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Class size as a determinant factor in dietary changes in nursing students

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ABSTRACT

Introduction: While nursing students receive foundational education in biochemistry and nutrition during their first year of studies, the influence of nutrition education at the university level on their dietary behavior, particularly considering class size, remains unclear.

Aim: The aim of this study is to assess the impact of a nutrition course on dietary changes among undergraduate nursing students, taking into account the size of the class group.

Methodology: A pre-post quasi-experimental study with a within-subject design was conducted, measuring the baseline period (T0-T1) and intervention period (T1-T2). The educational intervention focused on providing basic nutritional knowledge about nutrients, balanced diets and the Mediterranean Diet within a Faculty of Medicine and Nursing. Participants included first-year undergraduate nursing students, divided into three groups based on class size: large group (n = 101), medium group (n = 70) and small group (n = 22). The frequency of recommended food group consumption for main, daily, weekly and occasional meals, as well as adherence to the Mediterranean Diet was analyzed.

Findings: Only the small class group demonstrated a significant improvement in dietary quality following the educational intervention ($p < 0.05$), with increased consumption of fruits ($p < 0.05$), nuts ($p < 0.001$), and oily fish ($p < 0.05$).

Discussion: Choosing the best teaching strategy can be crucial in getting nursing students to put healthy dietary knowledge into practice to improve their eating habits.

Conclusions: The findings suggest that enhancing students' personal dietary habits can contribute to the improvement of their nutrition counseling skills.

KEYWORDS

University, Student, Mediterranean diet.

ABBREVIATIONS

FFQ: Food Frecuency Questionnaire.

MD: Mediterranean Diet.

MDS: MedDiet Score index.

INTRODUCTION

Entering university represents a critical period in the lives of many adolescents, as they leave home, begin third–level education and embark on their adult lives[1]. The transition to college has been shown to be related to a high incidence of eating disorders and weight increase[2] at this stage. These factors collectively highlight the vulnerability of college students and their heightened susceptibility to adopting poor eating habits[2,3].

To analyse and try to change the habits of the university students, various nutrition interventions have been conducted, particularly among youth populations, with multicomponent interventions showing promising results in promoting lifestyle changes[4]. While previous studies have explored the impact of nutritional interventions on university

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students[5], the specific effects of nutrition education at the university level on students eating behavior remain unknown, especially, depending on the size of the group receiving the nutritional intervention. This knowledge gap is particularly relevant for health science students, as previous research has indicated low adherence to the Mediterranean Diet (MD) among medical and nursing students despite receiving nutrition information during their studies[6]. The MD has been associated with a lower risk of cardiovascular disease and obesity[7].

Nursing curricula have been found to lack a comprehensive understanding of nutrition concepts[8], underscoring the significant role of nursing educators in selecting effective teaching and learning methodologies to achieve desired learning outcomes[9]. Recent research has highlighted the importance of employing strategies that facilitate the transfer of knowledge from theory to practice in nursing education[10], yet the extent to which these strategies enable students to apply learned to their everyday lives remains unclear.

During the first year of their degree studies, nursing students acquire core knowledge about biochemistry and nutrition, through the teaching of a subject based on healthy eating habits and the Mediterranean Diet (MD), however, the effect of this subject on students is unknown. At our faculty, the subject of nutrition is taught in three different languages (Basque, Spanish, and English) and in groups of varying sizes. This unique context provides an ideal opportunity to examine the effect of class size on the practical application of nutritional knowledge and subsequent changes in food consumption. Therefore, the aim of this study is to assess changes in dietary consumption and adherence to the Mediterranean diet among nursing students following a course in biochemistry and nutrition, with a focus on the influence of class size.

METHODOLOGY

Design and sample

This is a quasi-experimental study with a within-subject design, with no control group required due to internal validity considerations. The study was conducted in a Spanish university's Faculty of Medicine and Nursing from September 2019 to June 2020. All students enrolled in the first term of the nursing degree program were eligible for participation. The first-year students were divided into three groups of varying sizes: large (n = 101), medium (n = 70), and small (n = 22).

All students followed the same syllabus for the 'Structure and Function of the Human Body' course. Questionnaires were administered to the students at three different time points: at the beginning of the academic year (T0), after 6 weeks (prior to the nutrition course or T1), and at the end of the year (6 weeks later or T2).

Intervention

The intervention consisted of a 6-week lecture series covering various aspects of nutrition, including macronutrients, the glycemic index, micronutrients, healthy dietary choices, and the MD. The intervention was delivered through traditional lectures; where concepts were presented in class, and practical tasks were assigned to engage students, foster critical thinking, and enhance motivation.

Data and variables

Dietary information was collected using and adapted Food Frequency Questionnaire (FFQ), which captured data on participants' food consumption patterns. Adherence to the Mediterranean Diet was assessed using the MedDiet Score index (MDS). In addition to dietary information, participants were asked to provide details such as age, sex, habitual weight, height (to calculate body mass index), and any prior courses or education they had received in nutrition.

Food Frequency Questionnaire (FFQ)

Dietary habits were assessed using a validated semi-quantitative food frequency questionnaire (FFQ) consisting of 48 food items[11]. Participants reported the frequency of their food consumption in servings/per day, week, or month. The questionnaire used in this study was previously validated by Trinidad Rodríguez et al (2008)[12]. Specific items such as olive oil, brown bread/pasta/rice, and whole milk/yogurt were included to calculate the MDS.

Mediterranean Diet Score (MDS)

The MDS[13] is a reliable tool for assessing adherence to the MD in adults[14]. It consists of 11 food groups, and each item within these groups is assigned a score from 0 to 5 based on its frequency of consumption. Higher scores indicating greater adherence to the Mediterranean Diet.

Data analysis

Statistical analysis involved comparing the MDS scores and servings per month for the different food groups at three measurement time points using Wilcoxon signed-rank tests within each group size. A Kruskal-Wallis test was used to compare classes at baseline and during the intervention period. Statistical analyses were performed using SPSS (version 23.0, IBM Corp, Amonk, NY, 2015), and a significance level of $p < 0.05$ was applied.

Ethical considerations

All participants provided a written informed consent and the study protocol was approved by the Ethics Committee of the University of the Basque Country (CEISH, M10_2019_175).

RESULTS

A total of 139 students, including 126 women and 11 men, with ages ranging from 18 to 41 and BMI values ranging from 16.65 to 35.76, completed the questionnaires at three different time points.

Table 1 presents the changes in food frequency consumption for each main meal and the Mediterranean Diet Score in the small, medium, and large-sized groups. During the intervention period, significant changes were observed in the consumption of fruit, with an increase in the small group ($p = 0.042$) and a decrease in the large group ($p = 0.013$). Additionally, the consumption of 100% fruit juices decreased in the medium-sized group ($p = 0.006$). No significant changes were observed during the baseline period (T0-T1) in the small-sized group, while in the medium and large groups, the consumption of several common food items decreased.

Changes in the consumption of recommended food on a daily and weekly basis were observed in the small group at T2 (see Table 2). The small group showed an increased in the intake of nuts ($p = 0.001$) and oily fish ($p = 0.025$). Additionally, the medium-sized group demonstrated and increase in milk consumption ($p = 0.027$) after the intervention. Furthermore, the small group exhibited a decrease in oily fish intake at T1 ($p = 0.008$).

As for the frequency of occasional consumption of recommended Mediterranean diet foodstuffs (see Table 3), significant decreases in food consumption were observed after the intervention. This included a 50% decline in the consumption of cured meat in the small group ($p = 0.028$) and a decrease in the medium group ($p = 0.029$). There was also a decrease in the intake of Marie biscuits in the medium group ($p = 0.039$), less consumption of sugar candies in the small group ($p = 0.005$), and reduced beer consumption in the large group ($p = 0.029$). It is worth noting that the consumption of Marie biscuits ($p = 0.001$) and cured meat ($p = 0.003$) also decreased significantly in the medium group during T1.

Table 4 presents a comparison of changes in food consumption frequency by class size during the baseline (T0-T1) and intervention period (T1-T2). In the baseline period, the consumption of food items was similar in the three groups, except for extra virgin olive oil ($p = 0.045$), legumes ($p = 0.029$), and oily fish ($p = 0.011$). During the intervention period, an increase in healthy foods was observed only in the small group, where the intake of fruits ($p = 0.037$), nuts ($p < 0.001$) and oily fish ($p = 0.012$) significantly increased.

Table 1. Mediterranean Diet Score and frequency of food groups of every-main-meal consumption in the Mediterranean diet at baseline (T0), pre-intervention (T1) and post-intervention (T2) in different sized nursing classes

	Small-sized group			Medium-sized group			Large-sized group		
	T0	**T1**	**T2**	**T0**	**T1**	**T2**	**T0**	**T1**	**T2**
Mediterranean Diet Score	32.4 ± 5.1	32.5 ± 5.1	33.6 ± 6.2	31.3 ± 5.4	32.0 ± 5.3	32.4 ± 5.2	32.2 ± 5.1	31.7 ± 5.0	31.4 ± 5.5
Vegetables	24.8 ± 33	17.3 ± 12	14.2 ± 13	15.2 ± 11	11.8 ± 9.6[a]	11.6 ± 12	12.7 ± 9.6	9.99 ± 8.9[a]	10.8 ± 7.7
Potatoes	13.0 ± 20	5.78 ± 3.6	5.47 ± 2.7	10.0 ± 9.5	7.38 ± 8.8[a]	7.94 ± 6.3	9.46 ± 7.3	6.75 ± 5.5[a]	7.58 ± 6.0
Rice	5.39 ± 3.2	3.78 ± 2.2	4.24 ± 2.5	4.96 ± 3.2	4.18 ± 2.5	3.76 ± 2.5	5.70 ± 5.3	5.24 ± 3.9	5.18 ± 6.8
Whole wheat rice	1.44 ± 2.4	0.56 ± 1.3	0.89 ± 2.2	1.36 ± 4.5	0.76 ± 2.3	1.48 ± 4.6	0.73 ± 2.1	0.85 ± 3.6	0.31 ± 1.2
Pasta	6.22 ± 6.8	4.00 ± 2.7	4.00 ± 2.0	7.20 ± 5.9	5.12 ± 2.9[a]	5.38 ± 4.4	6.63 ± 4.5	5.92 ± 3.3	5.41 ± 3.5
Whole wheat pasta	2.50 ± 4.1	1.83 ± 3.1	1.56 ± 3.1	0.88 ± 2.5	0.9 ± 2.0	1.2 ± 4.2	0.59 ± 1.8	0.44 ± 1.7	0.41 ± 1.5
Bread	29.6 ± 45	18.9 ± 19	19.2 ± 27	26.4 ± 23	23.9 ± 26	21.9 ± 24	26.4 ± 27	19.3 ± 24[a]	23.2 ± 29
Whole wheat bread	9.33 ± 15	13.4 ± 24	10.3 ± 13	7.44 ± 16	6.8 ± 15	8.14 ± 15	9.56 ± 14	7.31 ± 14	8.18 ± 16
Fruits	28.0 ± 26	23.3 ± 24	**31.8 ± 30[b]**	27.7 ± 20	25.5 ± 24	24.2 ± 23	30.5 ± 28	23.9 ± 18[a]	**19.8 ± 17[b]**
100% Fruit juices	13.3 ± 13	12.3 ± 12	10.3 ± 12	10.4 ± 14	9.16 ± 11	**7.74 ± 15[b]**	10.7 ± 25	7.44 ± 11	8.01 ± 10
Extra virgin olive oil	42.0 ± 33	49.8 ± 57	73.4 ± 69	57.0 ± 44	56.7 ± 57	69.9 ± 54	36.8 ± 36	58.2 ± 59[a]	68.1 ± 76

Data are presented as mean and standard deviation (M ± SD). Wilcoxon Signed-rank test with a significance level of $P<0.05$ was used: [a]T0 vs. T1, [b]T1 vs. T2.

Table 2. Frequency of daily/weekly consumption of recommended Mediterranean diet foodstuffs at baseline (T0), pre-intervention (T1), and post-intervention (T2) in different-sized nursing classes

	Small-sized group			Medium-sized group			Large-sized group		
Daily	**T0**	**T1**	**T2**	**T0**	**T1**	**T2**	**T0**	**T1**	**T2**
Milk	8.33 ± 17	12.7 ± 24	0.33 ± 0.8	7.52 ± 16	5.54 ± 13	**10.1 ± 20[b]**	7.90 ± 14	7.10 ± 14	8.23 ± 16
(Semi-)skimmed milk	15.4 ± 13	15.7 ± 19	22 ± 20.3	17.3 ± 18	19.6 ± 18	17.3 ± 16	22.6 ± 27	19.7 ± 22	20.5 ± 20
Yogurt	8.72 ± 10	11.8 ± 16	10.5 ± 13	13.0 ± 16	11.7 ± 17	9.84 ± 15	10.5 ± 15	8.01 ± 15	6.79 ± 11
Cheese	8.89 ± 10	7.44 ± 10	5.06 ± 5.2	8.16 ± 10	5.70 ± 7.8	5.74 ± 10	5.70 ± 7.5	5.54 ± 9.4	5.03 ± 9.0
Nuts	11.8 ± 28	8.56 ± 14	**15.18 ± 19[b]**	9.22 ± 14	8.08 ± 11	8.04 ± 13	9.06 ± 11	8.51 ± 13	8.27 ± 12
Weekly									
Legumes	8.67 ± 4.4	6.17 ± 3.7[a]	6.82 ± 3.5	11.0 ± 7.3	8.42 ± 5.8[a]	8.26 ± 5.0	7.97 ± 4.7	8.49 ± 10	8.14 ± 7.5
Eggs	12.0 ± 7.3	13.3 ± 8.0	13.2 ± 8.1	11.8 ± 9.0	11.3 ± 8.7	9.72 ± 6.3	15.5 ± 14	13.0 ± 9.7	12.9 ± 10
Poultry	9.78 ± 8.7	6.39 ± 7.0[a]	6.39 ± 5.7	10.2 ± 6.6	7.88 ± 4.6[a]	8.76 ± 5.6	8.62 ± 6.4	7.73 ± 6.4	7.58 ± 5.3
Red meat	6.56 ± 7.2	4.00 ± 3.8[a]	4.61 ± 6.6	6.12 ± 4.2	4.24 ± 3.4[a]	4.38 ± 4.5	5.59 ± 4.7	5.13 ± 5.5	4.83 ± 4.7
White fish	6.11 ± 5.5	5.39 ± 4.0	5.89 ± 3.5	7.04 ± 5.1	6.14 ± 4.2	7.22 ± 8.6	5.66 ± 7.1	5.62 ± 7.7	4.13 ± 3.1
Oily fish	5.72 ± 4.8	3.39 ± 2.9[a]	**4.67 ± 3.9[b]**	4.72 ± 5.3	4.92 ± 4.6	4.88 ± 8.8	7.17 ± 14	5.49 ± 8.5[a]	3.99 ± 5.2

Data are presented as mean and standard deviation (M ± SD). Wilcoxon Signed-rank test with a significance level of $P<0.05$ was used: [a]T0 vs. T1, [b]T1 vs. T2.

Table 3. Frequency of occasional consumption of recommended Mediterranean diet foodstuffs at baseline (T0), pre-intervention (T1), and post-intervention (T2) in different-sized nursing classes

	Small-sized group			Medium-sized group			Large-sized group		
Occasionally	**T0**	**T1**	**T2**	**T0**	**T1**	**T2**	**T0**	**T1**	**T2**
Breakfast cereals	7.94 ± 10	9.50 ± 12	8.94 ± 13	8.68 ± 14	7.24 ± 11	5.88 ± 9.9	6.35 ± 11	4.89 ± 8.5	4.34 ± 8.1
Marie biscuits	16.5 ± 40	16.9 ± 43	10.1 ± 34	21.7 ± 34	9.52 ± 14[a]	**7.68 ± 15[b]**	7.44 ± 12	8.51 ± 33	4.69 ± 8.8
Cookies	12.1 ± 26	6.17 ± 8.8	8.41 ± 15	10.2 ± 15	7.62 ± 11	5.40 ± 8.4	13.6 ± 27	10.3 ± 22	7.21 ± 20
Cured meat	11.2 ± 9.2	10.0 ± 9.4	**4.94 ± 4.6[b]**	17.0 ± 11	12.4 ± 9.2[a]	**10.4 ± 9.0[b]**	15.0 ± 12	11.6 ± 10[a]	10.1 ± 9.4
Sugar-sweetened fruit	4.33 ± 7.5	5.72 ± 10	1.39 ± 3.3	3.00 ± 7.8	2.84 ± 7.1	2.32 ± 6.0	5.59 ± 24	2.48 ± 5.9	2.72 ± 6.4
Chips and crisps	6.44 ± 5.4	6.06 ± 7.3	5.06 ± 5.4	5.52 ± 6.6	4.28 ± 4.1	3.62 ± 5.2	4.83 ± 5.8	4.63 ± 6.0	4.00 ± 4.7
Sugar candies	4.61 ± 4.7	3.00 ± 2.7	**1.61 ± 2.2[b]**	3.44 ± 5.5	2.06 ± 3.3	1.74 ± 4.2	2.65 ± 5.2	2.39 ± 5.6	1.39 ± 2.5
Ice cream, cake…	3.72 ± 3.5	1.33 ± 1.4[a]	1.72 ± 1.6	3.58 ± 6.2	2.24 ± 3.5	1.98 ± 3.1	3.89 ± 6.4	1.79 ± 4.9[a]	2.17 ± 4.4
Sugary drinks	6.11 ± 13	2.00 ± 3.0	2.22 ± 4.1	2.96 ± 5.1	2.64 ± 4.4	2.12 ± 3.2	3.30 ± 4.4	2.21 ± 4.1[a]	1.97 ± 3.0
Wine	2.00 ± 2.1	2.00 ± 2.2	2.56 ± 2.2	1.98 ± 4.9	2.18 ± 2.9	2.14 ± 3.3	2.13 ± 3.6	2.52 ± 4.4	2.30 ± 3.8
Beer	1.56 ± 2.1	1.72 ± 2.0	1.83 ± 2.3	2.48 ± 5.0	4.20 ± 12	2.94 ± 5.7	4.39 ± 8.1	3.07 ± 4.7	**2.18 ± 3.4[b]**
Sunflower oil	4.61 ± 7.9	10.0 ± 27	3.28 ± 9.4	5.92 ± 12	8.50 ± 22	15.2 ± 46	15.5 ± 41	15.2 ± 27	16.7 ± 46

Data are presented as mean and standard deviation (M ± SD). Wilcoxon Signed-rank test with a significance level of $P<0.05$ was used: [a]T0 vs. T1, [b]T1 vs. T2.

Table 4. Effect of the baseline period (T0-T1) and intervention period (T1-T2) on the daily/weekly/occasional frequency of recommended consumption of Mediterranean-diet food groups amongst different-sized class groups

	Baseline period			Intervention period		
	Small-sized group	**Medium-sized group**	**Large-sized group**	**Small-sized group**	**Medium-sized group**	**Large-sized group**
Fruits	-4.67 ± 16	-2.20 ± 16	-7.09 ± 25	**8.24 ± 17[a]**	-1.26 ± 15	-4.07 ± 15
Olive oil	7.78 ± 58	-0.36 ± 57	**21.4 ± 62[a]**	23.6 ± 68	13.3 ± 64	9.92 ± 71
Milk	4.33 ± 10	-1.98 ± 8.5	-0.80 ± 6.4	-12.33 ± 24	4.52 ± 15	1.13 ± 9.8
Yogurt	3.06 ± 13	-1.24 ± 8.8	-2.49 ± 11	-1.28 ± 11	-1.88 ± 15	-1.23 ± 14
Cheese	-1.44 ± 8.4	-2.46 ± 10	-0.17 ± 8.0	-2.39 ± 9.4	0.04 ± 6.7	-0.51 ± 4.7
Nuts	-3.28 ± 24	-1.14 ± 10	-0.55 ± 12	**7.76 ± 8.4[a]**	-0.04 ± 7.9	-0.24 ± 12
Legumes	-2.50 ± 4.3	-2.62 ± 5.9	**0.52 ± 10[a]**	1.24 ± 3.2	-0.16 ± 5.8	-0.35 ± 9.8
Eggs	1.33 ± 6.1	-0.58 ± 5.1	-2.41 ± 11	-0.11 ± 9.9	-1.54 ± 5.7	-0.20 ± 6.2
Poultry	-3.39 ± 3.8	-2.32 ± 6.1	-0.89 ± 6.3	0.00 ± 8.0	0.88 ± 5.3	-0.15 ± 5.0
Oily fish	-2.33 ± 2.8	**0.20 ± 3.1[a]**	-1.68 ± 15	**1.28 ± 2.1[a]**	-0.04 ± 7.8	-1.51 ± 6.9
M. biscuits	0.44 ± 12.7	-12.2 ± 33	**1.07 ± 33[a]**	2.06 ± 40	-1.84 ± 16	-3.82 ± 31

Olive oil: extra virgin olive oil, M. biscuits: Marie biscuits. [a]Kruskal–Wallis test with a significant level of $p<0.05$ was used: Small vs. medium vs. large-sized group.

DISCUSSION

This study investigated the influence of class size on the dietary habits of nursing students during the learning of nutrition concepts. Our findings demonstrate, for the first time, that the transfer of nutrition knowledge is more effective in smaller class sizes, as evidenced by the increased consumption of healthier foods (such as fruits, nuts and oily fish) in the small group.

Previous studies have highlighted the need for improved nutritional knowledge among undergraduate students[15]. Hence, Yahia et al. showed that only 4% of university students had a "quite good" nutritional knowledge[15]. Other studies have shown that not only nursing students but also practicing nurses are lacking in the necessary nutritional knowledge[16]. It is concerning that practicing nurses also lack adequate nutritional knowledge about glycemic index and different dietary fats[17]. Given that nurses are expected to provide nutritional care[18], addressing this knowledge gap is crucial.

Reconsidering teaching methods is necessary to enhance undergraduates' nutritional knowledge. While traditional teaching methods have been suggested as the most effective due to the large class sizes[19], it should be noted that the transition from theory (good dietary guidelines) to practice (food frequency consumption) occurs more easily in smaller groups[20]. Our study demonstrates that teaching nutrition in smaller groups can improve students' own dietary habits, regardless of the language of instruction, taking into account, according to Unesco, that when the learning content is not in the mother tongue of the learner, the risk of information loss increases[21]. Even though all groups followed the same syllabus in different languages, teaching in smaller groups proved more effective than teaching in larger groups. This aligns with previous research indicating the positive impact of nutrition education interventions on the dietary habits[20], even among small sample groups, ranging from 22 to 43 participants. Although these results are difficult to generalise, they are consistent with those of this study. In our study, the intake of healthy foods such as fruits, nuts and oily fish increased in the smaller group compared to the larger groups after the nutrition course. These changes were only due to the teaching intervention, as there were no baseline changes beforehand, except for oily fish intake. However, this increase could be relevant, as no similar significant increase had previously been observed in any study.

The eating behavior of university students may be a complex variable to understand, since it depends on individual, social and environmental characteristics[22]. A given stimulation at an individual level may not change eating behavior

when acted upon in a non–beneficial social and/or physical environment, and vice versa. As other authors[23] have mentioned, healthy food choices may have a low priority compared to other commitments. Indeed, Marquis et al.[24] also found that university students often prioritize cost and convenience over health. Therefore, educational interventions should consider multiple factors to achieve better outcomes. Additionally, there is a lack of detailed literature on nutritional educational interventions among undergraduate health professionals[19]. However, it is suggested that nutrition education can lead to positive changes in students' eating habits, and increase their likelihood of recommending healthy behaviours to their patients[25]. In this case, medical students improved their own diet, increasing the frequency of wholegrain food intake, and also reported an increased likelihood to counsel patients on lifestyle behaviors after 13 hours of nutrition training. As for nursing students, few researchers have examined the effects of educational interventions on health behaviors in the pretest–posttest design. While some studies have shown the effectiveness of interventions in improving health behaviors among nursing students[26], few have focused specifically on nutrition or analyzed food consumption. Our study contributes to this gap in knowledge by demonstrating the impact of the nutrition curriculum on the dietary habits of nursing undergraduates.

The existing data available to date suggest that improving students' own lifestyle habits can have a positive impact on their nutrition counseling skills as well[27]. By reflecting on their own lifestyle behaviors, health students gain valuable insight into the process of behavior change, enabling them to be more empathetic and supportive when working with patients who also need to make similar changes[28]. Thus, nutrition education serves as an effective approach to enhancing students' eating habits and promoting overall health.

CONCLUSION

In conclusion, the findings of this study support the effectiveness of teaching nutrition in small groups of nursing students. The observed improvements in dietary habits, specifically the increased consumption of fruit, nuts, and oily fish, highlight the positive impact of the educational intervention. These results have important implications for educators and curriculum developers in the field of nursing, as they suggest the best teaching strategy for enhancing the quality of the diet of future nursing professionals. Future long-term research will be needed to expand students' knowledge and practical experience of healthy eating, enabling them to implement and promote it at both individual and community levels.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the majority of participants were female, which may introduce gender bias into the outcomes. Additionally, the study included a heterogeneous group of students with varying ages and level of nutrition experience, shish could potentially impact the analysis of results. Furthermore, the study focused exclusively on nursing students from a single university, limiting the generalizability of the findings. Replicating the study in different university settings would enhance the sample's homogeneity and increase the external validity of the results. In terms of methodology, the within-subject design used in this study may have introduced demand effects, whereby participants modify their behavior based on their perceptions of the experimenter's intentions[29]. Participants may also have faced difficulties in accurately completing the questionnaire for the first time, particularly in estimating their food and beverage intake. It is worth noting that respondents tend to overestimate food items when completing food frequency questionnaires, and there is a the general downward trend in the reported amount of food consumed over time as participants learn how to complete the questionnaire more effectively[30]. Finally, the long-term effects of the intervention were not assessed in this study, preventing an assessment of its sustained impact over subsequent academic years.

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