch and dinner alone was also higher among those with low incomes, which confirmed their vulnerability. Adequate and regular nutrient intake is important for those with MetS, and eating with one's family can potentially serve as an opportunity to receive support and comfort from them. According to Peggy A Thoits [23], adjustment disorders may be associated with changes in health behavior because they may accompany or predict too much or too little sleep, too much or too little appetite, or too much smoking or drinking. In addition, significant people, such as family, friends, and co-workers, can recognize the changes in these health behaviors and give advice or intervention. Therefore, the role of family, friends, and co-workers can be an important factor influencing the patient's disease management process and outcome. In particular,

mealtime with family is significant because it is not only a meal, but also a time to check changes in the family health behavior, as well as occation for support. As the future intervention strategy, the importance of securing meal time with family and strategic proposals for practical implementation should be included.

Among the stressful group in this study, those who dined with their family had a 5.56 times higher HRQoL than those who did not. However, in the group with less stress, the difference in the HRQoL between the group who dined with their family and those who did not was not significant.

A previous study revealed that the health status of participants who ate alone was poor [40]. Compared to those who ate with others, those who ate alone were found to suffer more commonly from typical adult chronic diseases such as hypertension, diabetes mellitus, hyperlipidemia, stroke, cardiovascular disease, arthritis, and even cancer [40]. Moreover, as the frequency of eating together decreased, their HRQoL decreased [40]. The HRQoL of those who dined alone decreased by 0.127, which is consistent with the results of this study. Another previous study [41] found that the HRQoL of the elderly who ate alone was lower than that of the elderly who ate with companions.

In a previous study [42] on the negative affectivity of people placed in a conflict situation between work and family, it was reported that the individual with high negative affectivity did not enjoy dinner with their family because the conflict between their work and family acts as a stressor.

In the case of stressed group, they often did not have dinner with their families, which prevented them from sharing information about their day [42]. Family dinner can be a field that connects family relations. This can be interpreted as the unavailability of a coping strategy that could reduce or eliminate negative affectivity, as one does not receive the support and warmth that can be received from the family.

Since these results were not classified based on the degree of stress experienced by the participants, a simple comparison with the results of this study is not possible. In addition, with the data used in this study alone, it was not possible to determine whether the factor lowering the frequency of family dinners was a problem with the participants in this study or other family members. Thus, in the future, it is necessary to identify facilitating factors and inhibitory factors of family dining through longitudinal prospective research and to analyze their causal relationships.

However, having meals with family was found to have a positive effect on the stressed group in this study and the vulnerable group in the previous study. Providing the physical and environmental conditions that enable stressed individuals to dine with their families will facilitate the improvement of their HRQoL. However, these aspects need to be dealt with in-depth through public welfare policies, as they are problems that necessitate a transformation of the social atmosphere and policy support.

This study had certain limitations. As mentioned earlier, the cross-sectional study design cannot definitively conclude a causal relationship, which states that frequent family dinners lower stress or improve HRQoL. Nevertheless, through this study, it is clear that meaningful factors related to HRQoL according to the stress level of middle-aged men with metabolic syndrome were discovered, and it was a starting point for elucidating the causal relationship. In addition, the dynamics of the family has both an objective aspect and a very subjective aspect. Therefore, it is necessary to find a way to conduct research on these subjective aspects. Also, dinner is important in Korean culture, but breakfast is as important as this. It is understood that eating breakfast with family members is the driving force that enables them to do their daily work well. They also want to stick to the traditional breakfast style, which consists of rice, soup, and a variety of side dishes. This traditional breakfast requires a lot of time and effort by the person preparing the meal. In the case of workers, they often go to work early in the morning and work overtime is very common, so most meals cannot be eaten with family. In particular, in the case of office workers, it was found that motivation to eat with family decreased due to work-related situations such as overtime [43]. If a situation in which one cannot control the time repeatedly occurs, even the effort to make an appointment in advance or to have a meal together will decrease. It is necessary to approach the results of this study based on the understanding of the characteristics of Korean lifestyle and their food culture.

However, the data used in this study can be representative of middle-aged men with metabolic syndrome in Korea. Therefore, the results of this study have the advantage of generalization that can be extended to all middle-aged men with metabolic syndrome in Korea. Hence, it is very meaningful as a population-based study. It is also meaningful as basic data for establishing strategies to improve the HRQoL of middle-aged men with metabolic syndrome.

5. Conclusions

Middle-aged men are at a high risk of developing MetS, and many physical and psychological factors threaten their HRQoL. In this study, the factors that affect the HRQoL of middle-aged men with MetS were investigated based on their level of stress. The results of this study are meaningful in that they expand the scientific understanding of the HRQoL of middle-aged men with MetS. Only family dining showed a significant difference in the dietary behavior according to stress level, and the HRQoL was found to be higher in the stressful group, especially when having dinner with family. As this is a cross-sectional study, the causal relationship between having dinner with family and improving HRQoL is not clear. However, this study contributed to an expansion of knowledge because it has a meaning as basic data that can be used for elucidating the relationship between health-related behaviors and HRQoL. To the best of our knowledge, no such finding has been examined in previous studies. Given the importance of dinner as a family meal, it is extremely unfortunate that a significant number of men do not get the opportunity to receive support from their families through family dinners at the end of a long day's work. Furthermore, the fact that the stressed group ate dinner alone more often confirmed that the person who should be supported most do not receive adequate support. Eating dinner with family is very difficult in the life of a middle-aged man in Korea today. The participants of this study were middle-aged men with metabolic syndrome, not normal middle-aged men, and to them, healthy and regular meals were more important than another person. In addition, during family dinner, one can receive support and encouragement from their family, and can receive monitoring and help for their metabolic syndrome relief and treatment meals. As confirmed through this study, although dietary behavior is more important for a middle-aged man with metabolic syndrome, he is not quite supported. These results can be important inferences that help form more efficient HRQoL intervention strategies. It is necessary to continuously educate the population about the importance of including family dining as an important element of intervention programs and therefore find ways to increase the frequency of its occurrence.

Author contributions

WHM, and SAK provided help and advice on the analysis. All authors wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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