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ORIGINAL RESEARCH

Enhance Adherence to the Mediterranean Diet in an Italian Academic Setting: A Workplace Health Promotion Programme

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ABSTRACT

Objective: Despite potential health benefits, workplace health promotion programmes still remain limited and varied. This study aimed to evaluate the effectiveness of a Mediterranean Diet (MD)-based intervention in improving the eating habits and the effects on anthropometric characteristics in a sample of University of Torino employees.

Methods: The study comprised 203 university employees (mean age of 47.1 ± 9.2 years, 66% females). At baseline (T0), MD adherence was assessed through the validated Medi-Lite questionnaire, anthropometric characteristics of height, weight and waist circumference were measured and body mass index (BMI) and waist to height ratio (WHtR) derived. The same measurements were repeated after 4 months (T1) to evaluate quantitative and qualitative changes in diet and anthropometric indicators.

Results: After the intervention, the sample showed a significant ($p < 0.05$) increase in adherence to the MD ($T0 = 12.4 \pm 2.2$ vs. $T1 = 13.0 \pm 2.0$) with higher consumption of vegetables (+12.8%), legumes (+10.3%) and fish (+10.8%). While no significant differences for body weight (-0.2 ± 2.3 kg) and BMI (-0.1 ± 0.9 kg/m^2) were observed, a significant decrease in waist circumference (-1.3 ± 4.5 cm) and WHtR (-0.01 ± 0.03) emerged. Furthermore, improvements in MD adherence were associated with a lower risk of metabolic and cardiovascular diseases (according to WHtR) and vice versa.

Conclusion: The nutritional intervention significantly enhanced MD adherence and increased the consumption of its key food groups, including vegetables, legumes, and fish, while reducing waist circumference, WHtR and related risk factors.

1 | Introduction

The work environment is an optimal setting for health promotion interventions because it is possible to reach many people in a short time in the same place, and because it is in the work setting that people spend most of their active day. The university work environment represents a unique setting for such interventions, characterized by a high number of employees compared to other contexts, and particularly by its role as a model institution for surrounding communities, facilitating the promotion of good practices in working conditions. Despite this, research on Workplace Health Promotion (WHP) programmes (WHPPs) targeting university employees is limited and varied. A recent review identified only 12 international studies evaluating the effectiveness of WHP interventions within university settings [1]. Among these, only three studies specifically addressed dietary habit modifications, all of which reported positive outcomes in terms of improved eating behaviours and weight reduction [2]. Most other

Summary

- A workplace health promotion programme significantly increased adherence to Mediterranean Diet guidelines among university employees after 4 months of the intervention.
- The sample reported a significant reduction in waist circumference and waist-to-height ratio, which are key indicators of cardiovascular and metabolic health.
- No significant changes were observed in body weight or body mass index, suggesting that health benefits may occur independently of weight loss.

studies have concentrated on reducing alcohol consumption and other detrimental lifestyle habits, seldom addressing broader nutritional aspects [1].

Interventions aimed at improving the quality and quantity of nutrition are scarce and are sometimes coupled with specific training in workplace canteens [3–5]. Some regionally conducted initiatives, which extended to local businesses, have demonstrated lasting positive effects on the promotion of healthier food consumption, such as fruits and vegetables, even a year after the intervention [6].

Various dietary models are recommended in the literature for promoting health and well-being, but the Mediterranean Diet (MD) stands out as the most universally recognized. It is widely acknowledged as one of the healthiest dietary models and is consistently associated with benefits in preventing chronic diseases and enhancing longevity [7, 8]. An umbrella review analyzing the relationship between MD adherence and 37 health outcomes found robust evidence for significant reductions in overall mortality, cardiovascular and neurodegenerative diseases, overall cancer incidence, and diabetes [9]. In the context of WHPPs, MD adherence has been examined across various work settings [4]. However, only one study has focused specifically on university employees, targeting a sample with overweight and obesity issues [10].

The aim of this study was to monitor and promote healthy eating habits within the community of the University of Torino (North-West Italy). To achieve this, a nutritional education intervention was organized to increase adherence to the MD and to encourage the consumption of specific foods, in addition to evaluating potential effects on anthropometric features and weight conditions after 4 months. Possible differences according to gender, level of education and employment position were also analyzed. An additional focus of the research was to evaluate which anthropometric indicator can most simply and effectively assess body changes following health promotion interventions based on the principles of the MD, even when of short duration.

2 | Materials and Methods

2.1 | Study Design and Participants

This study is part of a broader project within the welfare initiatives promoted by the University of University of Torino (North-West Italy) called Wellness@Work for UniTo. Specifically, the present study was conducted from October 2020 to December 2021, aiming to monitor and promote the well-being conditions of the university community. The university employees voluntarily took part in the study after the experimenters explained the study to them in detail. People were contacted through an institutional email from the university presenting the project and could freely join through a link to a calendar to book an appointment. Documentation regarding informed consent and data processing was presented for completion and signature, before assessments. During an initial visit (T0), the recruited participants underwent an evaluation of anthropometric measures and completed two questionnaires online on a tablet provided by researchers while they were in the waiting room. The first questionnaire collected socio-demographic information (gender, month and year of birth, civil status, educational level, employment position), while the other assessed adherence to the MD using the Medi-Lite questionnaire developed by Prof. Sofi's research group, published in its original version in 2014 and validated in 2017 [11, 12]. Based on the total score obtained from the questionnaire, while also taking into account the evaluation of anthropometric parameters, experimenters provided advice on how to improve adherence. The nutritional counselling intervention was conducted individually; each participant received a brief 10-min consultation with a nutritional biologist, who provided tailored dietary advice based on their adherence scores and anthropometric results. For instance, if the questionnaire indicated a low consumption of fresh fruit, suggestions were given on how to increase it. Additionally, suggestions for healthy and proper eating style were provided to enhance MD adherence, based on the Healthy Eating Plate (Harvard Medical School) and the Healthy Eating Guidelines [13], which provides additional information on preventing overweight and obesity, the implications of using supplements, and sustainability issues. The evaluation of anthropometric parameters and the completion of the Medi-Lite questionnaire were repeated for the participants after 4 months (T1) to assess the effects of the dietary counselling intervention on the MD adherence and weight conditions.

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Bioethics Committee of the University of Torino (protocol N. 20290, 17/12/2019) for studies involving humans.

2.2 | Data Collection

2.2.1 | The Medi-Lite Adherence Score

The adherence to MD was evaluated using the Medi-Lite questionnaire [11, 12]. The Medi-Lite adherence score consists of nine items that assess the daily consumption of fruit, vegetables, cereals, meat and meat products, dairy products, alcohol, and olive oil, and the weekly consumption of legumes and fish. For each food group composing the score, there are three categories of consumption. These categories have been defined based on data available in the literature in relation to adherence to the MD and health status. For foods typical of the MD (fruit and vegetables, cereals, legumes, and fish), 2 points are assigned to the highest consumption category, 1 to the middle category, and 0 to the lowest category. As to olive oil, 2 points are assigned for regular use, 1 for frequent use, and 0 for occasional use. Foods not typical of the MD (meat and meat products, dairy products) are scored as follows: 2 points to the lowest category, 1 to the middle category, and 0 to the highest category of consumption. Finally, 2 points are assigned to the middle consumption category of alcohol (1–2 alcohol units/day), 1 to the lowest category (1 alcohol unit/day), and 0 to the highest category (> 2 alcohol units/day). The final score ranges from 0 (low adherence) to 18 (high adherence to the MD).

2.2.2 | Anthropometric Measurements

Anthropometric measurements of stature (through the use of an anthropometer, Siber-Hegner model), weight (with a Seca digital scale), and waist circumference (through a Seca medical tape measure) were collected following international standards and literature guidelines [14, 15]. Body mass index (BMI) was calculated by dividing the weight (kg) by the height squared (m^2); the subjects in the sample were classified into weight categories according to the World Health Organization (WHO) cut-offs (BMI < 18.5: underweight; BMI 18.5–24.9: normal weight; BMI ≥ 25.0: overweight; BMI ≥ 30.0: obesity) [16]. Waist/height ratio (WHtR) was calculated by dividing waist circumference by height; the sample was divided into at-risk or not-at-risk categories using the WHtR cut-off of 0.5 [17]. From a methodological standpoint, it was decided to compare the results of anthropometric changes following the intervention using both of the mentioned indices (BMI and WHtR), in addition to evaluating changes in individual variables such as weight and waist circumference.

2.3 | Statistical Analysis

Statistical analysis was performed using the statistical package PASW 27.0 for Macintosh (SPSS Inc., Chicago, IL, USA). Normality of the data was assessed using the Shapiro-Wilk test. Continuous variables were presented as means ± standard deviations (SD), while categorical variables were reported as frequencies and percentages (%). The Mann-Whitney or Kruskal-Wallis tests were used for testing differences between groups for continuous variables, while the Chi-square test was used for categorical variables. The significance of the change between T0 and T1 for continuous variables was analyzed using the Wilcoxon test, while for qualitative variables, the McNemar test was performed. For all tests, a p-value < 0.05 was considered statistically significant. Due to low participation of some socio-demographic groups in the sample, marital status was recategorized as unmarried/single and married/partner and education level was recategorized as low level (middle/high school), high level (graduates) and very high level (master/postgraduate/doctorate degree). In addition to descriptive statistical analyses, comparison tests were conducted by dividing the sample according to gender and occupation, as well as by educational level and age.

To investigate whether the promotion intervention improved adherence to the MD, weight status (according to BMI), and metabolic/cardiovascular risk status (according to WHtR), the sample was divided based on changes from T0 to T1 in Medi-Lite scores (increased/unchanged/decreased), changes in BMI (increased/decreased), and changes in risk status according to WHtR (improved if it changed from > 0.5 to < 0.5; positively unchanged if it remained < 0.5, negatively unchanged if it remained > 0.5; worsened if it changed from < 0.5 to > 0.5). Chi-Square Test and Likelihood ratio test were used to investigate the relationship between changes in Medi-Lite scores and changes in weight status and risk status according to WHtR. The effectiveness of the intervention was evaluated by a longitudinal approach using paired sample tests.

3 | Results

At the T0 recruitment, 479 people were evaluated, but only 203 people offered themselves to be re-evaluated after 4 months (T1) on anthropometric measurements and on the Medi-Lite questionnaire, and were included in the analysis. Among completers and non-completers, no differences were found at T0 in females, while males who did not return to T1 showed higher body weight (+3.9 ± 1.9 Kg; $p = 0.04$) and BMI (+1.4 ± 0.6; $p = 0.02$). The results presented here concern a sample comprising 134 females (66%) and 69 males (34%), with a mean age of 47.1 ± 9.2 years. The majority of the study sample were either married or in a relationship ($n = 141$; 69.5%) and held a university, master's or doctorate degree ($n = 176$; 86.7%). In terms of employment position, 46.3% ($n = 94$) were administrative technicians, 19.7% ($n = 40$) were scientific technicians, 13.3% ($n = 27$) were professors and 20.7% ($n = 42$) were researchers.

3.1 | Assessment of the MD Adherence

At the initial assessment, the average Medi-Lite score within the sample was 12.4 ± 2.2, suggesting a good level of MD adherence. Noteworthy, no statistically significant variations were observed based on gender ($p = 0.19$), education level ($p = 0.56$) and employment position ($p = 0.05$) with respect to MD adherence.

Following the nutritional intervention, the sample showed a notable and statistically significant enhancement in its MD adherence level (T0 = 12.4 ± 2.2 vs. T1 = 13.0 ± 2.0; $p < 0.001$). Specifically, females and individuals with higher levels of education demonstrated significant improvements in adhering to the MD, as illustrated in Figure 1. Additionally, analogous findings were observed concerning employment positions, with professors, researchers and administrative technicians registering a significant increase in their Medi-Lite scores.

3.2 | Evaluation of the Food Group Consumption

The analyses of the optimal responses (i.e., the choice that gave 2 points) for individual food groups composing the Medi-Lite score at T0 in the entire sample and according to socio-demographic characteristics are shown in Table 1. Fewer than half of the sample reported optimal consumption for fruit ($n = 96$; 47.3%), vegetables ($n = 93$; 45.8%), legumes ($n = 95$;

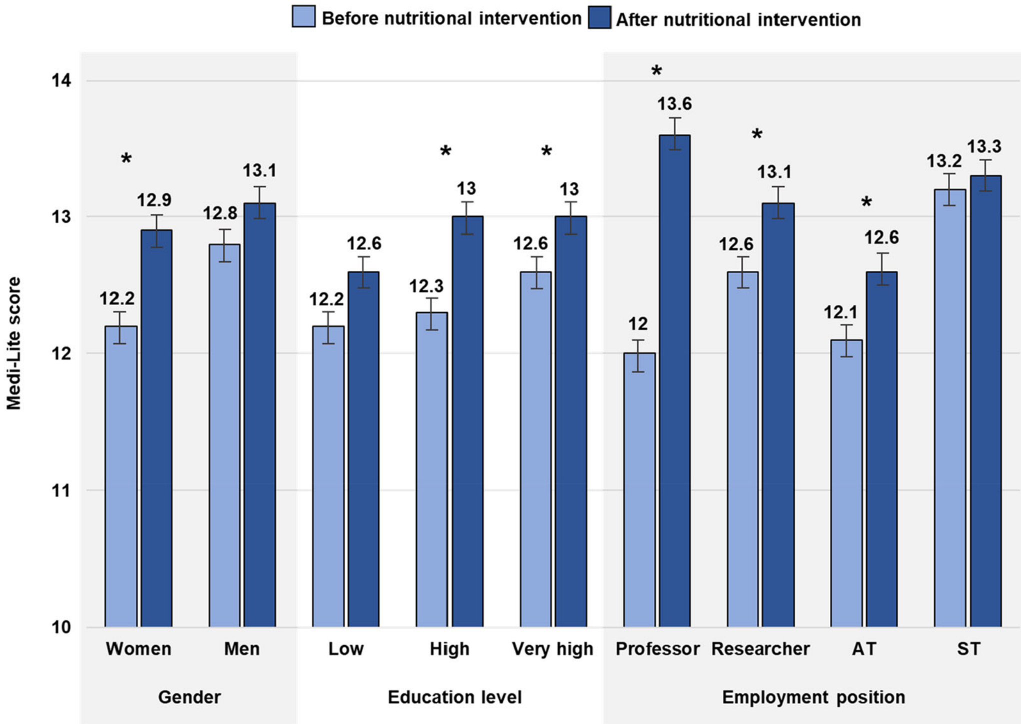

FIGURE 1 | Medi-Lite scores before and after the nutritional intervention according to socio-demographic variables (*$p < 0.05$). AT, administrative technician; ST, scientific technician.

46.8%) and fish ($n = 82$; 40.4%). Conversely, a substantial percentage of participants indicated a high-frequency consumption of meat and meat products ($n = 115$; 56.6%). In addition, the analyses based on socio-demographic variables showed that males reported a significantly higher consumption of cereals and legumes compared to females, while no differences emerged according to the education level. However, concerning employment positions, scientific technicians reported a significantly lower frequency of meat and meat products consumption.

The optimal responses for individual food groups composing the Medi-Lite score after the nutritional intervention are reported in Figure 2. Interestingly, the sample exhibited a significant increase in the consumption of vegetables (+12.8%; $p < 0.001$), legumes (+10.3%; $p = 0.01$) and fish (+10.8%; $p = 0.005$). Although a higher number of optimal responses were also noted for fruit, dairy products and olive oil, statistical significance was not achieved.

Regarding gender, only females showed an enhancement of dietary habits, demonstrating a significant increase of the optimal responses for vegetables (+13.4%; $p = 0.002$), fish (+10.5%; $p = 0.04$), dairy products (+9.7%; $p = 0.04$) and olive oil consumption (+9%; $p = 0.04$) (Figure 3).

Similarly, individuals with high education level were significantly associated with increased consumption of legumes (+16.5%; $p = 0.02$) and olive oil (+12.9%; $p = 0.02$), while those with a very high level of education reported a significant rise in vegetables (+15.4%; $p = 0.004$) and fish (+13.2%; $p = 0.03$) intake. In terms of employment position, only professors exhibited a significant improvement in their eating habits, with a significant increase in the consumption of fruit (+29.3%; $p = 0.04$), vegetables (+30.7%; $p = 0.02$), cereals (+26%; $p = 0.02$) and fish (+26%; $p = 0.02$).

3.3 | Evaluation of Anthropometric Measurements and Ponderal Status

The evaluation of the anthropometric variables and indexes is presented in Table 2, distinguishing the results at baseline (T0) and post-4-month intervention (T1).

No significant differences in anthropometric features of body weight and BMI were observed after the nutritional intervention in the total sample (body weight: -0.2 ± 2.3 kg; BMI: -0.1 ± 0.9 kg/m^2) and both in the female (body weight: -0.4 ± 2.2 kg; BMI: -0.1 ± 0.9 kg/m^2) and in the male (body weight: $+0.1 \pm 2.6$ kg; BMI: $+0.01 \pm 0.8$ kg/m^2) samples. On the contrary, after the intervention waist circumference and WHtR significantly ($p < 0.001$) decreased in the total sample (waist circumference: -1.3 ± 4.5 cm; WHtR: -0.01 ± 0.03), and both in the female (waist circumference: -1.3 ± 4.6 cm, $p = 0.002$; WHtR: -0.01 ± 0.03, $p = 0.002$) and male (waist circumference: -1.3 ± 4.4, $p = 0.02$; WHtR: -0.01 ± 0.03, $p = 0.02$) samples.

According to BMI, at T0, 3% ($n = 6$) of the participants were classified as underweight, 66% ($n = 134$) as normal weight, 25% ($n = 51$) were classified as overweight and 6% ($n = 12$) as obese. After the re-evaluation, no changes were observed in the distribution of the sample except for the frequencies of underweight conditions (2%, $n = 5$) and normal weight (67%, $n = 135$), showing the shift of a person from the underweight to the normal weight condition.

TABLE 1 | Number and percentage of subjects that answered the optimal responses (i.e., the choice that gave 2 points) in the individual food groups composing the Medi-Lite score at T0 for the total sample and according to gender, education level and employment position and corresponding *p*-value of the difference among groups.

		Gender			Education level				Employment position				
	Tot	Females	Males	*p* value	LEL	HEL	VHEL	*p* for trend	Professor	Researcher	AT	ST	*p* for trend
Fruit, > 2 servings/day	96 (47.3)	62 (46.3)	34 (49.3)	0.61	18 (66.7)	39 (45.9)	39 (42.9)	0.16	9 (37.5)	11 (40.7)	8 (44.4)	11 (50)	0.18
Vegetables, > 2.5 servings/day	93 (45.8)	67 (50)	26 (37.7)	0.24	11 (40.7)	36 (42.4)	46 (50.5)	0.65	10 (41.7)	15 (55.6)	9 (50)	12 (54.5)	0.79
Legumes, > 2 servings/week	95 (46.8)	55 (41)	40 (58)	0.03	11 (40.7)	27 (43.5)	47 (51.6)	0.27	7 (29.2)	17 (63)	11 (61.1)	12 (54.5)	0.19
Cereals, > 1.5 servings/day	126 (62.1)	70 (52.2)	56 (81.2)	< 0.001	12 (44.4)	57 (67.1)	57 (62.6)	0.09	9 (37.5)	21 (77.8)	12 (66.7)	15 (68.2)	0.06
Fish, > 2.5 servings/week	82 (40.4)	55 (41)	27 (39.1)	0.95	12 (44.4)	38 (44.7)	32 (35.2)	0.32	8 (33.3)	6 (22.2)	10 (55.6)	8 (36.4)	0.89
Meat and meat products, < 1 serving/day	88 (43.3)	64 (47.8)	24 (34.8)	0.05	10 (37)	32 (37.6)	46 (50.5)	0.46	15 (62.5)	10 (37)	7 (38.9)	14 (63.6)	0.009
Dairy products, < 1 serving/day	98 (48.3)	59 (44)	39 (56.5)	0.14	13 (48.1)	43 (50.6)	42 (46.2)	0.25	11 (45.8)	11 (40.7)	9 (50)	11 (50)	0.84
Alcohol, 1–2 AU/day	74 (36.5)	41 (30.6)	33 (47.8)	0.02	11 (40.7)	25 (29.4)	38 (41.8)	0.36	11 (45.8)	10 (37)	7 (38.9)	10 (45.5)	0.25
Olive oil, regular use	161 (79.3)	108 (80.6)	53 (76.8)	0.56	18 (66.7)	65 (76.5)	78 (85.7)	0.21	20 (83.3)	23 (85.2)	14 (77.8)	21 (95.5)	0.17

Abbreviations: AT, administrative technicians; HEL, high education level; LEL, low education level; ST, scientific technicians; VHEL, very high education level.

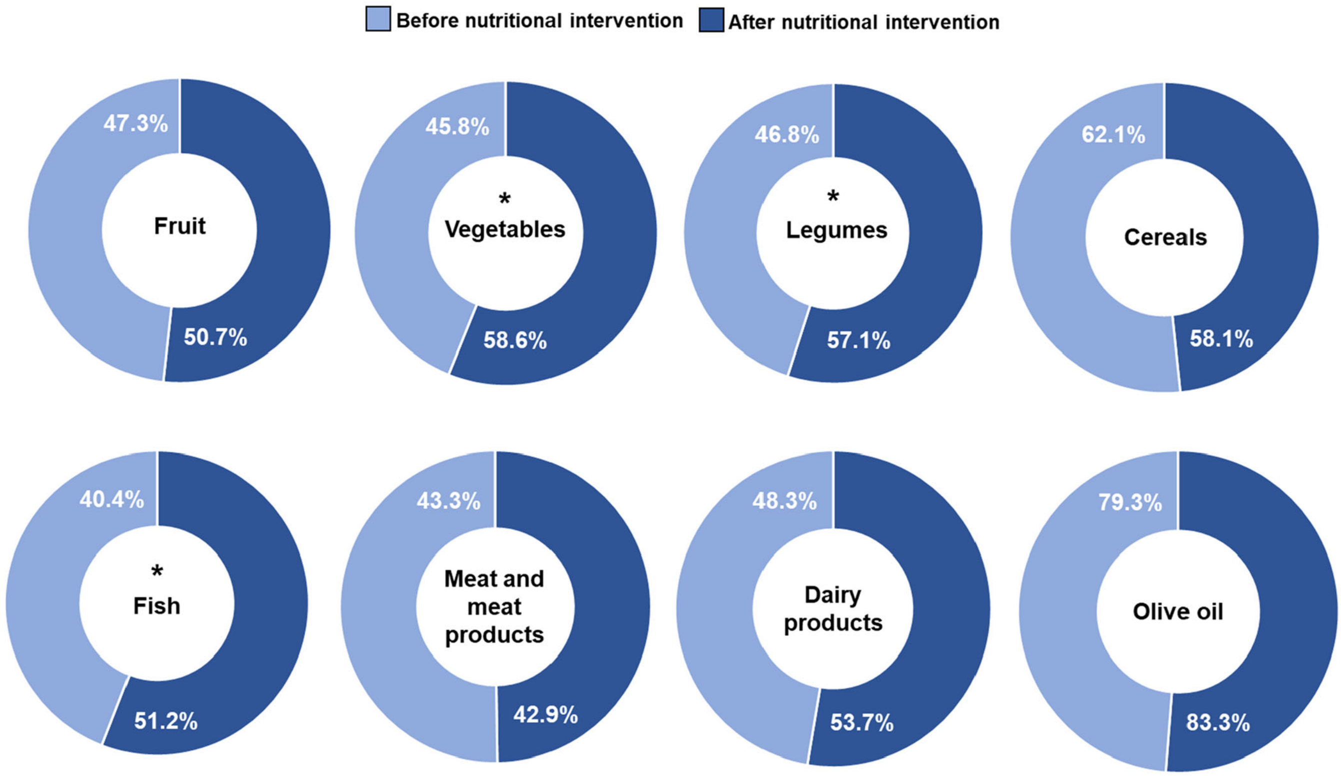

FIGURE 2 | Assessment of the optimal responses (i.e., choice that gave 2 points) to the questions relating to single food groups composing the Medi-Lite score before and after the nutritional intervention in all the study sample (*$p < 0.05$).

Increase in optimal responses   Reduction in optimal responses

	GENDER		EDUCATION LEVEL			EMPLOYMENT POSITION			
	Women	Men	LEL	HEL	VHEL	Professor	Researchers	AT	ST
Fruit >2 servings/day	+3.7%	+2.9%	-18.6%	+3.5%	+9.8%	+29.3% *	+7.2%	+1%	-12.5%
Vegetables >2.5 servings/day	+13.4% *	+11.6%	+11.2%	+10.5%	+15.4% *	+30.7% *	+7.1%	+9.6%	+15%
Legumes >2 servings/week	+10.5%	+10.1%	+3.7%	+16.5% *	+6.6%	+22.3%	+7.1%	+9.6%	+7.5%
Cereals >1.5 servings/day	-2.9%	-5.8%	-11.1%	-8.3%	+2.2%	+26% *	-7.1%	-6.4%	-15%
Fish >2.5 servings/week	+10.5% *	+11.6%	+14.9%	+7.1%	+13.2% *	+26% *	+14.8%	+5.5%	+7.5%
Meat and meat products <1 serving/day	+0.8%	-2.9%	+11.1%	+2.4%	-6.5%	-18.6%	+9.5%	-1%	+2.5%
Dairy products <1 serving/day	+9.7% *	-2.9%	+18.6	+3.5%	+3.3%	=	+11.9%	+7.4%	-2.5%
Olive oil regular use	+9% *	-5.8%	+7.4%	+12.9% *	-5.5%	+3.7%	-2.3%	+7.5%	+2.5%

FIGURE 3 | Variations of the optimal responses (i.e., choice that gave 2 points) to the questions relating to single food groups composing the Medi-Lite score after the nutritional intervention according to socio-demographic variables (*$p < 0.05$). AT, administrative technicians; HEL, high education level; LEL, low education level; ST, scientific technicians; VHEL, very high education level.

3.4 | Relation Between Changes in MD Adherence and Changes in BMI-WHtR

As described in Section 2, the sample was divided into groups to investigate the relationship between changes from T0 to T1 in MD adherence based on Medi-Lite score (increased, unchanged, decreased), BMI (increased, decreased), and metabolic/cardiovascular risk defined by WHtR (improved, positively unchanged, negatively unchanged, worsened). The intersections between the various groups are presented in Table 3.

While changes in adherence to the MD were not significantly associated with changes in BMI ($p = 0.12$), a significant relationship was found between changes in the Medi-Lite score and changes in risk according to WHtR ($p = 0.002$), showing that improvements in adherence to the MD could be associated with

TABLE 2 | Anthropometric measurements and indexes (means ± standard deviation and *p*-value of the differences between T0 and T1) in the total sample and according to gender.

	Tot ($n = 203$)			Females ($n = 134$)			Males ($n = 69$)		
	T0	T1	*p* value	T0	T1	*p* value	T0	T1	*p* value
Body weight (kg)	66.04 ± 11.73	65.83 ± 11.83	0.20	61.11 ± 9.46	60.76 ± 9.34	0.06	75.60 ± 9.63	75.67 ± 9.82	0.83
BMI (kg/m^2)	23.74 ± 3.43	23.65 ± 3.38	0.14	23.31 ± 3.58	23.17 ± 3.48	0.06	24.58 ± 2.95	24.59 ± 2.98	0.91
Waist circumference (cm)	80.72 ± 11.21	79.47 ± 11.38	< 0.001	76.62 ± 9.70	75.36 ± 9.56	0.002	88.68 ± 9.59	87.57 ± 10.33	0.02
WHtR	0.48 ± 0.06	0.48 ± 0.06	< 0.001	0.47 ± 0.06	0.47 ± 0.06	0.002	0.51 ± 0.06	0.50 ± 0.06	0.02

Note: Values are reported as mean standard deviation.
Abbreviations: BMI, body mass index; WHtR, waist/height ratio.

TABLE 3 | Number of subjects which increased, unchanged, decreased MD adherence (from T0 to T1) intersected with BMI changes (increased, decreased) and WHtR changes (improved, positively unchanged, negatively unchanged, worsened).

	Adherence to the MD		
	Increased	Unchanged	Decreased
BMI post-intervention			
Increased	45	21	20
Decreased	56	19	42
Risk according to WHtR			
Negatively unchanged	22	12	19
Positively unchanged	66	24	32
Improved	13	4	4
Worsened	0	0	7

Abbreviations: BMI, body mass index; WHtR, waist/height ratio.

a lower risk of cardiometabolic diseases (according to WHtR) and vice versa.

4 | Discussion

This cohort study examined the impact of a nutritional intervention aimed at promoting adherence to the MD among the employees of the University of Torino. The primary goal was to assess changes in dietary habits, specifically adherence to the MD, and its effects on anthropometric characteristics after a 4-month period.

Our findings demonstrated that the nutritional intervention programme effectively enhanced adherence to the MD, as evidenced by a significant increase in the Medi-Lite score at T1. The MD is globally recognized as one of the best diets to prevent cardiometabolic diseases and reduce morbidity and mortality from all causes [9]. Despites its renowned properties a steady decline in its adherence over the past 50 years occurred. This global trend of declining adherence is especially pronounced in Mediterranean countries, which paradoxically report the largest decreases [18]. A similar pattern is found in Italy, where a recent observational study involving over 10,000 adults highlighted a significant decline in the MD adherence from 2019 to 2022 [19]. Therefore, in this complex scenario, our results were particularly noteworthy. They suggest that the intervention could have a positive impact on the short-term and long-term health of the participating workers, attributable to both qualitative and quantitative improvements in the consumption of specific food groups.

Indeed, the intervention also led to a significant increase in the consumption of key food groups associated with the MD, with more than half of the sample reporting adequate consumption of vegetables (T0 = 45.8% vs. T1 = 58.6%), legumes (T0 = 46.8% vs. T1 = 57.1%) and fish (T0 = 40.4% vs. T1 = 51.2%). These findings are consistent with those of an Italian worksite canteen study that, following a minimally intensive MD-based intervention similar to ours, observed an increased intake of legumes, fruits, and vegetables [20], and with those of a randomized clinical trial conducted among U.S. firefighters, which reported significant improvements in MD adherence [21]. Vegetables and legumes are excellent sources of fibre, vitamins and minerals, while fish is one of the primary dietary sources of omega-3 fatty acids, which are essential for reducing inflammatory states and cardiovascular risk [22, 23]. Regrettably, numerous studies in Italy have consistently reported inadequate consumption of these important food groups. In a previous study, we observed that only half of the Italian adults analyzed reported optimal consumption of fruit, vegetables, legumes, and fish [24]. Similarly, a study conducted on a representative sample of the Italian population, which compared the consumption of various food groups with the Italian Dietary Guidelines, found that only about 50% of participants reported optimal consumption of legumes and fish, and less than 30% for vegetables [25]. Our observations suggest that workplace-based nutritional interventions can play a significant role in addressing these dietary inadequacies. However, although the intervention was successful in promoting some aspects of MD, no significant changes emerged in the consumption of other foods, such as cereals and meat and meat products, suggesting that further strategies may be needed to encourage comprehensive dietary changes.

Another interesting finding of the present study is that the improvement in adherence to the MD and consumption of some of its typical food groups was more pronounced among females, those with higher levels of education, and those with specific work positions, such as professors. These findings are consistent with previous research conducted in several countries [19, 26, 27] and were expected, as females usually show greater confidence in healthy eating and greater commitment to body weight control, leading them to have better eating behaviour [28]. Similarly, those with higher levels of education seem to be more aware of the role of nutrition on health status and thus make better food choices [29].

Although dietary improvements were significant only among female participants, positive changes in some anthropometric indicators were observed in both genders. In terms of anthropometric measurements and indices, the study observed a significant reduction in waist circumference and WHtR among participants, both for males and females, indicating the possibility of a positive impact of the improvements in the adherence to MD on metabolic and cardiovascular risk factors, even though no significant changes in body weight and BMI were found. It is in fact known that WHtR and waist circumference are effective indicators of abdominal obesity, a factor that directly links to visceral adiposity, which is strongly associated with metabolic/cardiovascular diseases [30–32]. Conversely, BMI considers only the weight and height of the subjects, not taking into account neither the quantitative differences between fat mass and free fat mass nor the distribution of the fat mass in the body (visceral and subcutaneous fat) [33]. For these reasons, numerous studies suggest WHtR as a better indicator of metabolic/cardiovascular risk than BMI [34–37]. The fact that body weight did not significantly decrease in the sample, regardless of gender, could be attributed to the short duration of the intervention, which may not be sufficient to observe significant weight loss (and consequently, BMI changes) despite improvements in dietary habits. However, despite the short duration of the intervention, significant improvements were observed in waist circumference and WHtR. Therefore, from a methodological perspective, we suggest that these two variables are the most sensitive indicators and should therefore be considered and prioritized over body weight or BMI in future WHP studies focused on dietary improvement, especially in short-term interventions.

This study also highlighted a significant relationship between changes in MD adherence and changes in the risk condition for cardiovascular diseases, defined by the WHtR cut-off of 0.5 [17]. Subjects that improved their Medi-Lite score were more likely to remain categorized as not-at-risk (WHtR < 0.5) or even to switch from the at-risk to the not-at-risk category (from WHtR > 0.5 to WHtR < 0.5), while subjects that reported a worse Medi-Lite score tended to remain in the at-risk category or move from the not-at-risk category to the at-risk category, suggesting that improving dietary habits following the MD model could be associated with reduced metabolic/cardiovascular risk. Other studies have found that MD has an impact on waist circumference and, therefore, on health risk [38, 39]. This finding underscores the potential of dietary interventions in the workplace to contribute to long-term health benefits, supporting previous research on the benefits of the MD [9]. Consistent with the pattern observed for MD adherence, significant improvements in anthropometric indicators were observed more prominently in females, who generally participate more actively in such programmes, and they are more attentive to dietary practices [40, 41].

This study has several strengths in that it uses a validated questionnaire to measure adherence to MD at the individual level and evaluates the effectiveness of a dietary intervention on a variety of aspects, such as adherence to MD, consumption of its food groups, anthropometric parameters, and health risk. However, the results must be interpreted with some limitations. The sample size was reduced, and this may limit the generalizability of the findings. Among males, participants who returned at T1 showed lower body weight and BMI values at T0 compared to those who did not return. This finding may suggest that participation in WHP interventions could be higher in individuals who are more attentive to their health. Additionally, while a short intervention may be effective to improve lifestyle habits and work-related outcomes [1], a 4-month duration intervention might be insufficient to observe significant changes in some anthropometric characteristics, such as weight and BMI. Future studies should consider longer follow-up periods and larger sample sizes to validate these findings. Moreover, the limited changes in some food groups (e.g., cereals, meat) and the improvements seen mainly among certain subgroups suggest that future interventions could be better tailored to cultural or occupational contexts.

In conclusion, the nutritional intervention promoting the MD among a sample of University of Torino employees successfully improved dietary habits and some anthropometric parameters over a 4-month period. These results highlighted the workplace as a viable setting for implementing effective health promotion programmes and contributed to the growing body of evidence supporting the MD as a beneficial dietary pattern for improving health and reducing the risk of chronic diseases.

Author Contributions

Margherita Micheletti Cremasco, Alessia Moroni, Francesco Sofi and Barbara Colombini designed the research. Margherita Micheletti Cremasco and Alessia Moroni conducted research. Sofia Lotti, Francesco Sguaizer and Monica Dinu analyzed data. Margherita Micheletti Cremasco, Sofia Lotti, Francesco Sguaizer and Barbara Colombini wrote the paper. Margherita Micheletti Cremasco had primary responsibility for the final content. All authors read and approved the final manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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