



# Nutrition Care Practices, Barriers, Competencies and Education in Nutrition: a Survey Among Ghanaian Medical Doctors

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## Abstract

**Background** We evaluated medical doctors' nutrition care practices, competencies and barriers to providing nutrition care. Furthermore, doctors' satisfaction and perceived adequacy of their nutrition education as well as the use and effectiveness of training and learning resources for continuing nutrition education were also investigated.

**Methods** This cross-sectional study included medical doctors working at various levels of care in Ghana who responded to either an online or paper-based survey. Appropriate statistical tools were used to analyse the data.

**Results** Majority (70%) of the 114 doctors who responded to the survey estimated that more than 60% of their patients needed nutrition care. However, only  $\leq 40\%$  received such care. More than 80% of doctors referred patients to dietitians/nutritionists. Comfort levels correlated positively ( $r = 0.288$ ;  $p = 0.002$ ) with attitudes about nutrition care. The most common barriers to nutrition care were lack of time (79%), inadequate knowledge (78.6%) and counselling skills (68.4%). About 66% perceived their nutrition education in medical school to be inadequate, and more than 70% were either unsatisfied or undecided with their nutrition educational experiences. Perceived adequacy ( $r = 0.200$ ;  $p = 0.016$ ) and satisfaction with nutrition education ( $r = 0.218$ ;  $p = 0.002$ ) were associated with doctors' comfort levels. Only 30% were currently using a nutrition-related learning resource for continuing education in nutrition.

**Conclusion** Doctors felt their patients required more nutrition care than they could provide. Their nutrition care was hindered by lack of time, inadequate knowledge, confidence and counselling skills. Educational interventions that improve on medical doctors' attitudes and comfort levels in providing nutrition care may be needed.

**Keywords** Nutrition care · Medical doctors · Barriers · Nutrition education · Ghana

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## Introduction

Nutrition or diet-related diseases are important contributors to the global burden of morbidity and mortality. For instance, excessive weight has been shown to be a risk factor for cardiovascular disease, type 2 diabetes mellitus, hypertension, osteoarthritis, cancers among others [1–3]. Referred to as noncommunicable or chronic diseases (NCD), these conditions are responsible for 70% of all deaths annually, making them by far the leading cause of death in the world [4]. Eighty-two percent of these deaths occur in low- and middle-income countries. Furthermore, three of the four major risk factors contributing to the rise of NCDs are nutrition-related: physical inactivity, unhealthy diets and harmful use of alcohol [5]. In comparison with pharmacological interventions, there is increasing evidence that the benefits of nutrition, diet and physical activity interventions are either comparable or

better, with attended benefits of low side effects, reduced risk and lower cost [6–8].

In the pursuit of optimal health, doctors are important players who are best positioned to encourage individuals to adopt healthy lifestyles, such as optimal dietary intake and physical activity. However, many medical doctors are unable to effectively provide nutrition counselling due to inadequate training, resulting in inadequate knowledge, skills and low confidence to provide nutrition care [9–14]. These may stem from factors, such as low priority given to nutrition education during medical school, inadequate faculty to provide nutrition training, resistance to the addition of new courses or lectures in nutrition, with a curriculum emphasising on disease treatment rather than disease prevention [15–21]. Obviously, it is necessary to develop and integrate nutrition education into the training of medical doctors to realise its translational impact on prevention and treatment of disease [22].

Recognising the fact that doctors drive the health care system in Ghana and in several countries within the sub-Saharan Africa region and considering that nutrition-related conditions are mostly presented at the health facilities, nutrition education for doctors is of utmost importance. Increasing greater awareness and support for nutrition care among doctors may help them become proponents and important sources of referral to dietitians, nutritionists and other relevant healthcare professionals [22].

The majority of studies that report on medical doctors' nutrition care practices, competencies and barriers as well as their nutrition educational experiences during medical school emanate from developed countries, such as the USA, Australia, Canada, New Zealand and the UK [10, 11, 22–29]. The evidence regarding this subject matter is limited in sub-Saharan Africa. In our search of the literature, we found only two studies from sub-Saharan Africa, which reported on medical students' views and perceptions of their nutrition education [13, 14] but not those of medical doctors. It is not usually possible to translate these findings to the context of sub-Saharan Africa that is characterised by poor healthcare systems, nutrition transition and urbanisation. It is thus necessary to undertake a needs assessment of the nutrition care competencies, barriers and views of medical doctors regarding their past nutrition education (during medical school), as they are important stakeholders of the medical education milieu. A recent realist review [30] has noted the importance of executing needs assessments to inform the design of educational interventions to improve nutrition educational experiences during medical school or continuing education in nutrition during practice.

The current study aims to answer the following research questions.

1. What are doctors' nutrition care practices and competencies (comfort levels and attitudes) in the general practice setting?
2. How do doctors' perceive barriers to the provision of nutrition care in the general practice setting?
3. Do doctors feel adequately prepared by, and satisfied with their nutrition educational experiences during medical school?
4. Are doctors' nutrition care practices and competencies related to their perception of the adequacy and satisfaction of their nutrition educational experiences during medical school?
5. How do doctors perceive the effectiveness of the nutrition-related training and learning resources they are currently using or may use in the future?

## Methods

### Participants

This cross-sectional study included medical doctors across Ghana working in varied clinical settings. This study is part of a series of studies intended to investigate the nutrition educational needs of both students and medical doctors in Ghana. The current study was conducted from October 2016 to July 2017. Participants were approached through two procedures: face-to-face and an online survey. Through purposive sampling, doctors were approached at their practices by one of the authors and invited to participate in the study. Those who agreed and consented were given a printed version of the questionnaire to fill out at their convenience. This procedure yielded 26 responses. For the online survey procedure, the questionnaire was mailed through a survey link to all listed members of the Ghana Medical Association (GMA), which is an organised group of all medical practitioners in Ghana. The link of the online survey was also placed on social media groups (i.e. Facebook and WhatsApp) whose members were mainly doctors working at a particular hospital or graduates of the same medical school. Non-respondents were sent three reminders at 1, 3 and 4 months respectively after the initial mailing. Eighty-eight doctors responded to the questionnaire online. Ethical approval for the study was granted by the Navrongo Health Research Centre Institutional Review Board (Ethics Approval ID: NHRCIRB209), Ghana.

### The Survey Instrument

The survey instrument consisted mostly of closed ended items with a few open ended. The items were adapted from previous surveys conducted among doctors [24, 28, 31] and medical students [13, 32]. The items measured the following variables.

- a. Demographics: These included gender, age, medical school graduated, number of years since graduation from

- medical school, place of practice and type of practice (i.e. house officer, medical officer, consultant/specialist, etc).
- b. Comfort levels in providing nutrition care: Based on a 10-point Likert scale doctors were asked to indicate their level of comfort in discussing nutrition topics with their patients categorised into three broad areas: general nutrition, maternal and child nutrition and nutrition in chronic disease. This scale consisted of 11 items categorised into the three broad areas. Items for this scale were adapted from previous study conducted among Canadian family physicians.
  - c. Attitudes towards nutrition care: Consisting of ten statements relating to nutrition care, doctors were asked to indicate their level of agreement with those statements using a 5-point Likert scale (1 = totally disagree; 2 = disagree; 3 = neutral; 4 = agree and 5 = totally agree). Items for this scale were derived from the nutrition attitudes survey.
  - d. Nutrition care practice: This was measured by two items. The first item requested doctors to indicate the proportion of their patients they believed will benefit from nutrition care. The second item required doctors to indicate the proportion of their patients they believed actually received nutrition care from them.
  - e. Referral of patients to dietitians/nutritionists and reasons for referring patients: Doctors' referral behaviour was assessed using the question "Do you refer your patients to dietitians? Yes or No." To determine the frequency of referrals doctors were asked to indicate the number of times they referred their patients to a dietitian/nutritionist in the last 12 months. Using open-ended questions, doctors were asked to provide reasons why they usually referred their patients to dietitians/nutritionist and the kind of conditions they did so.
  - f. Barriers to the provision of nutrition care: Using a list of seven barriers to nutrition care, doctors were asked to indicate the extent to which they considered those barriers hindered them from providing effective nutrition care to their patients using a 5-point Likert Scale (1 = totally disagree; 2 = disagree; 3 = neutral; 4 = agree and 5 = totally agree).
  - g. Training adequacy: Using a 3-point Likert scale doctors were asked to indicate their perceived level of adequacy of the nutrition training they received during medical school [23] (1 = inadequate; 2 = adequate and 3 = more than adequate).
  - h. Satisfaction: Based on four items adapted from previous surveys [10, 14, 32], doctors were asked to indicate their level of satisfaction regarding the quality and quantity of nutrition education they received during medical school using a 5-point Likert scale (1 = very dissatisfied; 2 = dissatisfied; 3 = neither satisfied nor dissatisfied; 4 = satisfied and 5 = very satisfied).
  - i. Nutrition-related learning/training resources for continuing education in nutrition: Using items from a previous survey [24], doctors were asked to indicate the nutrition-related learning/training resources they considered to be effective in improving their continuing nutrition education (1 = not effective; 2 = somewhat ineffective; 3 = neither ineffective nor effective; 4 = effective 5 = very effective). In addition, doctors were asked to indicate which nutrition-related learning/training resources they were currently using or are likely to use in the future for their continuing nutrition education.
- The entire questionnaire (in appendix 1) had 19 items and was evaluated by a team of experts in nutrition and health professions education who found it to be content valid. The questionnaire was also administered to a pilot sample of ten participants to determine its comprehensibility and understanding. Participants spent 10–20 min to complete the questionnaire.

## Statistical Analysis

All data were entered into, and analysed using the statistical software IBM SPSS version 21.0. Descriptive statistics of mean, standard deviation, frequencies and bar charts were used to describe the data. All categorical variables were compared using cross-tabulation with chi-square. Comparisons between categorical and continuous variables were done using Student *t* test and one-way ANOVA, where appropriate. Pearson zero-correlations were calculated to identify relationship among continuous variables. A *p* value of less than 0.05 at a 95% confidence interval was considered statistically significant. Composite "comfort" and "attitude" scores were generated for each doctor. These continuous variables were calculated by averaging each doctor's responses to the individual component variable.

## Results

### General Characteristics of Participants

One hundred and 14 medical doctors responded to the questionnaire in which 99 answered all items to yield a completion rate of 87%. Reasons for non-response included lack of time and poor internet service at practice location of some participants. Demographic and general characteristics of the doctors are presented in Table 1. The doctors had a mean (SD) age of 36.70 (10.41) years and have been working for an average of 10 years.

**Table 1** General and demographic characteristics of participants

Variable	Frequency (%)
Gender	
Male	63 (66.3%)
Female	32 (33.7%)
Type of practice	
House officer	16 (16.7%)
Medical officer	41 (42.7%)
Consultant/specialist	31 (33.3%)
Resident	8 (8.3%)
Type of place of practice	
Teaching hospital	48 (47.5%)
Regional hospital	7 (6.9%)
District hospital	30 (29.7%)
Public clinic	5 (5.0%)
Private hospital	11 (10.9%)
Medical school graduated	
KNUST-SMS	24 (26.4%)
UDS-SMHS	25 (27.5%)
UGMS	29 (31.9%)
Foreign trained	13 (14.3%)
Age	
< 35 years	48 (57.1%)
≥ 35 years	36 (42.9%)
Number of years since graduating from medical school	
≤ 10 years	63 (64.5%)
> 10 years	29 (31.5%)

Frequencies do not add up to 99 due to missing responses

### Doctors' Comfort Levels in Discussing Nutrition Topics with Patients and Attitudes Towards Nutrition Care

With a Cronbach alpha value of 0.92 and explaining 75% of the total variance three factors emerged from the 11-item comfort scale. Having factor loadings that ranged from 0.60–0.80, items in factor 1 (4 items) constituted maternal and child nutrition. Items on factor 2 (factor loadings = 0.52–0.83) with three items related to general nutrition and well-being and factor 3 (factor loadings = 0.59–0.78) constituted nutrition in chronic disease. All three factors had alpha values that ranged from 0.77–0.87. Doctors reported being more comfortable discussing items relating to the maternal and child nutrition factor (7.84; 95% CI: 5.40–6.26;  $p < 0.001$ ) compared with those of the general nutrition (5.83 95% CI: 5.40–6.26,  $p < 0.001$ ) and with nutrition in chronic disease factors (6.70; 95% CI: 7.45–8.23). Among responses of individual doctors to the items, strong correlations ( $r = 0.787$ ;  $p < 0.001$ ) were noted, with those who were comfortable discussing one topic being generally comfortable with all topics. Doctors who reported being more comfortable discussing nutrition topics with their

patients were more likely to be older ( $p = 0.015$ ) and graduated from medical school in the last  $\geq 10$  years ( $p = 0.029$ ).

A Cronbach alpha value of 0.81 was recorded for the 6-item attitude towards nutrition care scale. With a total mean (SD) weighted attitude score of 4.2 (0.76) (95% CI: 4.12–4.41), over 80% of doctors agreed that nutrition care was one of their responsibilities; 94% felt nutrition is a significant component in the prevention and progression of chronic diseases; 81% felt their patients needed more nutrition information than they were able to provide and 84% believed that their patients will adopt healthier lifestyle if counselled to do so. Attitude scores correlated positively with comfort levels of participants ( $r = 0.288$ ,  $p = 0.002$ ) but not with number of years since graduation from medical school. Furthermore, attitude scores did not differ significantly by type of practice ( $p = 0.571$  vs.  $p = 0.685$ ), medical school graduated ( $p = 0.067$  vs.  $p = 0.125$ ), gender ( $p = 0.768$  vs.  $p = 0.149$ ) and type of place of practice ( $p = 0.406$  vs. 0.249).

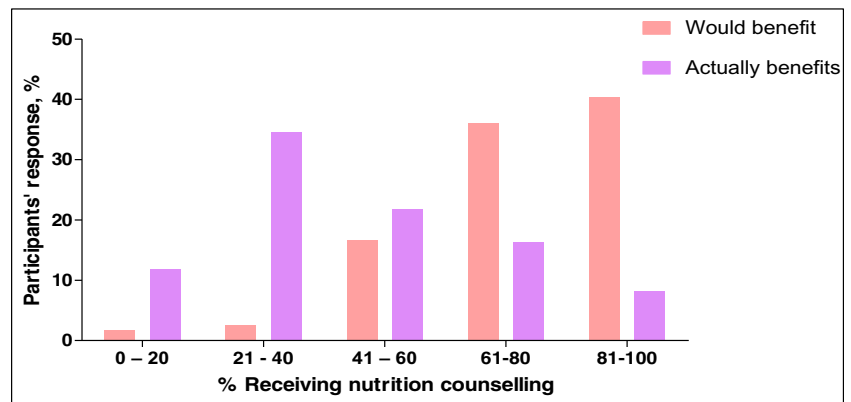
### Practice of Nutrition Care

Some 86% ( $n = 86$ ) of the participants said nutrition care was relevant to their practice, 12.1% ( $n = 12$ ) said irrelevant and 2.0% ( $n = 2$ ) were undecided. As shown in Fig. 1, a large number (76.4%,  $n = 87$ ) of doctors believed that more than 60% of their patients will benefit from nutrition care; however, majority of them felt only  $\leq 40\%$  of their patients actually received such counselling ( $p < 0.001$ ). Poor agreement was observed between proportion of patients doctors believed will benefit from nutrition care compared with proportion of those they said were actually receiving such care (Kappa = 0.023, S.E = 0.035,  $p = 0.502$ ). Only 27% ( $n = 27$ ) of doctors spent  $\geq 6$  min providing nutrition care to their patients. Perceived relevancy of nutrition care was not associated with doctor's estimate of the proportion of patients who will benefit from nutrition care but was significantly ( $p = 0.012$ ) associated with their estimate of proportion of patients who actually received such care. Doctors who were more comfortable discussing nutrition topics with patients believed a greater proportion of their patients would benefit from nutrition counselling ( $p < 0.001$ ) and were more likely to estimate that a greater proportion of their patients actually received such counselling ( $p = 0.011$ ). Doctors' estimate of the proportion of patients that they believed will benefit from nutrition care differed by their attitudes towards nutrition care ( $p = 0.002$ ). However, their estimate of the proportion of patients that actually received nutrition care was independent of their attitudes towards nutrition care ( $p = 0.527$ ).

### Referral to Dieticians/Nutritionist

More than three quarters (84.8%,  $n = 95$ ) of doctors referred patients to dieticians. Fifty-seven percent ( $n = 49$ ) reported

**Fig. 1** Participants' estimates of the proportion of their patients they believed would benefit from nutrition care and the proportion of patients actually receiving such counselling



making fewer than 10 referrals; 18.6% ( $n = 16$ ) made 10–20 referrals and 24.4% ( $n = 21$ ) made > 20 referrals in the last 12 months. Frequency of referrals did not differ by the proportion of patients doctors believed will benefit from nutrition care ( $p = 0.726$ ) or with the proportion of patients actually receiving nutrition care ( $p = 0.527$ ) or with the amount of time spent providing nutrition care ( $p = 0.358$ ). In addition, frequency of referrals was not associated with type of practice ( $p = 0.379$ ); medical school graduated ( $p = 0.089$ ); number of years since graduating from medical school ( $p = 0.830$ ); doctor's age ( $p = 0.956$ ), gender ( $p = 0.643$ ); doctor's place of practice ( $p = 0.274$ ) and attitudes towards nutrition care ( $p = 0.450$ ). Doctors who were more comfortable discussing nutrition with their patients were more likely to refer patients to dietitians/nutritionists for specialist care ( $p = 0.032$ ). The number of times doctors referred patients to dietitians was independent ( $p = 0.840$ ) of their level of comfort when discussing nutrition topics with patients or with their attitudes towards nutrition care ( $p = 0.532$ ).

Doctors referred patients to dietitians for varied medical conditions, including general nutrition (7.1%,  $n = 7$ ), malnutrition (37.8%,  $n = 37$ ) and chronic conditions such as diabetes (55.1%,  $n = 54$ ).

Doctors had several and varied reasons for referring patients to dietitians. Doctors said they referred patients as a result of high patient load as illuminated in the following code “*Too many patients to attend to*”. (Participant 10, Male Medical Officer).

Another reason for referral was to allow the patients to obtain specialist care as demonstrated in the following code “*Provide some advice but prefer expert opinion since management of cases is a shared responsibility*”. (Participant 14, Male Senior Specialist).

Other reasons provided by the doctors were availability of nutritionists/dietitians to refer patients to, to help motivate patient and reinforce advice given and inadequate knowledge and skills to provide nutrition care. These reasons are substantiated by the following codes.

“*There is a nutritionist available who would do a better job.*” (Participant 101, Male Medical Officer).

“*I do counsel, but refer them for reinforcement.*” (Participant 89, Female Specialist).

“*I am not well-versed in the detailed caloric contents of our local foods.*” (Participant 88, Female Resident).

### Doctors' Reported Barriers to the Provision of Nutrition Care

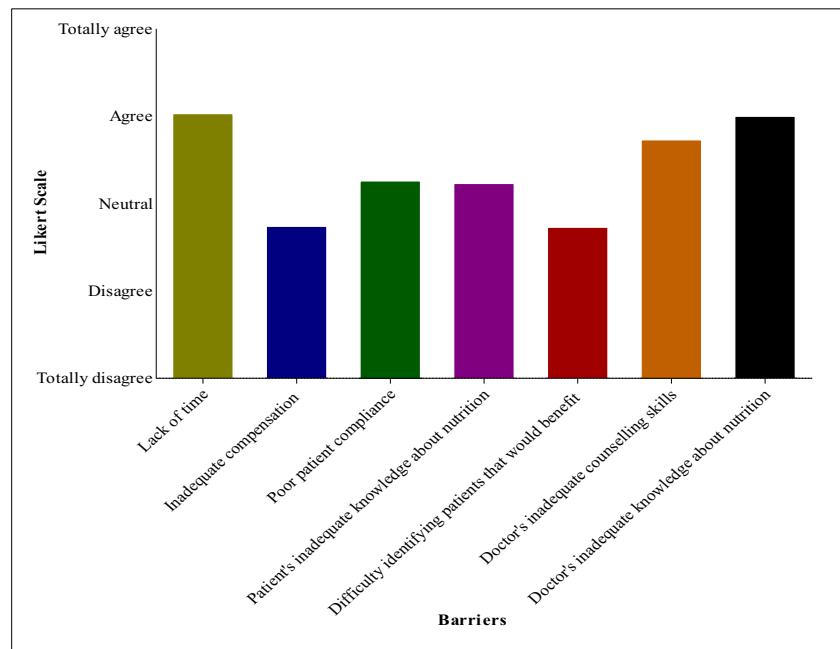
Commonly perceived barriers were lack of time, doctor's inadequate knowledge about nutrition and inadequate counselling skills (shown in Fig. 2).

### Nutrition Training during Medical School

About 66% ( $n = 66$ ) of the doctors said they had inadequate nutrition education during medical school, whereas 33.3% ( $n = 33$ ) and 1.0% ( $n = 1$ ) said it was adequate and more than adequate respectively. This finding was independent of gender ( $p = 0.178$ ), age ( $r = 0.147$ ;  $p = 0.107$ ), number of years since graduation ( $r = 0.075$ ;  $p = 0.476$ ), type ( $p = 0.085$ ) and place of practice ( $p = 0.289$ ). More than 70% of the participants were either unsatisfied or undecided regarding the quality and quantity of their nutrition educational experiences during medical school (shown in Table 2). These findings did not differ by gender ( $p = 0.082$ ), age ( $r = 0.149$ ;  $p = 0.055$ ), number of years since graduation ( $r = 0.172$ ;  $p = 0.100$ ), type ( $p = 0.059$ ) and place ( $p = 0.305$ ) of practice. Adequacy of nutrition education and satisfaction with nutrition educational experiences correlated positively ( $r = 0.561$ ;  $p < 0.001$ ). Notably, doctors who graduated from foreign medical schools were more likely ( $p = 0.023$ ) than their local counterparts to be more satisfied with their nutrition educational experiences during medical school and also felt more adequately prepared from their nutrition training ( $p = 0.036$ ). Doctors who said their nutrition education was adequate ( $r = 0.200$ ;  $p = 0.016$ ), and those who felt more satisfied with their nutrition educational experiences during medical school ( $r = 0.218$ ;  $p = 0.002$ ) were more likely to report being more comfortable discussing nutrition topics with their patients. However, the perceived adequacy of, and satisfaction with nutrition



**Fig. 2** Barriers to providing nutrition care in the general practice setting



education experiences were not associated with doctors' estimate of the proportion of their patients they believed will benefit from nutrition care ( $p = 0.864$ ) or proportion of their patients that actually received such care ( $p = 0.784$ ). Doctors who perceived their nutrition education to be inadequate significantly reported spending 2 min or less counselling patients about nutrition (15.3 vs. 10.0%;  $p = 0.009$ ).

### Nutrition-Related Training and Learning Resources for Continuing Education in Nutrition

Regarding training types that had contributed to doctors' current nutrition care competencies, reading and self-directed learning had the largest contribution (46.4%), followed by clinical practice (32.3%) and undergraduate medical curriculum (25.3%). Conferences/workshops had the least contribution (12.1%). Doctors were asked to indicate the effectiveness of a number of nutrition learning resources in improving their continuing education in nutrition. The participants said all the

listed nutrition learning/training resources could be effective in improving their nutrition counselling skills and did not consider one modality to be more effective than the other. Considering the use of those nutrition-related learning resources, only 41% ( $n = 55$ ) were currently using any of them (shown in Fig. 1). Among those that were using, 43% ( $n = 17$ ) were currently calling nutritionists or dietitians for consultation. Although less than half of the participants were currently using a nutrition-related learning/training resource, more than 80% of them said they were likely to use them in future (shown in Fig. 3).

### Discussion

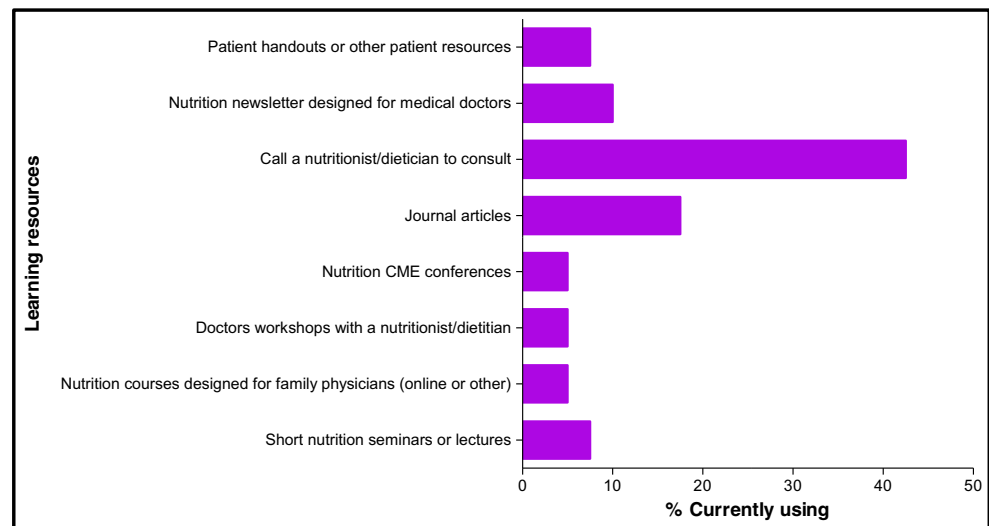
In this study, we evaluated doctors' nutrition care competencies, practices and barriers to nutrition care. In addition, nutrition education during medical school and continuing education in nutrition were also investigated. Doctors' comfort

**Table 2** Doctors' level of satisfaction with their nutrition educational experiences during medical school

Nutrition educational experiences	Dissatisfied	Neutral	Satisfied	Weighted average
Amount of time dedicated for nutrition	46 (46.9%)	20 (20.4%)	32 (32.6%)	2.71
Integration of nutrition content into courses/blocks	43 (43.9%)	19 (19.4%)	36 (36.8%)	2.86
Inclusion of materials to promote independent study of nutrition	49 (50.0%)	19 (19.4%)	40 (31.6%)	2.74
Nutrition course content in general	49 (50.0%)	21 (21.4%)	28 (18.6%)	2.73
Mean satisfaction score = 2.74 (1.09)				

Responses for dissatisfied and somewhat dissatisfied were summed to yield dissatisfied. Responses for satisfied and very satisfied were summed to generate satisfied. Frequencies do not add to 99 due to missing responses

**Fig. 3** The proportion of respondents indicating that they were currently using the listed resources; some respondents were using more than one resource



levels were varied, but they had positive attitudes and believed they had an important role to play in nutrition care. Furthermore, doctors believed a greater majority of their patients will benefit from nutrition care than they could effectively provide. Lack of time, inadequate knowledge and counselling skills were the most common barriers to nutrition care. The doctors were unsatisfied with their nutrition educational experiences in medical school and felt inadequately trained to provide nutrition care. Very few were currently using nutrition-related learning resources, although a large majority of them felt that those resources could be effective in improving their nutrition care competencies.

As shown in previous reports [24, 33], the majority of doctors estimated that a greater proportion of their patients will benefit from nutrition care; however, they were unable to provide such care given that they estimated a fewer proportion of their patients actually received the needed nutrition care. A number of barriers were identified for this situation including lack of time, inadequate knowledge in nutrition care and poor nutrition care skills [11, 24].

Corroborating with previous reports [24, 33], almost all doctors referred patients to dietitians for further nutrition care. This may suggest that doctors recognised the benefits of multidisciplinary team-based approach to the provision of patient care and readily supported it. In addition, they may also be aware of their limitations regarding nutrition care and recognise the need to grant their patients the opportunity to seek for specialised nutrition care. These assertions are further illuminated by the reasons given by doctors for referring their patients to dietitians/nutritionist in which majority of them said they referred patients to give them the opportunity to receive expert and specialised care in nutrition. It is, however, worth noting that doctors' frequency of referring patients to dietitians did not correspond with the number of patients they believed will benefit from nutrition care. Consequently, several patients may be needing nutrition care but are not referred

as needed. Future studies should explore why doctors may not be referring patients to dietitians/dieticians as patients may need it. Given that doctors recognise the role of dietitians/nutritionist in the provision of nutrition care, encouraging doctors to refer patients to these healthcare professionals may improve the provision of nutrition care to patients and subsequently leading to improved clinical outcomes.

Doctors showed moderate comfort levels in their ability to discuss nutrition topics with their patients. Previous reports have noted doctors' ambivalent confidence and self-efficacy in the provision of nutrition care [24, 25, 33, 34]. Taking cognisance of the important role of these in improving doctors' nutrition practice behaviour, it is imperative to design educational interventions that can improve the comfort/self-efficacy/confidence levels of doctors. These interventions should be implemented during medical school training and as continuing nutrition education programmes for doctors already in practice.

Reassuringly, doctors had positive attitudes towards the importance and role of nutrition in patient care to improve clinical outcomes. These findings are corroborated by previous reports among doctors [24, 25, 33, 34] and medical students [13, 29, 32].

Attitude and self-efficacy (referred to as comfort levels) that were found to be positively correlated in this study are important determinants of nutrition practice behaviour. It is thus unsurprising that doctors who felt more comfortable discussing nutrition topics with their patients were more likely to estimate that a greater majority of their patients will benefit from nutrition care; more likely to provide nutrition care to their patients and frequently referred patients to dietitians. Furthermore, those who had positive attitudes towards nutrition care were likely to estimate a greater proportion of their patients needed nutrition care. This is consistent with those reported by Wynn et al. among primary care physicians in Canada [24] and gives credence to the findings of a recent

realist review by Mogre et al. [30] in which they reported that improving self-efficacy (measured using comfort levels) may result in improved nutrition practice behaviour. The same review added that building doctors' attitude and empathy for nutrition care may be more important in determining nutrition practice behaviour than increasing doctors' knowledge only.

Another important finding of this study was that number of years after graduation correlated positively with the comfort level of doctors as those who graduated from medical school more than 10 years ago were more likely to report being more comfortable discussing nutrition topics with their patients compared to those who graduated in the recent 10 years. Given that majority of doctors indicated that clinical practice moderately contributed to their current nutrition care competence, it may suggest that longer duration of patient care, which relates to greater number of years after graduation may have exposed doctors to nutrition issues, granted them opportunities to participate in continuing nutrition education workshops and to learn more about nutrition.

Despite the doctors' recognition of nutrition care as being highly relevant to their practice as well as recognising it as their responsibility, majority of them were unsatisfied with their nutrition educational experiences during medical school and felt they had been inadequately trained for nutrition care. These findings, together with those of previous studies [10, 14, 24] recognise the need to identify nutrition education that is deemed essential by medical doctors. As shown previously and in the current study, doctors' perception of being inadequately trained in nutrition may demotivate them from effectively providing nutrition care to their expectant patients.

Only 41% of doctors were currently using any nutrition-related learning resource for continuing nutrition education. These findings are similar to those reported among family physicians in Canada [24]. It is, however, strange and concerning that these doctors reportedly considered nutrition care to be highly relevant to their practice, felt inadequately prepared for nutrition care but were not currently using any learning/training resources for their continuing education in nutrition. Future studies should explore reasons for doctors' apparent poor interest in using nutrition-related learning/training resources, although they report being inadequately trained.

Notwithstanding the fact that a greater majority of the doctors were not currently using any nutrition-related learning/training resource, they however considered all the strategies to be effective and were more likely to use them in the future for their continuing education in nutrition-related topics. This is similar to findings reported by Wynee et al. [24] but contrary to previous reports in which doctors have considered patient pamphlets and reading of peer-reviewed nutrition journals to be more useful [35, 36].

It is important to note that among the few doctors that were currently using a nutrition-related learning/training resource for their continuing education in nutrition, majority of them consulted their nutritionists/dietician to seek further information or clarification regarding nutrition care of their patients. This finding is consistent with those reported by Wyne et al. [24] among Canadian family physicians and Mihalynuk et al. among residents in Washington [36]. This is a demonstration of the multidisciplinary approach needed for nutrition care and the doctors' recognition of the important role of the dietician/nutritionist in patient care.

Consistent with previous studies perceived adequacy and satisfaction with nutrition education were significantly associated with doctors comfort levels when discussing nutrition topics with their patients [10, 23, 37].

Our finding that doctors from foreign trained medical schools felt more satisfied with their nutrition educational experiences and adequately prepared in nutrition than their Ghanaian trained counterparts presents yet another important reason for the revision and identification of avenues for the inclusion of nutrition education into the medical curricula in Ghana.

### Limitations, Strengths and Future Research Directions

It is imperative to note the limitations of this study. The self-report nature of the questionnaire might have influenced the responses of the doctors. However, the self-critical responses provided by the doctors might have minimised the effect of this limitation. The response to the survey was low and the participants may be those who have interest in nutrition, which might not be representative of the general population of medical doctors in Ghana. This limitation is not peculiar to the current study as previous studies among similar populations have reported low responses to surveys evaluating nutrition practice, education and competencies [33, 36, 38]. In addition, the effect of this limitation may be minimal given that a high completion rate of the survey items were recorded and also the findings are consistent with those of previous studies from the same setting that had higher responses rates [13, 14]. The cross-sectional nature of the study makes it difficult to establish causality. Notwithstanding the limitations, this study has important strengths worth reporting. It is the first study in sub-Saharan Africa to evaluate doctors' nutrition care practice behaviour, comfort levels, attitudes and barriers to nutrition care as well as the views and perceptions of doctors regarding their nutrition education in medical school. It thus makes available data that increases our understanding of the situation of nutrition education in medical education in the sub-region. Furthermore, its findings provide evidence that will serve as foundation towards identifying and defining the nutrition education and training needs of



the local medical workforce. The use of standardised and previously validated survey items have helped to increase the credibility of our findings. This study also adopted innovative non-traditional approaches, such as social media to reach out to the study participants. The varied responses provided by these doctors may represent a general observation of the nutrition education needs of Ghanaian doctors, and thus granting avenues for future studies to plan appropriately. This is particularly more relevant given that further research is required to determine doctors' priorities for nutrition care in relation with other aspects of patient care. The impact of attitudes and confidence on the actual nutrition care behaviour of doctors and its ultimate impact on the clinical outcomes of patients warrant further research. Appropriate nutrition education during medical school training and during practice is needed to allow the development of skills and confidence to support patients to make healthy dietary choices and help prevent chronic diseases.

## Conclusion

Doctors believed their patients required more nutrition care than they could provide. However, they were hindered by factors, such as lack of time, inadequate knowledge, confidence and counselling skills. Doctors' referral to dieticians/nutritionist may be important in improving patient nutrition care and clinical outcomes. The inadequacy in nutrition education may be a nationwide problem but not an issue of a single medical school and requires attention and collaboration from all medical schools together with the Ghana National Accreditation Board and the Medical and Dental Council of Ghana. Furthermore, educational interventions that improve on medical doctors' attitudes and comfort levels in providing nutrition care are urgently needed.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** Ethical approval for the study was granted by the Navrongo Health Research Centre Institutional Review Board (Ethics Approval ID: NHRCIRB209), Ghana.

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