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Authors

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Background

Between 2000 and 2014, Ethiopia made great progress in reducing rates of malnutrition among children less than five years of age. The prevalence of stunting[1] dropped from 58% in 2000 to 40% in 2014; the prevalence of underweight[2] dropped from 42% in 2000 to 25% in 2014 (CSA 2001, 2012 and 2014). Despite these improvements, malnutrition in Ethiopia still remains a major public health concern; at least 57% of under-five mortality can be attributed directly or indirectly to malnutrition (FMOH, 2005). Ethiopia is among the 36 countries with the highest burden of malnutrition (Black et al., 2008).

The Government of Ethiopia, in collaboration with nutrition development partners, has worked to reduce mortality by improving the nutritional status of mothers and children. In 2008, a National Nutrition Strategy was developed to address malnutrition, with a focus on reducing stunting in a comprehensive manner. As part of the strategy, a National Nutrition Program was developed which was aimed at improving the nutritional status of mothers and children (FMOH, 2008; GFDRE, 2013). However, the country's efforts to reduce stunting through a multi-sector approach have been hampered by the limited knowledge and skills of health care providers such as midwives and nurses. Therefore, one of the key initiatives the revised National Nutrition Program 2013 identified was the need to build institutional and human capacity for nutrition and incorporate nutrition in pre-service education of health care providers and in other relevant sectors, including agriculture and education (GFDRE, 2013). However, there are few training programs in nutrition and nutrition-related fields in the country and the capacity of these programs is limited (USAID, 2015).

In Ethiopia, frontline healthcare workers such as midwives and nurses provide nutrition services. It is important that nurses and midwives receive basic nutrition education during their pre-service education (Britton, McCormick, Renfrew, Wade, & King, 2007) and become familiar with the national nutrition strategy, nutrition program and guidelines, and malnutrition diagnosis and treatment protocols so they can provide quality nutrition services at the facility and community levels. The quality of nutrition pre-service education is one of the factors that influence the competence[3] of health care workers. Students' competence is an essential component in the measurement of education and training outcomes. Therefore, it is important to assess the degree to which practitioners can perform each of the tasks they will be required to perform at the facility and community levels (WHO, 2011).

Nurses and midwives should be able to apply nutrition principles to promote the health and well-being of mothers, children, and the population at large. Moreover, they need to understand how their work fits into the broader health and food systems. They will need sound interpersonal communication skills and the ability to work in a multi-disciplinary team with the various sectors involved in nutrition improvement programs (Fanzo et al., 2015). To meet these requirements,

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[1] *Stunting – indicator of chronic malnutrition manifested by shortness for one's age (WHO, 2010)*
[2] *Underweight – indicator of present and chronic malnutrition, manifested by low weight for one's age (WHO, 2010)*
[3] *Competence – in clinical contexts is defined as 'the habitual and judicious use of communications, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of the individual and community being served' (Epstein & Hundert, 2002; Kahn & Ramachandran, 2012).*

practitioners need competency-based education that aims to create competent and ethical professionals who are equipped with the essential knowledge, skills, and attitudes required for effective performance of their assigned tasks (Fullerton, Gherissi, Johnson, & Thompson, 2011).

To improve the competence of the nutrition workforce, higher education institutions in Ethiopia, in collaboration with nutrition projects funded by the United States Agency for International Development, revised the nutrition curriculum and strengthened the human capacity and nutrition learning environment of universities and health science colleges. The curricula of midwives and nurses were revised in light of the nutrition core competencies defined for them.

This study was conducted based on the premises that graduating midwifery and nursing students do have the required nutrition knowledge and skills competencies upon graduation to provide safe and beginning level nutrition services; and the nutrition learning environment (facility and infrastructure) and students' learning experiences are adequate for development of nutrition competencies in higher learning institutions in Ethiopia. No study has been done in Ethiopia to determine the level of nutrition competency of graduating health science students and little has been known about the factors that influence development of professional competencies in nutrition. However, one study indicated that factors that influence development of competence in nurses include both personal attributes and external factors such as the learning environment (Khomeiran, Yekta, Kiger, & Ahmadi, 2006). An understanding of these factors may help to enhance the process of developing nutrition competence in midwives and nurses. This study will add to the body of knowledge over the few studies conducted on similar cadres or other healthcare providers in other parts of the world.

The goals of this study were to: a) describe the knowledge, skills, and overall level of nutrition competence of undergraduate midwifery and nursing students, b) explore students' perception of the nutrition learning environment and experience, and c) identify factors that are associated with students' nutrition competencies.

Methods

Study Design

A cross-sectional study design was employed to assess the nutrition competences of midwifery and nursing students. This study targeted the 2015 graduating midwifery and nursing students in four public universities located in four regions in Ethiopia that received support from the United States Agency for International Development-funded Empowering New Generations to Improve Nutrition and Economic Opportunities (ENGINE) project. A total of 516 (210 midwifery and 306 nursing) students graduated from the four universities in the 2015 academic year.

Sample Size and Sample Selection

A representative sample size of 170 was calculated using the assumptions of 95% level of confidence; maximum variability of 50% nutrition competency level; design effect of 1.0 (all target universities participated); plus or minus 15 percentage points of relative errors (which is equivalent to 7.5% absolute margin of error).

The sample was adjusted using the total number of graduating students (516) and resulted in a calculated sample size of 128. The sampled students were allocated proportionally to the total number of graduating midwives and nurses—52 (41%) midwifery and 76 (59%) nursing students. Therefore, samples of 13 midwifery and 19 nursing students (total 32) per university (128/4) were randomly invited to participate in this study.

Data Collection Procedures

Three structured study instruments (for knowledge, skills, and perception assessments) were developed in reference to national nutrition core competencies defined for midwives and nurses (unpublished data), job descriptions and key nutrition tasks performed on the job, and nutrition curriculum. The assessment tools were reviewed and revised by the assessment team prior to data collection. Ten assessors were trained for two days on the assessment instruments, mainly on nutrition skills assessment using an objectively structured clinical examination (OSCE) and on data quality and ethical issues. OSCE is a skills assessment format where students rotate through a series of stations and demonstrate the correct steps of a skill or task with the assessor observing closely and checking performance with a standard checklist. It is known to be a *valid and reliable tool* for assessing skill competencies (Gormley, 2011; Khan, Ramachandran, Gaunt, & Pushkar, 2013; Smith, Muldoon, & Biesty, 2012).

The assessors were expert nutritionists, who have many years of experience working on nutrition and health service provision and in nutrition education and training. All of them were recruited from the study universities. All assessors had masters' degree or higher in health and nutrition fields with many years of training experiences including nutrition skills demonstration, coaching and mentoring. The assessors were not assigned to their own universities to avoid bias in data collection. Three supervisors were deployed to ensure data completeness and quality. Data collection was conducted in June 2015.

Students' knowledge about nutrition was assessed using competency-based objective written assessment comprised of 45 multiple choice and true false questions. Students' nutrition skill was also assessed using a five-station OSCE. A student was directly observed while she/he was demonstrating a skill in each of the manned OSCE stations. Three of the skill stations were anthropometric measurements, which are frequently performed by midwives and nurses. The stations were 1) weight measurement of children and filling growth monitoring chart; 2) measurement of mid-upper arm circumference of children; 3) height measurement of adults; 4) counseling of a mother on optimal breast feeding; and 5) demonstration of manual expression of breast milk to a mother and providing advice.

Students were required to demonstrate the correct steps of the procedure in each skill station after clear directions were provided by the assessors. The assessors closely observed while students demonstrated the steps and rated the performance of the student using objective checklists that had a three-point scale (performed correctly=2, performed partially=1, and not performed=0). Each OSCE station was attended by an assessor and every student rotated through all five stations and spent eight minutes at each station.

Students' socio-demographic characteristics were recorded and their perception of the nutrition learning environment and learning experience was captured in a one-to-one interview. The responses were rated as (yes=2, partially=1, no=0). Socio-demographic data were collected privately and no identifier related to study participants was recorded. Completed observation checklists and interview forms were stored in sealed envelopes and returned to Jhpiego office in Addis Ababa for data entry and analysis.

Data Analysis Plan

Paper-based completed data were cleaned before being entered into a computer. EpiData version 2.0.2.28 was used for data entry and exported to SPSS version 23 for data cleaning, using frequencies to detect outliers and inconsistent variables, and for further statistical analysis. The average percentage scores were calculated for each knowledge core competency area using a weighted average of competency scores.

Students' skill competence was assessed by calculating the number of steps that each student performed correctly or at least partially. The percentage scores for each station were averaged to calculate the average percentage score for all skill stations. The overall average percentage score was calculated by combining the average percentage scores of knowledge and skills assessment. A 50% government set pass score, as indicated in the Harmonized Academic Policy of Ethiopian Public Higher Education Institutions (2013), was used as the competency pass-fail cut-off point to determine level of competence of the study participants. Students' perceptions of the nutrition learning environment and their learning experience were examined by calculating the percentages of students' response as 'Yes', 'Partially', both interpreted as positive perception; or 'No' that was considered as a negative perception. 'Partially' responses were considered as positive perceptions since it means most of it is present but not completely or satisfactorily.

Statistical analyses, including Chi-square tests and independent sample *t-tests* were performed to detect statistically significant associations and differences in nutrition competences among the study participants by gender and type of profession. Linear regression models were employed to identify predictors that influence the attainment of nutrition competencies. Hence, bivariate linear regression was used to identify candidate predictors for the multivariable linear regression analysis that was fitted to differentiate predictors of the outcome variable. The outcome variable was the combined (knowledge and skill) average percentage score. Predictors were students' age, sex, type of profession, and perception of instructor effectiveness and practical sites. A *p-value* of less than or equal to 0.05 was used to determine statistical significance.

Ethical Approval and Consent to Participate

The study received ethical approval from Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB No. 6367). The study team obtained permission from all study universities to conduct the competence study. A verbal informed consent was obtained from all participants. To ensure confidentiality and comfort of the students, the interviews were conducted privately so they could not be overheard.

Results

Description of Study Participants

A total of 113 graduating midwifery and nursing students participated in this study with a response rate of 88%. The majority of study participants were male students (67.3%). More nursing students (59.3%) than midwifery students participated in the study. The mean age of the study participants was 22.7 years with more than half of them (55.8%) in the age range of 20-22 years.

Nutrition Knowledge Competency Assessment Scores

Table 1 shows that the average (arithmetic mean) percentage score for knowledge was 63.8%. There was a statistically significant difference in knowledge competency between female and male students (60.5% and 65.4%; *p=0.044)*. Male participants showed better understanding of 'nutritional assessment' than females *(p=0.032).*

Table 1: Knowledge competency average percentage score of study participants by gender (n=113)

Competency area	No. items/ questions	Average percentage score		Average composite score	*p-value**
		Female	Male		
Life cycle approach of nutrition	4	74.3	80.6	78.5	*0.119*
Nutrition promotion and community mobilization	8	70.3	73.7	72.7	*0.302*
Prevention and dietary management**	1	59.5	68.4	65.5	*0.351*
Management of malnutrition	11	60.9	65.9	64.3	*0.151*
Infant and young child nutrition	8	60.8	64.5	63.3	*0.293*
Nutritional assessment	2	50.0	65.8	60.6	*0.032*
Prevention and control of micro-nutrient deficiencies	10	50.8	56.7	54.8	*0.084*
Nutrition and HIV	1	37.8	23.7	28.3	*0.119*
Average composite score		60.5	65.4	63.8	*0.044*

Independent sample t-test
**Prevention and dietary management of diet-related non-communicable diseases*

The average percentage scores for midwives and nurses did not differ significantly in any of the eight competency areas assessed (*p>0.05*; Table 2). The participants attained the highest scores for 'life cycle approach to nutrition' (78.5%) and the lowest for 'nutrition and HIV' (28.3%).

Table 2: Knowledge competency average percentage score of study participants by type of profession (n=113)

Competency area	No. items/ questions	Average percentage score		Average composite score	*p-value**
		Midwife	Nurse		
Life cycle approach of nutrition	4	81.0	76.9	78.5	0.285
Nutrition promotion and community mobilization	8	74.2	71.5	72.7	0.388
Prevention and dietary management	1	67.4	64.2	65.5	0.727
Management of malnutrition	11	65.8	63.2	64.3	0.437
Infant and young child nutrition	8	63.0	63.4	63.3	0.907
Nutritional assessment	2	67.4	56.0	60.6	0.106
Prevention and control of micro-nutrient deficiencies	10	57.6	52.8	54.8	0.144
Nutrition and HIV	1	30.4	26.9	28.3	0.682
Average composite score		65.7	62.5	63.8	0.182

Independent sample t-test

Nutrition Skills Competency Assessment Scores

The average percentage score for skill competency of midwifery and nursing students was 46.6% (Table 3). The scores for female and male students did not show statistically significant differences (46.8% for females and 46.5% for males, *p=0.893*). Female students scored higher than male students on counseling mothers on optimal breast feeding *(p=0.025).*

Table 3: Skills competency average percentage score for midwifery and nursing students by gender (n=113)

Competency area	No. of steps performed	Average percentage score		Average composite score	*p-value**
		Female	Male		
Weight measurement and filling growth monitoring chart	10	56.2	53.8	54.6	0.493
Counseling of mother for optimal breast feeding	10	59.3	51.2	53.8	0.025
MUAC measurement**	9	40.8	48.1	45.7	0.161
Height measurement	9	42.3	47.2	45.6	0.333
Manual expression of breast milk and providing advice	11	35.3	32.0	33.1	0.462
Average composite score		46.8	46.5	46.6	0.893

Independent sample t-test
MUAC - Measurement of mid-upper arm circumference of a child

There were no statistically significant differences in skills competency between midwifery and nursing students (*p=0.192*; Table 4). Students scored the highest (54.6%) in 'weight measurement and filling growth monitoring chart' and the lowest (33.1%) in 'demonstrating mothers on manual expression of breast milk and providing advice'. Midwifery students were better in counseling mothers on optimal breastfeeding than nursing students *(p=0.001)*.

Table 4: Skills competency average percentage score for study participants by type of profession (n=113)

Competency area	No. of steps performed	Average percentage score		Average composite score	*p-value**
		Midwife	Nurse		
Weight measurement and filling growth monitoring chart	10	55.5	53.9	54.6	*0.635*
Counseling of mother for optimal breast feeding	10	60.9	49.0	53.8	*0.001*
MUAC measurement	9	41.4	48.7	45.7	*0.143*
Height measurement	9	49.0	43.3	45.6	*0.232*
Manual expression of breast milk and providing advice	11	35.1	31.7	33.1	*0.413*
Average composite score		48.4	45.3	46.6	*0.192*

*Independent sample t-test

Combined Nutrition Competence Score

The combined average percentage score (knowledge and skill) for midwifery and nursing students was 55.2% (Table 5). More male students (39.5%) than females and more midwifery (43.5%) than nursing students scored higher than or equal to the government pass score (≥50%). Overall, 38.1% of students scored equal to or above the government set pass score. There was no statistically significant difference in the combined nutrition competence score for males and females *(p=0.685)* or midwifery and nursing students *(p=0.333)*.

Table 5: Combined nutrition competence (knowledge and skill) scores of midwives and nurses (n=113)

Variable	Average % combined competency	*p-value**	Scores ≥50% (pass score) n (%)	*p-value**
Sex				
Female	53.6	*0.259*	13 (35.1)	*0.685*
Male	55.9		30 (39.5)	
Profession				
Midwife	57.0	*0.109*	20 (43.5)	*0.333*
Nurse	53.9		23 (34.3)	
Total	55.2		43 (38.1)	

*independent sample t-test

Students' Perception of Learning Process and Environment

There was no statistically significant difference between female and male students on their perception of the nutrition learning environment and experience *(p>0.05*; Table 6)*. Most students (72.6%) perceived that nutrition instructors were fair in assessing nutrition competencies. Only about a quarter (23.9%) perceived that clinical preceptors, who facilitate clinical and practical learning experience, were available at clinical settings, and 1.8% of students reported that there was a separate nutrition skills laboratory or nutrition corner in their school.

Table 6: Students' perception of learning environment and experience by gender (n=113)

Competency area	Positive Perception* n (%)		Total	*p-value**
	Female	Male		
Classroom Instructions				
Instructor was fair in students' assessment	30 (81.1)	52 (68.4)	82 (72.6)	*0.183*
Nutrition instructor was qualified to teach***	22 (59.5)	56 (73.7)	78 (69.0)	*0.135*
Instructor was effective in student-centered Learning	23 (62.2)	44 (57.9)	67 (59.3)	*0.689*
Learning resources were available and Accessible	17 (45.9)	44 (57.9)	61 (54.0)	*0.315*
Skills Laboratory				
School has nutrition skills lab/nutrition corner	1 (2.7)	1 (1.3)	2 (1.8)	*0.550*
Clinical/ Practical Teaching				
Practical learning materials adequate at practicum sites	26 (70.3)	53 (69.7)	79 (69.9)	*1.00*
Practical experience was sufficient at practicum sites	23 (62.2)	43 (56.6)	66 (58.4)	*0.685*
Practicum sites conducive for nutrition skills Learning	22 (59.5)	42 (55.3)	64 (56.6)	*0.692*
Preceptors were available at practicum sites	7 (18.9)	20 (26.3)	27 (23.9)	*0.484*

Positive perception: yes or partially yes (the latter means most of it is present but not complete or satisfactory)
**Chi-square tests
*** Qualified: has adequate knowledge and skills on nutrition

Table 7 shows that there was no statistically significant difference between midwifery and nursing students on their perception of the nutrition learning environment and experience *(p>0.05).*

Table 7: Students' perception of learning environment and experience by type of profession (n=113)

Competency area	Positive Perception n (%)		Total	p-value*
	Midwife	Nurse		
Classroom Instructions				
Instructor was fair in students' assessment	35 (76.1)	47 (70.1)	82 (72.6)	0.527
Nutrition instructor was qualified to teach**	35 (76.1)	43 (64.2)	78 (69.0)	0.217
Instructor was effective in student-centered learning	25 (54.3)	42 (62.7)	67 (59.3)	0.437
Learning resources were available and accessible	27 (58.7)	34 (50.7)	61 (54.0)	0.446
Skills Laboratory				
School has nutrition skills lab/nutrition corner	1 (2.2)	1 (1.5)	2 (1.8)	1.00
Clinical/ Practical Teaching				
Practical learning materials adequate at practicum sites	34 (73.9)	45 (67.2)	79 (69.9)	0.533
Practical experience was sufficient at practicum sites	25 (54.3)	41 (61.2)	66 (58.4)	0.561
Practicum sites conducive for nutrition skills learning	28 (60.9)	36 (53.7)	64 (56.6)	0.563
Preceptors were available at practicum sites	10 (21.7)	17 (25.4)	27 (23.9)	0.823

*Chi-square test

Determinants of Students' Nutrition Competency

The bivariate and multivariable linear regression models (Table 8) indicated that seven predictors were not associated with students' level of nutrition competency *(p>0.05)*. One predictor did show an association; students who had positively perceived that the clinical practice sites are conducive for nutrition skills learning, showed higher levels of nutrition competency, by an average percentage of 4.4%, compared to their counterparts (*p=0.022; 95% confidence intervals (CI) = 0.6 to 8.2)* when controlling other predictors.

Table 8: Bivariate and multivariable linear regression analysis for predictors of nutritional competency

Predictors	Bivariate linear regression			Multivariable linear regression		
	Crude Coef.	95% CI of Coef.	*p-value*	Adjusted Coef.	95% CI of Coef.	*p-value*
Sex						
Female (ref)						
Male	2.3	-1.7 to 6.3	*0.259*	2.2	-2.1 to 6.5	*0.321*
Age in years						
20–22 (ref)	–					
23–25	2.4	-1.5 to 6.3	*0.226*	0.5	-3.7 to 4.7	*0.814*
26–28	2.5	-7.9 to 12.8	*0.635*	1.2	-9.3 to 11.7	*0.816*
Type of profession						
Midwife (ref)						
Nurse	-3.1	-6.9 to 7.0	*0.109*	-2.5	-6.4 to 1.3	*0.195*
Instructor was effective in student-centered learning						
No (ref)						
Yes	-1.4	-5.3 to 2.4	*0.461*	–	–	–
Learning resources were available and accessible						
No (ref)						
Yes	-1.1	-4.9 to 2.7	*0.573*	–	–	–
Practicum sites conducive for nutrition skills learning						
No (ref)						
Yes	4.3	0.6 to 8.1	*0.023*	4.4	0.6 to 8.2	*0.022*
Preceptors were available at practicum sites						
No (ref)						
Yes	1.7	-2.8 to 6.1	*0.458*	–	–	–
Practical experience was sufficient at practicum sites						
No (ref)						
Yes	-3.1	-6.9 to 0.7	*0.104*	-3.1	-6.8 to 0.7	*0.111*

Discussion

This study was designed to assess the nutrition competences of midwifery and nursing students who were about to graduate from undergraduate programs from four universities in Ethiopia. Students' nutrition knowledge and skill competence was assessed. The study also looked at students' perception of the nutrition learning environment, their leaning experience and the factors that were associated with students' nutrition competence in their pre-service academic program. The study will add to the limited body of knowledge on this subject and provides baseline information for further research undertaking. The results of the study indicated that only

a little more than a third of the students scored above the pass score. If the Government of Ethiopia's goals to improve nutrition are to be met, the education of the target healthcare professionals needs to improve.

Knowledge Assessment

The nutrition knowledge assessment in general showed low scores among the study participants. However, the average score on the knowledge assessment (63.8%) is comparable to the knowledge score for physicians in a study in Canada (63.1%) which suggested that physicians need to receive more training on nutrition (Temple, 1999). Students in this study showed higher knowledge scores than practicing nurses in hospitals in Turkey – 48% (Yalcin, Cihan, Gundogdu, & Ocakci, 2013); physicians in primary health care centers in Jeddah, Saudi Arabia – 52% (Al-Zahrani & Al-Raddadi, 2009); primary care physicians in Taiwan area - 59% (Hu, Wu, & Liu, 1997); and nursing and midwifery tutors in Ghana – 36% (Ministry of Health, Republic of Ghana, 2013).

The knowledge scores for midwife and nurse students however were lower as compared to the knowledge scores for practicing physicians (74%), nutritionists (84%) and nurses (73%) in Tehran, where nutrition knowledge of all three groups was evaluated as poor, especially in areas of clinical nutrition, and effective nutrition training and continuing education had been suggested to improve their nutrition knowledge (Abdollahi et al., 2013). Another survey conducted in Iran on physicians and medical students has also indicated that nutrition knowledge of both groups was inadequate (Hosseini, Nayebi, Amirkalali, Seyedkhoei, & Heshmat, 2008).These results suggest that many medical schools around the world are not providing adequate instruction on nutrition. The scenario is similar for Ethiopia that midwives and nurses are not adequately prepared to provide quality nutrition services.

The lowest average score was seen for 'nutrition and HIV' (28.3%). While the HIV prevalence rate in Ethiopia is relatively low at 1.1%, the World Health Organization (2014) estimated that there were 753,100 people living with HIV in Ethiopia in 2015. Health care workers, particularly those working in the community, should be able to address the special needs of this population.

In the knowledge assessment, the average composite scores showed statistically significant difference between males and female students. Male students scored higher on the nutrition assessment than female students, except in the areas of nutrition and HIV, where both sexes scored the least. A similar study conducted in Ethiopia to evaluate the overall competence of graduating anesthesia students found that male students scored the highest points than their female counterparts in the competence assessment (Kibwana et al., 2016).

A review of Arrish, Yeatman, & Williamson (2014) on the role of midwives in nutrition education during pregnancy noted that midwives lack basic knowledge about nutrition during pregnancy. This review indicated that inadequate nutrition education provided at the university level may have accounted for low knowledge competency of midwives. A study in Ghana reported low scores for nurse and midwife tutors, with scores ranging from 27%–47% in basic nutrition and 57%–64% for nutritional assessment (Ministry of Health, Republic of Ghana, 2013). The study also reported that there was little difference in the scores of the tutors across the

programs studied—community health nursing diploma/certificate, midwifery, and registered general nursing programs.

Skills Assessment

The skills assessment showed that students had generally poor nutrition skills, with average composite scores below 50%. Both sexes and midwifery and nursing students have comparable competence, except in counseling skills where midwifery students were significantly better skilled than nursing students and female students were better than their male counterparts. The fact that midwifery students encounter mothers more often for counseling on issues related to nutrition and family planning may have helped them to master the counseling skills.

In the skills assessment, it was observed that both midwifery and nursing students lacked the competency to demonstrate mothers how to express breast milk manually – using just bare hand. Most students reported that they had no practical exposure on manual expression of breast milk. And almost all students confirmed that they had no practical sessions in a skills lab to practice the nutrition skills; only two students reported having a nutrition skills lab/nutrition corner at their school. The lack of practical, hands-on training and inadequate attention to the nutrition skill competencies may explain the low level of skill competence (Fanzo et al., 2015). The study on tutors in Ghana noted that there were few practical sessions conducted for students on nutrition and that tutors may not have appropriate skills and the confidence to properly educate students on the nutrition skills.

Combined Competence Assessment

The results of this study showed that only about four out of ten (38.1%) students managed to meet or exceed the government's pass score (50%) in combined competence score. More midwifery than nursing students and more male than female students appeared to have better combined knowledge and skill competencies, though the differences were not statistically significant. More than two out of three students perceived that nutrition instructors were qualified and prepare well prior instructions. This finding contradicts a study in West Africa on nutrition training of health and medical professionals that reported more than half (55%) of the respondents rated the quality of nutrition instruction in their institutions as inadequate (Sodjinou et al., 2014).

The participating midwifery and nursing students seemed in general to have better understanding of the nutrition information than they perform the basic skills. This alerts the need for nutrition pre-service education to better equip midwives and nurses with basic nutrition skill competencies using practical and hands-on training, through direct exposure of the skills and tasks to deliver better nutrition services.

Determinants of Nutrition Competency

Analysis showed that students' age, sex, and profession did not impact students' nutrition competency. A study conducted to assess the competence of graduating midwifery students in Ethiopia, however, found that sex was a significant predictor of higher competence scores

(Yigzaw et al., 2015). In the multivariable linear regression model, the single factor that was significantly associated with students' achieving higher competence was students' positive perception on the conduciveness of the clinical practice sites (*p=0.023*). Those who had a positive perception had higher knowledge and skills competence than those with a poorer perception. Other studies have shown that students with positive perception towards their academic environment had better learning experience and competence (Hakimzadeh, Ghodrate, Karamdost, Ghodrati, & Mirmosavi, 2013; Lizzio, Wilson, & Simons, 2002). Further studies are needed to understand the relationship of level of nutrition competence and student's perception towards the learning environment and process.

Implications

Midwives and nurses, as healthcare workers who provide nutrition services, need to be competent in nutrition knowledge and skills. For populations that are affected by malnutrition, such as Ethiopia, access to effective nutrition services is critical and these services in turn depend on well qualified nutrition practitioners (Fanzo et al., 2015).

The Government of Ethiopia is working to reduce malnutrition and has focused its national nutrition program on improving the nutritional status of mothers and children. To meet its goals, the competency of nutrition practitioners must improve, particularly for highly engaged midwives and nurses. Therefore, we recommend that strengthening human resource for health and nutrition should start at the pre-service education level and that the ministries of health and education should collaborate with other stakeholders to strengthen nutrition education and training (Oyewole & Amosu, 2013).

Student attainment of competence in nutrition is the sum of their knowledge of the curriculum, acquisition of skills, and absorption of all associated learning experience. It is therefore vital for the ministries of health and education and other stakeholders to determine if the pre-service curricula for midwives and nurses is adequate and up-to-date, considers the local context, and is well-integrated with related courses; if adequate practical learning experiences are available; and if the number of hours allocated for theoretical and practical learning is adequate. An integrated nutrition curriculum with adequate content and practical experience can improve the clinical nutrition practice of healthcare providers (Taren et al., 2001).

We recommend that nutrition instructors update their technical knowledge and skills as well as their teaching ability to effectively deliver current and up-to-date nutrition information. In addition, it is critical that higher learning institutions have the required facilities to meet the needs of its students, such as nutrition skills laboratories or, at a minimum, a nutrition corner in existing skill laboratories with the needed equipment and supplies for learning basic human nutrition skills.

The study showed that new midwifery and nursing graduates are being deployed with low nutrition competencies. This calls for short-term in-service trainings for practicing midwives and nurses to help them carry out their tasks with increased competency. The assessment also disclosed that male students perform better than female students, alerting the need for gender considerations and sufficient integrations of gender issues in pre-service education programs.

With Ethiopia's shortage of human resources for health (Yigzaw et al., 2015), it is essential that all students graduate with adequate knowledge and skills in order to discharge their responsibilities effectively.

Strengths and Limitations

The study was the first of its kind in Ethiopia and is believed to provide valuable evidence on graduating midwifery and nursing students' nutrition competence that can be used to inform education policies and design of in-service trainings. The use of OSCE to measure the nutrition skills competencies of students helped ensure that the measurements were valid and reliable. In addition, students' competence was assessed by qualified nutrition experts who taught nutrition courses in the study universities.

The shortage of literatures in nutrition competence assessment has limited our discussions and led us to making comparisons with practicing and other allied healthcare providers. The assessment tools were not pre-tested, evaluated and verified for their accuracy and precision mainly due to resource limitations, particularly time, but the assessors thoroughly reviewed and improved the survey tools prior to data collection.

Conclusions

This study showed that most graduating midwifery and nursing students lacked the essential knowledge and skills competencies to provide standard nutrition services competently at the work setting. Students were especially poor at performance of nutrition skills. On the other hand, students with a positive perception of the clinical and practical learning environment demonstrated higher levels of competence. This highlights the need to give due consideration to build the capacity of training institutions for better practical learning, through creating adequate learning facilities and conducive learning environment. Strengthening the nutrition curricula of midwives and nurses and enhancing the technical and instructional skills of nutrition faculty are also critical. Short-term in-service training on nutrition is also suggested for those who already have joined the clinical practice to improve the quality and delivery of nutrition services. Strengthened nutrition pre-service education for midwives and nurses will contribute to meet the ultimate goal of improved nutrition in the country.

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