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Original Article

The effects of team collaboration management intervention on enterprise employees with metabolic syndrome

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Abstract: Objective: This study aimed to analyze the effects of team collaboration management intervention on enterprise employees with metabolic syndrome. Methods: A total of 300 full-time employees with metabolic syndrome from an enterprise (n = 2,247) participated in this study and received an overall physical examination in 2018 before a 1-year team collaboration management intervention. In 2019, the same physical examination was performed again to analyze the effects of the team collaboration management intervention. Results: After the intervention, BMI, fasting blood glucose (FBG), systolic blood pressure (SBP), diastolic blood pressure (DBP), triglyceride (TG), and total cholesterol (TC) as well as the PSQI (sleep quality) scores were reduced in the enrolled subjects ($P < 0.05$). The behavior, environment, and recognition scores in the AHSMSRS and the SF-36 (quality of life) scores were increased in the enrolled subjects ($P < 0.05$). The total health knowledge rate, the smoking rate, the alcohol drinking rate, and the physical activity rate were 42.33%, 57.67%, 66.00%, and 47.33% before the intervention, and 92.33%, 16.33%, 17.67%, and 80.33% after the intervention ($P < 0.05$). Conclusion: In enterprise employees with metabolic syndrome, team collaboration management intervention helps to control their vital signs, improve their health management self-competence, the health knowledge rate, sleep quality, and quality of life, and reduce unhealthy living habits.

Keywords: Enterprise employees, metabolic syndrome, team collaboration management intervention, self-competence of health management, effects

Introduction

Metabolic syndrome is a new concept developed after in-depth studies of cardiovascular disease and diabetes. It is a cluster of hazards related to cardiovascular disease and metabolic disorders [1]. Under the influence of the rapid development of society and economy, people's lifestyles are changing rapidly, and the incidence of metabolic syndrome is gradually rising, leading to more and more cases of diabetes and cardiovascular disease [2]. At present, metabolic syndrome has gradually become a major public health problem in China and also in many other countries.

As a result of the continuous improvement in economic conditions and the abundance of food, the proportions of overweight and obese individuals keep on rising [3]. Published data indicate that the rate of metabolic syndrome is 25% in adults, over 15% in the population above 35 years of age and under 75 years of age, and significantly higher urban areas compared to rural areas [4, 5]. A random sampling survey showed that the incidence of metabolic syndrome exceeded 21% in among the overweight and approached 30% among the obese [6]. In a comparative study based on a large sample size, patients with metabolic syndrome had at least twice the risk of diabetes, cerebral stroke, and adverse cardiovascular events compared with the healthy group [7]. Known as a disease closely related to lifestyle, metabolic syndrome is generally caused by factors such as heredity, alcoholism, age, eating habits, smoking history, exercise, etc. [8].

The prevention and control of the risk factors are the key points in the prevention and treat-

ment of metabolic syndrome. Previous studies have mostly focused on patients with metabolic syndrome in communities or hospitals [9], but few have studied the development and intervention of metabolic syndrome in enterprise employees. It was found in some studies that occupational factors such as occupational stress, a long period of alternating shifts and poor working environments were also the influencing factors of metabolic syndrome [10]. Therefore, it is of practical significance and importance to study the management of metabolic syndrome in enterprises to improve the overall health level and work efficiency of enterprise employees. In this study, 300 employees diagnosed with metabolic syndrome through physical examinations in an enterprise were recruited as the study cohort to explore the application values of team collaboration management intervention, so as to provide a methodological reference for the future health management of enterprise employees with metabolic syndrome.

Materials and methods

Materials

In an enterprise with 2,240 employees who received a physical examination in 2018, 300 were diagnosed with metabolic syndrome and recruited for this study. Inclusion criteria: employees who met the diagnostic criteria for metabolic syndrome [11], employees who worked full-time with no intention of resigning in the most recent two years, employees who received a physical examination every year, and employees who agreed to participate in the study by providing an informed consent. The diagnostic criteria for metabolic syndrome included a body mass index (BMI) $\geq$ 24 kg/m^2 and meeting one or more of the following conditions: fasting blood glucose (FBG) $\geq$ 6.1 mmol/L, systolic blood pressure (SBP) $\geq$ 140 mmHg, diastolic blood pressure (DBP) $\geq$ 90 mmHg, triglycerides (TG) $\geq$ 1.7 mmol/L and total cholesterol (TC) $\geq$ 5.18 mmol/L. This study was approved by the ethics committee of the hospital responsible for the physical examinations. Exclusion criteria: employees not definitely diagnosed with metabolic syndrome before the study, employees who had filed an application of resignation, employees also suffering from diabetes, hypertension, myocardial ischemia, or dystrophia.

Methods

After a physical examination, the 300 patients received 1-year team collaboration management intervention by a dedicated team in the following three aspects: (1) Health education: the nurses in the team repeatedly introduced the significance, contents, and methods of health management to the employees, so as to raise their health awareness and self-management levels. The repeated, constant health education helped the patients change their ideas and behaviors voluntarily and build an awareness of the need to maintain healthy behaviors and lifestyles. The contents of the health education included definitions, hazards, risks, and metabolic syndrome prevention methods, healthy lifestyles and normal vital sign ranges. (2) Diet intervention: the general principle was foods containing appropriate amounts of proteins and complex carbohydrates and low in fat and energy as well as fruits and fresh vegetables. The daily diets aimed to limit fat to 25%, carbohydrates to between 60% and 65%, and proteins from 15% to 20% [12]. The employees were guided in diet control based on BMI, physical strength, and exercise. Foods were diversified and energy intake was balanced. To ensure good dietary intervention effects, the patients were instructed to reduce their energy intake appropriately, including cutting down on calories by 1/3 and maintaining a level between 1,000 and 1,200 for females and between 1,200 and 1,600 for males. They were also required to undertake physical activities actively. (3) Exercise intervention: through sufficient communication with patients, the doctors formulated individual exercise plans form them according to their current exercise amounts and durations as well as their weight-loss goals. For example, if a patient plans to lose 2 kg in about 1 month, the daily energy deficit should be around 550 kilocalories, and 300 kilocalories should be additionally consumed by doing moderate exercises for 1 to 1.5 h. If a patient plans to lose 1 kg in about 1 month, the daily energy deficit needs to be around 270 kilocalories, and 150 kilocalories need to be additionally consumed by doing moderate exercises for 1 h [13]. Applicable exercises include swimming, jogging, walking, and other aerobic exercises with the duration slowly increased from half an hour to 1 or 1.5 h and the intensity gradually increased.

The intervention lasted for 1 month and a WeChat group was set up to visit the patients once a month and for the yearlong online supervision.

Observation indices

Vital signs: the BMI, FBG, SBP, DBP, TG, and TC were measured using a glucometer, sphygmomanometer, and automatic biochemical analyzer before and at 12 months after the intervention.

Health knowledge rate: before and at 12 months after the intervention, a questionnaire designed for the study was used to learn about the patients' health knowledge related to metabolic syndrome, including the hazards, risks, and prevention methods, and the blood pressure, glucose and lipid control criteria. The patients knew about the disease completely if they correctly answered the 6 questions or partially if only 2 to 5 questions were answered or little if only 1 question was answered or if no answer was given. The health knowledge rate = Complete knowledge rate + Partial knowledge rate.

Changes in living habits: before and at 12 months after the intervention, the smoking rate, alcohol drinking rate, and physical activity rate were recorded and compared. Criteria [14]: smoking: at least 1 cigarette on average each day for at least half a year, drinking alcohol: any kind of wine, two or more times a week and over 50 g each time for at least 1 year, physical exercise: at least 3 times a week and half an hour each time.

Self-competence of health management: the 38-item Adult Health Self-Management Ability Scale (AHSMSRS) [15] was used for the evaluations before and at 12 months after the intervention. The scale covers self-management behavior (14 items), self-management environment (10 items), and self-management recognition (14 items). Each item was graded using the five-point Likert system. The total scores ranged between 38 and 190 and from 141 to 190 indicated high, from 90 to 140 indicated moderate, and from 38 to 89 indicated low.

Sleep quality: the Pittsburgh Sleep Quality Index (PSQI) [16] was used to evaluate the patients' sleep quality, duration, and efficiency, time to fall asleep, sleep disorders, hypnotics, and daytime dysfunction before and at 12 months after the intervention. Each item was given a score of 0, 1, 2, or 3 based on the severity, and the total score ranged from 0 to 21. A higher score indicates poorer sleep quality.

Quality of life: the SF-36 [17] was used to evaluate the patients before and at 12 months after the intervention. It contains 36 items in 8 dimensions, namely, physical function (PF), role-physical (RP), body pain (BP), vitality (VT), role-emotional (RE), mental health (MH), social function (SF), and general health (GH). The total possible score of each dimension is 100. A higher score represents a higher quality of the corresponding item.

Statistical analysis

The statistical analysis was performed with SPSS 23.0. In the case of numerical data expressed as the mean ± standard deviation (mean ± SD), comparison studies were carried out using *t* tests. In the case of nominal data expressed as [n (%)], comparisons were carried out using X^2 tests for the intergroup comparisons. In the case of comparisons at multiple points, ANVOA and F tests were used. The graphics were drawn using GraphPad Prism 8. For all the statistical comparisons, significance was defined as $P < 0.05$.

Results

General employee information

Among the 300 patients with metabolic syndrome in this study, 220 (73.33%) were male and 80 (26.67%) were female. The proportion of males was higher than the proportion of females ($P < 0.05$). In the 300 patients, 1 (3.33%) was 0-20 years old, 38 (12.67%) were 21-30 years old, 62 (20.67%) were 31-40 years old, 50 (16.67%) were 41-50 years old, 49 (16.33%) were 51-60 years old, and no patients were over 60 years old. The symptoms with a higher abnormal rate found in the physical examinations before the intervention included light fatty liver, positive urinary protein, obesity, low high-density protein, prostatic calcification, and high triglycerides (**Table 1**).

Vital signs

Among the 300 patients with metabolic syndrome in this study, before the intervention, their BMI was (27.45 ± 1.93) kg/m^2, their FGB was (6.98 ± 1.01) mmol/L, their SBP was

Table 1. General information on the 300 employees ($\bar{x} \pm s$)/[n (%)]

Materials		Results
Gender	Male	220 (73.33)
	Female	80 (26.67)
Age (y)		40.15 ± 20.69
Age distribution	0-20	1 (3.33)
	21-30	38 (12.67)
	31-40	62 (20.67)
	41-50	50 (16.67)
	51-60	49 (16.33)
	≥ 61	0 (0.00)
Abnormalities in the first physical examination	Light fatty liver	54 (18.00)
	Positive urinary protein	50 (16.67)
	Overweight	48 (16.00)
	Low high-density protein	20 (6.67)
	Prostatic calcification	11 (3.67)
	High triglyceride	17 (5.67)

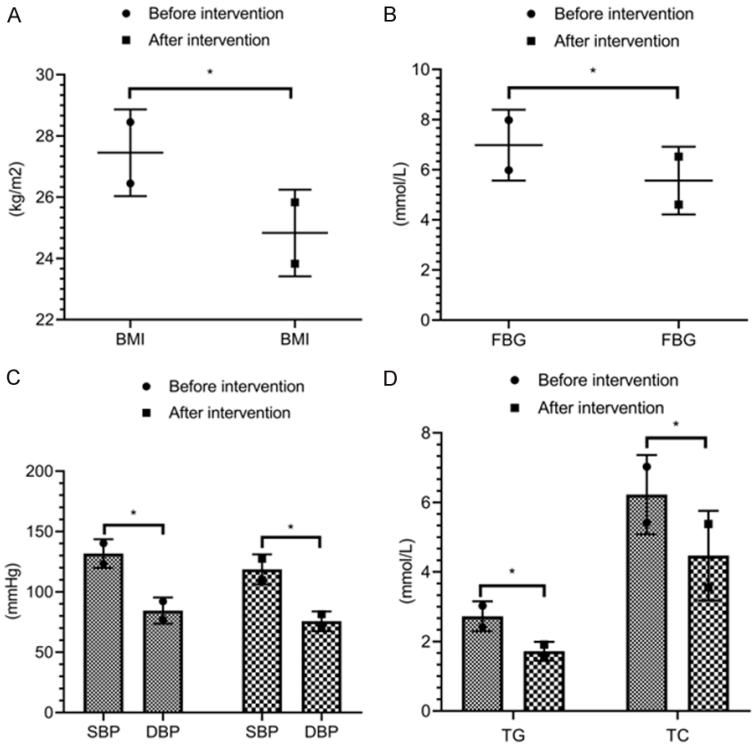

Figure 1. Changes in vital signs before and after the intervention. BMI (A), FBG (B), SBP and DBP (C), and TG and TG were (D) reduced after the intervention ($P < 0.05$). *$P < 0.05$ vs. before intervention.

(130.82 ± 11.46) mmHg, their DBP was (84.19 ± 8.34) mmHg, their TG was (2.70 ± 0.39) mmol/L, and their TC was (6.38 ± 1.02) mmol/L; after the intervention, the values of the corresponding indicators were (24.83 ± 1.03) kg/m^2, (5.61 ± 0.98) mmol/L, (118.72 ± 10.37) mmHg, (75.43 ± 6.16) mmHg, (1.72 ± 0.20) mmol/L and (4.52 ± 1.03) mmol/L. After the 1-year continuous intervention, the BMI, FBG, SBP, DBP, TG and TC were lower than they were before the intervention, indicating significant differences ($P < 0.05$) (**Figure 1**).

Health knowledge rate

The complete knowledge rate, partial knowledge rate, and unknown rate were 31 (10.33%), 96 (32.00%) and 173 (57.67%) before the intervention, and 102 (34.00%), 175 (58.33%) and 23 (7.67%) after the intervention ($P < 0.05$). The total knowledge rate was 42.33% before the intervention and 92.33% after the intervention. The total knowledge rate after the intervention was higher than it was before the intervention ($P < 0.05$) (**Table 2**).

Changes in living habits

The smoking rate, alcohol drinking rate, and physical activity rate were 173 (57.67%), 198 (66.00%) and 142 (47.33%) before the intervention, and 49 (16.33%), 53 (17.67%) and

Table 2. Health knowledge rate before and after the intervention [n (%)]

Time	Completely know	Partially know	Unknown	Total knowledge rate
Before intervention (n = 300)	31 (10.33)	96 (32.00)	173 (57.67)	127 (42.33)
At 12 months after intervention (n = 300)	102 (34.00)	175 (58.33)	23 (7.67)	277 (92.33)
X^2				170.489
P				< 0.000

Table 3. Living habits before and after the intervention [n (%)]

Time	n	Smoking rate	Alcohol drinking rate	Physical activity rate
Before intervention	300	173 (57.67)	198 (66.00)	142 (47.33)
After intervention	300	49 (16.33)	53 (17.67)	241 (80.33)
X^2		239.323	144.009	70.756
P		< 0.000	< 0.000	< 0.000

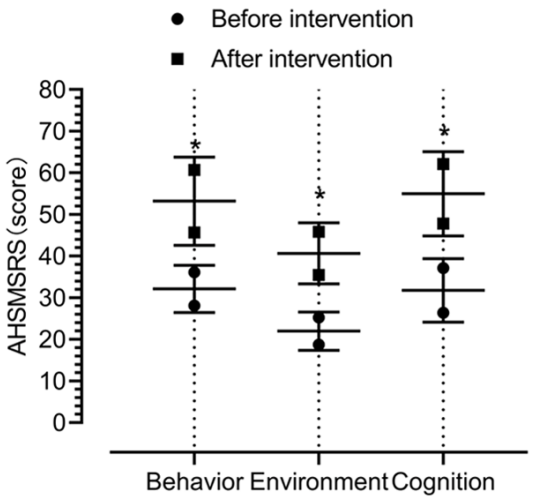

Figure 2. Self-competence in health management before and after the intervention. The self-management behavior, self-management environment and self-management recognition scores after scores of intervention were significantly higher than they were before the intervention ($P < 0.05$). *$P < 0.05$ vs. before intervention.

241 (80.33%) after the intervention. The smoking rate and alcohol drinking rate after the intervention were lower than they were before the intervention, and the physical activity rate after the intervention was higher than it was before the intervention ($P < 0.05$) (**Table 3**).

Self-competence of health management

The self-management behavior, self-management environment, and self-management recognition AHSMSRS scores were (53.69 ± 10.77), (40.12 ± 6.38) and (55.49 ± 9.36) before the intervention, and (32.12 ± 5.94), (21.39 ± 4.18) and (31.46 ± 6.05) after the intervention ($P < 0.05$) (**Figure 2**).

Sleep quality

After the intervention, the sleep quality, time to fall asleep, sleep duration, sleep efficiency, sleep disorders, hypnotics and daytime dysfunction PSQI scores were (0.72 ± 0.19), (0.80 ± 0.22), (0.71 ± 0.23), (0.83 ± 0.29), (0.68 ± 0.13), (0.71 ± 0.26), and (0.67 ± 0.27), after the intervention, which were lower than the (1.98 ± 0.34), (2.02 ± 0.39), (2.12 ± 0.27), (2.08 ± 0.30), (2.11 ± 0.24), (1.86 ± 0.47), and (1.95 ± 0.42) before the intervention, showing significant differences ($P < 0.05$) (**Figure 3**).

Quality of life

After the intervention, the PF, RP, BP, VT, RE, MH, SF, and GH scores on the SF-36 were (80.15 ± 10.43), (82.61 ± 10.15), (81.49 ± 11.45), (80.49 ± 10.75), (80.31 ± 11.46), (82.79 ± 10.17), (81.25 ± 11.46), and (83.92 ± 10.18), which were higher than the (68.75 ± 8.94), (65.75 ± 7.15), (66.39 ± 7.82), (68.45 ± 6.95), (70.12 ± 7.45), (63.86 ± 8.25), and (64.75 ± 7.49) before the intervention, showing significant differences ($P < 0.05$) (**Figure 4**).

Discussion

The clinical features of metabolic syndrome are general obesity, elevated blood pressure, glucose and triglycerides and decreased DHP. These features are also the risk factors for atherosclerosis, so patients with metabolic syndrome are highly prone to atherosclerosis [18]. According to published studies, metabolic syndrome is associated with an increased risk of ischemic cardiocerebrovascular disease and

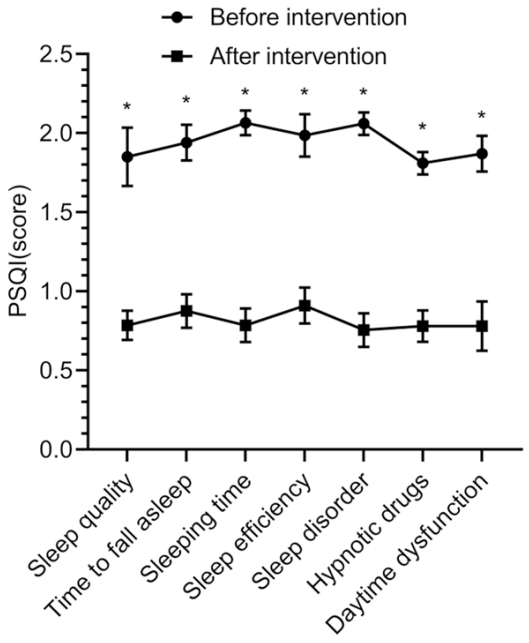

Figure 3. Sleep quality before and after the intervention. After the intervention, the sleep quality, duration, and efficiency, time to fall asleep, sleep disorders, hypnotics and daytime dysfunction were lower than they were before the intervention ($P < 0.05$). *$P < 0.05$ vs. before the intervention.

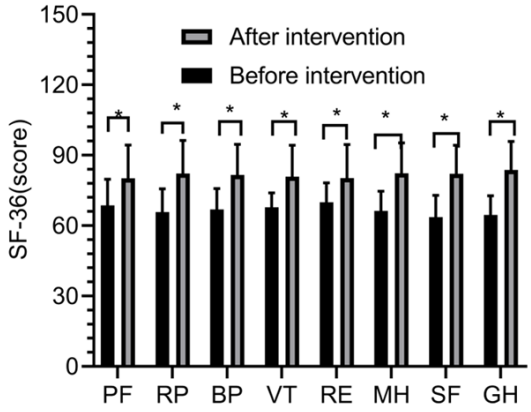

Figure 4. Quality of life before and after the intervention. After the intervention, the PF, RP, BP, VT, RE, MH, SF, and GH scores were significantly higher than they were before the intervention ($P < 0.05$). *$P < 0.05$ vs. before the intervention.

markedly elevated disability and death rates in patients with cardiocerebrovascular disease complications [19].

The clinical interventions for metabolic syndrome mainly emphasize improving the patients' lifestyles and targeting various hazards to reduce the high-risk status. Specifically, the intervention means include weight control, diet adjustment, an increased amount and intensity of exercise, etc. In this study, the team collaboration management intervention was performed, and a full-time management team was set up for patients diagnosed with metabolic syndrome after a physical examination to professionally guide them in health education, diet, and exercise. In the later stage, the patients were followed up through WeChat provided that they had mastered the correct methods, so as to learn about their diets and self-control in exercise, and to supervise, encourage, and guide them. After the 1-year intervention, BMI, FBG, SBP, DBP, TG and TC were reduced in the 300 patients with metabolic syndrome ($P < 0.05$). Studies by other scholars also demonstrated that diet and exercise intervention can effectively improve the blood lipid, glucose, and pressure levels of metabolic syndrome patients. These findings suggest that the team collaboration management intervention, including health education, diet and exercise, can be an effective means of controlling the body weight, blood glucose, blood pressure, and lipid levels in patients with metabolic syndrome and reducing hazards. The analysis indicated that after the intervention, the patients' diets were controlled and their amount of exercise was increased. As a result, they gradually lost weight and cut down their BMIs. The ingredients abundant in dietary fiber and low in hypo-saturated fatty acids played a direct role in controlling their blood pressure, glucose, and lipids. In the dietary interventions, the patients were instructed to choose diversified foods such as fish, poultry, eggs, lean meat, vegetables, fruits, tubers, cereals, milk, and beans and to decrease or eliminate their intake of fried, high-salt, and preserved foods as well as animal oil [20]. The rational diets reduce the burdens on the kidneys and heart, and reduce the risk of heart failure, renal dysfunction and cardiac hypertrophy and the hazards of cardiovascular and cerebrovascular diseases [21]. Exercise is a widely accepted and important method of health maintenance. Keeping good physical exercise habits can reduce physical and mental pressure, improve cardio-pulmonary functions, promote blood circulation, and prevent various cardiovascular and cerebrovascular diseases [22].

The total health knowledge rate was 42.33% before the intervention and 92.33% after the intervention ($P < 0.05$), suggesting that team

collaboration management intervention can affect the health knowledge degree related to the disease. Patients can master more health knowledge and consciously understand the role of maintaining a healthy lifestyle in controlling their conditions, which also contributes to the improvement of their nursing adherence. Some studies proposed that health education is an important method for increasing the health knowledge of metabolic syndrome [23]. After the intervention, the smoking and alcohol drinking rates were significantly decreased and the physical activity rate was remarkably increased ($P < 0.05$), which is closely related to the active health education provided by the nurses. Through health education, the patients mastered more health knowledge and learned about the adverse impacts of smoking and drinking alcohol as well as the positive influence of physical exercise on the disease. Therefore, they became more conscious of the need to maintain a healthy lifestyle. According to studies, smoking and drinking alcohol are independent factors significantly raising the incidence of metabolic syndrome [24]. The incidence of metabolic syndrome is significantly higher in smokers and drinkers than in nonsmokers and nondrinkers, and it is much lower in people who exercise two to three times a week than in those who never or seldom (≤1) exercise [25]. After the intervention, the self-competence of health management, sleep quality, and quality of life scores were better than they were before the intervention ($P < 0.05$). Improvement in the employees' self-competence in their health management skills contributed to better sleep quality and quality of life and depended on the nurses' active instructions on health, diet and exercise. Studies have shown a positive correlation between self-management competence and quality of life, which means that patients' quality of life can be improved by promoting their self-management competence [26]. Through constant team collaboration management intervention, patients maintained a health status in recognition, diet and exercise. It also changed the situation of employees with high work pressure, such as irregular diet and insufficient exercise. This means helping patients pay more attention to their health, keeping balanced diets consciously and persisting in their exercises. As a result, their conditions were effectively improved.

In conclusion, for enterprise employees with metabolic syndrome, team collaboration management intervention is conducive to controlling vital signs, improving self-competence in one's health management, increasing the rate of health knowledge, eliminating adverse living habits, and ameliorating sleep quality and quality of life. However, this study was defective as the study subjects were from the same enterprise, such that they shared some similarities as a whole, so they couldn't represent the entire population. Furthermore, it focused on the intervention of metabolic syndrome and its effects rather than analyzing the factors leading to this disease. These defects shall be supplemented and improved in the future studies.

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Disclosure of conflict of interest

None.

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References

[1] McCracken E, Monaghan M and Sreenivasan S. Pathophysiology of the metabolic syndrome. Clin Dermatol 2018; 36: 14-20.

[2] Saklayen MG. The global epidemic of the metabolic syndrome. Curr Hypertens Rep 2018; 20: 12.

[3] Ansarimoghaddam A, Adineh HA, Zareban I, Iranpour S, HosseinZadeh A and Kh F. Prevalence of metabolic syndrome in Middle-East countries: meta-analysis of cross-sectional studies. Diabetes Metab Syndr 2018; 12: 195-201.

[4] Mendrick DL, Diehl AM, Topor LS, Dietert RR, Will Y, La Merrill MA, Bouret S, Varma V, Hastings KL, Schug TT, Emeigh Hart SG and Burleson FG. Metabolic syndrome and associated diseases: from the bench to the clinic. Toxicol Sci 2018; 162: 36-42.

[5] Di Daniele N, Noce A, Vidiri MF, Moriconi E, Marrone G, Annicchiarico-Petruzzelli M, D'Urso

G, Tesauro M, Rovella V and De Lorenzo A. Impact of Mediterranean diet on metabolic syndrome, cancer and longevity. Oncotarget 2017; 8: 8947-8979.
[6] Rochlani Y, Pothineni NV, Kovelamudi S and Mehta JL. Metabolic syndrome: pathophysiology, management, and modulation by natural compounds. Ther Adv Cardiovasc Dis 2017; 11: 215-225.
[7] Mazidi M, Rezaie P, Kengne AP, Mobarhan MG and Ferns GA. Gut microbiome and metabolic syndrome. Diabetes Metab Syndr 2016; 10 Suppl 1: S150-7.
[8] Gisondi P, Fostini AC, Fossà I, Girolomoni G and Targher G. Psoriasis and the metabolic syndrome. Clin Dermatol 2018; 36: 21-28.
[9] Gluvic Z, Zaric B, Resanovic I, Obradovic M, Mitrovic A, Radak D and Isenovic ER. Link between metabolic syndrome and insulin resistance. Curr Vasc Pharmacol 2017; 15: 30-39.
[10] Marotz CA and Zarrinpar A. Treating obesity and metabolic syndrome with fecal microbiota transplantation. Yale J Biol Med 2016; 89: 383-388.
[11] Sherling DH, Perumareddi P and Hennekens CH. Metabolic syndrome. J Cardiovasc Pharmacol Ther 2017; 22: 365-367.
[12] Tobias DK, Chen M, Manson JE, Ludwig DS, Willett W and Hu FB. Effect of low-fat diet interventions versus other diet interventions on long-term weight change in adults: a systematic review and meta-analysis. Lancet Diabetes Endocrinol 2015; 3: 968-979.
[13] Schenkman M, Moore CG, Kohrt WM, Hall DA, Delitto A, Comella CL, Josbeno DA, Christiansen CL, Berman BD, Kluger BM, Melanson EL, Jain S, Robichaud JA, Poon C and Corcos DM. Effect of high-intensity treadmill exercise on motor symptoms in patients with De Novo Parkinson disease: a phase 2 randomized clinical trial. JAMA Neurol 2018; 75: 219-226.
[14] Li X, Liu Y, Luo R, Li G, Luo P, Liu M, He T and Hua W. The effects of smoking and drinking on all-cause mortality in patients with dilated cardiomyopathy: a single-center cohort study. Eur J Med Res 2015; 20: 78.
[15] Setiawan IMA, Zhou L, Alfikri Z, Saptono A, Fairman AD, Dicianno BE and Parmanto B. An adaptive mobile health system to support self-management for persons with chronic conditions and disabilities: usability and feasibility studies. JMIR Form Res 2019; 3: e12982.
[16] Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM and Colantonio A. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: a systematic review and meta-analysis. Sleep Med Rev 2016; 25: 52-73.
[17] Laucis NC, Hays RD and Bhattacharyya T. Scoring the SF-36 in orthopaedics: a brief guide. J Bone Joint Surg Am 2015; 97: 1628-1634.
[18] Schnack LL and Romani AMP. The metabolic syndrome and the relevance of nutrients for its onset. Recent Pat Biotechnol 2017; 11: 101-119.
[19] Grandl G and Wolfrum C. Hemostasis, endothelial stress, inflammation, and the metabolic syndrome. Semin Immunopathol 2018; 40: 215-224.
[20] Ngandu T, Lehtisalo J, Solomon A, Levälahti E, Ahtiluoto S, Antikainen R, Bäckman L, Hänninen T, Jula A, Laatikainen T, Lindström J, Mangialasche F, Paajanen T, Pajala S, Peltonen M, Rauramaa R, Stigsdotter-Neely A, Strandberg T, Tuomilehto J, Soininen H and Kivipelto M. A 2 year multidomain intervention of diet, exercise, cognitive training, and vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial. Lancet 2015; 385: 2255-2263.
[21] Ozemek C, Laddu DR, Arena R and Lavie CJ. The role of diet for prevention and management of hypertension. Curr Opin Cardiol 2018; 33: 388-393.
[22] Cattadori G, Segurini C, Picozzi A, Padeletti L and Anzà C. Exercise and heart failure: an update. ESC Heart Fail 2018; 5: 222-232.
[23] Lin CC, Chen SH and Huang LY. Effectiveness of an interdisciplinary health education intervention on metabolic syndrome in community residents: a study of four towns in Northern Taiwan. Hu Li Za Zhi 2018; 65: 36-48.
[24] van den Driessche JJ, Plat J and Mensink RP. Effects of superfoods on risk factors of metabolic syndrome: a systematic review of human intervention trials. Food Funct 2018; 9: 1944-1966.
[25] Thoefner LB, Rostved AA, Pommergaard HC and Rasmussen A. Risk factors for metabolic syndrome after liver transplantation: a systematic review and meta-analysis. Transplant Rev (Orlando) 2018; 32: 69-77.
[26] Kocaaslan EN and Akgün Kostak M. Effect of disease management education on the quality of life and self-efficacy levels of children with asthma. J Spec Pediatr Nurs 2019; 24: e12241.