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Research

Nutrition learning gaps in the undergraduate curricula of Nursing and Medicine degree and diploma programs in Tanzania Mainland

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Background

Nutrition has been widely ignored in the curricula of many health professional training programs in Sub-Saharan African countries. The present review was conducted to explore the adequacy of medical and nursing curricula in training graduates to treat, educate effectively, and counsel patients/clients with nutritional disorders in Tanzania.

Methods

An assessment of accredited medical and paramedical curricula in mainland Tanzania. The assessment followed Stufflebeam's CIPP model (context, input, process, and product) to enhance methodological rigour and transparency.

Results

Of the twelve curricula studied, only one had a dedicated course for nutrition. In the undergraduate medicine degree curriculum, only 119 out of 6580 hours over five years were allocated for nutrition training, which is merely 1.7% of the total curriculum hours. Similarly, in the undergraduate nursing degree curriculum only 370 hours out of 5280 over four years were allocated for nutrition training, which is equivalent to 0.07% of the total hours. In the paramedical diploma programs of clinical medicine and nursing, nutrition content was scattered among various courses within the curriculum. Most curricula were teacher-centred with limited use of validated methods to assess trainee on skills such as Observed Structured Practical/ Clinical Examination.

Conclusions

Based on this assessment of accredited curricula, nutrition receives scant attention in medical and paramedical education in mainland Tanzania. Thus, it is imperative to support integrating stronger nutrition content into medical and paramedical schools focusing on skills and attitudes to enhance the efficient implementation of the nation's nutrition policies and strategies.

INTRODUCTION

The detrimental effects of inadequate nutrition cannot be emphasized enough. However, it has been widely ignored in the curricula of many health professional training programs in Sub-Saharan African countries, including Tanzania. Unfortunately, the reality is that many Sub-Saharan African countries still face the triple burden of malnutrition, comprising over-weight, under-nutrition, and micronutrient deficiencies (DeWalt et al 2004; Crowley et al. 2019).

Studies have shown that with comprehensive nutrition education in medical curricula, Sub-Saharan African countries like Tanzania will likely significantly improve nutritional care, particularly in the healthcare sector (Crowley et al. 2019; Gouda et al. 2019). A systematic review revealed that medical education and curricula worldwide lacked sufficient nutrition content, which could negatively impact doctors' ability to provide adequate nutrition care and treatment (Crowley et al. 2019)

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This is concerning because low levels of nutrition-related health literacy could affect nutrition behaviours and increase the risk of chronic diseases (Gouda et al. 2019; Pallangyo et al. 2024; Hughes 2004). According to the World Health Organization (WHO), the objectives of Universal Health Coverage cannot be achieved until nutrition actions are integrated across the medical and paramedical professionals (World Health Organization 2020).

Proper nutrition is critical to maintaining good health and preventing diseases. Inappropriate nutritional management often leads to the development of diseases, which can progress to complications and require longer hospitalization, resulting in higher healthcare costs (Crowley et al. 2019; Pallangyo et al. 2024; Hughes 2004). Over-weight, micronutrient deficiencies, and under-nutrition are recognized problems that affect many people (Crowley et al. 2019; Pallangyo et al. 2024; Hughes 2004). Doctors and nurses are often patients' first point of contact and are highly trusted in most societies (van Vliet et al. 2020). If equipped with basic nutritional skills, they can play a vital role in preventing the development of nutrition-related diseases (van Vliet et al. 2020; Lepre et al. 2021). By assessing nutritional risk, understanding essential nutrients, and identifying food groups, doctors and nurses can provide their patients with knowledge and tools to make better dietary choices (Mwakigonja 2016; Chung et al. 2014).

Numerous studies have demonstrated that providing appropriate and sufficient nutritional support in healthcare settings is linked to improved quality of life for patients and more cost-effective service delivery (Kris-Etherton et al. 2014). Doctors and nurses also play a crucial role in ensuring patients receive adequate nutrition, supplementing the work of dieticians and nutritionists (van Vliet et al. 2020; Lepre et al. 2021). They often act as nutrition counselors by carrying out nutrition screening and providing advice to patients.

However, several obstacles prevent healthcare providers from having adequate nutrition knowledge (Mogre et al. 2018; DiMaria-Ghalili et al. 2014). Some of these include poor training methods, lack of detailed nutrition knowledge in their curriculum, absence of clear protocols at work, insufficient integration of nutrition as a theme throughout the curriculum, and low priority given to nutrition education (Pallangyo et al. 2024; Lepre et al. 2021; Mwakigonja 2016). By integrating nutrition competency into entry-level medical courses, we can ensure that graduates are better prepared to work in multi-disciplinary healthcare teams and have the necessary skills to help people adopt healthier lifestyles (Mogre et al. 2018; DiMaria-Ghalili et al. 2014; Christian and Dake 2022; Greveson and Spencer 2005; Thircuir et al. 2023).

Tanzania has been implementing five-year evidence-based strategic action plans, the first being National Multisectoral Nutrition Action Plans (NMNAP-1) 2016-2021, followed by NMNAP-II 2021/22-2025/26. Both use a life-cycle and systems approach and promote multisectoral collaboration to address the triple burden of malnutrition (MOHCDGEC. 2021). These plans outline a holistic approach that involves multiple sectors to tackle the issue of poor nutrition and prevent associated diseases. By prioritizing this issue and implementing a multisectoral approach, Tanzania can improve the health of its citizens and build a brighter future for the country (World Health Organization 2020).

Tanzania's government has made considerable progress in improving training among health care providers, including the existence of the Tanzania Commission for Universities (TCU) and the National Council for Technical Education (NACTVET), which oversee standards and quality of the degree and diploma curriculum for health care providers (Mrema et al. 2023). According to the TCU and NACTVET, it is advisable to review the academic curriculum periodically. This is to ensure that the latest findings from national surveys, international and national guidelines (NMNAP), emergencies, and health demands are incorporated (Gouda et al. 2019; van Vliet et al. 2020; Christian and Dake 2022; Greveson and Spencer 2005; Thircuir et al.2023).

However, the perspective of updated nutrition content to academic medical and nurse curricula has yet to be given adequate attention. Therefore, this assessment aimed to explore the adequacy of medical and nursing curricula on nutrition in training graduates to treat, educate effectively, and counsel patients/clients with nutritional disorders.

METHODS

This assessment was conducted to identify the nutrition areas that were missing from accredited, in use diploma and undergraduate curricula of medical and nursing professionals in Tanzania's Mainland. It was conducted using the CIPP model proposed by Stufflebeam (Stufflebeam et al. 2017), which comprises four crucial components: context, input, process, and product. The adoption of this model aimed at enhancing methodological rigour and transparency in the review process (Stufflebeam et al. 2017; Tanzania National Nutrition Survey. 2018; National Bureau of Statistics, United Republic of Tanzania. 2016)

RESEARCH QUESTIONS

During the curriculum reviews, we explored these specific questions: (i) what are the gaps in learning outcomes related explicitly to nutritional competencies? (ii) What are the gaps in learning outcomes for nutrition that are associated with the affective domain? (iii) What are the gaps in assessment methods, such as the alignment of assessment methods with learning outcomes according to Miller's pyramid (Miller 1990) of competence for assessment, redundancies in assessment methods, and types of assessment methods? (iv) What are the gaps in instructional methods, such as the alignment of teaching methods with learning outcomes, teaching methods that encourage student-centred learning, and teaching methods that foster critical thinking? (v) What are the gaps in content, such as courses, course content, course sequencing (simple to complex), and content alignment with learning outcomes?

DESK REVIEW OF CURRICULA

We reviewed 12 accredited pre-service nursing and medicine undergraduate curricula that were in use in Tanzania. Among these, nine were for medicine and nursing degree programs that have their curricula accredited by the Tanzania Commission for Universities (TCU) and four curricula were for medicine and nursing diploma programs that have their curricula accredited by the National Council for Technical Education (NACTVET). The degree program curricula were

from used by the Muhimbili University of Health and Allied Sciences (MUHAS), University of Dar es Salaam- Mbeya College of Health and Allied Sciences (UDSM-MCHAS), University of Dodoma (UDOM), Catholic University of Health and Allied Sciences (CUHAS), Kilimanjaro Christian Medical University College (KCMUco), St. Joseph University In Tanzania (SJUIT), Kampala International University in Tanzania (KIUT), and Hubert Kairuki Memorial University (HKMU). There were four accredited levels of diploma programs by the NACTE, namely Diploma Nursing (levels 5 and 6) and Diploma Clinical Medicine (levels 5 and 6).

The review focused on the nutrition content of the curricula, including courses and related topics such as micronutrients, overweight and obesity, and under-nutrition. Doctors' and nurses' educational systems have often adopted the philosophy of outcome-based education (CBC), where the focus has shifted from inputs to outcomes and the professionals produced become the outcome (Taren et al. 2001). The CBC, in its structure and composition, has to facilitate the achievement of these outcomes by students and hence needs to be equipped with appropriate curriculum content (syllabus), learning opportunities (teaching-learning methods) and assessments, which are selected based on the expected learning outcomes chosen (Taren et al. 2001; Baute et al. 2017). The curriculum should include the components with activities explicitly targeted to achieve learning outcomes (Baute et al. 2017). The number of hours dedicated to teaching nutrition was assessed, and any alignment gaps of learning outcomes (LO) for the developed benchmarks were evaluated.

The review process was divided into the following two stages:

1. SELECTION OF NUTRITION TOPICS FOR ASSESSMENT IN THE CURRICULUM REVIEW

A desk review of relevant documents explored key priorities for malnutrition to be included in the curriculum review. The documents include NMNAP-I and NMNAP-II (MOHCDGEC. 2021), National Nutrition Surveys 2018 (Ministry of Health, Community Development, Gender, Mainland], Ministry of Health (MoH) [Zanzibar], Tanzania Food and Nutrition Centre (TFNC), and of Statistics (NBS) 2019), Tanzania Demographic Health Survey 2015-2016 (National Bureau of Statistics, the United Republic of Tanzania 2016), published articles in peer-reviewed journals (Crowley et al.2019; Pallangyo et al. 2024; Hughes 2004; Lepre et al. 2021; Chung et al. 2014; Kris-Etherton et al.2014 DiMaria-Ghalili et al. 2014; Mrema et al. 2023; Christian and Dake 2022; Greveson and Spencer 2005; Thircuir et al. 2023) guidelines on the management of acute malnutrition, anaemia and, overweight and obesity (MOHCDGEC. 2021; Benn Benner 2004; Semlitsch et al. 2019; Seal and Kerac 2007; WHO 2003). From this above desk review, three areas of concentration were identified for concentration during the review. These included acute malnutrition, anaemia, overweight and obesity.

2. BENCHMARK LEARNING OUTCOMES FOR ACUTE MALNUTRITION, ANAEMIA, OVERWEIGHT AND OBESITY

Benchmarks for competency learning outcomes were developed for three nutritional domains: anaemia; acute malnutrition; and overweight and obesity. These benchmarks were adopted and adapted from the nutrition learning outcomes specified by the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and national guidelines (MOHCDGEC. 2021; Miller 1990; Benner 2004). These benchmarks were then used to review all the degree and diploma medicine and nursing program curricula, as shown in Table 1.

Table 1: Curricula nutrition learning outcome (LO) benchmarks

	Overweight and Obesity	**Acute malnutrition**	**Anaemia**
Competence	Prevention and care of overweight and obesity	Prevention and care of acutely malnourished children	Prevention and treatment of Anaemia
Learning outcomes	· Describe overweight and Obesity · Describe risk factors of overweight and Obesity · Explain the consequences of overweight and Obesity · Explain how to classify Obesity according to international standard guidelines · Take anthropometric measurement (weight, length/height), MUAC, waist circumference · Interpret anthropometric measurement (weight, length/height), MUAC, and waist circumference. · Explain healthy lifestyle concepts (healthy eating and physical activities) · Perform nutrition counselling to patients/client of overweight and Obesity	· Describe and classify acute malnutrition in children · Describe risk factors of acute malnutrition · Describe the concept of integrated management of acute malnutrition · Describe the physiologic changes that occur in severe acute malnutrition and its consequences in care · Explain why malnourished children need special care than other children · State 10 steps of routine care for severely malnourished children · Describe the causes of death during the treatment of malnutrition · Describe the therapeutic feeding in different phases of treating severe acute malnutrition	· Describe the vulnerable groups of Anaemia · Describe the different types of Anaemia · Describe the signs and symptoms of different types of Anaemia · Describe the risk factors and consequences of Anaemia · Describe laboratory measurements of Anaemia · Interpret different measurements of Anaemia · Management of Anaemia · Perform counselling to patient/client with Anaemia

VALIDATION WORKSHOP WITH STAKEHOLDERS

On June 4th, 2021, a one-day stakeholder meeting was held to discuss the gaps in nutrition learning identified in diploma and degree programs in Tanzania's Mainland. The meeting was attended by heads of academic units and directors from the University of Dodoma, University of Dar es Salaam, Muhimbili University of Health and Allied Sciences, Kilimanjaro Christian Medical University College, Muhimbili College of Allied Health Sciences, and Kibaha College of Allied Health Sciences. Additionally, quality assurance representatives from the National Council for Technical Education, researchers from TFNC, representatives from government agencies (Ministry of Health and President's Office, Regional Administration and Local Government), and development partners (UNICEF and WHO) were also present. Participants were informed of the findings of this assessment, a structured questionnaire in a likert scale circulated, and no participants expressed disagreement with any of them.

RESULTS

CURRICULA FORMATS

M.D. AND CLINICAL MEDICINE CURRICULUM TYPES

The MD program curricula from MUHAS, MCHAS and UDOM were all five-year competency-based curricula (CBC). The MUHAS curriculum was used for the review exercise, as the generic curriculum template, as the two other universities were using the prototype MUHAS curriculum. The MD program curricula from KCMUco and CUHAS were input based curriculum. The NACTVET diploma curricula for clinical medicine levels 5 and 6 were all in CBC format.

BSC NURSING AND NURSING DIPLOMA CURRICULA

All of the BSc Nursing program curricula were four-year degree programs. Only the BSc Nursing Program from MUHAS and the NACTVET diploma level 5&6 nursing curricula were in CBC format.

GENERAL NUTRITION GAPS:

1. 11 of the 12 curricula did not have dedicated courses in nutrition. The BSc Nursing Program from KCMUco was the only course that had a dedicated nutrition course. Nutrition topics for most of the curricula were taught in others programs of the curriculum such as biochemistry, hematology, pathology, pediatrics, obstetrics, community field and medical surgical nursing.
2. The time dedicated to nutrition training was limited. In the MD curriculum, only 119 out of 6580 hours over five years were allocated to nutrition training, which is merely 1.7% of the total curriculum hours. Similarly, the BSc Nursing curriculum only allocated 370 hours out of 5280 over four years, equivalent to 0.07% of the total hours. There was no specific course on overweight/obesity in the MD/clinical medicine curricula.
3. Learning outcomes: The LO was mostly for the domains of knowledge and skills with no LO for the domain of attitude even within curricula labeled as competency-based.
4. Learning methods: The majority of teaching methods were teacher-centered methods (lecture) with limited number of curricular using interactive student centered teaching methods that foster the development of competencies and critical thinking skills (e.g. concept mapping).
5. Assessment methods: Assessment methods used in most of the curricula were assessing nutrition knowledge only. There was limited use of validated methods to assess trainees on skills such as observed structured practical/clinical exams (OSPE/OSCE). None of the curricular used methods to assess trainee's attitudes regarding nutrition.
6. Course content: In almost all curricula reviewed, the nutrition content focus was on the somewhat outdated concept protein energy malnutrition and on anaemia. Moreover, most of nutrition content was taught as part of teaching of various medical conditions/diseases.

SPECIFIC NUTRITION GAPS:

1. BSC NURSING DEGREE AND NURSING DIPLOMA CURRICULA

Very few courses had nutrition-related topics. In the CUHAS Nursing degree program, nutrition was covered in the Medical and Surgical Nursing (MS 203) course. In that course, the nutrition topics were covered in 370 hours of the entire four-year program. In the diploma programs, general nutrition content was scattered among various courses.

2. M.D. AND CLINICAL MEDICINE CURRICULA

There were limited numbers of specific course topics that covered nutrition-related content. These included biochemistry, community medicine and paediatrics and child health junior clerkship courses.

GAPS IDENTIFIED IN THE THREE SELECTED NUTRITION THEMES

Gaps identified on three nutrition themes i.e. overweight and obesity, severe acute malnutrition and anaemia are depicted in Tables 2, 3 and 4:

Table 2: Gaps identified in the nutrition theme of overweight and obesity

	BSc Nursing degree and Diploma Curricula		**MD and Clinical Medicine Curricula**	
	Finding(s)	**Description**	**Finding(s)**	**Description**
Learning outcomes	There were no specific learning outcomes related to overweight/obesity.	The available Community Nutrition course: • Discuss the causes and dangers of overweight, • Conduct anthropometrics assessment • Provide dietary assessment, • Provide basic nutrition counseling and education, • List six classes of nutrients and their primary functions,	There were no specific learning outcomes related to overweight/obesity.	The available NMT 04105 course; • Describe common basic concepts in nutrition, • Identify common nutritional deficiencies, • Differentiate patients/clients with common nutritional deficiencies, • Develop plan for managing patients/client' nutritional problems.

Table 2. *continued*

		• Demonstrate the understanding the science and importance carbohydrates, fats and protein in the body • Summarize the metabolism of nutrients, errors, and their associated diseases.		• Provide nutritional counseling to individuals and families.
Teaching methodology	The teaching methodology and approaches impart nutrition knowledge competencies	No methodology for develop the necessary skills	The methods used were adequate for knowledge acquisition.	No methodology for develop the necessary skills
Assessment methods	The assessment methods were suitable for validating knowledge acquisition.	There were no methods for assessing skill competencies such as OSPE/OSCE and Direct Observation Procedures (DOPS).	The assessment methods were insufficient as they only assessed knowledge.	Lack a comprehensive methodology that included clinical assessments, skills, and attitudes.

Table 3: Gaps identified in the nutrition theme of acute malnutrition

	BSc Nursing degree and Diploma Curricula		**MD and Clinical Medicine Curricula**	
	Finding(s)	**Description**	**Finding(s)**	**Description**
Learning outcomes	There were no smart learning outcomes for acute malnutrition. E.g. Describe Community Management of Acute Malnutrition (CMAM).	Several key LOs were are missing; • Describe the physiological changes and its consequences. • Explain why malnourished children need different care than other children. • Describe the common causes of preventable death • State 10 steps of routine care • Explain how to feed malnourished children • Perform calculation for chart feeds.	There are no specific learning outcomes for acute malnutrition	As with the nursing curricula, there were several key LOs missing; • Describe the physiological changes and its consequences. • Explain why malnourished children need different care that other child. • Describe the common causes of preventable death. • State 10 steps of routine care. • Explain how to feed malnourished children. • Perform calculation for chart feeds.
Teaching methodology	The methods were for theoretical knowledge acquisition	The methods used were not evoking critical thinking and develop skills.	The methods were adequate for theoretical knowledge acquisition.	The methods used were not evoking critical thinking and develop skills
Assessment methods	Methods used for assessment were based on knowledge acquisition.	The assessment methods were not evaluated skills or attitudes.	Methods used for assessment were based on knowledge.	The assessment methods were not evaluated skills or attitudes acquisition.

Table 4: Gaps identified in the nutrition theme of anaemia

	BSc Nursing degree and Diploma Programs		**MD and Clinical Medicine programs**	
	Finding(s)	**Description**	**Finding(s)**	**Description**
Learning outcomes	There are several specific learning outcomes for anaemia.	There were no learning outcomes for elderly, adolescents, and patients with chronic disease (CKD /Cancer)	There are several specific learning outcomes for anaemia.	There were no learning g outcomes for elderly, adolescents, and patients with chronic disease and also on nutritional counseling.
Teaching methodology	The methods were adequate for theoretical knowledge acquisition	The methods used were not evoking critical thinking and develop skills.	The methods were adequate for theoretical knowledge acquisition.	The methods used were not evoking critical thinking and develop skills.
Assessment methods	Methods used for assessment were based on knowledge acquisition.	The assessment methods were not evaluated skills or attitudes.	Methods used for assessment were based on knowledge	The assessment methods were not evaluated skills or attitudes acquisition.

DISCUSSION

This assessment examined the current state of nutrition education offered to medical and nursing students in mainland Tanzania. The purpose was to identify opportunities to enhance the quality of nutrition education and empower future doctors and nurses to provide adequate nutrition care to patients.

We uncovered a concerning trend: nutrition is inadequately emphasized in medical education. There were notable nutrition gaps such as a lack of dedicated courses, limited time allocated, and learning outcomes of the only

knowledge domain within mainland Tanzania's medical and paramedical curricula. Comparable findings have been documented by Long and colleagues in the UK (W Long 2009) and Thircuir and colleagues in France and the United States study (Thircuir et al. 2023). The similar findings had also been highlighted in other developing countries (Gouda et al. 2019; Pallangyo et al. 2024; Hughes 2004). In Tanzania as well, Mwakigonja (Mwakigonja 2016) documented that Tanzania's medical and paramedic curricula are inadequate and inconsistent with the country's national nutrition policies and priorities.

The available evidence indicates that healthcare providers are predominantly engaged in resolving patients' issues at the individual, familial, and community levels (Hughes et al. 2012; Collins et al. 2006; Goddard et al. 2011). However, Kris-Etherton and colleagues (Kris-Etherton et al. 2014) found that most nurses and doctors offer limited nutrition services regarding counselling, education, and care. Thus, there is a need for a different training approach that would encourage collaboration among diverse disciplines to deliver comprehensive healthcare and well-being (Chisholm et al. 2013; Adams et al. 2006; Nestle M and Baron R 2014; Jefferies et.al 2018; Mcclinchy et al. 2015).

Scholars worldwide advocate for a shift towards student-centered teaching methods within the context of CBC as a means to cultivate highly skilled medical and paramedical professionals on a global scale(Harden et al. 1999; Harden et al. 2007). But our assessment suggests that in mainland Tanzania, prevailing educational practices in medical and paramedical schools predominantly align with teacher-centered methods within the context of discipline-based CBC. The teacher-centered approach fails to foster the necessary interaction to impart practical skills to students. This underscores the urgent need for curriculum revisions in medical and paramedical schools.

The TCU has been advocating for competence-based curricula in health sciences disciplines to train health professionals who have the necessary competence and skills to provide quality health care services in both health care facilities and the community. In 2022, a key milestone reported by TCU was the launch of benchmarks for the BScN program and benchmarks for the MD programs. These benchmarks establish standards for the award of a discipline, and articulate the attributes and capabilities that graduates with such qualifications should possess.

However, NACTVET has not yet developed benchmarks for paramedical programs in the country. Therefore, to support the successful implementation of benchmarks, attention should also be given to creating a supportive environment within medical institutions that offers an opportunity for nutrition integration. We also urge NACTVET to develop benchmarks for paramedical graduates to ensure that our programs produce the expected quality and standards.

Our current research revealed coherence between the curriculum content and the respective knowledge domain assessment methods of nutrition education in medical and paramedical schools of mainland Tanzania. The importance of using accurate assessment methods to support sustainable competency development cannot be overstated. Studies have shown that assessments enhance knowledge retention in medical students.

In addition, we found that nutrition was widely integrated into various curricula. Both a systematic review study by Crowley and colleagues (Crowley et al. 2019) and an empirical study by Becker and colleagues (Becker et al. 2022) recommended that nutrition learning objectives be integrated into the existing medical and paramedical programs. Nutrition integration into the existing medical and paramedical programs is posited to be advantageous, as it would allow students to discern the relevance of nutrition and its application.

Our assessments of medical and paramedical programs utilized validated methods to assess skills such as Observed Structured Practical/Clinical Examination (OSPE/OSCE). OSPE/OSCE is effective in assessing the ability to apply knowledge in clinical settings (Mogre et al. 2018; DiMaria-Ghalili et al. 2014). Miller also underscores the importance of assessment methods that improve nutrition care competencies within the context of OSPE/OSCE (Mogre et al. 2018). Therefore, applying existing learning to a nutrition context may improve the competency of medical and paramedical graduates in providing nutrition care in future practice.

However, this assessment needs to be considered in the context of its limitations. It was limited to specific areas of nutrition knowledge and did not evaluate the student's ability to apply this knowledge or their attitudes related to nutrition.

Only if there is agreement on the minimum level of nutrition knowledge that students in the health professions in Tanzania should acquire will it be possible to determine if the students' knowledge is adequate. It is, therefore, essential to establish national benchmarks for nutrition knowledge that relevant training programs should meet.

CONCLUSIONS

While considerable progress has been made, Mainland Tanzania still grapples with the challenges of integrating nutrition content into the curricula of medical and paramedical schools. Thus, the government and partners should step up and advocate for the integration of nutrition competencies into those curricula to ensure that graduates are well-equipped to handle nutrition-related issues effectively. Further research in Sub-Saharan African countries would provide more insights on how this might best be achieved.

AUTHOR CONTRIBUTIONS

Elizabeth Lyimo, Ramadhani Mwiru, Julieth Shine, Abela Twinomujuni, Maria Msangi, Fatma Abdallah, Ray M. Masumo and Patrick Codjia conducted searches the curricula, analyzed data, interpreted it, and helped in manuscript writing. Raman Bedi, Doreen Mloka and Germana H. Leyna were supervisors performed manuscript revisions and advises on design and interpretation of data. . All authors contributed to the review design and manuscript drafting. They also critically reviewed and approved the final version of the manuscript submitted for publication.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

ETHICS STATEMENT

Ethics approval was not required for a review the curricula of medical and nursing schools.

TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with Stufflebeam's CIPP model. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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