

Impact of a Nutrition Education Programme Focused on the Sustainability of the Mediterranean Diet among Health Science Students in Morocco – A Pilot Study

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Abstract: Sustainability is a major public health and environmental issue today. The Mediterranean diet, recognised for its health benefits and its compatibility with sustainability principles, offers a relevant model for promoting responsible eating habits in which healthcare professionals can play a key role. This study aimed to evaluate the effect of a nutrition education programme focused on the sustainability of the Mediterranean diet on the knowledge, perceptions and eating habits of nursing students. An educational intervention was conducted with nursing students (mean age 20.65 ± 2.01 years, range 18–30) at the ISPITS in Safi, using a participatory and contextualised approach. The evaluation was based on a Knowledge-Attitudes-Practices (KAP) questionnaire administered before and after the intervention. The data obtained were analysed quantitatively and qualitatively to measure changes in cognitive, perceptual and behavioral dimensions. The results revealed a clear increase in knowledge and perceptions regarding food sustainability, while the observed behavioural changes, although positive, remain more limited. Nutrition education based on adherence to the Mediterranean diet appears to be an effective educational tool in nursing training for promoting sustainable eating. Such an approach can contribute to the transition towards more equitable food systems that respect health and the environment.

Keywords: Nutrition education, Food sustainability, Mediterranean diet, Nursing students

Introduction

The transformation of food systems is a central issue today in the face of the multiple environmental, health, economic, and social challenges confronting modern societies. The intensification of production and the globalisation of markets and trade have contributed to exacerbating pressures on natural resources. In addition, changing dietary habits have contributed to the rise of diet-related chronic diseases, such as obesity, type 2 diabetes, and cardiovascular diseases (Belahsen, 2014; FAO, 2019; WHO, 2021). In this context, the concept of sustainable food systems emerges as an integrated response, aiming to reconcile human health, environmental protection, social equity and the economic viability of food systems (FAO & WHO, 2019). Indeed, according to the FAO (2010), sustainable food systems are defined as having low environmental impacts and contributing to food security and healthy lives for present and future generations. It also encompasses nutritional, cultural, economic and environmental dimensions, and implies a paradigm shift in consumption practices.

Achieving food sustainability requires changes at both individual and collective levels, which depend not only on the availability of information, but also on people's perceptions, motivations and living contexts (Aguirre Sánchez et al., 2021; Fautsch Macías & Glasauer, 2014). In this regard, university students represent a particularly relevant target group, since this stage of life is marked by increasing autonomy in food choices and by the consolidation of habits that may persist over time (Aguirre Sánchez et al., 2021). This issue is especially important among health sciences students, including nursing students, who are future professionals likely to contribute to health promotion and nutrition education within the wider population (FAO & WHO, 2019; Irazusta-Garmendia et al., 2023).

Several studies have highlighted gaps in knowledge, awareness and adoption of sustainable food concepts within higher education curricula, including among students in health-related disciplines (Aguirre Sánchez et al., 2021; Irazusta-Garmendia et al., 2023). This shortcoming raises questions about the effective integration of sustainability into university health training, even though international institutions increasingly call for these competencies to be strengthened in educational pathways to support prevention-oriented and health-promoting professional practices (FAO & WHO, 2019; WHO Regional Office for Europe, 2021). In Morocco, this issue is particularly relevant given

the gradual dietary transitions and low adherence to the Mediterranean diet among young people, which underscores the need for context-specific educational initiatives (Belaoufi et al., 2024; El Rhazi et al., 2012; Mziwira et al., 2024).

From this perspective, educational approaches focused on sustainable development in general, and sustainable food systems in particular, can provide a relevant response to the gaps identified in university health education. More specifically, participatory and context-adapted nutrition education programmes have been shown to improve knowledge, attitudes and, to a lesser extent, eating behaviours, especially when they are rooted in the socio-cultural environment of learners and linked to concrete eating practices (Enríquez & Hernández-Santana, 2021; Fautsch Macías & Glasauer, 2014; Lua & Wan Dali, 2012)

In Mediterranean countries, including Morocco, the Mediterranean diet represents a recognised cultural, nutritional and environmental model. Characterised by a high consumption of fruits, vegetables, whole grains, legumes and olive oil, and a moderate consumption of animal products, this diet offers proven health benefits and a low environmental impact (Dernini & Berry, 2015; Serra-Majem et al., 2020). In 2010, it was inscribed on UNESCO's Intangible Cultural Heritage list (2013) and later identified by the EAT-Lancet Commission (Willett et al., 2019) as one of the diets most compatible with the principles of sustainability.

However, several recent studies highlight a gradual erosion of this model, particularly among younger generations, in favour of Westernised diets richer in ultra-processed foods, red meat, and added sugars (Burlingame & Dernini, 2019; Donini et al., 2016). Similar trends have also been reported in Morocco, where recent studies suggest suboptimal adherence to the Mediterranean diet and variations according to sociodemographic and geographical characteristics (Belaoufi et al., 2024; El Rhazi et al., 2012; Mziwira et al., 2024).

Despite the growing interest in the literature on knowledge attitudes, and practices (KAP) related to sustainable food, relatively few studies have been conducted among health sciences students in Mediterranean settings, and even fewer from an educational perspective explicitly integrating the Mediterranean diet as a structuring model (Aguirre Sánchez et al., 2021; Irazusta-Garmendia et al., 2023). In Morocco, data remains limited despite recent studies showing

uneven adherence to the Mediterranean diet and an ongoing dietary transition among young people (Belahsen, 2014; Belaoufi et al., 2024; El Rhazi et al., 2012; Mziwira et al., 2024). It is within this context that the present study was conducted at the Higher Institute of Nursing Sciences and Health Techniques of Safi (ISPITS Safi), a health training institution particularly relevant for testing a pilot educational intervention on food sustainability among future healthcare professionals. The objective of this pilot study was to evaluate the effect of nutrition education focused on the sustainability of the Mediterranean diet on the knowledge, perceptions and eating habits of nursing students. The KAP (Knowledge, Attitudes and Practices) model was used as an analytical framework, offering a structured approach to assess the cognitive, attitudinal and behavioural dimensions targeted by nutrition education interventions, particularly in the context of pre- and post-intervention assessments (Fautsch Macías & Glasauer, 2014). By mobilising the KAP model, this research aimed to contribute to the integration of food sustainability into health training curricula as a cross-cutting competency serving both human and environmental health.

Methodology

Study design

This pilot quasi-experimental study was conducted using a pre-test/post-test design without a control group. Its aim was to evaluate the effect of a nutrition education programme focused on food sustainability on the knowledge, perceptions, and sustainable eating habits of students at the Higher Institute of Nursing and Health Techniques (ISPITS) in the Safi province of Morocco. Study participants were students from a randomly selected class who received this educational intervention, thus constituting the exposure group.

This study represents a preliminary step in a broader research project on the impact of educational programmes on food sustainability. The objective was to assess the pedagogical feasibility and acceptability of such a programme within a health training context. The findings of this pilot study will help refine the programme and inform the design of subsequent larger-scale research.

Population and sampling method

The study took place during May and June 2025 at the ISPITS in Safi. It targeted the 430 students enrolled in the three semesters (S2, S4 and S6), all of whom were invited to participate by the research team.

A final total of 231 students agreed to complete the initial questionnaire (pre-test), representing a participation rate of 53.7%. Participation was voluntary and anonymous, and consent was obtained after an oral explanation of the study's objectives.

The inclusion criteria were:

- Enrollment at ISPITS in 2024–2025 (S2, S4 and S6 levels);
- Presence at the time of data collection;
- Informed consent provided.

The exclusion criteria included:

- Absence on the day of data collection;
- An incomplete questionnaire (less than 70% of responses);
- Voluntary withdrawal.

For the implementation of the educational intervention programme, one class was randomly selected from the available groups. This class, composed of 63 students, participated in the entire nutrition education programme and completed a post-intervention questionnaire immediately after the final educational session. The other classes were not included in the post-intervention phase due to organisational constraints. This study was designed as a pilot educational intervention intended primarily to assess the pedagogical feasibility of the programme and to generate preliminary data, therefore no formal a priori sample size calculation was performed.

Measurement instruments

Data were collected using a self-administered, structured questionnaire developed by the research team based on the scientific literature, including KAP studies related to sustainable food among university and health sciences students, as well as methodological recommendations for KAP surveys related to nutrition (Aguirre Sánchez et al., 2021; Fautsch Macías & Glasauer, 2014; Irazusta-Garmendia et al., 2023;). This tool was initially tested with 11 students to assess its clarity and comprehensibility, and then slightly adjusted based on their feedback. A standardised coding grid and interpretation grids were used for the analysis. The questionnaire included three sections with questions on:

a) Sociodemographic and socioeconomic characteristics: The information collected in this section constitutes the variables used to describe the students' profile; namely, gender, age, level of education, place of residence

(urban/rural), type of housing, parents' education level and monthly household income.

A composite socioeconomic level score was constructed from these data, calculated using four variables (type of housing, income and the education level of both parents). This score was then divided into three categories to define socioeconomic level as low, medium or high.

b) The dimensions of knowledge, perceptions and sustainable habits:

The set of questions concerning these dimensions assessed students' knowledge, perceptions/attitudes and sustainable eating habits according to a coding sheet validated by the research team.

The knowledge dimension (score out of 6) was assessed through questions focused on the ability to define food sustainability, identify its pillars (environment, equity, biodiversity), recognise the most polluting foods (e.g., red meat) and understand global food losses.

The perceptions dimension (score out of 20) was assessed through four statements that measured students' awareness and attitudes toward sustainable food. These items explored their level of environmental awareness, their motivation for change, and their acceptance of constraints or sacrifices related to responsible food choices. Responses were collected on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree," allowing for an assessment of the strength of expressed beliefs. The total score ranged from 4 (minimum) to 20 points (maximum).

The questionnaire also included questions on sustainable eating habits. These were assessed through seven items that explored the frequency of specific dietary behaviours that promote sustainability. These questions evaluated, among others, preference for local or seasonal products, reading nutritional and environmental labels, managing food scraps and reducing red meat consumption. Participants were asked to indicate their level of practice on a five-point frequency scale, ranging from "never" to "always." An inverse item (related to the behavior of discarding uneaten food) was coded in reverse to avoid central tendency bias. A maximum score of 35 points reflected a high level of adoption of sustainable eating practices.

The different maximum scores obtained for the three dimensions reflected the number of items included in each section, not conceptual weighting. In all dimensions, higher scores indicated a more favourable profile: greater knowledge of food sustainability, a more positive perception of sustainable foods, and greater adoption of sustainable eating behaviours. Therefore, low, medium and high score categories were used to reflect limited, intermediate and more favourable levels, respectively, within each dimension. The sum of the sub-scores obtained for all sections of the questionnaire yielded a potential total score of 61 points, including scores for knowledge (/6), perceptions (/20) and eating habits (/35). This total score was categorised into three classes defining the levels: low when the score was less than or equal to 26, medium if the score was between 27 and 43 and high when the score was 44 and above.

Description of the educational intervention

The educational intervention was implemented with a subgroup of 63 selected students. It consisted of a training programme totaling 8 hours, spread over 4 weeks and delivered in four two-hour sessions. This training aimed to impart key knowledge and promote behavioural changes related to sustainable food practices.

The development of the educational programme was guided by the need for appropriate adaptation to the profile of the ISPITS students, who are future healthcare professionals destined to play an active role in promoting healthy and sustainable eating habits among the population. This specific group benefits from paramedical academic training focused on public health, nutrition, health education, and prevention. In this context, it seemed relevant to ground the intervention in their future professional missions, while considering their level of education, their sociocultural background and their perceptions.

The programme was therefore designed in a progressive and interactive manner, combining fundamental concepts (sustainability pillars, environmental impacts) with transferable practical skills (reading labels, sustainable practices, reducing waste, promoting the Mediterranean diet). The teaching approaches encouraged active participation, local cultural grounding and concrete application, thus facilitating better assimilation of the educational messages. This methodological choice aligned with the didactic guidelines in sustainable nutrition education and the competency-based approach advocated in paramedical training. Therefore, the intervention aimed not only

at the acquisition of knowledge, but also at developing critical thinking and decision-making autonomy in the face of contemporary food, health and environmental challenges.

Recruitment and ethical considerations

Before the start of this research, written authorisation was obtained from the head of the institution. This was followed by an oral presentation on the study's objectives to the student group, indicating as well that participation was free and voluntary and data collection would be anonymous. Informed consent was obtained from each student prior to every data collection.

The questionnaires were self-administered and contained no personally identifiable information. Data processing was carried out in accordance with the principles of confidentiality, specifically the Declaration of Helsinki on research involving human participants.

Data analysis

The data from the questionnaires were coded and entered into a file using Microsoft Excel, then analysed using SPSS version 26. A descriptive analysis was performed (means, frequencies, standard deviations). Scores for knowledge, perception and habits were calculated according to the coding sheet and then classified into three levels (low, medium and high) based on predefined interpretation thresholds.

The data for the subsample of 63 students who underwent the intervention was isolated to allow for a pre/post training comparison, but no inferential statistical tests were carried out at this stage, in accordance with the exploratory aim.

Results

Pre-intervention phase

Sociodemographic characteristics of the ISPITS of Safi student sample

The sample consisted of 231 nursing students, with a majority of females (84.8%) and a majority residing in urban areas (84.8%) (table 1). The distribution by year of study was balanced, with a slight predominance of

third-year students (36.4%). In terms of socioeconomic status (SES), 83.6% of the students belonged to a low or middle SES category.

Table 1 *Socioeconomic Characteristics of the Study Sample (n=231)*

Variable	Categories	Number (n=231)	Percentage (%)
Gender	Male	35	15.2
	Female	196	84.8
Mean age (yrs)	Mean $\pm$ SD Min-Max	20.65 $\pm$ 2.01 (18–30)	—
Education level	1st year	80	34.6
	2nd year	67	29
	3rd year	84	36.4
Area of residency	Rural	35	15.2
	Urban	196	84.8
Socioeconomic score*	Low	96	41.6
	Medium	97	42
	High	38	16.5

***Source:** Socioeconomic categories (low, medium and high) were defined using a composite score based on type of housing, monthly household income and the educational level of both parents, in accordance with the socioeconomic classification standards established by the Haut-Commissariat au Plan of Morocco (HCP, 2023).

Students' knowledge, perceptions and sustainable food habits pre-intervention

The results concerning these variables were obtained from a sample of 231 students. The distribution of these students according to the categories of knowledge, perceptions and sustainable habits before the educational intervention is presented below in table 2. The data in the table show that, initially, the students' profile was generally characterised by a modest or limited level of knowledge about sustainable food and moderate adherence to sustainable eating behaviours.

Indeed, the knowledge of sustainability was particularly low among 77.1% of the students, who thus fell into the “low” category; while those belonging to the high level represented only 5.2%.

The results also show that the participants' perception was slightly better; with nearly half of the students (48.9%) in the "medium" category and 25.1% in the "high" category.

Also, data concerning sustainable eating practices and habits show that the majority of students (65.8%) were in the "medium" level category, 22.5% were in the "high" level category, while only 11.7% of participating students were in the low-level category. The total score, which combines knowledge, perceptions and eating habits, reflects an intermediate profile. This reveals that 72.3% of students fell into the "medium" category, and only 14.7% belonged to the "high" category.

Overall, these pre-test results highlight a limited knowledge base and areas for improvement in behaviour, fully justifying the implementation of a nutrition education program targeting knowledge, attitudes, and sustainable eating practices.

Table 2 *Pre-Test Distribution of the Students Across Sustainability Categories of Knowledge, Perception and Habits (n=231)*

Categories	Knowledge of food sustainability n (%)	Perceptions of food sustainability n (%)	Sustainable habits n (%)	Total score n (%)
Low	178 (77.1%)	60 (26.0%)	27 (11.7%)	30 (13.0%)
Medium	41 (17.7%)	113 (48.9%)	152 (65.8%)	167 (72.3%)
High /Good	12 (5.2%)	58 (25.1%)	52 (22.5%)	34 (14.7%)

Post-intervention phase

This section focuses on the class of 63 students who received nutrition training focused on food sustainability. Only data relating to the impact of this intervention on knowledge, perceptions and habits related to food sustainability are presented here (table 3). Although the study did not use inferential statistical tests, the analysis of the results revealed several notable cognitive and behavioural changes following the intervention.

As the results show, the impact of the training on knowledge of food sustainability was highly significant, as evidenced by the increase in the proportion of students with a "high" level of knowledge, rising from 5.2% before the intervention to 33.3% after – more than fourfold. Conversely, the proportion of students classified as having a "low" level decreased sharply, from 77.1% to 17.5%. This significant improvement suggests that the educational content addressed initial theoretical gaps, demonstrating a better understanding of key sustainability concepts.

Regarding perceptions, the percentage of students with a "high" level of awareness increased from 25.1% to 65.1%, while those with a "low" perception represented only 1.6% after the intervention (compared to 26.0% at pre-test).

Furthermore, in terms of behaviour, sustainable eating habits also improved. The "high" category increased from 22.5% to 34.9%, while the "low" category decreased from 11.7% to 3.2%. Although the "medium" category remained the most prevalent, a trend toward more sustainable practices, including purchasing local or seasonal products, reducing red meat consumption and managing food waste, was visible. This slower pace of change reflects an evolution in behaviour consistent with newly acquired knowledge and perceptions. Although this analysis did not aim to demonstrate statistical significance, the results suggest potentially positive effects of the educational intervention on students' perceptions and behaviours regarding sustainable food.

Table 3 *Observed Changes Before (n=231) and After (n=63) the Intervention*

Scores	Categories	Pre-test n (%)	Post-test n (%)
Knowledge of food sustainability	Low	178 (77.1%)	11 (17.5 %)
	Medium	41 (17.7%)	31 (49.2 %)
	High	12 (5.2%)	21 (33.3 %)
Perceptions of food sustainability	Low	60 (26.0%)	1 (1.6 %)
	Medium	113 (48.9%)	21 (33.3 %)
	High	58 (25.1%)	41 (65.1 %)
Sustainable food habits	Low	27 (11.7%)	2 (3.2 %)
	Medium	152 (65.8%)	39 (61.9 %)
	High	52 (22.5%)	22 (34.9 %)

Discussion

Analysis of initial results

Analysis of the data collected before the intervention reveals a generally homogeneous profile among nursing students. Although they express a relatively low level of knowledge, their attitudes remain partially favourable toward sustainable food, and their habits are largely in line with the principles of responsible consumption. Indeed, 77.1% of the students have a low level of knowledge, while only 5.2% demonstrate a high level. These figures are concerning, especially since they involve a population training in the healthcare sector. This profile, characterised by such a cognitive deficit, is largely congruent with the Spanish study by Irazusta-Garmendia et al. (2023), which revealed that more than half of healthcare students were unaware of the links between food choices, the environment and the sustainability of food systems. Similarly, García-González et al. (2020) observed that, among the Spanish adult population, sustainability is perceived as an abstract concept, rarely associated with concrete practices. Insufficient knowledge about foods with a high environmental impact, food waste and sustainable production criteria has also been reported among higher education students in Malaysia (Hassan et al., 2015) and Egypt (Mohammed et al., 2022). These studies converge on the finding of a lack of academic training in food sustainability in university settings, particularly in health curricula.

The results of this study confirm the absence of structured teaching integrating sustainability principles into the nursing training programme. This is of concern given that FAO and WHO recommendations (2019) call for a reorientation of health training toward a systemic vision of nutrition, encompassing the environmental and social impacts of food.

Regarding students' perceptions, pre-intervention results showed that only 26% had a high level of awareness, while nearly half (48.9%) had a medium level. This data indicates only partial awareness of food sustainability. Participants generally recognised that their food choices could influence the environment, but underestimated the extent of this impact.

These results are consistent with several international studies. In Malaysia, Mokhtar et al. (2025) observed that, although the majority of students recognised the importance of sustainable food, only 40% understood its practical implications. Similarly, Aguirre Sánchez et al. (2021), in their

systematic review, emphasise that students' positive attitudes toward sustainable development are often self-reported and do not translate into stable behavioural intentions or effective practices. This gap may be explained by several contextual barriers identified in the literature, including the cost of sustainable products, their accessibility, the influence of social norms and certain constraints related to the university food environment.

Regarding dietary practices, the results show that the majority of students have moderate habits in terms of sustainable development: 65.8% of participants are at an average level, 22.5% at a high level, and 11.7% at a low level. However, studies by Mokhtar et al. (2025) and Hassan et al. (2015) have highlighted that, despite favourable attitudes, economic and contextual constraints, such as the price of sustainable products, the availability of university food services, and social habits, limit the implementation of sustainable behaviours. From this perspective, the Mediterranean diet constitutes a particularly relevant reference framework, as it combines practices consistent with sustainability (greater consumption of plant-based foods, preference for local and seasonal products, moderation in red meat consumption, and the promotion of a culturally grounded dietary model) with recognised benefits for both health and the environment (Dernini et al., 2016). Nevertheless, a trend towards the erosion of the Mediterranean diet among young people is well documented internationally (Dernini & Berry, 2015), as well as in Morocco (Barakat et al., 2022; Belaoufi et al., 2024; Mziwira et al., 2024), where a growing shift towards Westernised dietary patterns rich in ultra-processed foods can be observed, in contradiction with public health and sustainability recommendations.

Overall, the pre-intervention phase reveals a profile of students who are aware of food sustainability but insufficiently trained in the field. Their knowledge remains incomplete, their perceptions partial and their habits only moderately aligned with the principles of sustainable eating. This finding aligns with observations from the FAO and WHO (2019), which indicate that understanding of sustainable development remains insufficient among young adults, even in Mediterranean regions. These results, therefore, fully justify the relevance of a structured educational intervention aimed at strengthening the coherence between knowledge, attitudes and eating habits, and at training healthcare professionals aware of their role in the sustainable food transition.

Effect of the educational intervention on knowledge, perceptions and dietary habits

Analysis of the results following the educational intervention conducted in this study revealed a significant improvement in all three dimensions examined. Specifically, the proportion of students with a high level of knowledge increased from 5.2% to 33.3%, while those with a high level of perception rose from 25.1% to 65.1%. Similarly, the proportion of students reporting high levels of sustainable dietary habits increased from 22.5% to 34.9%.

Similar improvements were also reported by Enríquez and Hernández-Santana (2021), who demonstrated that among university students in Latin America, interactive training on sustainable nutrition could significantly improve knowledge and attitudes toward sustainable eating, even without radically changing ingrained habits. Similarly, Yarrow, Remig and Higgins (2009) observed a simultaneous increase in knowledge and attitudes among students following a participatory educational intervention, confirming the role of experiential reinforcement in integrating learning.

The positive effect observed in our study can be attributed to the programme's pedagogical structure, which combined a theoretical approach (key concepts of sustainability and the Mediterranean diet) with a reflective approach (critical analysis, cultural contextualisation, and group discussions). This approach aligns with the recommendations of Masseboeuf and Delestre (2020), indicating that active learning and concrete experience are the most powerful drivers of sustainable behavioural change.

The marked increase in knowledge and perceptions observed here also conforms to Bandura's (1986) socio-cognitive model, according to which behavioural change occurs through the acquisition of knowledge, the construction of positive beliefs, and the development of self-efficacy. In other words, understanding the link between food, the environment and health strengthens intrinsic motivation to adopt sustainable behaviours.

Indeed, Lua and Wan Dali (2012) in their review of university nutrition education, showed that educational interventions based on cultural and contextual examples strengthen the motivation to adopt responsible behaviours. In the present study context, the choice of the Mediterranean diet as the guiding thread of the intervention played a crucial role. This model,

recognised by the UNESCO (2013) and by FAO and WHO (2019) for its heritage value and its compatibility with the principles of sustainability, offers a culturally grounded framework that fosters student understanding and engagement.

Thus, the intervention appears to have successfully completed the first stage of behavioural change by reinforcing the knowledge and perceptions necessary for the future transformation of practices. This gradual process, observed in other educational interventions (Enríquez & Hernández-Santana, 2021), suggests that follow-up or reinforcement actions could consolidate the long-term effects. Other authors, notably Aguirre Sánchez et al. (2021) and Mokhtar et al. (2025) also emphasise that taking action depends not only on knowledge and attitudes, but also on external factors such as the availability of sustainable food, cost and social norms.

Some studies proposing targeted educational interventions show that these gaps and challenges can be bridged. For example, Rabie et al. (2019) demonstrate that a structured programme significantly improves not only knowledge, but also certain dietary practices among Egyptian adolescents. Similarly, Oluwafemi's (2025) pilot study of dietetics students reveals an increase in confidence and skills related to sustainable choices following interactive training on sustainable food systems.

In short, these results demonstrate that training nursing students represents a strategic lever for promoting food sustainability. By giving them the tools to understand, assess and act, the intervention enables them to become agents of change capable of raising awareness among their patients and communities in the long term. This conclusion aligns with the recommendations of the FAO and WHO (2019) as well as those of UNESCO (2012), which encourage the integration of sustainability principles into the training of future health professionals.

Study limitations

This study has several limitations. The most significant is the limited number of post-intervention participants ($n = 63$), which restricts the statistical significance of the results. Furthermore, the absence of a control group prevents the establishment of a formal causal link between the intervention and the observed changes.

The study also relies on self-reported data, which is susceptible to social desirability bias. Finally, no longitudinal follow-up was conducted, making it impossible to assess the sustainability of the changes over time.

In the future, further research could incorporate a control group, a larger sample size and a delayed evaluation to measure the persistence of the effects. It would also be relevant to explore the contextual barriers (price, accessibility, family habits) that prevent the effective adoption of a sustainable diet among young adults.

Implications and perspectives

Despite its limitations, this study confirms that contextualised educational interventions, grounded in the Mediterranean diet model, can improve knowledge and attitudes regarding sustainable food. It also highlights that changes in practices require ongoing, multi-sectoral educational efforts.

The introduction of cross-cutting modules on food sustainability into health sciences training programmes could represent a strategic lever, both for promoting public health and supporting the ecological transition (UNESCO, 2021; FAO & WHO, 2019). The cultural grounding and promotion of the Mediterranean diet represent, in this context, a major educational asset.

Conclusion

This study examined the effect of nutrition education focused on the sustainability of the Mediterranean diet on the knowledge, perceptions and eating habits of nursing students at the ISPITS in Safi in Morocco. The results show that a contextualised and participatory educational intervention can produce measurable changes in all three dimensions of the KAP model, particularly at the cognitive and perceptual levels. These improvements demonstrate the effectiveness of an educational approach that integrates cultural and environmental values into nutrition teaching.

Beyond individual learning, this work highlights the strategic role of nursing education in the transition to sustainable eating behaviors. By training professionals capable of linking their and their patients' food choices to ecological, social and health issues, nursing programmes can contribute to the emergence of a new sustainable food literacy. This finding aligns with the

international recommendations of the FAO and WHO (2019), which encourage higher education institutions to include sustainability in their public health curricula.

This study has some methodological limitations which limit the generalisability of the results. Future longitudinal and multi-centre research is recommended to confirm the sustainability of the observed effects and to explore the integration of similar educational modules into other health training programmes.

Ultimately, this research confirms that food sustainability, conveyed through the cultural framework of the Mediterranean diet, is an effective lever for educational and societal transformation. By training healthcare professionals to be aware of the environmental challenges of nutrition, this work contributes to achieving the Sustainable Development Goals, particularly those related to health, education and responsible consumption.

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