



# Trend of nutrition research in endocrine disorders, gaps, and future plans: a collection of experiences of an endocrinology research institute

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## Abstract

**Background** Nutrition plays a pivotal role in the prevention and treatment of endocrine disorders. The aim of this study was to provide a window in order to display the 25-year activities of Endocrinology & Metabolism Research Institute (EMRI), and the gaps and future plans in the field of nutrition and endocrine disorders.

**Methods** To collect papers affiliated to the EMRI in field of nutrition from the inception to December 1st 2019, the electronic databases including PubMed/Medline, Web of Science, and Scopus were searched. Publications in English and Persian languages were included. Scientific Landscapes (VOS viewer) software version 1.6.13 was used to provide bibliometric maps.

**Results** Of 4082 studies identified in the initial search, 319 relevant papers were included. They contributed systematic review and meta-analysis/review ( $n = 76$ ), clinical trials ( $n = 58$ ), cross-sectional ( $n = 171$ ), case-control studies ( $n = 11$ ), and animal studies ( $n = 3$ ). Accordingly, most nutrition studies were dedicated to the level of evidence III (cross-sectional studies: 53.60%) followed by systematic review studies (23.82%) with the level of evidence I. There was also an increasing trend in the nutrition studies through years, with a peak in 2019.

**Conclusion** An increasing trend in the publications related to nutrition science is observed at EMRI. However, nutrition research and publications can grow further through expanding collaborations with other fields related to endocrine. Given nutritional assessments in national projects and focusing on the identification of preventive nutritional strategies, considering the situations of our society can be helpful to make nutritional findings more practical.

**Keywords** Nutrition · EMRI · Future plan · Endocrine · Publications

## Introduction

Based on the report published by the World Health Organization (WHO), non-communicable diseases (NCDs) represent the leading cause of mortality across

the world [1]. In the past 20 years, NCD deaths including cardiovascular diseases, diabetes, and obesity have increased by 14.5% in Iran [2]. Therefore, policy makers need to pay specific attention to identifying preventive strategies in order to reduce economic, social, and psychological burden of such diseases [2, 3]. Prevention efforts focus on the four main factors including physical activity, tobacco use, alcohol consumption, and diet [4]. Adherence to healthy dietary patterns and changing from unhealthy eating habits to recommended ones can be helpful in preventing and treating a wide range of diseases including endocrine disorders [5].

Evidence suggests that healthy dietary patterns including Mediterranean diet and Dietary Approaches to Stop Hypertension (DASH) can decrease the risk of various NCDs [6–12]. Healthy diets can also reduce all-cause mortality and mortality attributed to cancer and cardiovascular diseases (CVD) [6, 13, 14].

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To find preventive strategies to manage endocrine -related diseases, the research centers and groups affiliated to Endocrinology & Metabolism Research Institute (EMRI) consider nutrition assessments in their research activities. Furthermore, in both professional and public educational programs, nutrition recommendations and their associations with endocrine disorders are considered as well. Although there is no specific nutrition research center at EMRI, accumulating research has been published by researchers affiliated to this institute, particularly in the recent years.

In the present report, we aimed to summarize the 25-year activities of EMRI by focusing on the trend, types of publications, and their remarkable findings in the field of nutrition. Secondary aims were to shed light on nutrition research gaps and suggest a road for the future research, accordingly.

## Methods

To find papers affiliated to the EMRI from the inception to 1 December 2019, PubMed/Medline, Web of Science, and Scopus, the electronic databases were searched. In the present study, we included papers in English or Persian language in the field of nutrition that at least the affiliation of one author was EMRI. Grey literatures including conference papers, theses, letter to editors, and interviews were not included.

All findings were exported to the Endnote library. After removing the duplicates, screening was conducted based on the titles and abstracts to collect all the publications in the field of nutrition. As in this specific issue of journal, there are specific reports on CASPIAN studies, probiotic, Islamic fasting, and osteoporosis, in this study; we did not consider the aforementioned topics to avoid repetition.

Eligible articles were classified based on the type of studies (systematic review, clinical trials, cross-section, case-control, and animal studies). Moreover, the level of evidence for the included studies was determined based on the evidence-based medicine pyramid. In order to clarify the main topics of the nutrition publications, papers were also allocated to either dietary pattern or dietary supplement categories in case of relevancy.

The frequency of publications in each category was expressed as number and/or percent. The trend of publications through years was illustrated as a graph. To provide bibliometric maps, Scientific Landscapes (VOS viewer) software version 1.6.13 was used.

## Results

### Literature search

In total, 8049 papers (duplicate,  $n = 3951$ ) were identified from PubMed, Scopus, and Web of Science. Initial screening

based on titles and abstracts was conducted and 503 nutritional were considered possibly relevant. As publications studies conducted on probiotic, osteoporosis, and Islamic fasting will be explained in other reports, they were excluded from the study to avoid repetition. In the next step, selected papers were checked for affiliations and papers with irrelevant affiliations ( $n = 184$ ) were excluded from the study. Finally, we reached 319 papers in the field of nutrition published by researchers affiliated to EMRI.

### Main characteristics of the included studies

The included papers were classified based on the type of studies. They were systematic review and meta-analysis/review ( $n = 76$ ), clinical trials ( $n = 58$ ), cross-sectional ( $n = 171$ ), case-control ( $n = 11$ ), and animal studies ( $n = 3$ ). Most studies were dedicated to secondary research. From the view of evidence-based pyramid, 23.82% of nutritional studies were placed at the top of the pyramid with the level of evidence I. The most studies had the level of evidence III (53.60%).

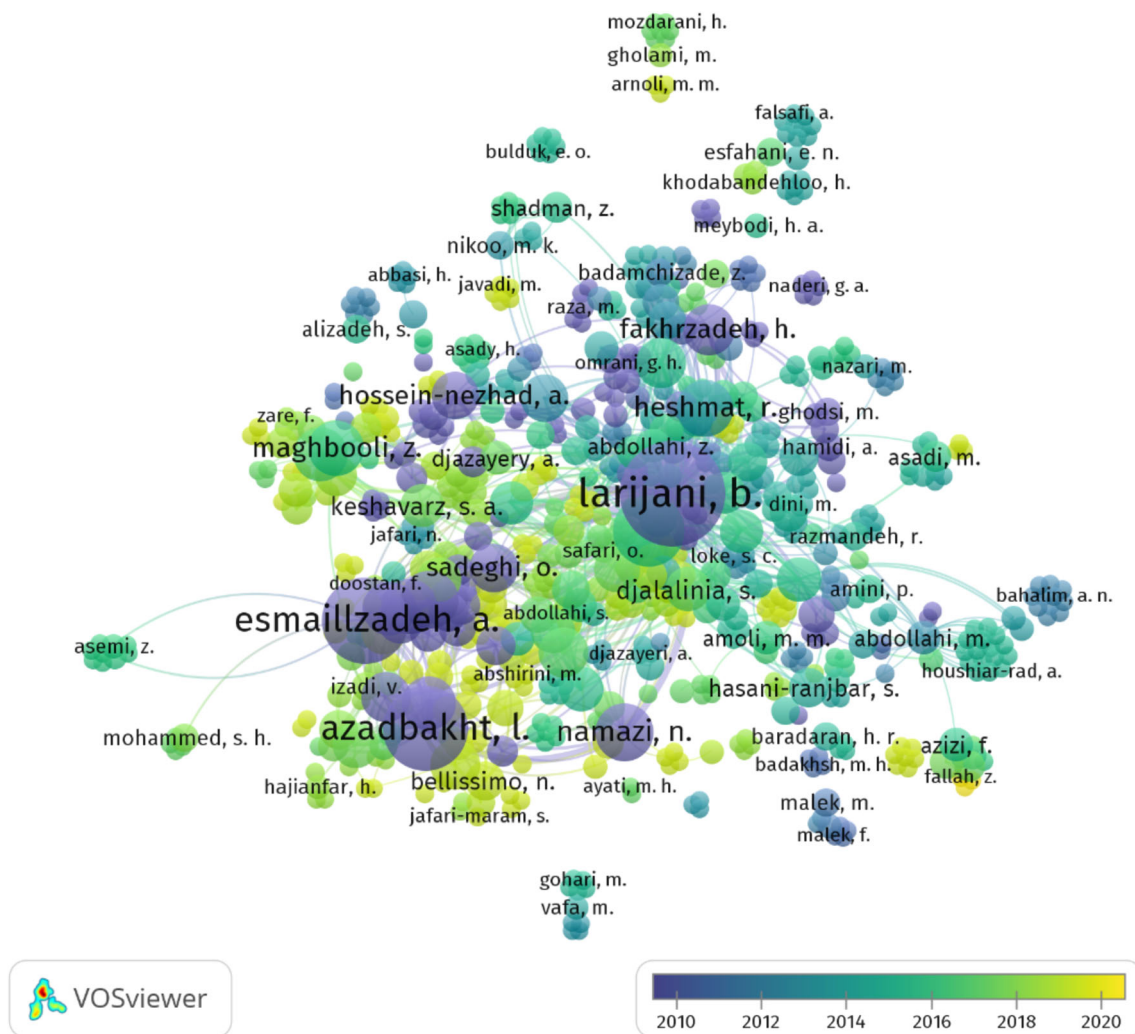
Figure 1 shows the trend of studies conducted in the field of nutrition through years. The first papers with the scope of nutrition were published in 2004. Generally, there was an increasing trend from 2004 to 2019. As shown in Fig. 1, there was a fluctuation in the number of papers between 2004 and 2013. However, after 2013, an increasing trend was observed. Between 2018 and 2019, the number of papers was sharply increased. The most publications were published in the recent 3 years, particularly 2019 ( $n = 100$ ) (Fig. 1). As shown in Fig. 2, most papers were conducted on obesity and metabolic syndrome. Other frequently used keywords in the title of papers were inflammation, oxidative stress, meta-analysis, health, insulin resistance, overweight, and prevalence. Outstanding authors with high publications in the field of nutrition were Prof. Bagher Larijani, Dr. Ahmad Esmaeilzadeh, and Dr. Leila Azadbakht (Fig. 3). As shown in Fig. 3, the mentioned professors apart from joint papers with each other, have several national and international networks in their publications. In 2019, 32 nutrition papers were dedicated directly to endocrine disorders.

### Findings of systematic reviews and meta-analyses

Based on evidence-based medicine pyramid, the level evidence of systematic review and meta-analysis is “I” and, we only briefly focused on only some results of this type of study.

Systematic review and meta-analysis can be classified into dietary supplements [15–19] and food groups/dietary patterns [20–27]. For instance, cinnamon may be helpful in reducing the serum levels of glucose with no changes in other glycemic parameters and anthropometric indices in patients with diabetes. It can also reduce both systolic and diastolic blood pressures [28]. In addition, its positive effects on obesity measures





**Fig. 3** Outstanding authors in nutrition publications at EMRI

have been revealed [29]. Namazi et al. also concluded that conjugated linoleic acid had positive effects on anthropometric indices and body composition. However, from the clinical points of view, its effects were slight [15]. Regarding supplementation with calcium, it has been shown that it is not effective in reducing serum levels of total cholesterol and triglyceride in overweight and obese individuals. However, it may modulate low-density lipoprotein and high-density lipoprotein cholesterol concentrations [30]. In addition, the consumption of whole-grains did not show any effect on anthropometric indices and body composition [20].

### Findings of national nutritional research

Numerous national studies and international studies [2, 31–47] with collaboration of European and American countries have been published so far. In this study, we pointed out only some of them as examples.

Rezaei et al., conducted a national study on 18,624 adults and found that the mean salt intake among Iranian population

was 9.52 g/day. In 97.6% of participants, minimum level of salt consumption was 5 g/day. Besides, in about 41% of participants, the level of salt intake was at least twice greater than that recommended by the World Health Organization [44]. Gholami et al. (2016) performed STEPS survey in Iran, and demonstrated that salt intake could increase systolic blood pressure in both Iranian subjects with hypertension and normotensive individuals. However, the magnitude of this increase was greater in hypertensive ones [39].

Obesity is a growing metabolic disorder which has been examined from various aspects. For instance, Djalalinia et al. (2011) found that excess BMI was responsible for 39.5% of total deaths in subjects (55% male, 45% female) aged 25 to 65 years old at national level. The highest mortality was attributed to ischemic heart diseases (55.7%) followed by stroke (19.3%) and diabetes mellitus (12.0%) [35]. Apart from original papers, several systematic reviews and meta-analyses on Iranian studies have been conducted. Based on a systematic review and meta-analysis on 119 studies in Iran, it was revealed that increased age, being married, low level of



education, residence in urban regions as well as being female were positively associated with obesity [36].

### Other activities

Apart from papers and conference abstracts, some specific activities in the field of nutrition particularly in diabetic research center affiliated to EMRI have been conducted. In the clinical guideline for diabetes published in 2014, a section was dedicated to this field that it was updated in 2018 considering main international guidelines in diabetes as well as national research. The level of evidence has been dedicated to each recommendation in order to help clinicians for making decision. In addition, the road map of diabetes including nutritional section has been provided in 2015 [48, 49] and in 2019 an update based on new evidence has been started.

Furthermore, in several symposiums and conferences held by EMRI including diabetes, osteoporosis, and probiotics, some panels have been dedicated to nutrition. Apart from workshops for physicians and other clinicians, 7 visual educational programs in the field of nutrition and diabetes also have been prepared by cooperation with the visual faculty of Tehran University of Medical sciences, so far. Moreover, numerous booklets and pamphlets in various endocrine disorders, particularly different types of diabetes mellitus, osteoporosis, and elderly disorders have been published and they were updated after a certain period of time to provide recommendations based on new evidence. Several clinics affiliated to EMRI provide nutrition consult and diet therapy for patients. Apart from providing nutrition services for people, they can be suitable ground for doing research in various fields.

### Activities in the COVID-19 pandemic

For adapting to the COVID-19 pandemic, public education in the field of nutrition has been shifted to virtual forms. Animations, motion graphics, E- books, and short films are examples of educational materials that spread through social networks and media by EMRI amid COVID-19. In addition, a guideline on diabetes management in the COVID-19 pandemic is prepared that a specific section has been considered for nutritional recommendations in this challenging time.

### Discussion

Trends of publications in the field of nutrition showed a considerable increase in the recent years at EMRI. Due to the topics of publications, it can be reported that most research centers and groups have considered nutrition assessments in their projects. However, as there is no nutrition research center at EMRI, nutrition roadmap is not completely clear. However, since 2019 a specific group started to develop a roadmap in this field.

Many research projects affiliated to EMRI did not consider nutrition assessments as their main aims; therefore sometimes tools and questionnaires dedicated to this part of projects were not ideal and did not cover the main dimensions of nutrition assessments. Several national research projects have been designed and run by EMRI in collaborations with other institutes including STEPS [50], IMOS [51], Heavy Metal (unpublished protocol), BEHVARZ [52], CASPIAN [53], and Bushehr elderly health program [54] in which nutritional assessments has been considered and some topics on nutritional factors extracted from the aforementioned studies have been published [55–59], but nutrition assessments were only their secondary outcomes. It is suggested that considering specific nutrition aims in such national surveys to draw nutrition status of our society for different age groups and genders, to clarify nutrient deficiencies and other requirements. Based on these findings we can help to policy makers and health providers to develop and implement effective strategies to overcome nutritional problems.

Although the different levels of nutrition research, including international, national, and small studies with various study designs have been conducted at EMRI, more high-quality studies are needed to find nutritional requirements and suggest appropriate strategies to prevent and manage endocrine disorders and other NCDs. On the other hand, it seems that paying more attention to basic studies in the field of nutrition can be helpful in developing the effective therapeutic and preventive methods based on nutrition knowledge. It seems that developing studies with several phases from In vitro to clinical trial phase for developing novel dietary supplements and clarification of pathways can be helpful in increasing the numbers of product-based projects.

Based on the publications and activities in the field of nutrition through 25 years, main research gaps in this field related to endocrine disorders are as follows:

- (i) No specific strategic plan and action plan in the field of nutrition
- (ii) Less attention to basic studies such as animal studies and In vitro studies.
- (iii) Undefined priorities in nutrition research
- (iv) Less specific attention to nutrition status of study populations and conducting specialized nutrition assessments in national studies conducted by EMRI
- (v) Few product-based projects

Given the publications in the field of nutrition, more clinical trials with nutrition topics including different types of diet and dietary supplements were expected. Annual strategic plan and action plan based on the requirements of society, literatures, and the opinion of experts in nutrition sciences can improve the current status.

Developing multidisciplinary mega projects with practical aims and expanding national and international networks can be considered as a future plan for this research group. Along with increasing the numbers of nutrition projects with high-quality methodology, paying attention to hot topics and checking the topics of nutrition research in valid international universities and centers periodically can improve our position in the world. Other proposed future plans in the field of nutrition and endocrine disorders are as follows:

- (i) Providing a strategic plan by a professional team in the field of nutrition sciences
- (ii) Identifying research gaps in the field of nutrition for each research center particularly for diabetes and obesity research centers to define research priorities
- (iii) Focusing on finding preventive strategies for endocrine diseases (national projects considering a collection of nutritional assessments can be helpful)
- (iv) Expanding collaborations with experts in the field of basic sciences
- (v) Increasing interdisciplinary projects

There were two major limitations in this study that should be addressed. First, the quality of studies was not examined. Second, grey literature such as theses, books, and conference abstracts in the field of nutrition were not considered. The main strengths of this study were as follows: summarizing publications through 25 years in this field, clarifications of research gaps, and putting forward suggestions as future plans.

## Conclusion

An increasing trend in the publications related to nutrition research is observed. However, nutrition activities and publications can grow further through expanding collaborations with other fields related to endocrine. Considering nutritional assessments in national projects and focusing on the identification of preventive nutritional strategies specific to our society can shed light on how to prevent NCDs and decrease the burden of such diseases.

## Compliance with ethical standards

**Conflict of interest** All authors declared no conflict of interest.

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