



REVISIONES

Teaching and learning methods for nursing students on nutrition: scoping review

Enseñanza y aprendizaje sobre nutrición en estudiantes de enfermería: revisión de alcance

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ABSTRACT:

Introduction: Food intake can determine a person's individual state of health and well-being. Addressing relevant nutrition content in the nursing curriculum is the key to providing knowledge, attitudes and skills on prevention and treatment and to promoting health.

Objective: To review the evidence concerning teaching and learning methods on nutrition for undergraduate nursing students.

Methods: A search was carried out in MEDLINE (PubMed/Ovid), Web of Science (WOS), EMBASE (through OvidSP), CINAHL (through EBSCO Publishing), ERIC (Educational Resource Information Center) and Scopus. The search included publications in English and Spanish from the launch of the databases until January 2021. Primary empirical studies, studies with nursing students in the sample and studies that reported on teaching and learning about nutrition were included in this review.

Results: 22 articles met the inclusion criteria, identifying four relevant themes: 1) Review of nursing programs and curricula; 2) Teaching designs; 3) Assessment of learning; 4) Student perceptions of the teaching methodology.

Conclusions: This scoping review highlights the benefits of teaching nursing students about nutritional care programmes. The publications included show great heterogeneity across programmes, explicit learning outcomes and evaluation methods. Our findings suggest the need to further expand and strengthen research on design, implementation and evaluation of learning sequences.

Key words: Students, nursing; Nutritional sciences; Learning; Nursing education research; Scoping review.

RESUMEN:

Introducción: La ingesta de alimentos puede determinar el estado individual de salud y bienestar de la persona. El abordaje de contenido relevante sobre nutrición en el curriculum de enfermería resulta clave a la hora de proporcionar conocimientos, actitudes y habilidades sobre prevención, tratamiento y promoción de la salud.

Objetivo: Revisar el tipo de evidencia en relación a la enseñanza y aprendizaje sobre nutrición en estudiantes de grado en enfermería.

Método: Se llevó a cabo una búsqueda en MEDLINE (PubMed/Ovid), Web of Science (WOS), EMBASE (a través de OvidSP), CINAHL (a través de EBSCO Publishing), ERIC (Educational Resource Information Center) y Scopus. La búsqueda incluyó publicaciones en inglés y español desde el lanzamiento de las bases de datos hasta enero de 2021. En esta revisión se incluyeron estudios empíricos primarios y que contuvieran en la muestra estudiantes de enfermería, y estudios cuyos resultados informaran sobre la enseñanza y aprendizaje en nutrición.

Resultados: 22 trabajos cumplieron los criterios de inclusión, identificándose cuatro temas relevantes; 1) Revisión de programas y curriculum; 2) Diseños de enseñanza; 3) Evaluación del aprendizaje; 4) Percepción de los estudiantes sobre la metodología de enseñanza.

Conclusiones: Las publicaciones incluidas presentan una gran heterogeneidad entre los programas implementados, los resultados de aprendizaje explicitados y los métodos de evaluación, lo que imposibilitó la comparación. Sin embargo, todos destacaron los beneficios de la enseñanza de la nutrición en estudiantes de enfermería. Estos resultados sugieren la necesidad de seguir investigando sobre el diseño, implementación y evaluación de las secuencias de aprendizaje.

Palabras clave: Estudiantes de enfermería; Ciencias de la nutrición; Aprendizaje; Investigación en Educación de Enfermería; Revisión de alcance.

INTRODUCTION

Food intake is the first step in cell growth, metabolism and repair⁽¹⁾. According to the World Health Organisation, problems associated with excessive or deficient intake of macro- and/or micronutrients can determine a person's individual state of health and well-being⁽²⁾.

Nurses play an essential role in disease prevention and health promotion by advising on eating habits⁽³⁾. This requires nurses to ensure provision of nutritional care, working alongside other health professionals⁽⁴⁾.

Considering the nursing activities related to nutritional care in healthcare practice, it is key to include relevant content on nutrition in the nursing curricula to be able to provide knowledge, attitudes and skills on prevention and treatment and to promote health⁽⁴⁾.

For this reason, this review aims to obtain a comprehensive view of the teaching methods and student learning regarding nutrition content in the undergraduate nursing curricula.

METHODS

Design

This review followed the methodology proposed by the Joanna Briggs Institute to develop scoping reviews⁽⁵⁾. To maintain research transparency, a protocol was

registered with the Open Science Framework (OSF) on 9 November 2020 (<https://osf.io/h489y/>).

Search Strategy

The search strategy was used in the MEDLINE (PubMed/Ovid), Web of Science (WOS), EMBASE (through OvidSP), CINAHL (through EBSCO Publishing), ERIC (Educational Resource Information Centre) and Scopus databases. The search strategy was designed using natural language and controlled language adapted to each database. The following or similar terms were used in all databases: "*Education, nursing*", "*Nutritional sciences*", "*Health Knowledge, Attitude, Practice*", "*Students, nursing*", "*Diet, food and nutrition*". The search was limited to publications in English and Spanish from the launch of the databases until January 2021. In addition, as a secondary search strategy, the reference list of all included bibliographic sources was examined for additional studies.

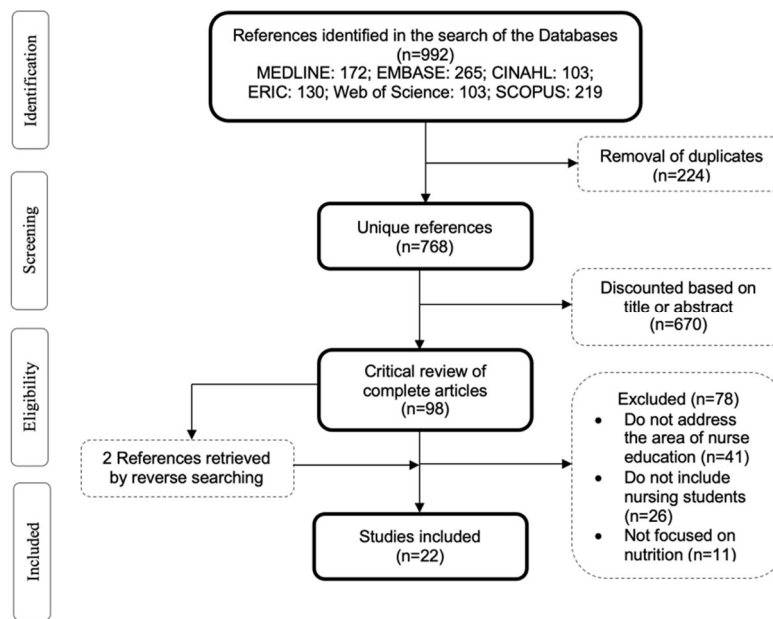
The following inclusion criteria were determined for this review: 1) Primary empirical studies; 2) Including all undergraduate year-groups taking a nursing degree; 3) Including face-to-face or online teaching interventions, conducted in the classroom or in clinical settings; 4) Reporting on nutrition programmes in the undergraduate nursing curriculum; 5) Reporting on the teaching and/or learning method. The exclusion criteria were: 1) Editorials, opinion articles, proceedings, protocols, and posters; 2) Studies that did not include nursing students or if included, the data were not disaggregated from other types of students; 3) Studies that reported exclusively on postgraduate or continuing education for nursing professionals.

Study Selection

A total of 992 records were identified in the selected database search. These were subsequently imported into the Mendeley® bibliographic reference manager to eliminate duplicates. Out of the remaining references, 670 were excluded after reading the title and abstract, because they did not match the research study objective. The text in 98 articles was read in full, followed by a consensual discussion between at least two of the reviewers. In this screening phase, 78 references were excluded: 41 did not match the context of undergraduate nursing education, 26 did not include nursing students in the sample and 11 did not meet the determined selection criteria. Finally, 2 more articles were obtained secondarily through references from other registers, bring the inclusion total to 22 studies.

The search results and the study inclusion process are shown in the flow diagram with extension for scoping reviews (PRISMA-ScR)⁽⁶⁾ (Figure 1).

Figure 1: PRISMA Flow Diagram



Information extraction

After completing the article search and selection, a data extraction template was created: author, year, country of origin; research aim(s); participants, setting and design; learning outcomes, teaching methodology and learning sequence; evaluation method; and main findings. Two reviewers then independently extracted data from all the studies, discussed the results and updated the data extraction tool. Any discrepancies during data extraction were addressed by bringing a third reviewer into the discussion until consensus could be reached.

Summary of results

To understand and classify the content of the articles, several reiterative readings were carried out to produce a narrative synthesis.

There was emphasis on analysing teaching designs for nursing students concerning nutrition. The narrative content synthesis was evaluated again to identify patterns and similarities and differences in the variables. This was useful to determine the most important relationships between the included studies, making it easier to establish definitive categories to meet the objective of this scoping review.

RESULTS

Study Characteristics

The 22 studies included in this review were published from the launch of the databases until January 2021 (7-28).

According to the origin of publication most of them were contextualised in the USA (n=11), although also found in Europe (n=8), Oceania (n=1), Latin America (n=1) and Africa (n=1) (Table 1).

Table 1: Main results of the included articles

Author(s), Year, Country	Aim(s)	Participants (P), Context (C) and Design (D)	Learning Outcomes (LO), Methodology (M) and Learning Sequence (LS)	Evaluation method	Key Findings
Trooboff, RC 1972 USA	To identify methodologies that facilitate learning on nutrition concepts and practices as part of comprehensive nursing care.	P: Nursing programmes (n=18) C: University, institutions D: Action-oriented research project	LO: Not established M: Most programmes included 50h of nutrition theory. Half of the programmes had a qualified nutrition teacher for theory and practice. LS: Not specified	Questionnaire (Format not specified) 40 questions	Need to improve the basic nutrition and diet therapy component. Essential to teach nutrition in theory and practice.
Stotts NA, et al. 1987 USA	To determine the type and nature of nutrition education provided in nursing programmes in the United States.	P: Nursing schools in the USA (n=264) C: University, institutions D: Narrative review	LO: Not established M: Not specified LS: Not specified	Questionnaire (e-mail) Short answers	54% present exclusive nutrition content in the classroom (mean=32h; MD=21.5). In 61% of programmes, nutrition content is integrated in other subjects. Hours of exclusive nutrition internships (M= 3.3; DM = 7.8); 70% had no internships focused exclusively on nutrition; 40% did not provide information on this aspect. Content in the curriculum: 96% Nutritional assessment; 84% Enteral and parenteral nutritional therapy; 84% Dietary counselling; 71% Nutritional biochemistry; 72% Differentiation of the role of health team members; 76% Assessment of therapeutic effects
Corbett RW, et al. 1992 USA	To review the basic nutritional principles of therapeutic diets, the anatomy and physiology of the digestive system and nutrition in health care.	P: Nursing students (4th year) (n= not specified) C: University, classroom D: Case study	LO: Identification of essential nutrients, dietary requirements, dietary sources, clinical manifestations of deficiencies and toxicities, purpose of therapeutic diets, dietary principles and associated nursing implications. M: NUTRIQUEST (Play-based learning) LS: Individual or group; Description of learning and rules; Teacher acting as facilitator	Not specified	Fun way to learn nutrition concepts in an informal setting. Teaching methodology increased interaction among students and facilitated retention of nutrition concepts (data not included).
Weigley, ES 1994 USA	To review nutrition content in the nursing curricula.	P: Nursing studies in the USA C: University, institutions D: Narrative review	LO: Not established M: Not specified LS: Not specified	Not specified	Traditionally nutrition was taught by a member of the dietetic staff. Nutrition is a component of the holistic concept and must be included. Collaborative role of the nurse in nutrition. "Morse" model for developing nutrition content for the nursing curriculum. Fluid and electrolyte management as a major theme when starting nursing practice. Importance of knowledge of

basic nutrients across the lifespan and when ill.

Cheatham M, et al. 2002 USA	To explore the development and use of a computer-based nutritional assessment tutorial by three different groups of health professions students.	P: Nursing students (n=45) + Medical students (n=36) + Physiotherapy students (n=68) C: University, classroom D: Comparative study	LO: Not established M: Computer-based tutorial on nutritional assessment (interactive) (1h duration) LS: Videos; Examples of nutritional assessment with simulated cases; Practical questions using simulated patients; Tutorial instructions; Quiz questions.	Questionnaire (Pre-Post) (Format not specified) Use of computer tool	The use of computer-based tutorials to supplement nutrition education for health science students can provide more consistent learning and save instructors' time.
Buckley, Kathleen M 2003 USA	To compare the effectiveness of traditional face-to-face, enhanced and web-based courses. Perceptions of learners experiencing the same course content through different formats.	P: Nursing students (4th year) (n=58) C: University, classroom, web D: Case study	LO: Not established M: Traditional; Traditional + improved via web; via web LS: Comparison of the three groups. Same subject (15 nutrition topics)	Multiple choice test (Pre-Post) (paper or online) (SUMMA) 27 questions.	Non-significant differences between the three methodologies with respect to intermediate (p=0.06) and final (p=0.62) measurement. Statistically significant differences in student perception (SUMMA) (p=0.000); web-based course lower score, web-enhanced course better score.
Thomas DT, et al. 2006 USA	To identify students' knowledge deficits and attitudes about nutrition that need to be reinforced through education.	P: Nursing students (academic year not specified) (n = 54)+ Physiotherapists (n = 48)+ Fitness (n = 62) C: University, classroom D: Descriptive study	LO: Not established M: Not specified LS: Not specified	Questionnaire [nutrition knowledge test (NKT)] (Paper) 32 questions Likert-type scale	Better knowledge on carbohydrates; Poorer results in identifying dietary sources of cholesterol (77% incorrect answers) and referring to physical activity (76% incorrect answers). 88% Willingness to decrease the amount of fat in their diet; 96% Intention to engage in moderate exercise and include fruits and vegetables in their diet; 97% Maintain a healthy weight; 98% Encourage patients to maintain a healthy weight by including fruit, vegetables and moderate exercise, to prevent the onset of chronic diseases.
Feresin C. et al. 2007 Brazil	To analyse nutrition teaching in six undergraduate nursing courses in terms of workload, content, teaching strategies and assessment from the perspective of the lecturer who teaches it.	P: Teachers of undergraduate nutrition in Nursing (n=6) C: University, classroom D: Descriptive study	LO: Not established M: Use of different methodologies: Seminars; case studies; self-assessment of eating habits; Assessment: written exam or test. LS: Not specified	Semi-structured interviews (thematic or categorical analysis)	Need for a different teaching approach with nursing students to address nutrition education
Lewis-Basson J. 2012 UK	To give students the opportunity to network with professionals and other students	P: Nursing students (4th year) (n=700) C: University, classroom and practice	LO: Not established M: One-day event called "Nutrition across the Lifespan". Collaborative work in relation to patient	Not specified	Importance of collaboration between university and clinical practice The students were more motivated than in a normal class.

	from related disciplines	D: Case study	nutrition. LS: Not specified		
Buxton C, et al. 2013 Ghana	To assess the levels of nutritional knowledge of nursing students in a developing country (Ghana)	P: Nursing students (3rd-4th year) (n=166) C: University, (not specified) D: Cross-sectional descriptive study	LO: Not established M: Not specified LS: Not specified	Questionnaire (format not specified) 20 questions	62.7% of students had adequate knowledge of nutrition. Limited or poor knowledge of low cholesterol diets, sources of soluble fibre, main types of fatty acids, foods for the prevention and management of cardiovascular disease or obesity and nutrient metabolism.
DiMaria-Ghalili RA, et al. 2014 USA	To analyse deficits in nutrition education and training within different health professions (nursing, pharmacy, dentistry and dietetics).	P: Nursing studies in the USA C: University, institutions D: Narrative review	LO: Not established M: Not specified LS: Not specified	Not specified	It might be effective to incorporate nutrition content into several year-groups. It is essential to identify advanced competencies in nutrition. The role of nurses in promoting nutritional health and wellness across the lifespan should be reviewed. Need for interprofessional competencies
Rodrigo Vega, M., et al. 2014 Spain	To determine variations that can be achieved by teaching nutrition and food issues, both in knowledge and following the Mediterranean Diet (MD).	P: Nursing students (1st year) (n=216) + Teacher training students (1st year) (n=183) C: University, classroom D: Comparative study	LO: Not established M: Not specified LS: Not specified	One open-ended question (representative qualities of the MD model) (Pre-Post) DM Adherence: KIDMED TEST. 16 (Format not specified)	Pre: 50.5% of nursing students do not have congruent ideas about MD compared to 14.8% of teacher training students. Post: Increase in knowledge about MD in both groups, significant differences (p<0.005). A greater improvement is observed in nursing students.
Chepulis LM. Et al. 2015 New Zealand	To measure the nutrition knowledge among undergraduate nursing students to identify knowledge gaps that could be addressed in an updated curriculum.	P: Nursing students (1st-2nd year) (n=197) C: University, classroom, various campuses D: Comparative study	LO: Not established M: Control and intervention group Control: No nutrition education (n = 57) Intervention: Minimum 8h of classroom instruction on nutrition (n = 140) LS: Not specified	Questionnaire (Post) (ad hoc) (paper) 30 questions (multiple choice)	General nutrition knowledge (pooled data) was 55%; there was a significant ethnicity effect (p =0.001). Students who received nutrition instruction had better general nutrition knowledge (p = 0.001). The level of knowledge shown by the students regarding different items was as follows: BMI: (81.1%); Overweight Range: (31.5%); Glycaemic Index: (47.4%) Saturated fats: high blood cholesterol levels: (54.1%); ¼ Trans fats as major contributor; 7.7% thought it was due to unsaturated fats.
Gibbs H., et al. 2015 USA	To demonstrate how clinical simulations can be incorporated into the curriculum to improve interprofessional practise (IPP) communication and provide formative and summative assessment	P: Nursing students (academic year not specified) (n=81) + Dietetics students (n=10) C: University, classroom D: Quasi-experimental	LO: Improving interprofessional communication in clinical judgements. M: Control and intervention group Control: Simulation only (n=39) Intervention: Simulation + dietetics students (Ratio: 1/ 2-3 nursing students) (n=39) 3 Simulation classes (20 min duration each)	Questionnaire (Pre-Post) (online) Pre: 6 questions Likert-type scale Post: 11 questions Likert-type scale + 4 open questions	95% of the students agreed or strongly agreed that the simulation was useful for them to understand the role of the dietitian. No significant differences in mean knowledge were found between the control and intervention groups. The simulation with dietetic students experienced a decrease between pretest (72.5%) and posttest (67.0%) scores.

Braband BJ, et al. 2017 USA	Application of digital photography in analysis	P: Nursing students (2nd year) (n=70) C: University, classroom, campus D: Case study	LS: Access to simulated electronic patient record; 2 mini-debriefings after each case between students, instructor and dietetic student; Longer debriefing after all cases to discuss IPP components of the experience; A care plan is issued 1 week after simulation.	LO: Improve students' knowledge of nutritional factors and other determinants of health to promote wellbeing. M: Photos and discussion groups LS: Two photo assignments and two classroom sessions	Photovoice	Barriers and advantages of the university environment related to food (choices, cost) Appreciation of local, fresh food sources
Eglseer D, et al. 2018 Austria, Netherlands, Germany	To determine whether formal nursing degree programmes in Europe address nutrition and specifically malnutrition in older adults.	P: Nursing Education Institutions in Europe (n=131) (31 countries) C: University, institutions D: Cross-sectional descriptive study	LO: Not established M: Malnutrition in the elderly (MaNuEL) project. LS: Not specified	Questionnaire (online) 15 questions	Regarding nutrition education in nursing programmes, 86.3% had nutrition content, which was compulsory in 73.3% and optional in 13%. 73.7% addressed the topic of malnutrition in older adults; screening (70.8%); causes (67.2%) and consequences (68.7%). The topic of malnutrition in older adults is taught by nurses in 52.7%, by dietitians in 23.7%, by nutrition scientists in 18.3% and by physicians in 19.8% of the institutions.	
Huisman-de Waal, G., et al. 2018 Netherlands	To explore student nurses' perspectives on nutrition and communication	P: Nursing students (NS) (academic year not specified) (n=226) + Nursing assistants (NA) (n=30) C: University, classroom and practice D: Descriptive study	LO: Not established M: Theoretical classes and practical rotation LS: Not specified	Questionnaire (online)	Better learning outcomes in both groups during clinical practice (CP) vs. lecture (L) regarding: eating and hydration [CP (NS 89% / NA 93%) - L (NS 27-28% / NA 70-67%)]; nutrition protocols and guidelines [CP (NS 63% / NA 73%) - L (NS 31% / NA 23%)] and recognition of malnutrition and identification of relevant interventions [CP (NS 88% / NA 93%) - L (NS 72% / NA 77%)]. Better learning outcomes regarding communication with patients in both groups during L vs. PC regarding how to inform patients [L (Total 90%) - PC (Total 87%)] and how to ask patients about nutrition [L (Total 92%) - PC (Total 87%)]. The didactic teaching method was rated positively by both groups of students: "IPE - Social Climate" (M=4.6, SD=0.76) and estimated relevance of the topic (M=4.47, SD=0.59).	
Wesselborg, B., et al. 2019 Germany	To try out an interprofessional (IP) training session on the topic of malnutrition.	P: Nursing students (academic year not specified) (n=25) + Medical students (n=21) C: University, classroom D: Research-based learning study	LO: Develop interprofessional skills in the nutritional approach. M: Case-oriented practice LS: Group, interprofessional (3-4 students). 6 Sessions (12h); Compulsory 1s: malnutrition; 2s: results group work; 3s: elaboration of a	"IPE - Social Climate" scale. "Application of research-based learning" scale. "Course balance scale".	The results of the scales "Application of Research-based Learning" (M=3.9, SD=0.72) and "Course Balance" (M=3.9, SD=0.79) show satisfactory to good results. Increased cognitive elaboration and meta-cognition	

			systematic plan; 4s: pre-planning; interprofessional treatment plan; 5s: poster of results and reflection; 6s: presentation of the treatment plan.		(interprofessional teams working through argumentative discourse) Provides cooperative skills and realistic preparation for future career tasks.
Braun, B., et al. 2019 Germany	To determine whether student feedback leads to change in nutritional management of patients.	P: Nursing students (academic year not specified) (n=31) + Medical students (n=22) C: University, classroom and practice (Internal Medicine) D: Prospective cohort intervention study	LO: Not established M: Research-oriented learning LS: Preparation (lectures), nutritional management (real patients and interprofessional groups); development of individualised treatment plan; reporting of work to professional team; presentation of research results (poster).	Questionnaire (Pre-Post) [German-(UWE-IP)]. (Format not specified)	Pre: Identification of malnutrition or risk of malnutrition in 67% of patients; Post: in 56%. Students presented more information on nutritional management in the Post (M=9.3, SD=2.9) than in the Pre (M=7.9, SD=3.1); (p=0.002). A change in frequency was seen in the data on "Thirst assessment" (p<0.001) and "Appetite assessment" (p<0.001).
Bollo M, et al. 2019 Italy	To measure nursing students' attitudes towards nutritional care in older hospitalised patients	P: Nursing students (1st-2nd-3rd year) (n=255) C: University, classroom and practice D: Multicentre cross-sectional study (pre-post)	LO: Not established (attitudes) M: Assessment of knowledge prior to and after hospital rotation LS: Not specified	Questionnaire [Italian-(SANN_G scale)] (paper) 18 questions Likert-type scale	58.82% of the total nursing students showed a neutral attitude towards nutritional care in elderly hospitalised patients. Distribution by year-group of neutral attitude: 63.96% of 1st year, 67.65% of 2nd year and finally 50% of 3rd year students.
Chao AM, et al. 2020 USA	To describe teachers' perceptions of nutrition education; describe nutrition content and quantify hours; assess barriers to delivering nutrition education.	P: Faculty lecturers (n = 50) C: University, faculty D: Cross-sectional study	LO: Not established M: Not specified LS: Not specified	Questionnaire (online) Likert-type scale	Main nutrition content: 97.7% growth and development; 97.7% enteral nutrition; 97.6% parenteral nutrition. Barriers identified to nutrition education: 52% insufficient curriculum time; 34% highest priority content areas; 22% insufficient numbers of qualified faculty. Resources needed to include nutrition content in the nursing curriculum: Case scenario (4.4 ± 1.0); Nutrition teacher training (4.2 ± 1.5); interprofessional education (4.2 ± 1.2); model curriculum (3.7 ± 1.4); web resources (3.5 ± 1.4); didactic modules (3.5 ± 1.3)
Holmberg, C. et al. 2021 Sweden	To describe the learning outcomes for nursing students	P: Nursing students (1st year) (n=161) C: University, classroom D: Cross-sectional descriptive	LO: Not established M: "The Food Diary". LS: Information on how to record their daily intake; Nutritional calculation; Seminar (optional) to present their cases, a semi-structured question guide was used.	Questionnaire (Format not specified) Likert-type scale + Open questions (Number of questions not specified)	Increased understanding of nutritional recommendations (median, M = 5); Increased awareness of their overall dietary health (M = 4); Increased knowledge of nutrients in various foods Increased knowledge of sources of carbohydrates, fibre, vitamin D and iron

Abbreviations: (P) Participants, (C) Context, (D) Design, (LO) Learning Outcomes, (M) Methodology, (LS) Learning Sequence.

The studies included in this review considered nursing programmes (n=7) or nursing students (n=15), as the subject of study. Four of the studies are contextualised within

interprofessional education, including students from medical, physiotherapy or dietetics degrees⁽⁷⁻¹⁰⁾.

There was great variability in the academic year in which the subject was taught. In 13 studies, the academic year was not specified and in the remaining 9 that did, there was great heterogeneity: in a single academic year; 1st year (n=2); 2nd year (n=1) and 4th year (n=3) and in more than one academic year; (1st and 2nd) - (1st, 2nd and 3rd) - (3rd and 4th), (n=3).

According to the identified research designs, descriptive studies (n=7), comparative studies (n=5), case studies (n=4) and narrative reviews (n=3) stood out, while other types of designs such as research-based studies (n=2) and a quasi-experimental design (n=1) were also found in smaller numbers.

Description of the results of the included studies

Four relevant themes were identified in the study analysis: 1) Review of nursing programmes and curricula; 2) Teaching designs; 3) Assessment of learning; 4) Students' perceptions of the teaching methodology.

Theme 1: Review of nursing programmes and curricula

A total of seven studies based their research on the review of nursing programmes or curricula with regard to the nutrition content taught⁽¹¹⁻¹⁷⁾. Five of them in US institutions,⁽¹¹⁻¹⁵⁾ one in a European institution⁽¹⁶⁾ and one in Brazil⁽¹⁷⁾.

Only one study specified that nutrition content was integrated in different subjects⁽¹²⁾, but this was not specified in the rest of the studies^(11,13-17).

There is emphasis on the theoretical aspects of nutrition, the significance of teaching about basic nutrients across different life stages and nutrition in cases of illness^(13,15,17). On the practical side, instruction on fluid and electrolyte management is prioritised^(12,13,15).

In this review, two teaching contexts were identified: the university classroom and clinical placements. Most studies focused on theoretical classes taught in the classroom^(7,9,10,17-24) and some combined traditional theoretical teaching with clinical placements^(8,25-27). Additionally, several studies highlighted the necessity to enhance basic nutrition content in the nursing curriculum, although the most suitable context for this is not specified^(11,12,15).

In addition to delivering theoretical and/or practical content, only two studies specified the faculty responsible for teaching nutrition subjects^(13,16). In the work carried out by Weigley,⁽¹³⁾ in US institutions, the subject was traditionally taught by dietetics professionals. More recently, in their study conducted in 31 European countries, Eglseer et al.⁽¹⁶⁾ identified that nurses were responsible for teaching nutrition in more than half of the educational institutions.

Theme 2: Teaching designs

Four studies explicitly identified the proposed learning outcomes for instruction^(9,10,18,23). Two of them focused on acquiring interprofessional communication skills to address the patient's nutritional needs and develop clinical judgement^(9,10). The other two studies established learning outcomes focusing on knowledge acquisition^(18,23), identifying different dietary sources of nutrients and implications for nurses⁽¹⁸⁾ and exploring nutritional factors and other health determinants to promote wellness⁽²³⁾.

Eleven studies specified the teaching designs used: lectures;⁽²²⁾ lectures reinforced with case-based practice^(9,26); lectures supported by computer tools^(7,19); clinical practice⁽²⁷⁾; nutrition diary⁽²⁴⁾; one-day nutrition event⁽²⁵⁾; photovoice⁽²³⁾; game-based learning⁽¹⁸⁾; and simulation⁽¹⁰⁾. Three did not explain the methodology and teaching strategies used^(8,20,28).

Theme 3: Assessment of learning

From the studies included in this review, 4 report on the use of different tests and/or rating scales to assess acquired learning, without specifying whether this was part of the subject evaluation ^(20-22,28).

For this purpose, the following were used: a questionnaire developed ad-hoc by the authors of the research with 30 multiple choice questions⁽²²⁾; the validated *Nutrition Knowledge Test* (NKT) questionnaire⁽²⁰⁾; a 20-item questionnaire, used in similar previous studies to assess nutrition knowledge in other unspecified countries⁽²⁸⁾. Finally, a specific open-ended question on Mediterranean diet in addition to the *KIDMED TEST* (Pre-Post) used to assess adherence to the Mediterranean diet⁽²¹⁾.

Within this category, five papers were also found that reported on student learning using lectures as the unique mode of instruction or in combination with other types of strategies^(7,9,19,22,26). The use of lectures alone provided an increase in general nutrition knowledge in the intervention group⁽²²⁾. Complementing the theoretical teaching with case studies increased the level of learning and was useful to work on interprofessional competencies^(9,26). In addition, theoretical classes supplemented with computer tools provided consistent learning, saving instructors time^(7,19).

Other studies assessed student participation and motivation in different activities that involved developing learning content^(18,23-25). Students reported a better understanding of nutritional recommendations through keeping a food diary.⁽²⁴⁾ Practical tools such as photovoice gave greater awareness of the barriers and benefits of food provision on campus⁽²³⁾. Organising a collaborative event between university and clinical practice seems to increase student motivation⁽²⁵⁾. Other methodologies such as game-based learning also seem to help improve motivation and learning of nutritional concepts⁽¹⁸⁾. Simulation is another teaching method that, although no differences have been found, is expected to increase clinical judgement and interprofessional communication⁽¹⁰⁾.

Regarding the results of the learning assessment in the studies included in this review, better results were obtained on general knowledge about nutrition^(22,28), carbohydrates⁽²⁰⁾ and Body Mass Index (BMI)⁽²²⁾. Worse results were obtained for sources of cholesterol^(20,22,28), sources of water-soluble fibre⁽²⁸⁾, food to prevent and

manage cardiovascular disease⁽²⁸⁾, obesity or overweight ranges^(22,28), nutrient metabolism⁽²⁸⁾ and physical activity⁽²⁰⁾. According to Vega et al.⁽²¹⁾ slightly more than half of the nursing students did not have congruent ideas about the Mediterranean diet prior to instruction, with a statistically significant increase after instruction.

Theme 4: Students' perceptions of the teaching methodology

Two papers were identified which assessed students' perceptions of the teaching methodology^(19,26). Students perceived increased learning regarding eating and hydration, protocols and recognition of malnutrition and identification of relevant interventions when devising cases studies⁽²⁶⁾.

On the other hand, a study that compared face-to-face training and web-based teaching, using the *Student Opinion of Instruction (SUMMA)* tool, obtained better results in terms of students' perception for the former mode of instruction compared to the latter⁽¹⁹⁾.

DISCUSSION

This review has addressed the analyses carried out by various authors on nursing training programmes and curricula, teaching designs, assessment methods and the learning acquired, plus the students' perception of the nutrition teaching methodology.

The analysis of the different programmes included in this scoping review highlights the importance of looking in greater depth at nutrition concepts in nursing curricula. This idea coincides with other health areas such as Van Horn et al.⁽²⁹⁾ who highlights the need to improve nutrition content in health science studies.

Another aspect to consider would be revising the role of nurses in promoting nutritional health and lifelong wellbeing⁽²⁰⁾ with the aim of including the most relevant nutrition contents for future professional practice. In addition to improving nutrition-related content, several authors reflect the need to acquire other types of competences related to the interprofessional collaborative role⁽⁷⁻¹⁰⁾. Several studies include training on this skill with other students from different health areas such as medicine,⁽⁷⁻⁹⁾ physiotherapists^(7,20) or dietetics students⁽¹⁰⁾.

In this sense, from the results included in this review, there is no agreement on where teaching on nutrition should be included, or whether this content should be taught in a single academic year or in several academic years throughout a nursing degree. There is no consensus on the scientific literature on how to address nutritional concepts in nursing curricula design. Several authors propose that nutrition content should be integrated in several subjects⁽¹²⁾, throughout various academic years⁽¹⁴⁾, and including nutrition training both in the classroom and in clinical placements⁽¹³⁾. Likewise, nutritional content should explicitly appear as a compulsory subject on nursing curricula⁽³⁰⁾.

Nurse educators have an important role to play in choosing the teaching and learning methodology to achieve the desired learning outcomes⁽³¹⁾. As a preliminary step, other authors emphasise the importance of identifying learning difficulties to select the most appropriate teaching and learning strategy in each case in relation to the subject

matter⁽³²⁾. They also highlight the need to promote learning that links theory with practice through pedagogical strategies⁽³³⁾.

This review identified a wide variety of teaching designs for nutrition-related instruction, of which eight studies provided a detailed description of the sequence^(7-10,18,19,19,23,24). This is relevant as the detailed description of the learning design facilitates interpretation of the results derived from measuring the effectiveness of the teaching interventions. Feresin et al. ⁽¹⁷⁾ pointed out that the approach to teaching nutrition to nursing students should differ from the traditional stance.

Regarding the knowledge acquired by students, worse levels of knowledge were identified regarding the different sources of cholesterol,^(20,22,28) identification of foods to prevent and manage cardiovascular diseases⁽²⁸⁾, and managing obesity or overweight ranges, among others, with better results obtained regarding general knowledge of nutrition^(22,28). For this reason, educational efforts should target improving these results, with an emphasis on training teachers who cover nutrition topics⁽⁹⁾.

It is expected that if nursing students improve their learning concerning nutrition content, they would be able to provide better care to their patients⁽³²⁾, not to mention the ultimate goal of measuring the impact of educating future professionals on individual healthcare^(32,34).

Limitations

Among the limitations encountered when conducting this review, it should be noted, firstly, that the study search was limited to English and Spanish, leaving out papers published in other languages that might have been relevant. Secondly, there is the limitation associated with the methodology chosen to meet the objective. Scope reviews do not take into account the methodological quality of the research, so this was not a criterion considered in the inclusion/exclusion criteria when selecting papers for this study. Finally, it should be noted that the scope of professional practice is not homogeneous throughout the world, so teaching may differ according to nursing profession regulations in each area.

CONCLUSIONS

This scoping review provides a comprehensive and integrated overview of nutrition and nutritional care education for nursing students.

Although there is great heterogeneity among the selected papers in terms of the nutrition education programmes implemented, learning outcomes reported and evaluation methods, nutrition education is clearly important for nursing students.

Therefore, our results suggest the need for further research on design, implementation and evaluation of learning sequences in nursing-related nutrition to generate adequate evidence in each sociocultural context.

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