Original Article

Effectiveness of a canteen-based dietary intervention for metabolic syndrome in occupational men: A randomized controlled trial

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Background and Objectives: Dietary intervention is an important strategy for the treatment and management of metabolic syndrome (MetS). This study is aimed to investigate the effectiveness of a canteen-based dietary intervention on MetS in occupational men. **Methods and Study Design:** A randomized controlled study was conducted in May 2022. A total of 321 men with MetS aged 25 to 59 years were recruited from Shengli Oilfield. Participants in one canteen were randomly allocated to dietary intervention group (IG) and those in the other canteen as control group (CG). CG received health education for 6 months. IG received a 6-month healthy lunch and personalized dietary advice added health education. Blood pressure, fasting blood glucose (FBG), lipid profiles, waist circumference (WC) and body mass index (BMI) were measured before and after intervention. **Results:** Compared with CG, FBG (β: -0.72, p = 0.010), TC (β: -1.49, p <0.001), LDL-C (β: -0.65, p <0.001), WC (β: -7.73, p <0.001), BMI (β: -2.01, p <0.001) decreased and HDL-C (β: 0.13, p <0.001) increased significantly in IG. The IG had a 30.4% reduction in MetS, whilst there was a 1.3% reduction in CG (p <0.01). Moreover, a significant reduction in central obesity (-30.4%, p <0.001), high FBG (-8.8%, p <0.001), and low HDL-C (-4.1%, p = 0.008) was observed in IG. Conversely, the CG showed an increase in low HDL-C (10.7%, p <0.001). **Conclusions:** Canteen-based intervention with a healthy lunch and personalized dietary advice can reduce the risk of MetS in occupational men. This study provides new empirical data for dietary intervention in ameliorating MetS.

Key Words: metabolic syndrome, dietary intervention, canteen, randomized controlled trial, occupational men

INTRODUCTION

Increasing global population has resulted in the metabolic syndrome (MetS) is a group of clinically complex syndromes characterized by abdominal obesity, elevated blood pressure, dyslipidemia and impaired glucose metabolism.[1] It has been linked to multiple health problems and chronic conditions, including cardiovascular disease, diabetes, high blood pressure, and obesity. Evidence show that MetS increases the risk of cardiovascular diseases and type-2 diabetes onset by five-fold and two-fold, respectively.[2] MetS has become a widespread global health concern. The prevalence of MetS in Chinese adults aged 15 years and above is 24.5%,[3] while it increases to 37.1% in middle-aged and elderly adults.[4] Although the pathogenesis of MetS is still controversial, dietary and lifestyle factors are widely considered to be the main influences on its onset.[5] Research on the global burden of disease shows that unhealthy dietary habits are the leading cause of disease and death in China.[6] The Mediterranean diet (MedDiet) and the Dietary Approaches to Stop Hypertension (DASH) diet, both representative of healthy dietary patterns, have been reported to comprehensively reduce the risk of MetS.[7, 8] However, these healthy dietary patterns are usually hard for individuals to adhere to in practice. In addition, few studies have examined the relationship between diet and MetS in occupational populations, particularly among workers in large enterprises who primarily rely on workplace canteens for their meals. A poor food environment plays a significant role in the development of metabolic disorders and cardiovascular diseases, thereby increasing the risk of MetS among these workers. Therefore, more effective and context-specific dietary interventions need to be explored in future research.

Shengli Oilfield is a large enterprise with a predominantly male workforce. This specific population shows a

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high prevalence of MetS, likely influenced by workplace and occupational factors such as high-intensity labor, irregular working hours, and elevated work-related stress. Additionally, the worksite food environment often promotes unhealthy eating habits, including excessive consumption of high-sugar and high-fat foods. MetS is a leading contributor to cardiovascular disease mortality among middle-aged men, significantly impacting their health and quality of life. In our previous study, the incidence of sudden death at work was 16 times higher in men than in women, with the highest proportion occurring among workers aged 40 to 50.[9] Medical examinations of workers in 2022 revealed significant health concerns among male employees, with 54.5% classified as overweight or obese and 44.4% presenting with dyslipidemia. As the prevalence of individual components of MetS rises, healthcare costs increase while work performance declines correspondingly.[10] Enterprises can improve the cardiometabolic health of their workers by raising awareness, conducting routine screening for MetS, and implementing health promotion programs at the workplace. The worksite offers a unique setting for dietary interventions aimed at promoting healthy eating and improving employee health.[11] Evidence shows that dietary interventions in workplace cafeterias can increase the consumption of healthy foods and reduce cardiometabolic risk factors.[12] In response to the rising prevalence of MetS, tailored nutrition prescriptions offer a promising strategy for both prevention and management.[13] While personalized dietary advice has shown success in some studies, evidence supporting its widespread implementation among workers who rely on workplace canteens remains limited.

Therefore, this study aimed to evaluate the effectiveness of a workplace canteen-based dietary intervention in male workers with MetS, with the goal of providing practical strategies and evidence-based approaches for MetS management.

METHODS

Study design and participants

This was a randomized controlled intervention study in two canteens. Using a computer-generated random number, the two canteens were randomly assigned as either the intervention canteen or control canteen. Eligible participants from each canteen were subsequently enrolled into the intervention group (IG) or control group (CG) accordingly. Sample size and power were calculated using PASS 15 software based on the results of a previous study.[14] The minimum sample size of 75 participants per group was needed to detect statistically significant differences in the positive and negative groups with 90% power and type I error α= 0.05. Assuming an attrition rate of 20%, the planned sample size was 90 participants in each group.

Participant recruitment was conducted at two canteens in Shengli Oilfield, a large petrochemical enterprise, during May 2022. A total of 337 occupational men were assessed for eligibility (Figure 1). The primary inclusion criteria included the following: 1) men aged 25 to 59 years diagnosed with MetS, 2) eating at least 3 days per week in the settled workplace canteen, 3) completed the questionnaire survey, dietary assessment, physical measurement, biochemical examination and other contents during the study. MetS was defined with meeting at least three of the five criteria: 1) central obesity: waist circumference (WC) ≥ 90 cm for men; 2) hyperglycemia: fasting plasma glucose (FPG) ≥ 6.1 mmol/L or diagnosed with diabetes; 3) hypertension: systolic blood pressure (SBP) ≥ 130 mmHg or diastolic blood pressure (DBP)

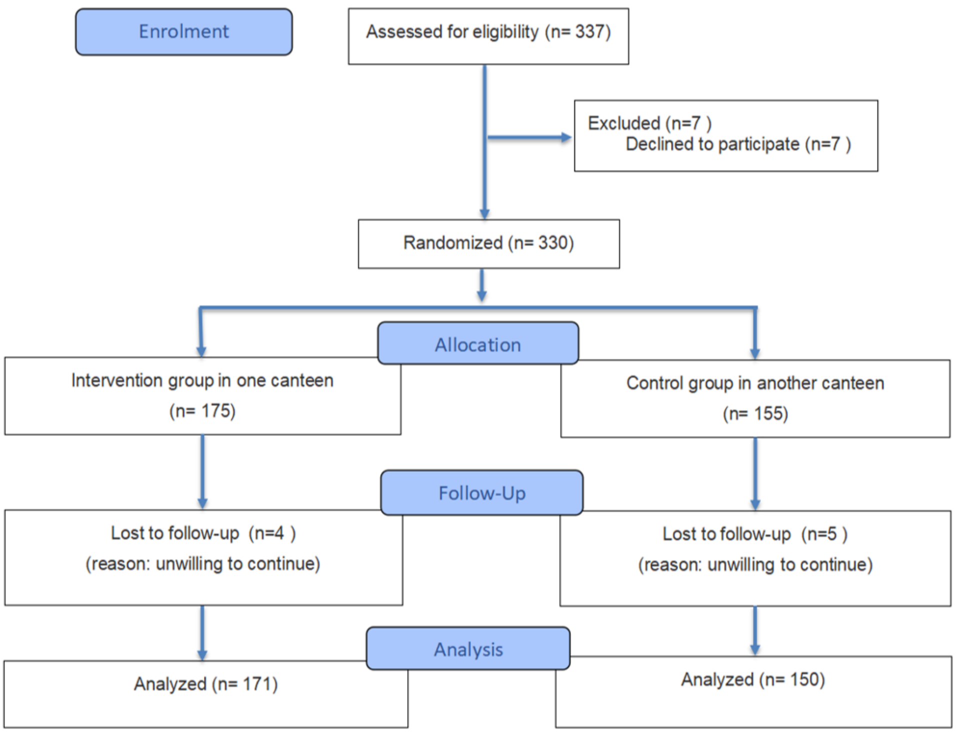

Figure 1. Flow diagram of participants in a study testing the effectiveness of dietary intervention on improvement of metabolic syndrome in occupational men

≥ 85 mmHg or diagnosed with hypertension; 4) triglycerides (TG) ≥ 1.70 mmol/L; 5) high-density lipoprotein cholesterol (HDL-C) < 1.04 mmol/L.4 The main exclusion criteria included: 1) severe diabetes, hypertension and cardiovascular disease; 2) waist and knee lesions or other reasons caused by inactivity; 3) not able to provide blood samples or finish physical examination, or failure to comply with program requirements. This study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Dongying Shengli Shengdong Hospital (2022-003). All subjects gave their informed consent for inclusion before they participated in the study. This study has been registered at the Chinese Clinical Trail Registry (registry number: ChiCTR2400093129). This study did not use blinding for the participants, but the laboratory testers and data analysts were blinded to the group assignment.

Dietary intervention

The IG was comprised of a 6-month health education and dietary intervention based on workplace canteens, provided with personalized dietary recommendations and recipes, healthy lunch meals according to DASH diet principles. Eating habits and food intake were obtained from a simple dietary survey before the intervention, which serves as the basis for personal dietary advice. In accordance with the individual differences and the goals of dietary intervention, tailored nutrition diet recipes were formulated for each participant through the agency service center. Types of food and intake of each meal were specified to ensure reasonable and healthy meals. Personal diet plans were timely adjusted and improved according to the feedback and effect of intervention in this study. In addition, dietary intervention guidance and training were given for canteen chefs, including the nutritional value of food, the selection and preparation of ingredients, and cooking skills like as low salt, low oil and low sugar. The IG canteen increased the supply of whole grains and mixed beans, fruits, soybean and its products, aquatic products in lunch, as well as moderately reduced the use of cooking oil, salt and condiments. The changes of food in lunch before and after intervention were shown in Figure 2(B). Moreover, participants in IG were encouraged to adhere to healthy food choices for breakfast and dinner. Health education was carried out in the form of setting up a health corner in the canteen and providing with brochures and manuals on dietary nutrition knowledge (e.g., food selection, reading labels), chronic disease health management (e.g., hypertension, diabetes, obesity), healthy lifestyles and mental health knowledge. The CG received the same health education as the IG during the 6-month period. It was not including specific guidance or prescriptions for exercise and other lifestyle changes. The lunch food supply in CG canteen was the same as before, and changes before and after intervention were not obvious in Figure 2(A).

Blood biochemical methods

Blood samples were obtained in the morning after an overnight fast, FPG, total cholesterol (TC), TG, HDL-C and low-density lipoprotein cholesterol (LDL-C) were measured at Dongying Shengli Shengdong Hospital clinical laboratory using an automated chemistry analyzer (Hitachi, Tokyo, Japan).

Physical examination

Height, weight and WC were measured with standardized procedures.[15] Body mass index (BMI) was calculated as weight (kg)/height (m^2). Blood pressure (BP) was measured according to a standard protocol.

Statistical analysis

Data were analyzed using SAS version 9.4 (SAS Institute, Cary, NC, USA). Descriptive statistics were presented as means ± standard deviation (SD) for continuity variables with normal distribution. Categorical variables were presented as percentage and examined with a chi-square test. Repeated measures analysis of covariance (ANCOVA) was performed to determine significant interactions between the group and time, with adjustments for age, education, occupation, medication use, exercise frequency and MetS severity at baseline. Bonferroni correction was applied for post-hoc comparisons of differences within groups before and after intervention and differences between groups at after intervention. McNemar's test was used to determine the significant differences in MetS and its components before and after intervention in each group. Values were considered significant at $p < 0.05$.

RESULTS

General characteristics of study participants at baseline

A total of 337 participants were assessed for eligible from two canteens. Of these, 330 participants were included and randomly assigned into IG or CG groups. However, 9 participants were lost to follow-up (dropout rate: 2.7%). The remaining 321 participants were included in data analyses with 171 in IG and 150 in CG. Table 1 shows the characteristics of the study participants between two groups at baseline. There were no statistically significant differences between the two groups in terms of age, education, occupation, medication use, exercise frequency and MetS severity ($p > 0.05$).

Outcome measures before and after intervention

Changes in the BP, glucose, lipid profiles, WC and BMI before and after intervention in the two groups are shown in Table 2. A significant group by time interaction effect was observed on all of the outcomes (all $p < 0.05$). No difference in all the outcomes between IG and CG was detected at baseline (all $p > 0.05$). After 6-month dietary intervention, there was a significant decrease in terms of DBP, FBG, TG, TC, LDL-C, WC and BMI (all $p < 0.001$), and a notable increase of HDL-C ($p = 0.003$) in IG compared with baseline. However, a significant increase of FBG, TG, TC, LDL-C, WC, BMI (all p <0.001), and a decrease of SBP and HDL-C (all $p < 0.001$) were observed in CG after health education for 6 months. Compared with those in CG, FBG (β: -0.72, 95%CI: -1.33, -0.12; $p = 0.010$), TC (β: -1.49, 95%CI: -2.02, -0.97; $p < 0.001$), LDL-C (β: -0.65, 95%CI: -0.90, -0.40; $p < 0.001$), WC (β: -7.73, 95%CI: -9.92, -5.55; $p < 0.001$), BMI (β: -2.01, 95%CI: -3.09, -0.93; $p < 0.001$) deceased and HDL-C (β: 0.13, 95%CI: 0.05, 0.21; $p < 0.001$)

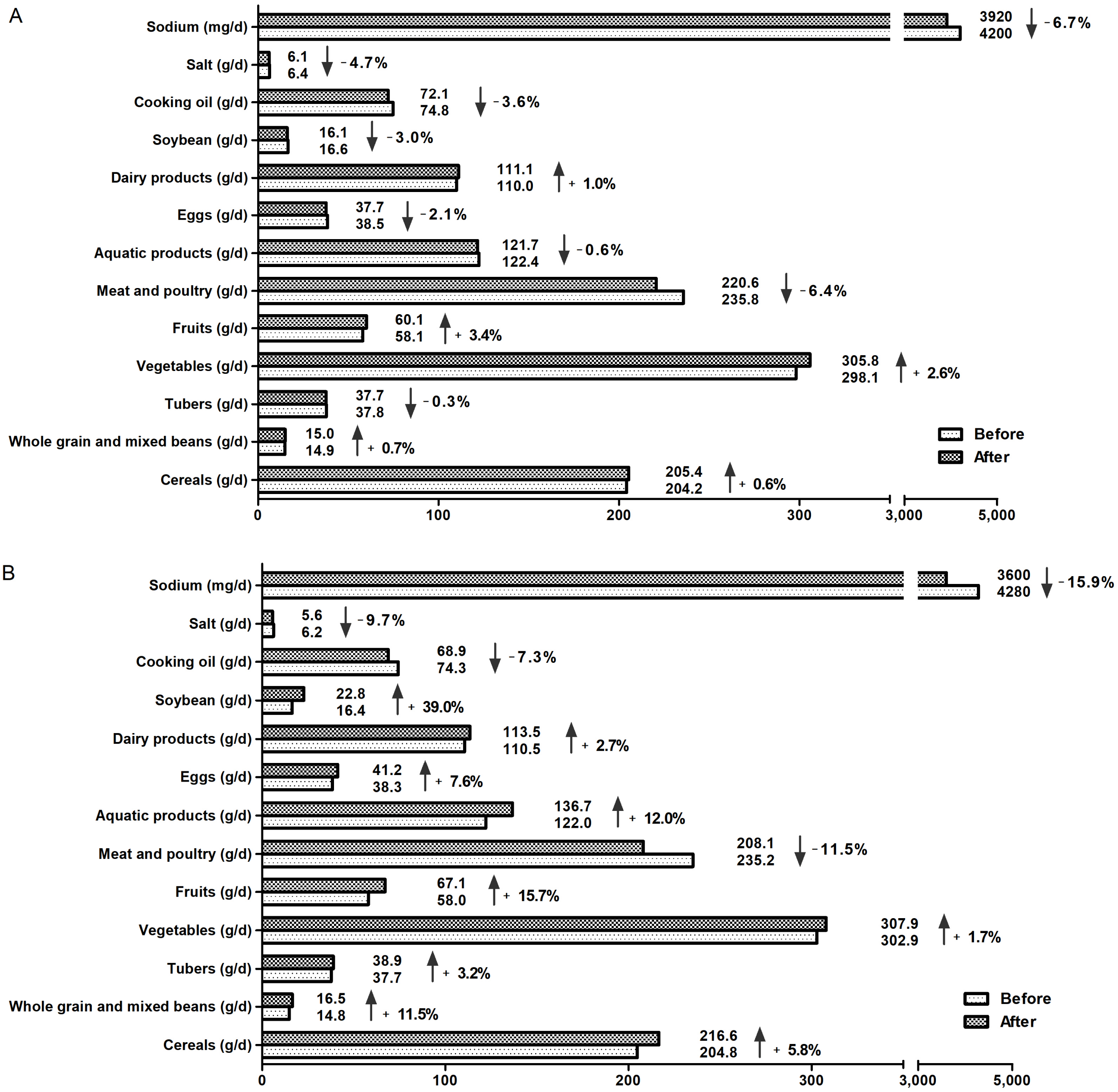

Figure 2. Changes of food consumptions in lunch before and after intervention in control group (A) and intervention group (B). Down arrow indicates a decrease and up arrow indicates an increase

increased significantly in IG after dietary intervention with adjusting for potential confounders.

MetS and its components before and after intervention

To study the effect of dietary intervention on MetS, participants were evaluated for MetS criteria again after the intervention. The results are shown in Figure 3 and Table 3 that the IG had a 30.4% reduction in MetS after 6 months of dietary intervention, while only a 1.3% reduction in CG (p <0.01). As for MetS components, there was a significant reduction in central obesity (-30.4%, p <0.001), high FBG (-8.8%, p <0.001) and low HDL-C (-4.1%, p = 0.008) in IG, but a significant increase of low HDL-C (10.7%, p <0.001) was observed in CG.

DISCUSSION

Dietary interventions play an essential role in the prevention and management of MetS. This study found that a 6-month dietary intervention with a healthy lunch at workplace canteen and personalized dietary advice significantly improved metabolic health outcomes, including blood glucose, lipid profiles, and central obesity in occupational male MetS, whereas a traditional health education did not improve these parameters obviously. These findings were similar to previous studies. Intake of a healthy lunch at workplace canteen for 3 months decreased blood pressure and serum lipids among middle-aged men.[16] A randomized controlled study revealed that dietary intervention reduced cardiometabolic risk and related indicators, including blood lipids, blood pressure and central obesity among Chinese population with dyslipidemia.[17] These changes were significantly associated with clinical benefits relevant to MetS. The adoption of a healthy diet has been recommended as one of the first-line interventions for management of MetS. Evidence based meta-analysis showed a 50% reduction in MetS incidence with adherence to a MedDiet pattern.[18] Moreover, some observational and clinical studies have reported the effective role

Table 1. General characteristics of study participants in IG (N=171) and CG (N=150) at baseline

Characteristics	IG (N=171)	CG (N=150)	Statistics	*p*-value
Age (years, n, %)			0.844	0.656
25~39	43 (25.1)	34 (22.7)		
40~49	87 (50.9)	84 (56.0)		
50~59	41 (24.0)	32 (21.3)		
Education (n, %)			3.037	0.219
≤9 years	4 (2.3)	2 (1.3)		
10-12 years	74 (43.3)	79 (52.7)		
>12 years	93 (54.4)	69 (46.0)		
Occupation (n, %)			0.854	0.652
managers	20 (11.7)	13 (8.67)		
technicians	36 (21.1)	31 (20.7)		
machine operators	115 (67.3)	106 (70.7)		
Medication use (n, %)			1.605	0.658
none	96 (56.1)	94 (62.7)		
1~2 kinds	36 (21.1)	29 (19.3)		
3~4 kinds	28 (16.4)	19 (12.7)		
≥5 kinds	11 (6.4)	8 (5.3)		
Exercise frequency (n, %)			1.828	0.401
None	95 (55.6)	76 (50.7)		
1~2 times/week	59 (34.5)	52 (34.7)		
≥3 times/week	17 (9.9)	22 (14.7)		
MetS severity (n, %)			1.363	0.506
3 items	116 (67.8)	93 (62.0)		
4 items	46 (26.9)	46 (30.7)		
5 items	9 (5.3)	11 (7.3)		

IG: intervention group; CG: control group; MetS: metabolic syndrome.
Data were presented as frequencies (percentages) and compared with chi-squared test.

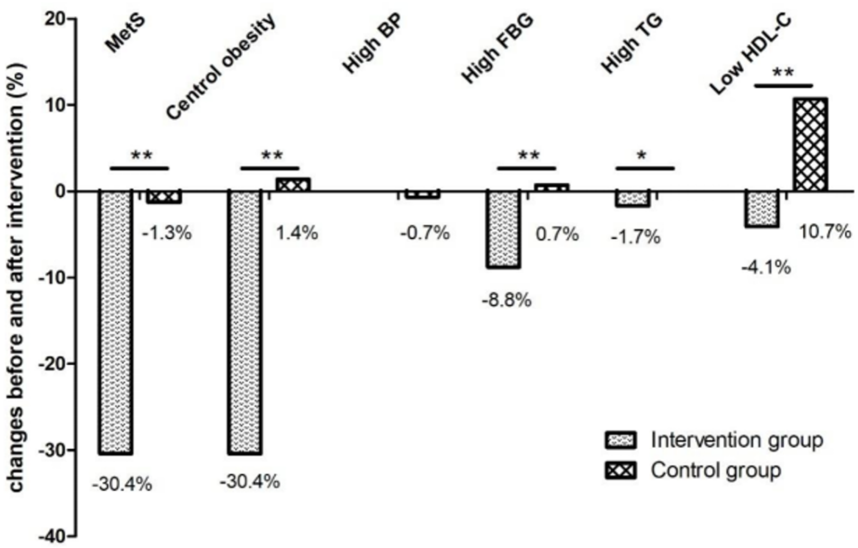

Figure 3. Changes of proportions of MetS and its components before and after intervention in intervention group and control group. MetS: metabolic syndrome; BP: blood pressure; FBG: fasting blood glucose; TG: triglyceride; HDL-C: high-density lipoprotein cholesterol. Data were performed with chi-squared test. * $p<0.05$; ** $p<0.01$

of MedDiet and DASH diet in ameliorating risk of MetS incident or its components.[19, 20] However, findings on the beneficial effects of DASH diet in some metabolic characteristics in intervention studies were not entirely convincing. Besides, personalized dietary advice resulted in positive effects on metabolic health in pre-MetS adults.[21] In this study, we implemented a 6-month intervention in occupational males with MetS, providing a healthy lunch based on DASH diet principles and personalized dietary advice. The intervention led to a significant reduction in the prevalence of MetS and its components, including central obesity, elevated fasting blood glucose, and low HDL-C. Obesity is a key factor for promoting MetS and its components, while weight loss is associated with metabolic benefits such as lowering BP,[22] regulating blood glucose and lipids levels.[23] In addition, the dietary intervention improved blood pressure, fasting blood glucose, and four lipid parameters, reinforcing the role of dietary modification in preventing hypertension, type 2 diabetes, and dyslipidemia.

The canteen-based dietary intervention improved the workplace food environment by increasing the availability of whole grains and mixed beans, soybeans and soybean products, aquatic products such as fish, and fresh

Table 2. Comparison of outcomes in IG and CG before and after intervention

Variables	IG (N=171)			CG (N=150)			p group*time	β (95%CI)	p between-group
	Before	After	p	Before	After	p			
SBP (mmHg)	143±17.7	143±17.0	1.000	145±17.1	143±16.2	<0.001	<0.001	0.08 (-4.85, 5.01)	0.964
DBP (mmHg)	92.1±13.7	91.2±12.4	<0.001	92.7±12.0	92.6±11.8	1.000	0.005	-0.83 (-4.37, 2.72)	0.536
FBG (mmol/L)	6.45±2.42	5.86±1.69	<0.001	6.14±2.02	6.54±2.61	<0.001	<0.001	-0.72 (-1.33, -0.12)	0.002
TG (mmol/L)	3.30±3.29	3.03±2.84	<0.001	3.19±2.74	3.23±2.74	1.000	<0.001	-0.12 (-0.91, 0.68)	0.697
TC (mmol/L)	5.34±1.28	4.98±1.10	<0.001	5.40±1.71	6.54±2.29	<0.001	<0.001	-1.49 (-2.02, -0.97)	<0.001
HDL-C (mmol/L)	1.12±0.26	1.16±0.28	0.003	1.13±0.26	1.03±0.26	<0.001	<0.001	0.13 (0.05, 0.21)	<0.001
LDL-C (mmol/L)	3.26±0.81	3.02±0.74	<0.001	3.32±0.74	3.65±0.92	<0.001	<0.001	-0.65 (-0.90, -0.40)	<0.001
WC (cm)	98.6±8.7	91.1±6.3	<0.001	97.3±8.2	98.7±8.5	0.001	<0.001	-7.73 (-9.92, -5.55)	<0.001
BMI (kg/m^2)	28.6±4.0	27.3±3.7	<0.001	28.7±3.5	29.4±3.8	<0.001	<0.001	-2.01 (-3.09, -0.93)	<0.001

IG: intervention group; CG: control group; SBP: systolic blood pressure; DBP: diastolic blood pressure; FBG: fasting blood glucose; TG: triglycerides; TC: total cholesterol; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; WC: waist circumference; BMI: body mass index.
Data were presented as means ± SD and compared with repeated measures covariance (ANCOVA) with adjustments for age, education, occupation, medication use, exercise frequency and MetS severity at baseline. Bonferroni correction was applied for post-hoc comparisons of differences within groups before and after intervention and differences between groups at after intervention.

Table 3. Comparison of MetS and its components in IG and CG before and after intervention

Variables	IG (N=171)				CG (N=150)			
	Before	After	χ^2	p	Before	After	χ^2	p
MetS	171 (100%)	119 (69.6%)	-	-	150 (100%)	148 (98.7%)	-	-
Central obesity	153 (89.5%)	101 (59.1%)	52.000	<0.001	137 (91.3%)	139 (92.7%)	1.000	0.317
High BP	151 (88.3%)	151 (88.3%)	-	-	139 (92.7%)	138 (92%)	1.000	0.317
High FBG	65 (38%)	50 (29.2%)	15.000	<0.001	48 (32%)	49 (32.7%)	0.200	0.655
High TG	135 (78.9%)	132 (77.2%)	3.000	0.083	132 (88%)	132 (88%)	-	-
Low HDL-C	73 (42.7%)	66 (38.6%)	7.000	0.008	62 (41.3%)	78 (52%)	16.000	<0.001

IG: intervention group; CG: control group; MetS: metabolic syndrome; BP: blood pressure; FBG: fasting blood glucose; TG: triglyceride; HDL-C: high-density lipoprotein cholesterol.
Data were presented as frequencies (percentages) and compared with McNemar's test

fruits, while reducing red meat, salt, and sodium. Whole grains are rich in diverse nutrients with potential health benefits and may lower the risk of hypertension and diabetes.[24] Moreover, whole grain consumption was indicated to be associated with a lower risk of MetS.[25] A whole grain-based diet could reduce blood glucose and TC level in MetS.[26, 27] Soybeans are known for their cardioprotective effect, and may beneficial in the treatment of MetS. Although some clinical trials have evaluated the effect of soybean consumptions in patients with MetS, their results were inconsistent. A meta-analysis has revealed that consuming soybean products in patients with MetS effectively improved lipid profile and glycemic parameters, but not significantly change anthropometric measures and BP.[28] Another cohort study suggests that habitual intake of soy protein and isoflavones is inversely associated with the risk of MetS and its components.[29] Mean soybean intake from lunch increased by 39.0% after dietary intervention to meet daily requirements, which may contribute to the improvement of metabolic parameters. In a dose-response analysis of cohort studies and cross-sectional studies, an increment of 100 g/d in fruit consumption was related to a 3% lower risk of the MetS, whereas an increase of vegetable consumption was not associated with a reduction in the MetS.[30] Higher intake of fruits was associated with modest weight loss and decreased WC.[31] Despite the dietary intervention increasing fruit intake at lunch by 15.7%, the actual intake among males remained well below recommended levels.

Evidence from observational studies suggests that MetS is positively associated with red meat consumption, inversely associated with fish consumption, and shows no significant association with poultry consumption.[32] The positive association between red meat consumption and MetS prevalence appeared to be largely driven by increased prevalence of elevated WC. Moderate red meat intake plays a potentially protective role against high BP.[33] Regular fish consumption has a positive impact on losing weight, improving glucose homeostasis, reducing age-associated increases in BP and the risk of MetS.[34] Daily fish consumption was associated with a 57% reduction in the risk of developing MetS for men in a cohort study in South Korea.[35] In particular, fish intake was significantly associated with TC and HDL-C levels among the MetS components. A 13-year follow-up study has reported lean fish consumption was associated with beneficial changes in abdominal obesity, lipid profile and BP, albeit some only statistically significant among men.[36] In individuals with MetS, the dietary intervention with fish intake significantly reduced LDL-C, waist circumference, and blood pressure. The intervention also decreased red meat and poultry intake while increasing consumption of aquatic products such as fish. Although these changes are generally beneficial for metabolic health, the average fish intake exceeded daily recommendations, which may offset potential benefits and introduce additional health risks.

Salt plays an important role in the development of hypertension and metabolic disorders. High salt intake is among the strongest dietary risk factors for cardiometabolic morbidity and mortality, and individuals with MetS consume more salt than those without MetS, even among those with only elevated waist circumference and/or blood pressure.[37] Salt intake should be reduced globally, with more intensive strategies targeted at individuals with MetS, particularly those with elevated blood pressure and waist circumference. In this study, salt use in the IG canteen was reduced to 5.6 g per person; however, excessive use of sauces and condiments still resulted in high sodium intake, which may explain the lack of significant improvement in BP. Conversely, the CG also showed a significant reduction in SBP, possibly due to decreased salt and sodium intake at lunch.

Although health education plays an important role in preventing and managing metabolic diseases and their risk factors, its effect in this study was limited. The reduction in the prevalence of MetS from baseline to the end of the study was greater in the IG than in the CG. Analysis of MetS components further indicated that a healthy lunch combined with personalized dietary recommendations was more effective than health education alone in improving MetS. Workplace canteen–based dietary interventions can offer tailored nutrition advice, balanced meal plans, and a supportive food environment, making it easier for individuals to adopt and maintain healthy eating habits. Such interventions not only improve MetS and related metabolic parameters but also yield broader health benefits. In the future, workplace canteen dietary interventions and diet management may be an effective strategy to promote healthy eating, prevent and control chronic diseases, and enhance overall health.

The canteen-based dietary intervention providing a healthy lunch and personalized dietary advice for workers was the highlight of this study. Although dietary improvement was targeted only at lunch, the observed amelioration of metabolic parameters in occupational males with MetS indicates the effectiveness of this approach. Nevertheless, several limitations should be noted. First, participants were not blinded, which may have introduced bias; however, laboratory testers and data analysts were blinded to minimize this risk. Second, dietary adherence was not formally evaluated using dietary recall logs or biomarkers. While positive feedback on personal diet recipes and the absence of a decline in healthy lunch consumption suggest good adherence, we did not assess the implementation of dietary recommendations or diet satisfaction during the intervention. Third, although more than 50% of daily food and energy intake typically comes from lunch, breakfast and dinner were not controlled, and these uncontrolled meals may have influenced the intervention outcomes. Fourth, the follow-up period was limited to 6 months, which, while sufficient for short-term evaluation, restricts assessment of long-term sustainability. Finally, as this study was conducted in the canteen of a large enterprise, the applicability of the findings to other workplace settings may be limited. Overall, workplace canteen–based dietary interventions appear to be an acceptable and feasible strategy for improving metabolic parameters in males with MetS and merit broader implementation to address MetS and its components in enterprise settings.

Conclusions

The study results showed that a 6-month dietary intervention improved FBG, lipid profiles (TG, TC, HDL-C, and LDL-C), WC, and BMI, and reduced the prevalence of MetS—particularly central obesity, high FBG, and low HDL-C—among occupational men with MetS. These findings suggest that a workplace canteen–based healthy lunch combined with personalized dietary advice can effectively enhance metabolic health in workers and may represent a novel approach for the improvement and prevention of MetS.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURES

The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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