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ORIGINAL PAPER

Evaluation of nutritional knowledge in relation to primary prevention of doctors and nurses in Morocco

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ABSTRACT

Introduction and aim. Currently, Morocco suffers the burden of non-communicable diseases. Healthcare professionals play a crucial role in guiding the population toward healthy dietary choices, which can reduce the risk of these types of diseases. This study aims to assess nutritional knowledge in relation to primary prevention of doctors and nurses working in the hospital network and primary health care facilities in Morocco.

Material and methods. The study population consists of 472 nurses and 185 physicians. A self-administered questionnaire composed of four main sections (nutrition by the Mediterranean diet; nutrition for children; nutrition for pregnant and breastfeeding women; and nutrition for the elderly) was used for data collection.

Results. The Mediterranean diet obtained the highest score of 0.46 (IQR [0.30, 0.53]) for physicians. But for nurses, the highest score was for child nutrition 0.33 (IQR [0, 0.333]). Our results reveal a statistically significant association of the median total score of answers of health professionals with basic training ($p<0.001$), receiving information on nutrition ($p<0.001$), their degree (doctors or nurses) ($p<0.001$) and the workplace ($p<0.001$).

Conclusion. The training programs of the medical faculties and nursing training institutes in Morocco should be revised in favor of a more in-depth training in nutrition.

Keywords. doctor, health professionals, nurse, nutritional knowledge, primary prevention

Introduction

According to the World Health Organization (WHO), the prevention of non-communicable diseases (NCDs) is possible through the identification of the main common risk factors, their prevention, and their control. An unhealthy diet is considered one of these risk factors.[1]

The prevention of metabolic and cardiovascular diseases is strongly correlated with diet quality.[2] Diet is considered the greatest modulator of the immune system and is of great interest where new challenges appear in the field of prevention and treatment.[3]

The Mediterranean diet (MD) is considered one of the healthiest diets. The main characteristics of the

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Mediterranean diet, such as high consumption of fruits, vegetables, legumes and whole grains, as well as the use of olive oil as the main source of fat, and the limitation of the consumption of red meat and dairy products, are associated with a lower incidence of coronary heart disease and a 30% reduction in the risk of type 2 diabetes, as well as protection against cardiovascular disease.[4,5]

Certain categories of population are in the most nutritionally vulnerable stages of the life cycle, such as pregnant and breastfeeding women, children, and the elderly. They need to pay particular attention to their diet.

A healthy and balanced diet during pregnancy is crucial to meet the energy and nutrient needs of both the mother and the growing fetus. Nutritional deficiencies can lead to negative outcomes such as anemia, premature delivery, and low birth weight.[6]

During lactation, energy and micronutrient needs are higher than in adulthood and pregnancy. Infants should be exclusively breastfed for the first 6 months to support optimal growth and development, with micronutrient levels based entirely on the mother's nutrition.[7,8]

Elderly individuals face a higher risk of malnutrition due to physiological and psychological factors, such as a diminished sense of taste and difficulty chewing or swallowing. The preference for soft, easy-to-eat foods, which are often high in sugar and fat, can increase the risk of comorbidities such as metabolic syndrome and cardiovascular disease.[9,10]

Morocco is experiencing an epidemiological and health transition characterized by lifestyle changes and increased risk factors for non-communicable diseases (NCDs), such as sedentary behavior and unhealthy eating habits.[11] Only 28.2% of the urban population adheres to a Mediterranean diet, with excessive carbohydrate (43%) and lipid (18%) intake.[12] Salt and sugar consumption also exceeds WHO recommendations, at 11g and 95.25g per person daily, respectively.[13] Non-communicable diseases are the leading cause of mortality, accounting for 84% of deaths in 2022.[1] The prevalence of hypertension is 29.3%, diabetes is 10.6% and high cholesterol is 10.5%, with 33% of the population overweight and 20% obese.[14] This underscores the crucial importance of having healthcare professionals who are well versed in nutritional knowledge. These experts play a vital role in educating the public about healthy and balanced diet choices, thereby helping to prevent the increasing prevalence of various health conditions. By incorporating nutritional advice tailored to the cultural and socioeconomic needs of Moroccans, these professionals can not only raise awareness about the risks associated with an unbalanced diet, but also promote healthy lifestyle habits.

In Morocco, doctors and nurses play a vital role in nutritional education by assessing the dietary needs and providing personalized advice. Medical training includes fundamental nutrition education, while nursing programs focus on patient counseling techniques. This collaborative approach ensures comprehensive nutritional support, although there may be variations between different regions and institutions. However, training programs in Moroccan medical schools lack well-developed nutrition modules, offering only basic concepts related to certain diseases and some recommended practices. Similarly, health professional training institutes typically include only one nutrition module, which consists of a total of 40 hours.

The training of health workers must provide an adequate and up-to-date level of knowledge of nutrition for prevention. Recognizing this need, decision-makers are aware of this, and a dynamic of reforms of health professionals training curricula is being incubated in all medical faculties as well as nursing training institutes. Furthermore, the orientation and adaptation of continuing education programs also requires knowledge of the needs of health professionals in terms of nutrition.

Aim

This study aims to evaluate the knowledge of health workers in the north region of Morocco about nutrition for the primary prevention of non-communicable diseases.

No previous research has examined the nutritional knowledge of healthcare professionals in Morocco. The results of this study could have significant implications on the review of training programs for physicians and nurses in the country.

Material and methods

Study design

This cross-sectional exploratory study was conducted in northern Morocco between June and December 2022, involving 146 health centers and 9 public hospitals in the Tangier-Tetouan-Al Hoceima region. The target population included a sample of 1,692 health professionals, including 253 doctors and 1,439 nurses, who met the inclusion criteria: having completed basic training in public nursing institutes and public medical schools, working in health centers or public hospitals, and participating voluntarily, in order to control for possible confounder variables. However, laboratory and radiology technicians, physiotherapists, specialist physicians, private sector professionals, and those who refused to participate were not included. Furthermore, dietitians were excluded because their presence could distort results by influencing responses on nutritional knowledge compared to other health professionals. The study examined the effect of basic training, continuing education, workplace, and access to nutritional information, including Ministry of Health guides, on the level of knowledge of these professionals on primary prevention. Taking into account the similarities between pub-

lic health facilities and the uniformity of basic training at the national level, the sample was randomly selected by clusters, including 146 health centers and 9 public hospitals in the region, with all eligible professionals working in these facilities. This random selection method reduced bias and improved the generalizability of the study results. The planned sample size was 657 participants (185 doctors and 472 nurses), calculated from Cochrane equations and determined by power analysis.[15] The sample was then stratified into four strata: 238 nurses and 131 physicians working in primary health care centers and 234 nurses and 54 doctors working in public hospitals.

Data collection

Data collection was carried out using a self-administered questionnaire to collect sociodemographic information and training information (initial, continuing, and other sources of nutritional information). A multiple choice questionnaire assessed participants' knowledge of participants about nutrition, including the Mediterranean diet, infant nutrition, nutrition for pregnant and breastfeeding women, and nutrition for the elderly. The addition of a section on the Mediterranean diet highlights the knowledge and ability to advise on healthy food choices, reflecting their ability to integrate evidence-based dietary recommendations into their practice.

The quiz was developed based on similar studies inspired by literature and standardized nutritional guidelines (Moroccan Nutrition Guide (2016)[16]; Nutritional Guide Version 2 (2016)[17]; "Nutrition and Breastfeeding" Manual (2018)[18]; Nutrition Guide for Individuals Aged 55 and Over (2019)[19]; Integrated Child Care Guide: Algorithm for Health Professionals (2018)[20]; Nutrition Guide for Caregivers of the Elderly (2015)[21]; Nutrition for Children and Adolescents for All Parents (2015))[22] and was reviewed by experienced dietitians. Before the study, it was piloted with public sector physicians and nurses, who were not included in the final survey, to avoid potential misunderstandings. Participants received oral information about the study and participation was voluntary. The questionnaires were anonymous and took approximately 20 minutes to complete.

Statistical analyses

Statistical analyzes were performed using SPSS version 21.0 software (IBM, Armonk, NY, USA), with statistical significance evaluated using a threshold of $p<0.05$. The results of the Mediterranean diet knowledge scores were compared with other categories to identify specific gaps in the training of health professionals.

Descriptive statistics, including mean scores and medians, were presented to provide a concise summary of the variables studied. For each question, we assign a value of 1 to the correct answer and 0 to the incorrect answer (True=1; False=0). The score is the average of all participants' responses to each question. A score close to 1 indicates that healthcare professionals have good nutritional knowledge. Subsequently, we calculated the median of the scores for each axis and then determined the median of the response scores for all questions related to primary prevention. We chose response scores to directly measure each participant's correct responses, facilitating interpretation of performance, identification of areas for improvement, and comparison between doctors and nurses, while avoiding sample size bias.

A Kolmogorov-Smirnov normality test showed that the data did not follow a normal distribution ($p<0.05$), justifying the use of non-parametric tests. The response scores were described by the median and interquartile range. The Mann-Whitney test was used to assess the association between the mean score and variables such as gender, workplace, basic training, and continuing education. This test allows comparisons between two independent groups and the analyzes are bilateral with a significance level of $p<0.05$.

We used Spearman's rank correlation to analyze the relationship between physicians' and nurses' nutritional knowledge scores and their age. Then, multiple linear regression analysis was performed to identify significant sociodemographic variables associated with good nutritional knowledge (score close to 1). This approach allows us to examine the simultaneous effect of multiple independent variables on a continuous dependent variable.

In our study, we aim for a power of 80% (0.80) and a precision of 5% (0.05) to ensure the robustness of the results. To estimate the size of the effect, we used the formula $r=z^2/n$ for the Mann-Whitney test and r^2 for the Spearman correlation. This provides an indication of the magnitude of the observed relationships.[23]

Ethical approval

All participants received a written information sheet and signed informed consent. The right to refuse to participate, to refuse to respond to questions asked, or to withdraw at any stage of the process without any penalty or consequence was ensured before encouraging participation. The ethical principles of the Declaration of Helsinki and the Oviedo Convention on Human Rights and Biomedicine were followed.

Results

Information on the sociodemographic characteristics

The study involved 185 physicians (55.7% men, 44.3% women) with a median age of 42±5.32, and a response rate of 98%. Most (70.8%) work in primary care, and 82.2% reported no nutrition training during their education, while 14.6% participated in continuous training. About one third receive Moroccan nutrition guides.

Table 1. Information on the sociodemographic characteristics*

Variable	Doctors n=185	Nurses n=472
Age (year)		
26–36	16.2	44.1
37–47	68.6	40.9
48–55	15.1	15
Median age	42±5.32	38.00±6.83
Sex (% of total)		
Female	44.3	56.4
Male	55.7	43.6
Work place (% of total)		
Primary healthcare center	70.8	50.4
Hospital	29.2	49.6
Courses in nutrition during training (% of total)		
Initial training	17.8	92.4
Continuing education	14.6	7.4
Receiving information[a]	29.7	31.6

* [a] receiving information: reception of information through official documents from the Ministry of health such as Moroccan nutrition guides, national nutrition strategy guide, etc.

Furthermore, 472 nurses (56.4% women, 43.6% men) with a median age of 38.00±6.8 had a response rate of 94%. Half work in primary care and 92.4% stated that nutrition training was part of their basic education, but 92.6% reported that nutrition training. Nearly one-third claimed to have received Moroccan nutrition guides.

The study revealed that 17.8% of doctors received nutrition courses during their basic training and 14.6% during continuing education. Although 92% of nurses reported taking a 40-hour nutrition course in their basic training, and In the study, only 32% of the participants received ministerial nutrition guidelines.

Evaluation of nutritional knowledge

Table 2 presents the scores and percentages of correct answers from physicians and nurses to questions about nutrition for the Mediterranean diet, nutrition for children, nutrition for pregnant and breastfeeding women and nutrition for the elderly.

Regarding nutritional knowledge about Mediterranean diet, the median score of doctors'answers of the questions is 0.46 (IQR [0.30, 0.53]), except for questions on the type of the cereal and the shape of fruit to be preferred in this type of diet, where the majority (85% and 81% respectively) answered correctly. For nurses, the median of answers score to the questions is 0.24 (IQR [0.15, 0.30]), with the exception of the type of cereal to be preferred, two thirds of the participants correctly answered. The median of answers of both health professionals is 0.23 (IQR [0.15, 0.46]).

Regarding child nutrition, the median score of doctors' answers to the questions is 0.33 (IQR [0.33, 0.33]), and almost a quarter had no knowledge of exclusive breast feeding during the first 6 months of life. While the median of score nurses 'answers on child feeding scores is 0.33 (IQR [0, .033]), and more than a third did not know that the adoption of exclusive breastfeeding is recommended from birth to 6 months. The median of answers of both health professionals is 0.33 (IQR [0.33, 0.33]).

Regarding the nutrition of pregnant and breastfeeding women, the median of doctors' knowledge is 0.335 IQR [0.22, 0.44]), however, the median of the score of the nurses' responses is only 0.11(IQR [0, 0.22]). The median of answers of both health professionals is 0.11 (IQR [0, 0.33]).

Concerning the nutrition of the elderly, doctors have a high median score of answers (0.4 IQR [0.2, 0.6]) than nurses (0.2 IQR [0, 0.4]). The median of answers of both health professionals is 0.20 (IQR [0, 0.40]).

The results of the study provide an overview of the level of knowledge of physicians and nurses in relation to primary prevention. We can see from Figure 1 that the median of the response among physicians are optimal compared to those of nurses.

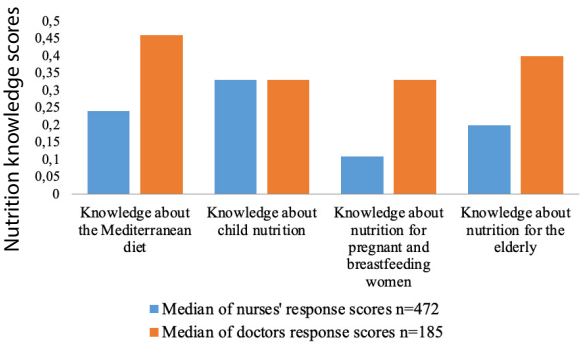

Fig. 1. Distribution of the knowledge of doctors and nurses about Mediterranean diet nutrition, nutrition for children, pregnant and breastfeeding women, and the elderly

Relationship between the median of the total score from answers of health professionals (doctors and nurses) to questions on nutritional knowledge in relation to primary prevention and their sociodemographic variables

To analyze the association between nutritional knowledge and sociodemographic variables, the median of nutritional knowledge in relation to primary prevention of all participants was calculated (Table 3).

The present study identified a significant ($p<0.001$) association between the median of answers of all participants to questions related to primary prevention and their degree (doctors or nurses). Furthermore, the analysis suggests a significant difference between health professionals who received a nutrition course during basic training and those who did not ($p<0.001$). Furthermore, the reception of nutrition information on nutrition

Table 2. Knowledge of physicians and nurses about Mediterranean diet nutrition

Variables	Score of answers (% of correct answers of nurses, n=472)	Score of answers (% of correct answers of doctors, n=185)	Score of total answers (% of total correct answers)	p	Effect size
Knowledge about the Mediterranean diet					
Frequency of fruit and vegetable consumption	0.26 (26.4)	0.38 (38.9)	0.30 (32.65)	0.02	0.015
Preferred form of vegetables	0.24 (23.9)	0.33 (31.9)	0.26 (27.90)	0.037	0.007
Preferred fruit shape	0.46 (45.8)	0.82 (81.1)	0.56 (63.45)	0.000	0.102
Frequency of consumption of (bread, cereals, potatoes legumes)	0.26 (25.4)	0.29 (28.2)	0.26 (26.80)	0.474	0.001
Frequency of pulse consumption	0.15 (14.8)	0.27 (26.9)	0.18 (20.85)	0.000	0.020
Preferred grain type	0.60 (60.0)	0.85 (85.8)	0.67 (72.90)	0.000	0.061
Frequency of consumption of milk and dairy products	0.25 (25.0)	0.39 (38.5)	0.29 (31.75)	0.001	0.018
Frequency of consumption of Meat, poultry, fish, eggs)	0.21 (21.6)	0.49 (47.0)	0.29 (34.30)	0.000	0.064
which food to favor(Meat, poultry, fish and eggs)	0.14 (13.6)	0.24 (21.6)	0.16 (17.60)	0.012	0.010
Frequency of fish consumption	0.26 (26.1)	0.44 (44.9)	0.31 (35.50)	0.000	0.033
Fats to favor daily	0.08 (7.8)	0.26 (24.9)	0.13 (16.35)	0.000	0.053
Sweet products to consume occasionally	0.15 (15.3)	0.45 (44.0)	0.23 (29.65)	0.000	0.093
Preferred drinks	0.13 (12.9)	0.42 (43.6)	0.21 (28.25)	0.000	0.111
Scores' median of answers (% of total correct answers)	0.24 (24.5)	0.46 (42.84)	0.23 (33.67)	0.000	0.196
Interquartile ranges	[0.15, 0.30]	[0.30, 0.53]	[0.15, 0.46]		
Knowledge about nutrition for children					
Exclusive breast feeding from 0 to 6 months	0.63 (62.5)	0.74 (73.5)	0.66 (68.00)	0.008	0.011
Complementary foods to give to the child other than breast milk from 0 to 6 months	0.12 (11.7)	0.23 (23.2)	0.15 (17.45)	0.000	0.021
Complementary foods to give the child other than breast milk from 6 to 12 months	0.16 (16.1)	0.20 (20.0)	0.17 (18.05)	0.234	0.002
Median of answers (% of total correct answers)	0.33 (30.1)	0.33 (38.9)	0.33 (34.50)	0.002	0.014
Interquartile ranges	[0, 0.33]	[0.33, 0.33]	[0.33, 0.33]		
Knowledge of nutrition for pregnant and breastfeeding women					
Priority fruits and vegetables for pregnant women	0.25 (24.6)	0.33 (32.4)	0.27 (28.50)	0.041	0.006
Frequency of consumption of (bread, cereals, potatoes and legumes)	0.14 (14.4)	0.32 (33.0)	0.20 (23.70)	0.000	0.044
Frequency of consumption of milk and dairy products	0.14 (13.6)	0.19 (19.5)	0.15 (16.55)	0.058	0.005
Milk and dairy products authorized for pregnant women	0.14 (14.4)	0.27 (27.2)	0.18 (20.80)	0.000	0.022
Milk and dairy products authorized for breastfeeding women	0.15 (15.3)	0.31 (31.3)	0.20 (23.30)	0.000	0.033
Meats allowed to pregnant women	0.20 (19.7)	0.43 (43.8)	0.26 (31.75)	0.000	0.060
Meats allowed to breastfeeding women	0.14 (14.4)	0.32 (31.4)	0.19 (22.90)	0.000	0.037
Preferred fish for pregnant and breastfeeding women	0.23 (22.9)	0.32 (33.5)	0.26 (28.20)	0.005	0.012
Drinks recommended	0.16 (16.1)	0.36 (36.8)	0.22 (26.45)	0.000	0.050
Median of answers (% of total correct answers)	0. 11 (17.26)	0.33 (32.1)	0.11(24.68)	0.000	0.154
Interquartile ranges	[0, 0.22]	[0.22, 0.44]	[0, 0.33]		
Knowledge about nutrition for the elderly					
Fruit and vegetables preferred by the elderly	0.27 (27.10)	0.35 (34.1)	0.29 (30.6)	0.080	0.005
Frequency of consumption of (bread, cereals, potatoes and legumes)	0.15 (14.60)	0.30 (30.8)	0.19 (22.7)	0.000	0.034
Frequency of consumption of milk and dairy products	0.14 (13.60)	0.32 (31.9)	0.19 (22.75)	0.000	0.044
Which food should limit(meat, poultry, fish, eggs)	0.34 (34.10)	0.49 (47.0)	0.38 (40.55)	0.002	0.014
Drinks recommended	0.23 (22.70)	0.57 (56.8)	0.32 (39.75)	0.000	0.107
Median score of answers (% of total correct answers)	0.2 (22.42)	0.4 (40.12)	0.20 (31.27)	0.000	0.113
Interquartile ranges	[0, 0.4]	[0.2, 0.6]	[0, 0.40]		
Median score of answers of the nutritional knowledge in relation to primary prevention (% of total correct answers)	0.21 (23.57)	0.36 (38.49)	0.24 (31.03)	0.000	0.211
Interquartile ranges	[0.15, 0.32]	[0.27, 0.50]	[0.16, 0.35]		

(p<0.001) and the workplace of physicians and nurses (p<0.001) are significantly associated with the median of -nutritional knowledge.

Table 3. Association between the median of answers of health professionals (doctors and nurses) to questions on nutritional knowledge in relation to primary prevention and their sociodemographic variables *

Variables	Correlation coefficient (r)	Median (Interquartile ranges)	Raw analysis p	Adjusted analysis p	Effect size
		Gender			
Female		0.24 [0.16, 0.35]	0.837		$6.04*10^{-5}$
Male		0.25 [0.16, 0.36]			
Age	0.169		0.00	0.166	0.0028
		Diploma			
Doctors		0.36 [0.27,0.50]	0.00	0.00	
Nurses		0.21 [0.15,0.32]			0.211
		Work place			
Primary healthcare Center		0.31 [0.2, 0.4]	0.00	0.00	0.104
Hospital		0.2 [0.12, 0.3]			
		Basic training			
Yes		0.22 [0.15, 0.33]	0.00	0.00	0.056
No		0.31 [0.23, 0.41]			
		Continuing training			
Yes		0.23 [0.15, 0,5]	0.172		0.003
No		0.25 [0.16, 0.35]			
		Receiving information[a]			
Yes		0.31 [0.2, 0.41]	0.00	0.00	0.045
No		0.24 [0.15, 0.32]			

* [a] receiving information: reception of information through official documents from the Ministry of health such as Moroccan nutrition guides, national nutrition strategy guide, etc.

The results show that the age of the participants is positively correlated with the mean score (r = 0.169, p<0.001). However, no statistically significant differences between the median on based on gender (p=0.83) or on continuing training (0.172) were found. Multivariate analysis confirmed the results of bivariate tests concerning the association between scores' median of nutrition response to the questions on nutrition in relation to primary prevention and sociodemographic dimensions with the exception of age (p=0.166), this variable is not significantly associated with the median of the response scores

The size of the effect of the Mann-Whitney test showed that diploma (r=0.211), continuing training (0.201), and gender (r=0.02) had a small effect. Furthermore, for basic education (r=0.78) and in the workplace it is high (r=0.61), but for receiving nutritional information it is moderate (r=0.38). Regarding age, it appears that the latter has a low explanatory capacity (r=0.028) for the differences observed between the median based on age.

Discussion

The study results reveal that, for both doctors and nurses, response scores to questions regarding the four domains studied are unsatisfactory, remaining well below 1. This raises questions about the nutrition training provided to these groups. A low level of knowledge can lead to inappropriate recommendations, harming patients' health, and reducing the risk of chronic diseases.

Among doctors, the highest scores were obtained for the Mediterranean diet (0.46), while nurses achieved their best results for infant nutrition (0.33). These differences may be explained by the fact that doctors, generally specialized in disease diagnosis and management, tend to attach greater importance to the Mediterranean diet, recognized for its benefits in cardiovascular health and the prevention of chronic diseases. On the contrary, nurses, often on the front lines of care, have more direct experience with infants and children, which explains their higher score (0.33) for infant nutrition. They play a vital role in educating parents about nutrition and child development. These results are suboptimal compared to other studies conducted in Arab countries, Asia, and in Croatia, where participants' (doctors and nurses') response scores to nutritional questions were above 0.5.[24-27]

Concerning the Mediterranean diet, the analysis of the interquartile range (IQR) shows greater variability in knowledge between doctors (IQR of [0.30, 0.53]) compared to nurses (IQR of [0.15, 0.30]), who show scores concentrated in a lower range. Although most doctors and a significant proportion of nurses correctly answered questions about some aspects of the Mediterranean diet. For physicians, this result is lower than that of Spain (0.55), but almost similar to the study in Las-Palmas (0.41).[28,29] Regarding nurses, the scores found in Las Palmas are higher than our result (0.40).[29]

Regarding the elderly, the interquartile range of doctor response scores (IQR [0.2, 0.6]) indicates greater knowledge and diversity of understanding, probably due to their varied clinical experiences, specialized training, or particular interest in nutritional issues related to the elderly. In the literature, although several studies have evaluated the knowledge of physicians in areas of nutrition for adults over 18 years of age, no studies evaluating the knowledge of the specific nutritional needs of the elderly were found. Our study seems to be the first to investigate this interesting aspect. On the contrary, for nurses, the interquartile range (IQR [0, 0.4]) suggests limited knowledge and possibly highlights gaps in their ability to adequately counsel elderly patients. The small number of similar studies reported in the literature a revealed generally higher score of answers than ours.[30-32]

The results on doctors and nurses' knowledge of infant nutrition highlight worrying gaps in parental education about their children's nutrition, which is essential

to prevent malnutrition-related diseases. In fact, nearly a quarter of doctors do not recognize the importance of exclusive breastfeeding during the first six months. This result is similar to a literature study, but lower than a study conducted in Baghdad reported that the score of doctors' responses to questions on child nutrition is 0.50.[25,34,35] This result remains very low in comparison with the Australian health professional population, which reported a score of 0.75.[33]

For nurses, the interquartile range reveals a lower variation (IQR of [0, 0.033]), which reveals a virtual lack of knowledge on this crucial subject. This result is lower than that of Ghana (0.54).[32]

The results on the nutritional knowledge of pregnant and breastfeeding women reveal significant differences between doctors and nurses, as well as a general concern about their level of knowledge. For physicians, the interquartile range (IQR [0.22, 0.44) indicates that the majority of them have low knowledge but some physicians show higher scores, which indicates that they have a better understanding of nutritional issues related to pregnancy and breastfeeding. This result is lower than that reported in Saudi Arabia (0.70) and Croatia (0.86).[27,37] In contrast, the interquartile range (IQR) of [0, 0.22] among nurses indicates a concerning lack of knowledge in this critical area. This situation is particularly alarming given the importance of providing appropriate nutritional guidance for the health of both mothers and their breastfeeding infants. This result is lower than that of a recent study conducted in Australia, which reported a value of 0.42 among all participants, including both physicians and nurses.[36] For nurses specifically, this finding is particularly concerning, as it indicates suboptimal levels compared to the researchers' conclusion of 0.54.[32]

The significant association ($p<0.001$) between the median response scores of healthcare professionals and their qualifications highlights the importance of adequate training and practical experience. Furthermore, the lack of association with demographic factors such as age ($p=0.166$) and sex ($p = 0.83$), indicates that other factors influence nutritional skills. This highlights the need to focus on experience and training; however, it is worth noting, some studies have noted an association with age.[32,38]

The study reveals a lack of adequate nutrition training for doctors and nurses, which is comparable to a study in the United States showing that only 25% of medical schools integrate nutrition into their curricula.[39] Although most nurses attend classes, many feel ill prepared to manage nutritional issues, highlighting gaps in their training.

The significant association ($p<0.001$) between basic training and scores' median nutrition knowledge highlights the importance of solid training in this area. Furthermore, a similar study also highlights the need for continuing training to maintain and update these skills.[41] It is crucial to improve both the basic and continuing training of healthcare professionals to enable them to effectively advise their patients on these issues. Furthermore, a significant relationship was observed between access to official nutritional guidelines and knowledge scores, indicating that regular updating recommendations can improve understanding.[42,44] In New Zealand, some midwives rely on documents from the Ministry of Health (47%), while others consult dietitians (53%).[42] They also use various resources, such as professional journals, websites and social media.[25,43] Regular access to these sources of information is essential for strengthening nutritional knowledge of healthcare professionals.

The significant association between the workplace and the median for doctors and nurses ($p=0.00$) reveals that participants who worked in health centers scored higher than those who worked in hospitals. This suggests that the activities at these centers are more focused on prevention, which encourages health professionals to engage in more self-training. On the contrary, in hospitals, the focus is primarily on curative care rather than preventive care. This finding is consistent with other previous research.[40,45,46]

The small effect of the Mann-Whitney test reveals that the median for doctors and nurses are very similar, indicating that the type of degree has no significant impact on the results. Similarly, the relationship between gender and scores is negligible, suggesting that other factors, such as previous training and professional experience, have a greater influence on nutritional knowledge.

Study limitations

The limitation of this study is that private sector professionals were not included in our study; in addition, the study was conducted in the northern region of Morocco.

Although basic training is unified, continuing training depends on the continuing training unit of the regions. Young doctors and nurses with less experience were relatively overrepresented in the sample. This could be due to selection bias, as it was difficult to obtain consent from relatively older doctors and nurses, who only concerned 26 professionals in the public sector.

Conclusion

In conclusion, this study revealed significant gaps in the nutritional knowledge of physicians and healthcare professionals on the primary prevention of non-communicable diseases. It appears that primary care health workers show better skills in nutrition compared to those working in hospitals, although this knowledge remains below expectations. As primary care physicians and nurses are on the front lines of providing care, it is

crucial that they receive continuing education in nutrition to provide appropriate and reliable advice to both patients and the general public. However, our results indicate that there is an urgent need to improve the nutritional knowledge of physicians and nurses in Morocco. Therefore, policy makers must actively engage in promoting educational initiatives in nutrition, both at the level of basic education and at the level of continuing education in faculties of medicine and nursing, to ensure that health professionals have the necessary skills to effectively advise the population.

Declarations

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Author contributions
Conceptualization, N.E. and A.N.; Methodology, Z.B.; Software, Z.B.; Validation, N.E., A.N. and Z.B.; Formal Analysis, A.N.; Investigation, Z.B.; Resources, Z.B.; Data Curation, Z.B.; Writing – Z.B and N.E Original Draft Preparation, Z.B.; Writing – Review & Editing, N.E. and A.N; Visualization, N.E.; Supervision, N.E.

Conflicts of interest
Authors declared they have no conflicts of interest.

Data availability
All the data generated or analyzed during this study are included in this published article.

Ethics approval
Informed consent was obtained from all participants.

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