Nurse Education in Practice 13 (2013) 355–360

Contents lists available at SciVerse ScienceDirect

Nurse Education in Practice

journal homepage: www.elsevier.com/nepr

Nutritional knowledge levels of nursing students in a tertiary institution: Lessons for curriculum planning

Christiana Buxton [a,*], Anita Davies [b,1]

[a] Department of Science and Mathematics Education, Health Sciences Education Programme,University of Cape Coast, Philips Place No. 2, New Site, Cape Coast, Ghana
[b] Department of Nursing, University of Cape Coast, Ghana

ARTICLE INFO

Article history:
Accepted 26 September 2012

Keywords:
Nursing students
Nutritional knowledge
Curriculum
University

ABSTRACT

This article presents findings of a study which assessed the nutritional knowledge levels of nursing students as nurses are in a better position to serve as nutrition educators and counselors by engaging their clients in discussions that would increase their knowledge about disease prevention and management through nutrition. This was a descriptive cross-sectional study, where a selfadministered questionnaire was completed by 166 undergraduate consenting third (3rd) and final (4th) year nursing students in a public university in Ghana who answered 20 multiple choice general nutrition questions. An average score of 8.95 ± 2.01 corresponding to 44.8%, below average, was obtained by the respondents. It was determined that the nutrition knowledge of 3.6%, 62.7% and 33.7% of the study participants was good, adequate and inadequate respectively. It was found that the differences with respect to the nutrition knowledge levels between the age groups, gender, work experience and educational background of respondents were not statistically significant at $p < 0.05$. The findings of this study support other reports that nurses need more training in nutrition and therefore have important implications for professionals planning curricula for nursing education at the undergraduate level in the university.

Introduction

Nutrition is regarded as the most controllable risk factor affecting long-term health (Warber et al., 2000; Schaller and James, 2005). As such, it is a vital component of health promotion, disease prevention and treatment. Therefore, it is important that health professionals have adequate knowledge in nutrition (Fletcher and Carey, 2011). The nutritional roles of nurses include conducting nutritional screening to identify nutritionally vulnerable patients (Ferguson and Capra, 1998; Holmes, 1999; Wilson and Lecko, 2005) and offering nutritional counselling services (Schaller and James, 2005; Henning, 2009; Waber et al., 2011).

Currently, with the upsurge of diet-related chronic diseases like heart diseases, diabetes, hypertension, obesity and cancer, an adequate knowledge regarding the dietary management of these chronic diseases is required to enable nurses impart correct information to their patients. Besides, the importance of nutrition in surgery cannot be ignored, particularly because nutritional requirements are raised during the wound healing process (Edmonds, 2007). Studies have confirmed that surgical patients confronted with malnutrition experience higher rates of complications, such as urinary tract infections, pneumonia and electrolyte imbalances, (Welch, 2008) which, in most cases, delay wound healing, compared with patients who are adequately nourished (McCamish, 1993; Potter et al., 1995).

On the basis of evidence shown in studies conducted in the United Kingdom (Elia et al., 2005; Lennard-Jones, 1992; McWhirter and Pennington, 1994), Australia (Kowanko et al., 1999) and Brazil (Isabel et al., 2003), there have been concerns regarding the deterioration in the nutritional status of patients (while on admission, which consequently affects their rate of recovery and length of stay in hospital). Among the factors identified as contributing to the frequent occurrence of malnutrition among patients is poor competence exhibited by nurses in recognizing malnourished patients or those at risk of malnutrition (McWhirter and Pennington, 1994; Kowanko et al., 1999).

The need to determine the nutritional competency levels of nursing students has been emphasized (Touger-Decker et al., 2001; Carney, 2010), perhaps because of reports that little emphasis is placed on clinical nutrition during the training of nurses (Waitzberg et al., 2001; Isabel et al., 2003). It has also been reiterated that, in most cases, what to teach health professionals

* Corresponding author. Tel.: +233 279 668 030.
E-mail addresses: naabux@yahoo.com (C. Buxton), anitadee2000@yahoo.com (A. Davies).
[1] Tel.: +233 246 452 789.

1471-5953/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.nepr.2012.09.014

under training with regard to nutrition remains a major question (Adams et al., 2006).

Crogan et al. (2001) in a similar study reported an average score of 65% among nurses from five East Washington nursing homes, while Warber et al. (2000) indicated an average nutrition knowledge score of 66% among nurses in a study conducted in England. Another study of nurses in Lebowa, South Africa, revealed that their nutritional knowledge was generally poor. An average score of 14 ± 3.8 (35%) was obtained by the study participants out of the 40 nutrition knowledge questions asked (Kpaphala et al., 1997).

Other studies conducted in Turkey (Ozcelyk et al., 2007a,b) and in Israel (Heller et al., 2007) also indicated that about 50% of nurses lacked knowledge with respect to dietary fat, types of food with the lowest glycemic index and food sources containing the different types of fatty acids.

The findings of the above-mentioned studies support the assertion by Yfanti et al. (2011) that most health professionals lack fundamental knowledge in nutrition.

In developing countries there is little published information about nurses' knowledge in nutrition (Kobe, 2006). Not many studies have been conducted to assess the nutritional knowledge of nursing students in training in particular, their knowledge levels and gaps in their knowledge in order to supply the needed inputs absent from their curriculum. Such studies are necessary because when any gaps in their knowledge are identified, then they will be addressed before the students finally graduate and start practicing in health facilities.

In view of concerns about the lack of nutritional knowledge and the insufficient nutritional education of nurses (Nightingale and Reeves, 1999; Yfanti et al., 2011), it has been deemed necessary to assess the nutritional knowledge of nursing students, identify gaps in their knowledge and, on the basis of the findings, make suggestions that can be considered to improve or modify the nutritional aspect of the nursing education curriculum.

The current study was conducted among nursing students in a university in Ghana where one nutrition course, Nutrition and Dietetics, is taught during their four years training. The course deals with functions of nutrients, nutrient requirements during the human life cycle and dietary management of deficiency and chronic diseases. The course does not address other basic nutrition topics on non-nutrient dietary food substances, such as fibre and cholesterol and the relationship between nutrients.

The aim of this paper, therefore, is to present the findings of a study which sought to assess the nutritional knowledge of nursing students in a developing country. Apart from the survey results which will provide baseline data regarding the knowledge of nutrition among nursing students in such a country, the results will also be useful to nursing departments in determining the needs and methods to improve nutrition education in their educational programmes.

Methods

This was a descriptive cross-sectional study designed to assess the nutritional knowledge of nursing students at a public university in Ghana. The study was carried out to identify 'gaps' in the nutritional knowledge of nursing students and to find out whether any knowledge level differences existed between diploma holders, that is, students who had received training at the Nurses Training College (NTC) and non-diploma holders, that is, students who had not been to the NTC.

Study participants

Participation was voluntary. Out of a total number of 280 3rd year and final year nursing students in the university, 178 gave their consent to participate in the study; but complete data were finally obtained from 166 nursing students representing approximately 59.3% of the population. Confidentiality was maintained and anonymity of responses was ensured.

Data collection

Self-administered questionnaires were distributed to third (3rd) and final (4th) year students after a pilot study. The questionnaires were modified versions of nutritional knowledge questionnaires employed in similar studies on Turkish nurses (Ozcelyk et al., 2007a,b), Canadian physicians (Temple, 1999) and Kenyan nurses (Kobe, 2006). Information sought from the subjects included demographic data, educational background, knowledge about nutrition and ability to apply nutritional knowledge to their career.

Data analysis

The data were analysed using the Statistical Package for the Social Sciences (SPSS) programme, (version 16.0). Each correct multiple choice question was assigned a score of 1 mark (with a maximum possible score of 20 marks). In addition, the nutritional knowledge level scores of the respondents were categorized as follows: 17–20 marks (very good), 13–16 marks (good), 9–12 marks (adequate), 8 marks and below (inadequate).

Descriptive statistics were run to summarize the data collected; and the results were displayed in frequencies, percentages and means. Analyses that were conducted included the independent-sample test to assess whether a significant difference existed between males and females with regard to their nutritional knowledge. In addition, the one way analysis of variance (ANOVA) was used to assess whether any significant difference existed between the age groups, educational backgrounds and work experience backgrounds with regard to the nutritional knowledge of respondents. A statistical significance level (p-value) of <0.05 was used in this study.

Results

Characteristics of study subjects

The background characteristics of the nursing students who participated in the study are presented in Table 1.

The study sample comprised 52 (31.3%) males and 114 (68.7%) females. Most of the respondents, 140 (84.3%), were between the ages of 25 and 34 years; and only 6 (3.6%) were above 44 years. The study revealed that of the total number of 166 respondents, 126 (75.9%) had diploma certificates from the Nurses Training College, though only 111 (66.9%) worked as nurses before enrolling in the degree programme at the university. Of the 126 respondents who were diploma holders, 112 (88.9%) indicated that they had completed a nutrition-related course at the Nurses Training College; and 88 (78.6%) of that number stated that they were able to apply the nutritional knowledge acquired when they worked as nurses. At the university level, a vast majority, 154 out of the 166 respondents (92.8%), indicated that they had completed a nutrition-related course in the university; and a similarly large majority, 157 (94.6%) out of the total population indicated that they were in a better position to apply the nutritional knowledge acquired at the university to their future career as nurses. Most of the respondents (62.0%) indicated that their main source of nutritional information was from nutrition books, rather than the internet or lectures.

The percentage distribution of students who gave correct answers to the nutrition knowledge questions presented in Table 2.

Table 1
Background information about nursing students.

Variable/Statement	*n*	Percentage (%)
Age group (years)		
<25	6	3.6
25–34	140	84.3
35–44	14	8.4
45–54	6	3.6
Educational background and work experience		
Group A[a]	40	24.1
Group B[b]	15	9.0
Group C[c]	111	66.9
Completion of a nutrition course at the Nursing Training College		
Yes	112	88.9
No	14	11.1
Ability to apply nutrition knowledge acquired (for diploma holders, $n = 112$)		
Yes	88	78.6
No	24	21.4
Completion of a nutrition course in the university		
Yes	154	92.8
No	12	7.2
Ability to apply nutrition knowledge acquired in the university		
Yes	114	68.7
No	52	31.3
Main source of nutritional information		
Nutrition Books	103	62.0
Internet	33	19.9
Television/Radio	8	4.8
Magazines, newspapers	8	4.8
Journals	3	1.8
Lecture notes	11	6.6

[a] Not a diploma holder/never worked as a nurse.
[b] Diploma holders but never worked as a nurse.
[c] Diploma holders who worked as nurses before enrolling in the university.

The mean score for correctly answered questions for all the study participants was 8.95 out of the total 20. As shown in Table 3, majority (62.7%) of the study participants had an adequate knowledge in nutrition. The results showed that 9 out of the 20 questions were answered correctly by 50% or more respondents. Some of these questions assessed respondents' knowledge of the nutrient that protects against hypertension, thrombosis and neural tube defects, the food group which has a preventive effect against some cancers, the nutrient highly deficient in alcoholics, interpretations of the body mass index indicator used for assessing the nutritional status of an individual among others. Two questions were answered correctly by only 8.4% of the respondents. One of them assessed respondents' knowledge of the nutrient whose excess intake increases loss of calcium in the body; the other tested knowledge of why a short-term diet helps in reducing body weight.

Comparisons between groups

Results indicating comparisons between groups – the age groups, the genders, those who had a nursing diploma and those who did not have, those who completed a nutrition course at the diploma level and those who did not are shown in Tables 3 and 4.

Table 3 shows that most of the study participants, 104 (62.7%) had an adequate nutritional knowledge (that is, had between 9 and 12 questions correct from the total 20). Some of the female students, 6 (5.3%), had a good knowledge in nutrition (that is, had between 13 and 16 out of the 20 questions correct). No male student had a good knowledge in nutrition, though a higher proportion of males, 69.2% compared with the 59.6% for females, had an adequate knowledge. A comparison between the groups with different educational and work experience background revealed that students who were diploma holders and had worked as nurses before enrolling in the university were more likely to have a good or adequate knowledge in nutrition than the students without such a background.

Table 2
Percentage of nursing students who provided correct answers to the various nutrition knowledge questions.

No	Abbreviated form of question	Correct answer	*n* (%)
1.	Excess of nutrient, increases body calcium losses	Protein	14 (8.4)
2.	Type of dietary fibre helps to lower blood cholesterol level	Soluble fibre	26 (15.7)
3	Major type of fatty acid in olive oil	Monounsaturated	49 (29.5)
4	Nutrient protective against hypertension	Potassium	98 (59.0)
5	Nutrient that protects against thrombosis	Omega-3 fatty acids	109 (65.7)
6	Frequent excess intake leads to toxic effect	Vitamin E	32 (19.3)
7	Substance that raises the blood HDL-cholesterol level	Alcohol	29 (17.5)
8	Proportion of daily total energy from fats	25–30%	49 (29.5)
9	Most concentrated source of vitamin B_{12}	Meat	115 (69.3)
10	Type of food group having a preventive effect against cancer	Fruits and vegetables	154 (92.8)
11	Quantity of kilocalories in 1 g of fat	9 kcal	115 (69.3)
12	Not an antioxidant nutrient	Iron	116 (69.9)
13	Nutrient highly deficient in alcoholics	Vitamin B_1 (thiamin)	157 (94.6)
14	Nutrient prevents neural tube defects	Folate	148 (89.2)
15	Hydrogenated fat compared to unprocessed vegetable oil contains	More trans fatty acids	29 (17.5)
16	Identify food source containing cholesterol	Lard	55 (33.1)
17	Rich food source of lycopene	Tomatoes	56 (33.7)
18	Identify food with lowest glycemic index	Ice cream	18 (10.8)
19	Interpretation of Body Mass Index (BMI) of 25–29.9 kg/m^2	Overweight	107 (64.5)
20	Why short-term diet helps in reduction of body weight	Causes the body to lose water	14 (8.4)

Out of the 126 diploma holders, 112 (88.8%) reported that they completed a nutrition course in the Nurse's Training College (NTC). Although the completion of the nutrition course did not appear to have given any advantage over those who did not complete such a course, all the 6 (3.6%) respondents who had a good knowledge in nutrition completed a nutrition course at the NTC.

Table 3
Nutritional knowledge levels of various categories of nursing students.

Variable	Very good *n* (%)	Good *n* (%)	Adequate *n* (%)	Inadequate *n* (%)
All study participants				
Age group (years)	0 (0.0)	6 (3.6)	104 (62.7)	56 (33.7)
<25 ($n = 6$)	0 (0.0)	0 (0.0)	5 (83.3)	1 (16.7)
25–34 ($n = 140$)	0 (0.0)	6 (4.3)	85 (60.7)	49 (35.0)
35–44 ($n = 14$)	0 (0.0)	0 (0.0)	12 (85.8)	2 (14.2)
45–54 ($n = 6$)	0 (0.0)	0 (0.0)	2 (33.3)	4 (66.7)
Gender				
Males ($n = 52$)	0 (0.0)	0 (0.0)	36 (69.2)	16 (30.8)
Females ($n = 114$)	0 (0.0)	6 (5.3)	68 (59.6)	40 (35.1)
Education/work experience				
Group A[a] ($n = 40$)	0 (0.0)	1 (2.5)	23 (57.5)	16 (40.0)
Group B[b] ($n = 15$)	0 (0.0)	1 (6.7)	6 (40.0)	8 (53.3)
Group C[c] ($n = 111$)	0 (0.0)	4 (3.6)	75 (67.6)	32 (28.8)
Completed nutrition course at diploma level ($n = 126$)				
Yes ($n = 112$)	0 (0.0)	6 (5.4)	72 (64.3)	34 (30.3)
No ($n = 14$)	0 (0.0)	0 (0.0)	9 (64.3)	5 (35.7)

[a] Not diploma holders/never worked as nurses before enrolling at the university.
[b] Diploma holders/never worked as nurses before enrolling at the university.
[c] Diploma holders in nursing/worked as nurses before enrolling at the university.

Table 4
The mean scores of various categories of nurses in respect of nutrition knowledge.

Variable	*n*	Mean score (%)	
All study participants	166	8.95 (44.8%)	
Variable	*n*	Mean score ± SD	Statistics
Gender			
Males	52	8.89 ± 2.08	$t = 0.399$
Females	114	9.02 ± 1.95	p-value = 0.690
Age group	6	8.67 ± 0.82	$F = 0.472$
>25	140	9.04 ± 2.05	p-value = 0.702
25–34	14	8.79 ± 0.51	
35–44	6		
45–54		8.17 ± 1.47	
Education/work experience			
Group A[a]	40	8.55 ± 2.136	$F = 2.140$
Group B[b]	15	8.47 ± 2.200	p-value = 0.121
Group C[c]	111	9.20 ± 1.877	
Completed nutrition course at diploma level			
Yes	112	9.14 ± 1.938	$t = 0.380$
No	14	8.93 ± 1.870	p-value = 0.705

[a] Not diploma holders/never worked as nurses before enrolling at the university.
[b] Diploma holders/never worked as nurses before enrolling at the university.
[c] Diploma holders in nursing/worked as nurses before enrolling at the university.

Table 4 shows that the highest mean scores with respect to nutrition knowledge level were obtained in the following groups: the females, the group aged 25–34 years, Group C (diploma in nursing holders who had some work experience in nursing before enrolling at the university) and the respondents who indicated that they completed a nutrition-related course at the Nurses' Training College (NTC). These groups had more students who obtained good scores ranging between 13 and 16 marks (65–80%).

The differences between the mean scores of the various groups with regard to nutrition knowledge levels were not statistically significant. For example, although respondents who had a nursing diploma certificate and had some work experience in nursing before coming to the university (Group C) obtained the highest mean score (9.20) compared with the other groups, the difference was not statistically significant ($p = 0.121$). Likewise, even though respondents who indicated that they completed a nutrition-related course at the NTC obtained a higher mean score (9.14), compared with those who did not study any nutrition course (8.93), the difference was not statistically significant ($p = 0.380$).

Discussion

Nutrition education in nursing schools has been described as narrow at the undergraduate level (La Trobe University, 2003; Arroyo et al., 2008), and the findings of some studies indicate that most practising registered nurses do not update their knowledge in nutrition (Crogan et al. (2001); Arroyo et al., 2008). As the need for an adequate and up to date nutritional knowledge among nurses increases, it has become important to assess the nutritional knowledge of nursing students and use it as a basis for suggestions that can be applied to update the curriculum in the training of nurses.

The results of the present study indicated that the mean score for correctly answered questions by all the study participants was 8.95 ± 2.01 (44.8%) out of the total 20, suggesting that the nutritional knowledge of nursing students was not adequate as has been reported in similar studies previously conducted among nurses in England (Warber et al., 2000), the United States (Crogan et al. (2001)), Australia (Schaller and James, 2005), Kenya (Kobe, 2006), Turkey (Ozcelyk et al., 2007a,b), Denmark (Lindorff-Larsen et al., 2007), Denmark, Sweden and Norway (Mowe et al., 2008), Greece (Yfanti et al., 2011) and in a review paper by Fletcher and Carey (2011).

In a study conducted among nurses in Lobewa, South Africa, the researchers reported that the respondents' nutritional knowledge was generally poor. Out of the 40 nutrition knowledge questions, an average of 14 questions items were answered correctly, resulting in a score of 35%, a performance below average (Kpaphala et al., 1997). In another study conducted in Kenya, an average nutrition knowledge score of 57% was obtained (Kobe, 2006). Similar studies undertaken in the developed countries revealed a higher average score compared with those in the developing countries. For example, the findings of a similar study indicated that Australian nurses obtained an average score of 60.2% (Schaller and James, 2005). Similarly, in another study among nurses in the United States, an average score of 65% was obtained (Crogan et al., 2001).

The findings in the present study revealed that most nursing students had knowledge in some fundamental areas in nutrition. For example, more than 90% of the study participants knew that the food group, fruits and vegetables, has a preventive effect against many types of cancers; and the nutrient (thiamin/Vitamin B_1) is highly deficient in alcoholics. This finding is consistent with that of a similar study among nurses in Turkey where it was also reported that 90% of the participants knew that the food group believed to have a preventive effect on various types of cancers is fruits and vegetables (Ozcelyk et al., 2007a,b). Likewise, in a similar study in Canada, it was reported that 95% of the respondents knew that thiamin (vitamin B_1) is the common nutrient deficient in alcoholics (Temple, 1999).

On the other hand, the study participants demonstrated that they lacked knowledge in other aspects of basic nutrition, with less than 50% of respondents providing correct answers to some questions. The questions that were answered correctly by less than 50% of the respondents include the following: the type of dietary fibre which helps in lowering the cholesterol level in the blood (15.7%), the major type of fatty acid present in olive oil (29.5%), food sources which increase high density lipoprotein (HDL) cholesterol levels in the blood (17.5%), food sources containing cholesterol (33.1%), food sources with the lowest glycemic index (10.8%), among others. In a similar study in Turkey, Ozcelyk et al. (2007a, b) reported that less than 50% of the study participants knew the following: the types of food with the lowest glycemic index value, the factor which increases the HDL-cholesterol level in the blood, the type of fibre which helps in the lowering of cholesterol levels in the blood and the main type of fatty acid present in olive oil. Similarly, in a study among nurses in Israel, it was revealed that nurses lacked knowledge in the area of dietary fat, definition of glycemic index and in the identification of food sources containing the different types of fatty acids (Heller et al., 2007). The results of the present study suggest that, generally, nursing students have limited knowledge regarding low-cholesterol diets, sources of water-soluble fibre and the major types of fatty acids that may be present in food. The implication of this finding is that nurses are likely not to have an adequate knowledge of specific food items that can help in the prevention and management of cardiovascular diseases and other related health conditions like obesity. This is of great concern, particularly considering the soaring trends in the prevalence of diabetes and other cardiovascular diseases not only in Ghana (Yeboah, 2007) but also in other countries, both developed and developing (Nugent, 2008).

In addition, the findings of the current study suggest that most nursing students do not have an adequate knowledge of the metabolism of nutrients. This was evident from the fact that only 8.4% and 19.3% of the study participants respectively knew that excess intake of protein results in calcium losses, and excess intake of vitamin E in the form of supplements causes toxicity.

Most of the respondents (62.7%) can be described as having an adequate knowledge in nutrition comparable to the finding of

Ozcelyk et al. (2007a, b) in Turkey where 56.9% of nursing students were described as having an adequate knowledge in nutrition. The poor performance of the participants in general in the present study can perhaps be attributed to the little emphasis or priority given to nutrition during the training of nurses as asserted in past studies (Waitzberg et al., 2001; Isabel et al., 2003; La Trobe University, 2003; Arroyo et al., 2008).

The present study revealed that in respect of nutrition knowledge, the highest mean scores were observed in the following groups: females, diploma holders who worked as nurses before enrolling at the university and respondents who indicated that they completed a nutrition-related course at the Nurses' Training College (NTC). This finding corroborates those of similar studies conducted among Australian and Turkish nurses in which it was asserted that the nutrition knowledge scores of respondents with many working years experience prior to enrolling in a university degree programme were significantly higher than those of respondents with less or without any work experience (Schaller and James, 2005; Ozcelyk et al., 2007a,b). This suggests that at the NTC, nurses obtained some knowledge in nutrition which was further built upon at work, giving them an upper hand over their counterparts who had no work experience in nursing before enrolling at the university.

Although the average score of females was higher compared with that of their male counterparts, the difference was not statistically significant. This finding supports that of a similar study conducted in Kenya where there was no significant difference in the mean knowledge score between male and female nurses (Kobe, 2006).

Most of the respondents (62.0%) indicated that their main source of nutritional information was nutrition books. Although students are encouraged to broaden their knowledge by reading books, in a similar study in which nutrition books and other reading materials were distributed to nursing students to help improve their knowledge in nutrition, it was observed that the difference between the results before and after nurses had completed reading the nutrition books and other reading materials was not statistically significant. The researchers therefore concluded that nutrition education solely through the distribution of reading materials is not an effective strategy to employ when imparting nutritional knowledge to nursing students (Thomas, 2006). Cadman and Findlay (2005) asserted that an active involvement of dieticians in the training of nursing students, particularly during their in-service training, improved their nutritional knowledge and also improved their confidence as they offered dietary advice to their patients. It is worthwhile considering this point in planning the curriculum to give students the opportunity to apply their theoretical knowledge in the field while being mentored by a dietician or a nutritionist.

The limitations of this include the small sample size used in this study and the fact that only one public university was studied instead of including the other two public universities where the nursing undergraduate degree programme is also being offered in Ghana. The response rate was also approximately 59.3% which to an extent may not give a wider representation of the study participants.

Conclusions and recommendations

The results of this study indicate that there are gaps in the nutritional knowledge of nursing students in the institution which was studied. Therefore these students are likely to have problems in offering nutritional counselling services to their patients particularly in the absence of a dietician. The study also provides clear evidence that nursing students need more education in nutrition, particularly because basic concepts in nutrition such as metabolism of nutrients, relationship between nutrients and dietary non-nutrient substances such as fibre and cholesterol were not known by most of the surveyed students. It would be worth considering adding an elementary nutrition course in which students are introduced to the most basic concepts in nutrition, including the metabolism of nutrients, sources of nutrients, functions, recommended intakes in humans and toxicity effects in the body before advanced courses like Nutrition and Dietetics are taught to help students identify specific diets recommended in the treatment and management of various diseases and health conditions.

A suggestion for further study is to include other universities to obtain findings that will reflect the situation in Ghana. Again, another suggestion is to conduct similar studies for diploma students at the Nursing Training College level in order to identify their knowledge gaps at that level since some of these students are likely not to enrol in the university after training at the Nursing Training College.

References

Adams, K.M., Lindell, K.C., Kohlmeier, M., Zeisel, S.H., 2006. Status of nutrition education in medical schools. American Journal of Clinical Nutrition 83 (4), 941S–944S.

Arroyo, M., Rocandio, A.M., Ansotegui, L., Pascual, E., Martínez, C. De La Pera, 2008. Cooperative learning strategies to teach nutrition to geriatric nursing staff. Archivos Latinoa Americanos de Nutricion 58 (1).

Cadman, L., Findlay, A., 2005. Assessing practice nurses change in nutrition knowledge following training from a primary care dietician. Nurse Education Today 25 (5), 405–412.

Carney, T.A., 2010. Knowledge, comfort level and the perceived role of nurses in promoting nutritional management of diabetes. M.Sc thesis. Drexel University, Pennsylvania, USA.

Crogan, N.L., Shultz, J.A., Massey, L.K., 2001. Nutrition knowledge of nurses in long-term care facilities. Journal of Continuing Education Nursing 32, 171–176.

Edmonds, J., 2007. Nutrition and wound healing: putting theory into practice. British Journal of Community Nursing 12 (12), 31–34.

Elia, M., Zellipour, L., Stratton, R.J., 2005. To screen or not to screen for adult malnutrition? Clinical Nutrition 24 (6), 867–884.

Ferguson, M., Capra, S., 1998. Nutrition screening practices in Australian hospitals. Australian Journal of Nutrition and Dietetics 55, 157.

Fletcher, A., Carey, E., 2011. Knowledge, attitudes and practices in the provision of nutritional care. British Journal of Nursing 20 (10), 570–574.

Heller, T., Maislos, M., Shahar, D., 2007. Physicians' and nurses' knowledge and attitude towards nutritional therapy in diabetes. Harefuah 146 (9), 670–674.

Henning, M., 2009. Nursing's role in nutrition. CIN: Computers, Informatics, Nursing 27 (5), 301–306.

Holmes, S., 1999. Hospital-related Malnutrition Nursing Times Clinical Monographs, vol. 3. Emap Healthcare Ltd., London.

Isabel, M., Correia, T.D., Waitzberg, D.L., 2003. The impact of malnutrition on morbidity, mortality, length of hospital stay and cost evaluated through a multivariate model analysis. Clinical Nutrition 22 (3), 235–239.

Kobe, J.A., 2006. Aspects of nutritional knowledge, attitudes and practices of nurses working in the surgical division at the Kenyatta National Hospital, Kenya. University of Stellenbosch, South Africa. Unpublished Master's thesis.

Kowanko, I.C., Simon, S., Wood, J., 1999. Nutritional care of the patient: nurses' knowledge and attitudes in an acute care setting. Journal of Clinical Nursing 1999 (8), 217–224.

Kpaphala, M.S., Wodarskit, L., Garrison, M.E.B., 1997. Nutrition knowledge of clinical nurses in Lobewa, South Africa. Implications for nutrition service delivery. Journal of Human Nutrition and Dietetics 10, 295–303.

La Trobe University, October, 2003. Bachelor of nursing curriculum document. Submission to the Nursing Board of Victoria.

Lennard-Jones, J., 1992. A Positive Approach to Nutrition as Treatment. King's Fund Centre, London.

Lindorff-Larsen, K., Rasmussen, H.H., Kondrup, J., Staun, M., Ladefoged, K., 2007. Management and perception of hospital undernutrition – a positive change among Danish doctors and nurses. Clinical Nutrition 26 (3), 371–378.

McCamish, M., 1993. Malnutrition and nutrition support interventions: costs, benefits and outcomes (editorial). Nutrition 9, 556–557.

McWhirter, J., Pennington, C., 1994. Incidence and recognition of malnutrition in hospital. British Medical Journal 308 (6934), 945–948.

Mowe, M., Bosaeus, I., Rasmussen, H.H., Kondrup, J., Unosson, M., Rothenberg, E., 2008. Irtun. Insufficient nutritional knowledge among healthcare workers? Clinical Nutrition 27 (2), 196–202.

Nightingale, J.M.D., Reeves, D., 1999. Knowledge about the assessment of under-nutrition: a pilot questionnaire in a UK teaching hospital. Clinical Nutrition 18, 23–27.

Nugent, R., 2008. Chronic diseases in developing countries, health and economic burdens. Annals of the New York Academy of Sciences 1136, 70–79. http://dx.doi.org/10.1196/annals.1425.027. New York.

Ozcelyk, O.A., Surucuoglu, M.S., Akan, L.S., 2007a. Nutrition knowledge level of nurses in Turkey: Ankara as an example. Pakistan Journal of Social Sciences 4 (3), 485–489.

Ozcelyk, O.A., Surucuoglu, M.S., Akan, L.S., 2007b. Survey on the nutrition knowledge level of Turkish physicians: Ankara as a sample. Pakistan Journal of Nutrition 6 (6), 538–542.

Potter, J., Klipstein, K., Reilly, J., Roberts, M., 1995. The nutritional status and clinical course of acute admissions to a geriatric unit. Age and Ageing 24 (2), 131–136.

Schaller, C., James, E.L., 2005. The nutritional knowledge of Australian nurses. Nurse Education Today 25, 405–412.

Temple, N.J., 1999. Survey of nutrition knowledge of Canadian physicians. Journal of the American College of Nutrition 18 (1), 26–29.

Thomas, K., 2006. Can Mental Health Nurses Improve Their Nutrition Knowledge after Exposure to a Nutrition Education Resource?. Retrieved May 25, 2011, from: www.Otago.ac.nz/humannutrition/dietetics/summary%20of%20Findings/Kate-Thomas.pdf.

Touger-Decker, R., Barracato, J.M.B., O'Sullivan-Maillet, J., 2001. Nutrition education in health professions programmes: a survey of dental, physician assistant, nurse practitioner, and nurse midwifery programmes. Journal of the American Dietetic Association 101, 7.

Waitzberg, D.L., Caiaffa, W.T., Correia, M.I.T., 2001. Hospital malnutrition. The Brazilian National survey study of 4000 patients. Nutrition 17, 575–580.

Warber, J.I., Warber, J.P., Simone, K.A., 2000. Assessment of general nutrition knowledge of nurse practitioners in New England. Journal of the American Dietetic Association: Research and Professional Briefs 100, 368–370.

Waber, J.I., Simone, M.S., Warber, C.P., 2011. Assessment of nutrition knowledge of nurse practitioners in New England. Nurse Education Today 31 (2), 192–197.

Welch, R., 2008. Considering the factors affecting nutritional status. Nursing and Residential Care 10 (10), 481–486.

Wilson, R., Lecko, C., 2005. Improving the nutritional care of patients in Hospital. Nursing Times 101 (32), 28–30.

Yeboah, L.A., 2007, March 26. Ghana Has More Obese People. Daily Graphic, p. 5.

Yfanti, E., Tsiriga, S., Yfantis, A., Tiniakou, I., Mastrapa, E., 2011. Nutrition knowledge in students of a nursing school. Health Science Journal 5 (2), 118–127.