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4 **Degree-granting nutrition programs in the Republic of Yemen: A status report on**
5 **postsecondary education**
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8 **Authorship and Affiliation**
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Abstract

Yemen is noted as one of the most food-insecure countries in the Arab world coupled with high rates of malnutrition. To address the public health outcomes related to nutrition, trained nutrition professionals are needed. This report provides a snapshot of current nutrition-affiliated programs offered in post-secondary institutions in Yemen. Partnering with or creating independent organizations responsible for defining the scope of practice is warranted. Additionally, ensuring educational quality, program accreditation, and competence of graduating students and readiness to practice will be central to progressively moving Yemen’s dietetics profession forward.

Keywords

Nutrition; Yemen; higher education; public health

Background

The Republic of Yemen is an Arabic-speaking country located in the southern end of the Arabian Peninsula and is regarded as one of the poorest countries in the ‘Arab world’. Since the end of the ‘Arab Spring’ in 2010, the on-going conflict in Yemen has been described as an unprecedented humanitarian crisis, leading to internally displaced populations, inadequate housing, significant food insecurity and a devastated public health infrastructure, compounded by the current COVID-19 pandemic [1-7]. Additionally, even prior to the ‘Arab Spring’, Yemen was one of the least developed countries in the region with widespread poverty, poor governance, and low investments in education, health, and nutrition that has been exacerbated by the on-going conflict and pandemic and resulted in poor human capital attainment. As a result, many public health facilities have collapsed due to limited or absence of essential services, medications, and medical equipment. In addition, healthcare workers and staff at public health facilities had not received compensation between October 2016 until early 2019 [5, 8, 9].

The ongoing conflict, rising food costs, and dramatic decline in access to health services have aggravated the general nutritional status of children in Yemen [10]. As a result, about 1.7 million children suffered from moderate acute malnutrition, and over 460,000 children suffered from severe acute malnutrition respectively, as defined by the World Health Organization (WHO) and the United Nations High Commissioner for Refugees [11, 12]. The World Food Program has asserted that Yemen has the highest rates of child undernutrition in the Arabian Peninsula [10]. The WHO defines *malnutrition* as nutritional deficiencies, excesses, or imbalances compared to a typical individual’s nutritional requirements [12]. Current literature continues to identify substantial food insecurity and severe undernutrition in Yemen [2, 3, 13-18]. A study involving 5276 Yemeni children (< 5 years) published in 2019 showed that 13.3%

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4 of the screened children were suffering from Global Acute Malnutrition and about 5% from
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6 Severe Acute Malnutrition [19]. Consequently, the Global Hunger Index categorizes the situation
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8 in Yemen as ‘alarming’[20].
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12 Yemen's current crises indicate an urgent need for qualified health professionals to address the
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14 escalating burden of malnutrition-related diseases, particularly undernutrition for internally
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16 displaced vulnerable populations especially children. The need for improved training capacity for
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18 nutrition professionals is critical to address the immediate humanitarian crisis as well as for the
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20 workforce development of the country in the long term [21]. Competent dietitians/nutritionists
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22 must successfully complete higher education programs that will qualify them to practice the
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24 proper nutrition care process, including nutrition assessment, diagnosis, and treatment, as well as
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26 training in health behavior change and development, implementation, and evaluation of
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28 appropriate nutrition interventions for a variety of populations. Moreover, dietitians/nutritionists
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30 play an essential role in mitigating nutrition deficiencies and improving overall health outcomes
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32 in the face of humanitarian crises and hunger [22, 23]. Due to the large public health burden of
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34 malnutrition that has been observed in Yemen, dietitians/nutritionists must work with individuals
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36 to improve and sustain their diet, develop and implement evidence-based nutrition interventions
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38 and advocate for policies that support health promotion and disease prevention to improve
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40 community health while considering religious beliefs, local culture, social norms, and the current
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42 conditions [24, 25]. In a humanitarian crisis, it is imperative to have nutrition and dietetics
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44 professionals to assist other health professionals and to ensure appropriate clinical management
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46 of wasting in children under 5 years, as well as appropriate rationing/distribution of food from
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48 humanitarian organizations targeting high risk groups (i.e, pregnant women, women of
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50 reproductive age, and children). While the World Health Organization (WHO) has issued
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4 recommended policy guidelines for healthy diets in countries of the Eastern Mediterranean
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6 region, Yemen has only 0.4 trained nutrition professionals per 100,000 people, the second lowest
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8 per capita in the region [26].
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14 Training capacity must be increased through offering nutrition programs at degree-granting
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16 higher education institutions, and such programs are vital to help develop competent care
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18 practitioners who can help with public health nutrition crises [27, 28]. Therefore, the purpose of
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20 this brief report is to provide a current synopsis of higher education institutions that offer post-
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22 secondary nutrition education to emphasize the importance of training for future nutritionists and
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24 dietitians in Yemen.
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27 28 29 30 31 **Activity**

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33 A comprehensive list of universities was obtained from the website of the Ministry of Higher
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35 Education and Scientific Research of Yemen [29]. To identify all nutrition degree-granting
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37 programs offered, an online review of universities and colleges' updated websites, department
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39 web links, and academic programs' homepages in Yemen was performed in both the English and
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41 Arabic language. The search was performed in June 2021. Only nutrition-affiliated degree
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43 programs offered in Yemen that require at least four years for completion were included and
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45 tabulated. Community and vocational colleges were also included in this report. Given the nature
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47 of this descriptive report, no ethical oversight or approval was found to be necessary and
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49 therefore not obtained.
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Results

The results of the review are summarized in table 1. A total of 45 universities and colleges were identified in Yemen, in both the private and public sectors. Of the 45 universities, eight universities offered bachelor's degrees, and one offered a Master's degree in addition to a bachelor's (University of Science and Technology). No identified university offered a doctoral-level program in nutrition. In terms of location (see figure 1), five universities were identified in the Capital city of Sana'a. With regard to the offered degrees, all of the eight universities offered programs in clinical/medical nutrition and dietetics. There are two universities offering programs in nutrition and food sciences (Sana'a University and Lebanese International University). While post-secondary accreditation is overseen by the Ministry of Higher Education and Scientific Research of Yemen, there is no standard accrediting body that oversees programming in Nutrition and Dietetics in Yemen [30, 31]. Due to the lack of specialized accreditation oversight, the curriculum offered across the institutions varies; a website search revealed that there is a common core curriculum that includes foundational courses in nutrition such as introduction to nutrition, community nutrition, and medical nutrition therapy. However, courses specific to the scope of practice in the geographic region such as nutrition focused physical examination, advanced medical nutrition therapy, human metabolism, micronutrients and trace minerals, public health nutrition, emergency preparedness and food relief programming, and maternal and child nutrition should be incorporated into a consistent curricular framework to ensure graduates will be competent and prepared dietetics practitioners.

Discussion

Undernutrition, including protein energy undernutrition in children, and micronutrient deficiencies across the population, are of public health concern to much of the population of Yemen. A critical examination of the content knowledge and skills taught, particularly in clinical/medical nutrition and dietetics degrees, is needed to determine whether those pursuing the degree are being appropriately educated to practice as a dietetics professional upon graduation; there is a clear and burgeoning need of such professionals to be trained, acknowledged, and incorporated as part of the health care and public health systems [26, 32, 33].

Further investigation into the career outcomes of those graduating with degrees in clinical/medical nutrition and dietetics as well as those in nutrition and food science should be assessed, and this data should be used to determine how to integrate those with a specialty in nutrition science into the workforce of Yemen. Because of the infrastructure challenges Yemen faces, existing partnerships with the Food and Agriculture Organization of the United Nations (FAO) and WHO could be capitalized on; a job opening search indicates the need for qualified nutrition and dietetics professionals to begin to help with this work [34-38].

In Western and European countries, the traditional pathway to become a dietitian is a combination of graduation from an accredited bachelor's or Master's program, and experiential practice under the guidance of those already credentialed in the field, with a terminal credentialing exam confirming competence in the field [39-42]. [39-42]. If Yemen wants to adequately train and incorporate this important healthcare team member into the workforce, it is essential that dietitians and nutritionists are educated at institutions of higher education, and that their role as healthcare professionals is well defined [43-45]. Additionally, the curricula should be surveyed to determine if students are being educated equally and holistically across the

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4 programs available about nutrition and dietetics so that upon graduation, they are qualified to
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6 provide nutrition education. It should also be determined, particularly in the programs in
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8 clinical/medical nutrition and dietetics, whether students are adequately trained to dispense
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10 medical nutrition therapy as part of a care team. If it is found that coursework in medical
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12 nutrition therapy and nutrition assessment is not part of the core curriculum, it would be of great
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14 public service to include appropriate coursework to ensure those attaining clinical/medical
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16 nutrition and dietetics degrees will have competency to practice in this area [46, 47]. Further, the
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18 curricula at the nutrition and food science programs should be examined to determine if it is
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20 equivalent to the programs in clinical/medical nutrition and dietetics, or if those graduating from
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22 the 2 programs with this title are being prepared for careers more related to food science. If there
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24 is a clear distinction in the career pathways that are associated with these two types of programs,
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26 it may be beneficial to consider whether a new or existing organization could oversee
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28 standardization of the curricula that graduate future dietitians and nutritionists. To address the
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30 health outcomes associated with undernutrition graduates of these programs, particularly those in
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32 clinical/medical nutrition and dietetics, need to demonstrate competency in caring for those with
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34 such conditions [14].
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43 A pathway for incorporation of these graduates into the public health and healthcare workforce
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45 should be defined and an understanding of the value of those with a degree in nutrition should be
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47 cultivated in clinical and community care settings. Partnering with an existing or creating an
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49 independent organization charged with defining the scope of practice and ensuring educational
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51 quality and competence of graduating students [48-52], as well as readiness to practice as part of
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53 a healthcare team or in a Public Health nutrition role will be integral to moving the profession
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55 forward in Yemen.
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4 Based on the findings of the status of nutrition education and practice in Yemen, this paper
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6 suggests potential next steps to incorporate those graduating with a degree in clinical/medical
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8 nutrition and dietetics and possibly those graduating with a degree in nutrition and food science
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10 into the healthcare and public health systems. First, educational standards and competencies
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12 should be defined and adhered to, as well as the scope of practice for those with degrees in
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14 nutrition. If it is found that the programs in nutrition and food science are substantively different
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16 and/or do not include core coursework in medical nutrition therapy, nutrition assessment, and
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18 nutrition education, these programs should be clear about the intended practice outcomes for
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20 graduates. Second, there should be a clear career pathway for those with the requisite coursework
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22 to be integrated into healthcare and public health settings, as well as settings where there are
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24 large populations experiencing malnutrition. Finally, there may be opportunity in partnering with
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26 or charging an independent or governmental organization to set educational standards for the
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28 field, defining what types of programs meet the standards to graduate competent dietitians and
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30 nutritionists, and proposing a mechanism to credential graduates and/or assess competency prior
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32 to them beginning practice.
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41 It is worth mentioning that during this review of colleges and universities in Yemen, some
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43 websites were labeled undeterminable or provided no further information on the degrees offered.
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45 Furthermore, information on availability of distance-based education was also a challenge to
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47 decipher in these institutions. Lastly, due to website inaccessibility or hyperlink errors, some
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49 institutions were not included for further review.
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Table 1. List of nutrition-affiliated programs offered in selected universities in Yemen

College/university	Location	Type	Program name	Degree(s) awarded
Hodeidah University	Al-Hodeidah	public	Clinical Nutrition	Bachelors
Ibb University	Ibb	public	Clinical Nutrition and Dietetics	Bachelors
Sana'a University	Sana'a	public	Food and Nutrition Science Clinical Nutrition and Dietetics	Bachelors
Al-Razi University	Sana'a	public	Medical Nutrition Therapy	Bachelors
Al Saeed University	Taiz	Private	Clinical Nutrition	Bachelors
British University in Yemen	Sana'a	Private	Dietetic and Nutrition	Bachelors
Lebanese International University	Sana'a	Private	Nutrition and Food Sciences	Bachelors
University of Science and Technology	Sana'a	Private	Clinical Nutrition and Dietetics	Bachelors and Masters

Figure 1. Geographic distribution of nutrition-affiliated programs offered in selected universities and colleges in Yemen (aligns with WHO areas of need for nutrition and dietetics professionals).

