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Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on the nutritional status of the immigrant population residing in Spain

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Abstract

The migratory phenomenon has had a significant demographic impact in Spain in recent years. Currently, 6.8 million foreign nationals have established their habitual residence in our country, representing 14 % of the total resident population. Within the acculturation process of the immigrant population - through which they adopt the lifestyle habits of the host society - food plays a fundamental role and is key to the integration of these individuals. However, it can be affected by various factors, such as individual factors (country of origin or length of residence in Spain), sociocultural

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factors (religious beliefs or difficulties in cooking), or structural factors (working conditions or educational level), which may impact their health.

Scientific literature on dietary intake and the nutritional status of immigrants living in Spain is very limited, especially compared to the native population and to studies conducted in other nearby countries on this population, and it presents limitations that hinder access to comprehensive information. Nonetheless, despite the scarcity of studies, the review carried out to prepare this report highlights that the dietary intake of the immigrant population in Spain is diverse and that lower adherence to healthy dietary recommendations is associated with a higher risk of obesity and its complications, such as type 2 diabetes or increased cardiovascular risk. Some studies show a decrease in fiber and certain nutrient intake, more commonly observed among the immigrant population compared to the native population, with variations depending on the country of origin. Information on the risk of malnutrition is very limited and does not allow for a definitive conclusion.

The Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) considers it essential to conduct studies that characterize the nutritional status of the immigrant population residing in Spain, including the dietary patterns of second generations. These studies should overcome the limitations of previous research by using longitudinal methodologies adapted to each ethnic group, ensuring the cultural validity of assessment tools, and addressing the diversity of the migratory experience. Additionally, the consumption of foods rich in nutrients that are deficient in this population should be promoted, with the collaboration of Public Administrations, the food industry, and the scientific community, to facilitate access to healthy eating. Likewise, it is crucial to strengthen nutritional education, especially aimed at immigrants who have recently arrived, by taking into account the cultural and socioeconomic conditions specific to each group, with special attention to seasonal agricultural workers.

Key words

Nutritional status, dietary intake, immigrant, foreign population, acculturation, nutrients, obesity, overweight, malnutrition.

Suggested citation

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1. Introduction

According to the United Nations, even though there is no legally agreed definition, a migrant is defined as "someone who has resided in a foreign country for more than one year regardless of the causes of her or his transfer, whether voluntary or involuntary, or of the means used, legal or otherwise". Although, as also noted, "common use includes certain types of shorter-term migrants, such as seasonal agricultural workers who move for short periods to work in planting or harvesting agricultural products" (UN, 2024). Specifically, and according to the dictionary of the Royal Spanish Academy (RAE), an immigrant is defined as someone who "arrives in a foreign country to settle there" (RAE, 2025).

In recent decades, the migratory phenomenon has been a very significant demographic event in Spain. According to the latest data from the National Institute of Statistics (INE), during the fourth quarter of 2024, the resident population in Spain increased by 115 612 people, 100 793 of them of foreign nationality and only 14 819 people of Spanish nationality. This means that a high percentage of the increase was due to the foreign population (INE, 2025a). By Autonomous Communities, Catalonia, Madrid, Valencia and Andalusia were those that, at the beginning of 2025, stood out for having the highest percentages of the foreign population (22 %, 17 %, 15 % and 13 % of the total number of foreign people residing in Spain, respectively) (INE, 2025b).

Despite the fact that there have been periods of slowdown, in the last 10 years the flow of migrations has meant that about 6.8 million foreign people have established their usual residence in Spain. This represents 14 % of the total population resident in our country (49 million inhabitants), with the predominant groups being those of Colombian, Venezuelan and Moroccan nationality (INE, 2025a). According to the latest report of the Organisation for Economic Co-Operation and Development on international migration (OECD, 2024), of the total number of permanent or long-term immigrants that Spain received in 2022, 35 % were beneficiaries of free mobility (without the need for a visa or special residence permit), 11 % were working immigrants, 22 % family members and 5 % were immigrants due to humanitarian reasons.

Furthermore, according to the demographic projections of the INE for the next 50 years, this migratory phenomenon will continue to rise, meaning that, by then, population increase in Spain may be due exclusively to international migration, since the progressive increase in deaths, exceeding the number of births, would give rise to a negative vegetative balance throughout the projected period, being exceeded by the positive migratory balance in most of the years of the projection period, which would cause, in balance, an increase in population (INE, 2024).

In relation to the migration process at a European level, in 2022, approximately 7 million people established their place of residence in European Union (EU) countries. In that year, the highest numbers of immigrant arrivals were observed in Germany (2 072 000 people, 30 % of the total immigrants in EU countries); Spain (1 259 000, 18 %); France (431 000, 6 %) and Italy (411 000, 6 %) (Eurostat, 2024a).

On the other hand, it should be noted that migration is a phenomenon linked to food, not only as a basic need, but also as a form of integration into the host society, and also linked to general well-being from a broader concept of health (Okutan et al., 2023). This is stated by the Statistical Office of

the European Union (Eurostat), which indicates that the health situation of immigrants is assessed through their self-perception of health status, together with a series of additional indicators that allow a better assessment of their well-being. These indicators include the daily consumption of fruit and vegetables, and the frequency of consumption of these foods. These factors help to analyse the health status of immigrants and to understand any inequalities that may exist (Eurostat, 2024b).

The immigrant group that resides in Spain has experienced a gradual integration in our country, adapting their diet to Spanish customs, not only in terms of food, but also in terms of schedules and number of meals, both at home and outside of it. This acculturation, whereby immigrants acquire the lifestyle habits of the host society, has implied that part of their eating habits change and modify the type and amount of nutrients they ingest with the diet. Hence, depending on the country of origin, there are foreign people whose nutritional intake improves due to their adaptation to the Mediterranean diet and others, however, experience a worsening in their nutritional intake. This is due to the identification of two types of immigrant models based on the cultural aspect, contact and community participation or interaction and relationship with other cultural groups. On the one hand, the group that reaffirms itself in its cultural identities and traits, avoiding interaction with other cultures and, on the other hand, the group that interacts with other cultural groups maintaining its original culture and daily life but also admitting entry to aspects of other cultures (Okutan et al., 2023). It has been seen that, in some cases, the quality of the diet of immigrants worsens with respect to the diet of their country of origin, observing, for example, a higher intake of fats and a lower intake of carbohydrates and vitamins; in contrast, in other cases, it has been observed that residence in Spain is related to a healthier eating pattern than in the country of origin (Benazizi et al., 2019). It should be indicated that maintaining an adequate diet is a determining factor for health, which can be achieved by following healthy and sustainable eating recommendations, such as those set by the AESAN (2022), or the Mediterranean diet pattern, which is associated with a decrease in the risk of chronic diseases.

Sometimes, the diet worsens in the second generation of the immigrant population in the country of residence, by adopting local dietary patterns more easily, increasing fat and reducing the consumption of vegetables, fruits and legumes, compared to the immigrant population of the first generation, with the consequent repercussions on the prevalence of obesity and cardiovascular diseases (Landman and Cruickshank, 2001) (Benazizi et al., 2019).

To all this, we should add the existence of factors that could affect the integration of immigrants in the country of residence, such as economic resources, age, sex, religious beliefs, time of residence or the customs of their country of origin (MISSM, 2025). This, for various reasons, could ultimately affect the dietary habits and, consequently, the nutritional intake of each consumer (Benazizi et al., 2019).

For all these reasons, the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) was requested to carry out an evaluation of the available evidence on the nutritional situation of the immigrant population, both adults and adolescents, residing in Spain and how this nutritional situation could be affected by various factors such as the sociocultural aspects of their places of origin, among others.

2. Dietary intake of the immigrant population

2.1 Dietary intake of the immigrant population in Spain

The diet of immigrants in Spain can differ significantly from the traditional Spanish diet, influenced by cultural, economic and food accessibility factors. This section presents some key points related to the dietary intake of this population and its determining factors.

2.1.1 Analysis of food in relation to the country of origin

Migrants who arrive in a new country undoubtedly experience a significant change in their lives, facing a migratory process that impacts their socioeconomic situation, their sociocultural relations, gender dynamics, access to health services or their lifestyle, as well as communication and information problems due to the language barrier, among other factors (Okutan et al., 2023). All these aspects can influence their health status.

Food is one of the aspects that is transformed to the greatest extent in the migratory process. Criteria for what is considered "appetising" vary significantly between different cultures and regions of the world. Eating habits, in particular, are closely related to the environment where you live, since food is one of the deepest traditions and rooted in peoples' culture. In addition to being a biological requirement, food is a manifestation of identity, a means to strengthen the feeling of belonging to a group.

In Spain, different population groups coexist with different cultural and food traditions that can give rise to a significant challenge in the eating habits of immigrants as they adapt to their new environment.

The choice of food is, therefore, not only determined by what is considered tasty, but, as in some cultures, religious beliefs play a fundamental role, since in certain cases they prohibit or restrict the consumption of certain products, either permanently or temporarily. The dietary characteristics of certain religious groups are shown in the following Table 1:

Table 1. Dietary characteristics of certain religious groups

Community	Prohibited beverages	Prohibited foods	Forms of consumption	
Muslim	Alcoholic beverages	Pork and pork products Blood Dead meat (carrion) Reptiles and insects	Meat must be *halal* [a]	Periods of regular fasts (*Ramadan*)
Jewish	-	Pork, hare, horse, camel, badger, ostrich, scavenger animals Insects Blood Eggs from *non-kosher* birds or fish [b]	Meat, milk and eggs, wine, must be *kosher* [b]	Meat and dairy cannot be cooked and/or consumed together
Hindu	Alcoholic beverages	Beef	Mostly vegetarians; they rarely eat fish	Regular fasting periods

[a] *Halal*: allowed in Muslim food according to the guidelines of the Qur'an and Hadith. [b] *Kosher*: foods allowed in Jewish diet according to the diet principles collected in the Torah and Talmud. **Source:** modified from Varela et al. (2009).

Therefore, the immigrant population, coming from various backgrounds, has had to adapt their eating habits for different reasons. Although, in some cases, immigrants try to maintain the culinary procedures and traditions of their countries of origin, they are often forced to modify certain ingredients or resort to pre-prepared products that are sold in stores specialising in international food.

Sometimes, the difficulty of finding specific foods on the Spanish market significantly conditions their eating patterns, since they cannot always access the typical products of their country, or because many of the Spanish foods are also to their liking. On the other hand, they have not only had to adapt their eating habits in terms of the foods they consume, but also in terms of schedules and number of meals, due to the jobs they perform and, above all, to their process of adaptation to Spanish culture and society.

Hence, to better understand this population group, it is crucial to know the eating habits of their countries of origin. A global analysis of the foods they consumed in their countries shows that their diet conforms, in general terms, to the recommended dietary patterns, such as, for example, with a high consumption of foods rich in complex carbohydrates, such as rice, tubers (potato or cassava) and corn cakes in the case of the population from Central and South America; couscous, rice and millet in the case of Africa; and rice and soy in people from Southeast Asia (Ngo and Vidal, 2008).

In a study investigating these issues, conducted with 724 immigrants residing in Spain for at least 2 years, it was observed that, in terms of overall dietary intake, more than 50 % of participants stopped consuming certain foods upon arrival in Spain, highlighting that the main reason was the impossibility of finding them in our country (Varela et al., 2009). Regarding the pattern of dietary intake throughout the day, they highlighted that the most common foods at breakfast were milk and coffee; 80 % of participants considered the midday meal as the main meal of the day, this percentage being even higher among the participants from Central and South America; rice was the most consumed food in this meal by the population from Central and South America, and Asia; and 73.7 % of the people who participated in the study indicated that they included beef in this midday meal; and, finally, at dinner, 50 % of the participants indicated that they consumed salad, being especially frequent among people from Eastern Europe, who also included other vegetables in that meal.

2.1.2 Dietary pattern and nutrient intake in the immigrant population

In the previously cited study, which investigated the dietary pattern and nutrient intake of the immigrant population residing in Spain (Varela et al., 2009), it was observed that the average energy intake exceeded the recommended one, both in women (Central and South America: 145 %; Eastern Europe: 141 %; Africa: 125 % and Asia: 103 %), as in men (Central and South America: 110 %; Eastern Europe: 104 %; Africa: 109 % and Asia: 106 %) . On the other hand, the average caloric profile, the energy intake by macronutrients, was practically in line with the recommendations contained in the study, highlighting that the percentage of energy supplied by lipids to the total diet did not exceed 35 % in any case, although a high percentage of saturated fatty acids was observed in relation to total energy.

These data reflect trends in the diets of immigrants, with significant differences in energy intake depending on the region of origin, which may contribute to nutritional imbalances in the immigrant population.

In the same study (Varela et al., 2009), it was observed that the consumption of certain micronutrients did not reach 80 % of the recommended intakes, specifically: zinc (in women from Africa and Asia); vitamin E (in men and women from all backgrounds); vitamin A (in men from all backgrounds and in women from Central and South America, and Asia); vitamin D (in men and women from Asia) and folic acid (in women from Africa). On the other hand, the intake of protein, phosphorus, thiamine, niacin, vitamin B12 and vitamin C exceeded 150 % of the recommendations, in all the people who participated in the study. Fibre consumption in all groups was below recommendations: Eastern Europe: 23.7 g/day; Africa: 21.3 g/day; Central and South America: 23.3 g/day; Asia: 21.1 g/day. The ratio of vitamin E (mg) to polyunsaturated fatty acids (g) did not exceed the recommended value of 0.4 in any of the populations (Eastern Europe: 0.18 g/day; Africa: 0.15 g/day; Central and South America: 0.19 g/day; Asia: 0.37 g/day). The population group from Asia was the one that showed the best density of nutrients in their diet.

In the adult population, a study carried out between 2005 and 2009, with 68 immigrants in the Community of Madrid, suggests the existence of an inadequate consumption of certain micronutrients. In both sexes, average energy intake was lower than the recommendations, especially in men (70.5 ± 22.8 % of recommended intakes). In women the intakes of iron, magnesium, zinc, potassium, folic acid, vitamin D and vitamin E did not reach 80 % of the recommended intakes, and in men the intakes of magnesium, zinc, folic acid, vitamins B2, A and D did not reach this value. The caloric and lipid profiles, without differences between the sexes, deviated from the recommendations. The deficiencies in micronutrients detected place this immigrant population as being at special nutritional risk and suggest the need for treatment disaggregated according to the country of origin (Ávila et al., 2019). A study conducted in 200 people from Ecuador living in the Region of Murcia showed a deficiency in the consumption of fibre, vitamin E, iodine and folate. A reduced iron intake was also observed in immigrant women (Neira, 2014). In a study conducted by Montero et al. (2017) in which the diet of adolescents of Moroccan origin residing in Madrid was compared with that of adolescents, also of Moroccan origin, residing in Ouarzazate (Morocco), the quality of food and the impact of migration on their dietary habits were evaluated, and it was observed that adolescents residing in Ouarzazate (Morocco) presented a greater adherence to the Mediterranean diet with adequate intakes of fibre (above the amounts recommended by the Food and Agriculture Organization of the United Nations/World Health Organization (FAO/WHO, 2003) - more than 30 g/day - and above 14 g/1000 kcal, an amount considered a protective factor of cardiovascular risk) and lower levels of cholesterol. In contrast, the group of adolescents living in Madrid showed a significantly higher intake of cholesterol and lower intake of fibre, below the amounts recommended in most cases, something of concern, for the authors, in terms of cardiovascular risk. Despite these changes, many immigrant adolescents retained traditional food customs from their country, such as consuming homemade bread, *halal* meat, and the custom of eating as a family from a single central dish. No significant differences were found in the quality of the diet according to the parents' educational level. However, it was observed that the migration process caused changes in the eating habits of the sample residing in Madrid; new eating behaviours similar to those of the Spanish adolescent population were acquired, such as the consumption of soft drinks, industrial pastries and snacks,

which resulted in a high contribution in their diets of added simple sugars and saturated fats, without differences highlighted by sex, something that was observed in the consumption of alcoholic beverages, which was significantly higher in boys than in girls.

2.1.3 Factors influencing the dietary intake of the immigrant population

The dietary intake of immigrants is determined by a combination of individual, sociocultural and structural factors that affect their eating habits and consumption patterns. Individual factors include demographics, health status, and nutrition knowledge that may vary by country of origin. Sociocultural factors include the food customs and traditions that immigrants bring with them and which may be difficult to maintain in their new environment, often due to the unavailability or high cost of certain traditional foods, and the conditions of employment. Furthermore, structural factors, such as access to affordable food and food insecurity, influence their food choice (Elshahat and Moffat, 2020) (Zou et al., 2022).

There is a complex interaction between these factors and exposure to the particularities and traditions of the host country. This determines to what extent immigrants can modify their attitudes and knowledge about food, their taste preferences and their purchasing and food preparation behaviours, and which may affect the dietary intake of immigrants in three main ways: maintaining their traditional dietary patterns; fully adopting the eating habits of the host environment or integrating aspects of both, while retaining some traditional dietary practices (Landman and Cruickshank, 2001) (Sanou et al., 2014) (Elshahat and Moffat, 2020) (Zou et al., 2022).

There are many and varied reasons for these changes. Thus, prolonged residence in the host country, together with an adequate educational level, greater economic resources, employment outside the home and fluency in the local language, increase exposure to the predominant culture by encouraging dietary acculturation among immigrants and causing changes in their traditional eating patterns. In addition, access to new food products can also change food buying and consumption habits both at home and in restaurants, while the lack of availability of traditional ingredients can encourage the consumption of products from the host country. It has also been seen that, when traditional foods are expensive or time-consuming to prepare, it is possible that highly processed foods are chosen or there is an increase the frequency of consumption in fast food establishments (Satia-Abouta et al., 2002, 2003).

The factors that influence the dietary intake of the immigrant population residing in Spain identified in previous studies are summarised below. They are grouped into two categories: individual, and socio-cultural and structural (Benazizi et al., 2018, 2019, 2021, 2022) (Badanta et al., 2021) (Urrego-Parra, 2022) (Chuquitarco-Morales et al., 2024) (Rodríguez-Guerrero et al., 2024a, b).

Individual factors

In relation to the country or area of origin, research shows better compliance with recommendations for macronutrient intake in people of Ecuadorian origin, and for Mediterranean diet, energy and fat in the Moroccan population. Excessive consumption of sweets and soft drinks has been observed in people from Central and South America and poorer compliance with recommendations

for micronutrients and vitamin D in people of Moroccan origin. The adolescent population from Morocco shows a worse dietary pattern (excessive consumption of calories, proteins, saturated fats, simple sugars and deficient fibre consumption) and worse compliance with the Mediterranean diet (Benazizi et al., 2018, 2019, 2021, 2022).

A longer residence time is associated with better compliance with the Mediterranean diet, higher intake of fibre, olive oil, vegetables and fish, and lower intake of soft drinks and fast food in the Latin American population; it is also associated with greater similarity to the diet of the Spanish population (Benazizi et al., 2019).

Studies of the adolescent population show that, with a longer period of residence in Spain, dietary patterns and the acquisition of healthier eating patterns improve. Others, however, show a higher consumption of meat and pastries. In the Romanian group, a higher percentage of inadequate dietary intake was observed and there was a high consumption of sausages, pastries, sweets and salty snacks, and lower consumption of fruit, fruit juices and vegetables (Benazizi et al., 2019).

Sociocultural and structural factors

Studies with immigrant families of Latin American origin, with both parents working, show that they have difficulty in cooking homemade food and often resort to less healthy options, such as eating fast food. Due to their limited purchasing power, some people find it difficult to buy products from their home countries, which are often more expensive, so they choose to prioritise price and take advantage of the offers available in supermarkets (Benazizi et al., 2018, 2019, 2021, 2022) (Chuquitarco-Morales et al., 2024).

Employment conditions (hours of work per day and days of work per week, and occupation) did not influence the monitoring of adherence to the Mediterranean diet of working people of Moroccan, Ecuadorian and Colombian origin, being higher in those with longer residence in Spain. This pattern differs from that observed in populations of Chinese origin, where it is observed that working conditions explain, to a large extent, their dietary patterns, attributed, in part, to the lack of time required for the preparation of the traditional dishes of their culture (Benazizi et al., 2018, 2021).

Ecuadorian people whose work is related to agriculture have worse compliance with nutrient recommendations, and it is better in those who work in restaurants and other service sector jobs (Benazizi et al., 2018, 2019, 2021, 2022) (Badanta et al., 2021) (Chuquitarco-Morales et al., 2024).

Studies carried out with temporary or seasonal migrant workers in Andalusia, La Rioja, Murcia and Catalonia show that the unfavourable working conditions of this group (low economic resources, housing situations in inadequate conditions and long working hours) have an impact on their dietary behaviour and food insecurity (Urrego-Parra, 2022) (Rodríguez-Guerrero et al., 2024a, b).

In the case of the population of Moroccan origin, the importance of cultural and/or religious factors is observed in the low consumption of processed pork-based meats, for example. These foods are not allowed for religious reasons and are not part of their food culture. In this group, it has been observed that living as a couple is related to greater dietary variety.

The influence of educational level has also been noted: the higher the level of education, the better the compliance with recommendations and consumption of healthier foods. And better compli-

ance with the Mediterranean diet has been observed in adolescents whose fathers have qualified jobs and university-educated mothers.

2.2 Dietary intake of the immigrant population in other European countries

Some public institutions in various countries of the European Union with competence in matters related to food safety have provided, through the focal points of the European Food Safety Authority (EFSA), information on the nutritional status or diet of foreigner residents in these countries, as well as on the risk management or communication measures aimed at the immigrant population on this matter. Although this report does not include the evaluation of the intake and nutritional situation in children, due to its relevance, the information received from the focal points on this group is provided in this section:

- In a study conducted in Austria (BMSGPK, 2021) on the nutritional behaviour of school-age children it was observed that, although there were no differences in the daily consumption of fruit and vegetables between students of immigrant origin and those who were not, there were differences in the consumption of sweets and soft drinks, being higher in students of immigrant origin, who also had a tendency to consume fast food and energy drinks more frequently.
- In France, a study performed by Miszkowicz et al. (2017), the diet of French-speaking immigrants served at the French Office of Immigration and Integration (OFII) in Paris was analysed, highlighting that their diet showed particularities compared to the general population in France: they consumed less fruit, vegetables and dairy products, but more fish, meat and eggs. These differences were influenced by cultural, economic and accessibility factors. Furthermore, almost half of the people surveyed consumed fatty, salty or sugary foods on a daily basis, especially those with a lower education level. The study highlighted the need to adapt prevention messages for this population, although methodological limitations and possible biases that had to be taken into account when interpreting the results were recognised.
- In Greece, Chatzivagia et al. (2019) conducted a study whose objective was to evaluate the nutritional intake and dietary habits of the beneficiaries of the Fund for the European Aid to the most Deprived (FEAD), which included immigrants, provided that they could communicate in Greek by themselves or through a proxy. The results showed that an alarming proportion of people benefiting from food assistance programmes continued to suffer from energy and protein malnutrition. They had a low intake of protein and energy foods, and often skipped meals, especially breakfast. In addition, they had a reduced consumption of meat, fish, seafood, oils and nuts. The diet of these people showed a change towards vegetable products, with higher intake of carbohydrates and fibre, but with lower consumption of healthy fats. A high prevalence of overweight and obesity was also observed, reflecting the double burden of malnutrition. Despite efforts, the food assistance programme failed to adequately improve the dietary quality of this vulnerable population, underscoring the need to adapt food distribution and provide nutritional education. Another recent study (Michalis et al., 2023) had the objective of discussing the experiences, practical needs and feelings of 22 immigrants from the Open School of Immigrants in Attica (Greece) related to health management, diet and food security,

concluding that lack of time, high cost of healthy foods and lack of knowledge were the most common obstacles to following a healthy diet.

- In the Netherlands, the dietary habits of immigrants from Turkey and Morocco were analysed, highlighting key differences with respect to the habits of the indigenous population (*Voedingscentrum* report 2016). It was observed that immigrants of Turkish and Moroccan origin residing in the Netherlands, as well as the native Dutch population, consumed less vegetables and fruit than recommended. On the other hand, they point out that people of Moroccan origin had a lower intake of saturated fatty acids compared to native ones, and a higher intake of heme iron and vitamin B12. They also indicate that the calcium intake of the resident population of Moroccan origin was relatively low due to the lower consumption of dairy products (although not deficient). Regarding the diet of immigrants of Turkish origin residing in the Netherlands, it was characterised by a cultural base rich in healthy traditional foods, although it showed imbalances in key nutrients compared to the native Dutch population. In particular, it highlights a higher consumption of saturated fats, animal proteins and added sugars, and a lower intake of calcium, vitamin A, omega-3 and water. These imbalances may contribute to the increased risk of overweight and metabolic problems seen in childhood within this group.

  Aspects such as the influence of religion on food (such as the consumption of *halal* meat and the prohibition of alcohol and pork products in certain groups); child overweight (common among children of Turkish and Moroccan origin) and attitudes towards food, such as the tendency not to waste food and to prevent children from going hungry were mentioned. The lack of awareness about the signs of satiety in children was also highlighted.

  Also, in the Netherlands, studies have been carried out on people living in Amsterdam from different ethnic backgrounds regarding the differences in their health status, such as the HELIUS study (2024) or the study carried out by de Boer et al. (2015) on the nutrition of immigrants of Moroccan, Turkish or Surinamese origin living in that city, in which it is observed that these people usually follow diets influenced by their religious beliefs and culinary traditions. These diets usually include foods typical of their countries of origin and a lower consumption of saturated fats. For example, it was observed that people of Turkish origin living in Amsterdam tended to eat more fruit than native Dutch people; those of Surinamese and Moroccan origin consumed relatively less unhealthy (saturated) fats. Due to the different food choices, these groups on average obtained, through diet, less dietary fibre, calcium, vitamin A and, women, among them, less vitamin B1. In addition, the population of Surinamese origin obtained less iron and magnesium through the diet. In general, in the immigrant population groups under study, overweight and obesity were more common than in the native Dutch population.

More recently, data have also been published in Germany corresponding to 2021 where a lower intake of vitamin D is observed among immigrant women when compared with non-migrant women (Taghvaei et al., 2022).

3. Nutritional status of the immigrant population. Nutrition-related clinical conditions

3.1 Overweight and obesity. Complications

3.1.1 Prevalence of overweight and obesity among the immigrant population

In the European Region of the WHO, according to age-standardised estimates for 2016, the prevalence of obesity among the adult population was higher than in any other WHO region, reaching epidemic proportions in that region and Spain being one of the countries of the European Union with the highest prevalence of obesity and overweight. The WHO estimates that 59 % of adults have overweight or obesity, and more than half of adults, in 50 of the 53 Member States of the European Region, have overweight or obesity. Levels are higher among men (63 %) than women (54 %) across the WHO European Region and in most countries, with a prevalence close to or above 70 % for men in several countries. Overweight would affect 41 % of men and 30 % of adult women, and obesity 24 % of women and 22 % of adult men, with Mediterranean and Eastern European countries showing the highest figures. The prevalence of excess weight in this region has increased since 1975 by 51 % and obesity by 138 %, especially in men (WHO, 2022). Moreover, none of the 53 Member States in the Region that have committed to the WHO's global target on non-communicable diseases is on track to meet the target of halting the rise in obesity (WHO, 2021).

According to the results of the ENE-COVID study, on the weight situation of the adult population in Spain in 2020, 55.8 % of the population residing in Spain over 18 years of age was overweight (18.7 % obese and 37.1 % overweight), with the prevalence of severe obesity being 4.9 % (ENE-COVID Study, 2023). The latest data available in adults (18 years of age or older), which correspond to the 2020 European Health Survey, indicate that in Spain the prevalence of obesity is 17 % in men and 16 % in women, the prevalence of excess weight is 45 % in men and 31 % in women, and the prevalence of severe obesity reaches 8 % of the adult population (6 % men and 9 % women) (Ministry of Health, 2020). Excess weight in adults has remained stable at around 54 % from 2011 to 2020, although in women excess weight (but not obesity) has increased in that period (AESAN, 2020). The prevalence of overweight and obesity may even continue to increase, making obesity prevention a priority in the near future for the health of the population and also for the sustainability of health systems (WHO, 2022).

Regarding other weight situations, according to data from the European Health Survey 2020, the prevalence of low weight in adults is 2 % (3 % women and 0.8 % men) (Ministry of Health, 2020).

On the other hand, as mentioned above, according to recent data from the Statistical Office of the European Union (Eurostat, 2024a), in 2022, Spain was the second country in the European Union with the highest percentage of immigrant population (18 % of total immigrants in the European Union countries), only preceded by Germany. During the last two decades, Spain has experienced an intense growth of the immigrant population principally from Colombia, Venezuela and Morocco (INE, 2025a). However, and despite this trend, as well as the importance of the place of birth and the migratory process as determinants of inequality, few studies have focused on the inequalities in obesity between the immigrant and native population in Spain.

An increase in the prevalence of overweight and obesity among the immigrant population has been described. This phenomenon has been explained through the theory of the "thrifty pheno-

type", which postulates that certain ethnic groups, having developed mechanisms of insulin resistance in contexts of food scarcity, can become more vulnerable to obesity and its complications, such as type 2 diabetes, when they move to other countries and come into contact with a more obesogenic environment, with diets with a greater contribution of high energy density foods, rich in simple sugars and more sedentary lifestyles (Hales and Barker, 2001) (Astrup et al., 2008) (Siddiqui et al., 2019). A systematic review and meta-analysis evaluating these aspects has recently been published (Bueno et al., 2023). Analysis of the data showed that adult immigrants experience a higher prevalence of type 2 diabetes than target populations (PR (Prevalence Ratio): 1.48; 95 % CI (95 % Confidence Interval): 1.35-1.65) and origin (PR: 1.80; CI 95 %: 1.40-2.34). Similarly, there is a significant excess prevalence of obesity in the immigrant child population (PR: 1.22; CI 95 %: 1.04-1.43), although not among the immigrant adult population (PR: 0.89; CI 95 %: 0.80-1.01).

Several studies conducted in the United States and Europe have shown significant variations in the prevalence of obesity among the immigrant population and the native population of the host country (Agyemang et al., 2024). However, there are very few studies conducted in the Spanish population. In this sense, Marín-Guerrero et al. (2010) analysed the prevalence of obesity in immigrants residing in Madrid. In the study they conducted, it was observed that the percentage of people with obesity was higher among the immigrant population than among the Spanish population, with the exception of the group of people from Western European countries. According to gender, male immigrants from Eastern Europe and Central and South America, and women from Africa-Asia and Eastern Europe showed higher obesity rates.

The residence time of immigrants and obesity has consistently shown a positive association in various studies conducted in the United States and Canada. Studies in European countries, however, have yielded less consistent results. In France, for example, a survey was carried out in 2014 on the food and health risks for immigrants in a precarious situation, within one of the Doctors of the World programs in France (Chappuis et al., 2017). The survey was conducted in seven sites and revealed that 78.5 % of immigrants lived in households with limited access to food, spent 2.5 euros a day on food, with an average of 2.2 meals a day, and 45.9 % went at least 1 day without eating in the last month. Only 42 % had turned to food aid agencies. Regarding nutritional status, 34.1 % were overweight and 18.7 % were obese. The results highlighted the need to guarantee access to healthy foods and adapt preventive actions. In a study conducted in the Netherlands, by Garssen et al. (2003) on mortality risks among foreigners and native people, it was observed that, between 1996 and 2001, the mortality risk of non-Western foreigners in the Netherlands was significantly higher than that of the native population, especially before the age of 35. However, in Moroccan men over the age of 35, the risk of mortality was considerably lower than in the Dutch. In terms of food and nutrition, it was highlighted that healthy eating habits were key protective factors for Moroccan men, who had a lower mortality rate in cardiovascular disease and cancer compared to the Dutch. These habits, which also included lower consumption of tobacco and alcohol, could explain the lower mortality observed among Moroccan men. The authors concluded that investigating dietary habits and their impact on the health of the Moroccan population, as well as other non-Western groups, has a high relevance for public health in the Netherlands.

As for Spain, in a study by Gutiérrez-Fisac et al. (2010) 7155 people over the age of 18 living in the city of Madrid were surveyed between November 2004 and May 2005. Information was collected on immigrant status (country of birth); time of residence in Spain; obesity; sociodemographic characteristics and lifestyle. Compared to the Spanish population, the Odds Ratio (OR) of obesity in the immigrant population according to residence time was less than 1 in all groups, approaching 1 as residence time increased (OR: 0.67, 0.73 and 0.81 for immigrants with less than 2, 2-4 and 5-9 years of residence in Spain, respectively), until 10 or more years of residence, in which it decreased (OR: 0.69). In other words, as immigrants spent more time in Spain, their risk of developing obesity approached that of the Spanish population. However, after 10 years, this risk decreased slightly again. The magnitude of this association decreased considerably after adjusting for sociodemographic and perceived health variables, but did not change further after adjusting for lifestyle variables.

Subsequently, the AFINOS study (Esteban-Gonzalo et al., 2015) compared the prevalence of overweight in the native Spanish adolescent population and the immigrant population, residing in the Community of Madrid, and whether the duration of residence affected the risk of the immigrant population being overweight. The study population was a representative sample of adolescents aged 13 to 17 years (n= 2081, 1055 women). Data were collected between November 2007 and February 2008 using a cross-sectional survey in which self-reported height and weight were used to calculate Body Mass Index (BMI). In general, no significant differences in the risk of overweight were detected between the Spanish native population and the immigrant population. However, immigrants who had resided in Spain for 6 years or less did show a higher risk of being overweight than the Spanish adolescent population (OR: 1.57) and that the immigrant population who had been living in Spain for more than six years (OR: 1.98). Lifestyle changes associated with a longer length of residence in Spain appear to have a slightly protective effect on the risk of overweight in the immigrant population.

In another study conducted on indigenous and immigrant children and adolescents, aged 2 to 14 years and residing in Spain, the prevalence of overweight/obesity was analysed, and its relationship with socioeconomic factors, habits and living and health conditions was explored (Moncho et al., 2022). This study used data from the 2017 National Health Survey, which collects health information from the population residing in Spain, and multivariate logistic regression models were adjusted to estimate the risk of overweight/obesity. The final sample consisted of 2351 households. The immigrant child population had a significantly higher overall prevalence of overweight and/or obesity than the native population, both in boys (40.5 % *versus* 295 %) and girls (44.8 % *versus* 30.3 %), and a higher adjusted risk of overweight/obesity (OR: 1.67). In addition, it was observed that the child population of immigrant origin had a higher risk of consuming sugary soft drinks, exercising less and using electronic devices more. In conclusion, the authors indicate that the increased risk of acquiring different habits that can contribute to developing overweight and having overweight/obesity in children of immigrant origin should guide public health policies and interventions, emphasising the groups at highest risk and incorporating considerations on socioeconomic inequalities. According to the authors, knowing the sociodemographic variables that can promote childhood obesity, including the child's origin, would provide an appropriate tool to intervene in the prevention and/or

reduction of excess weight in the most vulnerable communities, adapting strategies and policies to each population group and its needs. In this regard, interventions aimed at achieving the acquisition and development of healthy eating habits and patterns, both for children and their families, will have a positive impact on their health and on the health of the future adult population. Therefore, public health policies and interventions aimed at the prevention and treatment of childhood obesity must incorporate a sensitive and clear focus on social and economic inequalities, emphasising the groups at highest risk such as the immigrant population (Moncho et al., 2022).

In a study conducted in Catalonia (González-Solanellas et al., 2011), the dietary patterns and nutritional status of a random sample of 201 people treated in an urban health centre were evaluated, with a average age of 32.81 years (Standard Deviation (SD): 6.72), which included 62.7 % of migrants (126) (place of origin: 63 people of Asian origin: 38 people of Filipino origin and 25 people of Indo-Pakistani origin; from other European countries: 17 people; from Central and South America and the Caribbean: 37 people; from Morocco: 9 people). An increase in the prevalence of obesity in the immigrant population was observed (44.4 % *versus* 20.3 %; p= 0.001), as well as an increase in the percentage of people with visceral obesity, as assessed by waist circumference. The percentage of people who reported physical exercise was lower in the immigrant population (42.1 % *versus* 62.7 %; p= 0.013).

In the municipality of Villanueva de la Cañada, Madrid (Ávila et al., 2019), the dietary intake of a sample of 68 immigrants who attended orientation and help talks, organised by the city council of said town, was analysed, with an average age of 36.8 years (±10 years) in women and 31.7 years (±7.1 years) in men. This population came, mainly, from Central and South America (66.2 %), to a lesser extent from Central and Eastern Europe (19.1 %) and minority from Africa (10.3 %). The prevalence of obesity, defined by a BMI greater than 30 kg/m^2, was 15.9 % in women and 20.8 % in men, and overweight (BMI: 25-30 kg/m^2) of 34.1 % of women and 37.5 % of men.

3.1.2 Risk factors for obesity among the immigrant population

When people emigrate, they usually experience an uprooting, not only from their environment, but also from their family, which translates into a cultural uprooting that can be accompanied by depression and other mental health problems that predispose to the consumption of substances harmful to health, not only of alcohol, but also of certain foods, exceeding the recommended limits. There is evidence to suggest that immigrant populations from low- or middle-income countries migrating to high-income countries show a significant change in obesogenic behaviours in the host society, and that these changes are associated with cultural uprooting. A systematic review evaluated studies conducted in the United States with immigrant populations from eight different countries (Delavari et al., 2013). Six studies indicated overall positive associations between greater uprooting with respect to their culture of origin and BMI, although in three studies it was observed that the greater the cultural uprooting, the lower the BMI, mainly among women. Several potential explanatory hypotheses were developed for these emerging patterns. The "healthy immigrant effect" may decrease with greater cultural uprooting, since the host culture may encourage less healthy weight gain than the cultures of origin. This seems to be especially true for men, and a rapid form of nutri-

tional transition is likely to contribute to this. Inconsistent results observed in women may be due to the interaction of cultural influences on body image, food choice, and physical activity. In other words, the Western ideal of a slender female body and the greater valuation of activity and physical fitness can counteract the obesogenic eating environment of immigrant women.

Currently, many other factors are pointed out as responsible for the risk of obesity in the immigrant population, beyond cultural uprooting. Among them, the environment where immigrants live stands out, which can play an important role in the eating behaviours and lifestyles they adopt, favouring the gain or decrease of body weight, as well as the need to adapt to an urban environment. The place of socialisation of immigrants and their cultural beliefs and gender roles, as well as their body preferences will shape the way they acquire certain eating habits and health behaviours. And, of course, the socioeconomic status and the education level achieved will also modulate these associations, with the risk of increasing body weight, adding vulnerability to immigrant status. In this sense, the inequalities in obesity according to place of birth and educational level in men and women in Spain have been examined. In a cross-sectional study using data from the National Health Survey 2011-2012 and the European Health Survey in Spain 2014, with 27 720 adults aged between 18 and 64 years, of whom 2431 were immigrants (Rodriguez-Alvarez et al., 2018), a higher probability of obesity was observed in immigrant women and a lower probability of obesity in immigrant men, in relation to the native population, after adjustment. Significant heterogeneity was observed for the association of place of birth and obesity by education in men: men with lower levels of education had a lower prevalence of obesity than natives with a similar educational level. This study suggests that place of birth may affect the risk of obesity in women and men. However, this relationship between educational level and obesity may be different in men and women.

3.1.3 Complications of obesity in the immigrant population in Spain: type 2 diabetes and cardiometabolic risk

Visceral obesity is associated with an increased risk of metabolic complications.

Some studies have observed that the immigrant population has an increased risk of developing cardiometabolic problems. In 2014, a literature review was carried out in order to know the behavioural and biological risk factors of cardiometabolic disease in the immigrant population in Spain (Fernandes et al., 2014). 117 articles were identified, although only 16 were included in the review. Thirteen studies were published as of 2009. In total, 15 articles corresponded to cross-sectional studies and one to a non-randomised trial; 5 were population-based, 7 were performed in a clinical setting and 4 in mixed settings (population and clinical). In 9 studies, the sample was less than 500 participants, and 15 studies were conducted locally or regionally. Thirteen articles focused on dietary habits and nutritional status, but showed substantial heterogeneity in goals and outcomes. Some studies found that the frequency of obesity was higher in the immigrant population than in the native Spanish population, that the time of residence in Spain was not associated with obesity, and that immigrants consumed less tobacco and alcohol, but performed less physical activity than those born in Spain. This publication concluded that the information and scientific evidence on lifestyle and cardiometabolic risk factors among the immigrant population in Spain was quite scarce, and

does not allow to characterise the risk profile of this population.

Despite the scarce scientific production, recent studies continue to highlight the higher risk of cardiometabolic diseases in the immigrant population. In an analysis carried out in the European IDEFICS/I.Family cohort that includes the Spanish population, with 8745 children aged 2 to 17 years (Lindblad et al., 2023), linear regression models were used to investigate the association between the migrant origin of the parents (one or two immigrant parents *versus* native parents) and BMI, the Metabolic Syndrome score (MS) and their individual components. Outcome variables were parameterised as age- and sex-specific "z" scores. Adjustments were made based on the age, gender, country, and educational level of the parents and, in addition, based on the parents' income, lifestyle, including dietary factors, and maternal BMI. On average, children with two immigrant parents had higher BMI "z" scores (SD: 0.24) and MS score (SD: 0.30) when compared to children with native parents, while no significant differences were observed in children with one immigrant parent. Associations were attenuated by monitoring maternal BMI and activity in sports clubs. The educational level of the parents modified the associations with BMI and SM "z" scores, so that they were more pronounced in children with a low educational level of the parents.

Likewise, a study was carried out with 1080 adolescents aged 12, 14 and 16 years old, who attended 24 secondary schools enrolled in the SI! Program trial in Spain (Martínez-Gómez et al., 2024). After evaluating the "cardiovascular health pathways" (CVH), defined according to the criteria of the American Heart Association as the changes over time of cardiovascular risk factors (smoking, BMI, physical activity, diet, blood pressure, total cholesterol and blood glucose), it was observed that adolescents from families with lower-middle income, lower-middle educational level and immigrant origin, belonged more frequently to groups with poor or declining cardiovascular health pathways and also had a higher prevalence rate of overweight/obesity and metabolic syndrome at age 16.

These data make it necessary to carry out prevention interventions early in life, paying special attention to vulnerable populations, such as the migrant population.

Regarding metabolic pathologies, the scarce data available in Spain suggest that immigrants with type 2 diabetes are, generally, younger than native Spanish people and without serious complications, although with a metabolic control lower than that of the native population (Franch-Nadal et al., 2013). Research carried out in primary care centres indicated that the prevalence of type 2 diabetes in immigrants from India and Pakistan was three times higher than in the Spanish population, and that its onset was earlier (Valerio et al., 2006). Some studies have observed an increased risk of gestational diabetes in women residing in Spain, from the Maghreb, Asia and the Middle East (Orós, 2023).

On the other hand, a higher prevalence of cardiovascular risk factors has been observed among the immigrant population, which triples the risk of coronary heart disease compared to the Spanish population (Ortega et al., 2012).

In a review of the scientific literature published between 1960 and 2018, carried out by Agyemang and van den Born (2018), on the burden of non-communicable diseases among migrant groups in high-income countries, with special attention to cardiovascular diseases, cancer and diabetes, it was observed that diabetes was the only non-communicable disease with consistently higher prev-

alence in all immigrant groups compared to local populations, also developing at younger ages. As for cardiovascular diseases, the risks vary: for example, stroke was more common in immigrants from sub-Saharan Africa and South Asia, while coronary heart disease was more common in the immigrant population from South Asia and less common in those from North Africa. The risk also increased with time of residence. In the case of cancer, immigrants to Europe had lower overall morbidity and mortality rates, except for cancers related to infectious diseases, which were more frequent, while cancers linked to the Western lifestyle were less common in European immigrants. However, a more complex picture was observed in North America, with some groups showing higher rates of cancer. In Australia, as was the case in Europe and North America, high rates of diabetes and variability are observed in the other non-communicable diseases according to origin. The authors conclude that lifestyle changes following migration and the context of the country of destination significantly influence the risk of non-communicable diseases development. The study also concludes that deeper, longitudinal and culturally contextualised research is needed to better understand the factors driving these differentiated risks and to design appropriate preventive interventions and clinical strategies.

3.2 Malnutrition and micronutrient deficiency

3.2.1 Malnutrition

Information on the prevalence of malnutrition in the immigrant, adult and adolescent population in Spain is very limited and does not allow for a global assessment. In a study published by Mora et al. (2012), the changes in dietary habits associated with migration were analysed in a sample of 101 adolescents of Moroccan origin residing in Madrid, comparing the anthropometric indicators of their nutritional status with another sample of 327 adolescents residing in Morocco.

In this study, a lower percentage of overweight and obese people was observed in the adolescent population residing in Morocco (6.3 % and 1.0 %, respectively) compared to those living in Madrid (23 % and 4 %, respectively). In the sample of the population residing in Morocco, overweight coexisted with problems of thinness (5.5 % and 2.8 % in men and women, respectively) and severe thinness (1.8 % of men), while in the sample of the population residing in Madrid, no cases of malnutrition were observed. The average height in men was significantly higher in adolescents living in Madrid, which, according to the authors, may reflect better nutritional status.

There is very little information on the nutritional situation of elderly immigrants living in Spain and information in the countries around us is also very limited. We found a study, conducted in 2013, which investigated the nutritional status of a group of 23 immigrants (20 from Turkey and 3 of Arab origin) *versus* 37 non-immigrants, over 65, who lived institutionalised in two centres for the elderly in Germany (Paker-Eichelkraut et al., 2013). Malnutrition, defined as a BMI <22 kg/m^2 and/or a calf circumference <31 cm, was more prevalent among immigrants. However, this group had a worse clinical situation, so these results should be interpreted with caution.

A recently published study assessed the nutritional status and fragility of 153 Syrian immigrants residing in Turkey, with an average age of 71.64 ± 6.20 years (Değer et al., 2024). Using the Mini-Nutritional Assessment (MNA®) questionnaire, it was observed that 20.5 % were at risk of malnutrition and 3 %, malnutrition. A control group was not evaluated in this study.

No studies have been found that have evaluated the impact of immigrant status on the risk of malnutrition related to the disease in our country. The two most relevant studies, Predyces (Álvarez-Hernández et al., 2012) and SeDREno (Zugasti-Murilllo et al., 2021), do not include this variable in the analysis.

3.2.2 Micronutrient deficiency

Several studies have observed that the immigrant population may have a reduced dietary intake of certain micronutrients, which may have a negative impact on their health. The most evaluated and relevant nutrients are vitamin D, iron and vitamin B12.

3.2.2.1 Vitamin D deficiency

A meta-analysis on the prevalence of vitamin D deficiency among migrants from different geographical regions of the world was published in 2016 (Martin et al., 2016). The aim of the study was to estimate the prevalence of vitamin D deficiency (<50 nmol/l or <20 ng/ml) among dark-skinned migrants. 36 studies in the migrant population were identified, excluding pregnant women, none of which were conducted in Spain, although there were conducted in northern European countries. The prevalence of vitamin D deficiency in dark-skinned migrants, adjusted for the latitude of the study country, was 77 % (95 % CI: 70-84). The meta-analysis also included seven studies conducted in dark-skinned immigrant pregnant women. This group had a higher risk of vitamin D deficiency than native women in recipient countries.

During the years 2009-2010, a study was carried out in Spain with the measurement of vitamin D that included 502 pregnant women in the first trimester of pregnancy (83 of whom were immigrants) and who resided on the Mediterranean coast (Perez-Lopez et al., 2011). Vitamin D levels were lower in immigrant women. In addition, vitamin D levels were especially low in women of Arab origin compared to Caucasian women. A similar study conducted in northern Italy also found high prevalences of vitamin D deficiency in both immigrant mothers and their newborn children, when compared to the values of non-immigrant mothers (Cadario et al., 2015).

The country and region of origin of the immigrant population may influence the risk of vitamin D deficiency. A study published in Finland evaluated the nutritional status and intake of vitamin D in immigrants of Russian, Somali and Kurdish origin in relation to native people (Adebayo et al., 2020). The prevalence of vitamin D deficiency and insufficiency was higher in the global immigrant population than in the Finnish population, especially in people of Kurdish or Somali origin. Plasma levels of 25-hydroxy-vitamin D (25-OH-D) were 64 nmol/l (95 % CI: 62-66), 44 nmol/l (95 % CI: 41-46), 35 nmol/l (95 % CI: 34-37) and 64 nmol/l (95 % CI: 62-66) for the Russian, Somali, Kurdish and Finnish population, respectively. Differences in diet and intake of fortified foods were also observed. Exposure to sunlight, which could influence an increased risk of vitamin D deficiency, was not specifically assessed.

Vitamin D deficiency can be greatest when people migrate to a country from another latitude. In a study conducted in the United Kingdom, a high prevalence of vitamin D deficiency was observed

in the immigrant population from Bangladesh, much higher than that of the British native population and that of the Bangladeshi native population in their country of origin (Smith et al., 2021).

Vitamin D deficiency in the immigrant population could condition an increased risk of osteoporosis. No studies have been found in Spain on the prevalence of osteoporosis in the immigrant population compared to the native population. In Europe, in a study conducted in the Czech Republic on Afghan immigrant population it was observed that the age at which a hip fracture occurred was lower in people of Afghan origin than in native people (58 years *versus* 81 years, respectively, p <0.001). Likewise, Afghan women had their first fracture at a younger age than men (54 years *versus* 63 years, respectively, p= 0.002), with no gender-related differences observed in the Czech population (Zelenka et al., 2019).

3.2.2.2 Iron deficiency

Iron deficiency may be more prevalent in the immigrant population; most studies have been conducted during adolescence or gestation.

A study conducted in Almería evaluated 405 adolescents and observed a prevalence of iron deficiency of 13.3 %, with 1.2 % of anaemia due to iron deficiency. The multivariate analysis observed that immigrant status increased the risk of this deficiency (Ibáñez-Alcalde et al., 2020).

In a study conducted in Greece with 209 pregnant adolescents, with 11.6 % of migrant women from the Balkans, the Middle East and Asia, an increased risk of iron deficiency anaemia was observed in immigrant women and those from disadvantaged social strata (Theodoridou et al., 2024).

3.2.2.3 Vitamin B12 deficiency

This review has not found any publications that have evaluated the nutritional status of vitamin B12 in the immigrant population in Spain, compared to native people. In a study carried out in Denmark with 160 people in refugee status, it was observed that, although there was a low prevalence of communicable diseases, micronutrient deficiency was very frequent (vitamin D: 76 %, vitamin B12: 31 % and anaemia: 12 %) (Andersen et al., 2020). Also in Denmark, a more recent study evaluated 1431 refugees from different countries and observed vitamin B12 deficiency in 11.8 % of the child and adolescent population, and in 21.9 % of the adult population (Hvass et al., 2021), more frequent in people from Southeast Asia. Other studies conducted in Canada (Quay et al., 2015) and in New Zealand (Gammon et al., 2012) also observed a high prevalence of vitamin B12 deficiency in the immigrant population from Southeast Asia, especially if they followed a vegan diet.

3.3 Eating behavior disorders

Several studies have assessed the impact of migrant status, especially in the adolescent population, on mental health (Lievrouw et al., 2024). Among mental health problems, Eating Behavior Disorders (EBD) can directly affect nutrient intake and nutritional status.

EBD are a serious, multifactorial health problem that can lead to obesity, malnutrition, and micronutrient deficiencies. These are diseases that mainly affect the adolescent population and, partic-

ularly, women. Several studies have evaluated the effect of migrant status on the risk of developing these disorders, in relation to the native population. In Spain, information on the impact of the immigrant situation on the development of EBD is still limited, although published studies agree that they are more frequent in the immigrant population than in the native population.

A recently published systematic review with meta-analysis includes 10 studies, 2 of which were conducted in Spain. The authors observed that when an established diagnostic criterion was used, immigrants were less likely to be diagnosed with an eating disorder, with a pooled prevalence OR between immigrants and the native population of 0.45 (95 % CI: 0.35-0.59). However, these results seem to depend on the evaluation method used for the diagnosis and its suitability to be used in the immigrant population and may also depend on the ease of access of these people to the health system (Siddiqi et al., 2024).

Studies conducted in Spain seem to indicate that the prevalence of EBD in Spain depends on the population evaluated and the tool used for their detection. A recent review includes 37 studies, most of which were carried out in the Community of Madrid and in Catalonia (Benítez et al., 2024). This article highlights the heterogeneity of the studies, in terms of the characteristics of the evaluated population, the age range and the methodology applied, which limits the obtaining of adequate information.

In a study conducted in the Community of Madrid, the risk of EBD among the native adolescent population and the immigrant population residing in Madrid was evaluated and the impact of residence time in Spain was evaluated (Esteban-Gonzalo et al., 2014, 2015). The evaluation was carried out between November 2007 and February 2008, on a representative sample of adolescents aged between 13 and 17 years, with a total of 2077 people (1052 women). A higher risk of developing an EBD was observed in immigrant adolescent women than in native women (OR: 1.95; CI 95 %: 1.29-2.95; p= 0.001), according to the three logistic regression models constructed by the authors. Adolescents with a shorter residence time had a higher risk of EBD. Thus, a difference in the prevalence of EBD was observed if the time of stay in our country was less than six years (OR: 2.44 CI 95 %: 1.42-4.18; p= 0.001), with no differences found between native and migrant adolescents with a residence time ≥6 years. In the case of males, no differences in the risk of EBD were observed between native male adolescents and immigrant males, both together and in relation to the time of residence.

This same group, subsequently, published a 2-year longitudinal follow-up study, conducted in a group of 981 adolescents, with an age at baseline of 11-19 years. EBD risk was assessed using the SCOFF (Sick, Control, One stone, Fat, Food) questionnaire. The authors observed that immigrant adolescents, both male and female, had an increased risk of eating disorder. The prospective study showed that immigrant males were more likely to acquire risk of eating disorder over two years, compared to Spanish adolescent males (Esteban-Gonzalo et al., 2019).

The prevalence of EBD and the effect of different factors has also been evaluated in the Region of Murcia in 730 adolescents, aged 12 to 17 years, as part of the EHDLA study, (López-Gil et al., 2023). In this population, 84.5 % were Caucasian race, with a percentage of native speakers of 76.0 %. A prevalence of an ED was observed in 30.1 % of the total population evaluated, being more frequent in women than in men and in the immigrant population, with an OR: 2.22 (CI 95 %: 1.51-3.25). The

authors propose reasons that may explain this higher prevalence, such as acculturative stress and ethnic minority status.

Despite few studies having been published, it has been observed that the immigrant status in Spain can be associated with an increased risk of developing EBD, which seems to be more significant in the first years after arriving in our country. There is insufficient information on the influence of the country of origin, the relationship with socioeconomic, cultural or religious factors, family structure or the difference between the first-generation or successive-generation immigrant population. Finally, the discordant data observed in studies that are based on clinical diagnoses, and not on direct evaluation, suggest that EBD may go unnoticed in the immigrant population, compared to native-born people.

In a study conducted in Denmark and Sweden, on a population basis, all people, first and second generation immigrants, and natives, born between 1984 and 2002 (Danish cohort) and between 1989 and 1999 (Swedish cohort) who resided in the country corresponding to 10 years of age were evaluated (Mustelin et al., 2017). These individuals were followed longitudinally to assess the development of an ED, based on inpatient and outpatient clinical information. The study observed a lower risk of presenting a diagnosis of EBD in the immigrant population with both foreign parents, compared to the native population. The authors acknowledge that the results of this study do not coincide with others, that they do observe a higher risk and attribute this difference to sociocultural factors or poor detection of this problem in the migrant population.

The analysis in this section merits the inclusion of a brief review of an EBD that occurs more frequently in certain cultures and in the immigrant population, such as pica, which consists of the intake of non-food products, such as chalk, soil (geophagy), gypsum, vegetable fibres, etc. It can lead to nutritional deficiencies, especially iron or folic acid, as well as intoxication by some minerals (Bonglaisin et al., 2022). In some regions of Africa, geophagy is especially prevalent, as well as in Asia, Central and South America, and the Middle East, and may go unnoticed in the immigrant population. In pregnant women, this practice is favoured by the mistaken belief that it may decrease nausea and vomiting (Hunter-Adams, 2016), which may increase the risk of anaemia and other complications.

No studies have been found evaluating the prevalence and relevance of this EBD in Spain. In other countries around us, isolated clinical cases have been published in the immigrant population (Yersin et al., 2012) (Miranda et al., 2024). A study conducted in France evaluated 284 immigrant women, of whom 110 were pregnant (38.7 %) (Caillet et al., 2019) and 14.1 % of clay consumers were observed (95 % CI: 10.5-18.6), particularly when they came from Central or West Africa (adjusted Odds Ratio (aOR): 52.7; CI 95 %: 13.7-202.2). In another study, similar results were observed, as well as a low knowledge of the risks of this practice for health and as a risk factor for iron deficiency (Decaudin et al., 2020).

4. Limitations on literature search

To prepare this report, a narrative review of the scientific literature on the nutritional situation of the immigrant population, resident both in Spain and in other countries, has been performed, looking for

information, not only in databases of bibliographic references or indexed journals, but also, among others, in library catalogues or doctoral thesis repositories.

National reports on food consumption by the Spanish population have also been reviewed, such as, for example, the one recently produced by the Ministry of Agriculture, Fisheries and Food (MAPA, 2023), the National Survey of Food Consumption in the Child and Adolescent Population (ENALIA) (AESAN, 2014) or the Survey of Purchasing and Consumption Habits produced by the *Mesa de Participación de Asociaciones de Consumidores* (MPAC, 2023). However, none of these documents make comparative studies between the resident population of Spanish nationality and the foreign population, that is, the nationality or country of birth of the study population is not taken into account.

Moreover, most of the studies have been carried out in Northern Europe and, preferably, in immigrant populations of South Asian origin, highlighting the scarcity of studies comparing eating behaviours in a wide range of ethnic minority groups living in different contexts in Europe and in Spain (Okutan et al., 2023). When the information relating to Spain has been zero or insufficient, studies published in countries in our environment have been reviewed. Likewise, the information on this subject has been reviewed in the reports or studies prepared by the national Public Authorities and a consultation has been carried out with the public institutions of various European Union countries with competence in matters related to food security through the EFSA focal points, on the nutritional status or diet of foreigners residing in these countries, as well as on the risk management or communication measures aimed at the immigrant population, on this matter. Of the 36 institutions consulted, 14 submitted their responses. However, only five (Austria, France, Greece, Luxembourg and the Netherlands) sent information on studies carried out with the immigrant population or data on the nutrition of this population group and the remaining nine agencies reported that they had not carried out studies or did not have information on the nutritional situation of the immigrant population in their countries.

Within everything analysed, this report presents a series of limitations related to the studies from which it has been carried out. In general, a series of methodological adaptations for each context must be considered within the framework of a cultural sensitivity and collaboration between the actors responsible for the studies and the specific populations under study so that the results are not biased and allow establishing healthier eating practices that improve the well-being of each particular immigrant population group that is in circumstances of vulnerability (Okutan et al., 2023).

In general, most of the studies analysed suffer from one or more factors that are detailed below and that must be taken into account when considering them, so that unequivocal conclusive results can be obtained:

4.1 Heterogeneity of the immigrant population

Immigrants come from very diverse cultural, ethnic and socioeconomic backgrounds and have very varied work and housing situations in Spain. This heterogeneity causes dietary patterns and nutritional status to vary widely, complicating the generalisation of results and the identification of common trends in studies that, at times, fail to capture these differences adequately.

Indeed, there is no clear consensus on who should be considered an immigrant or how to classify these people (e.g., economic immigrants, refugees, documented or undocumented). This lack of standardisation makes it difficult to compare between studies and to generalise conclusions, since the groups assessed can have greatly different characteristics.

Furthermore, this leads to a lack of research in certain regions or in specific subgroups of immigrant populations, which prevents having an overall and comparative view of the nutritional situation in these groups.

4.2 Study design and sampling

Most research takes a cross-sectional approach, limiting the possibility of establishing causal relationships or observing changes over time in nutritional adaptation following migration.

In addition, a lack of control of confounding variables (educational level, occupation, family environment or living conditions) -which can converge and influence simultaneously- to isolate the effect of migration on dietary intake or nutritional status, may limit the validity of the studies.

4.3 Limitations in the instruments of measurement and interpretation of the results

4.3.1 Lack of cultural adaptation

Questionnaires and other methods (such as the 24-hour reminder or food frequency questionnaires) are often not validated or tailored to the cultural and linguistic particularities of each immigrant population group. This can lead to errors of interpretation or the omission of foods characteristic of certain cultures and consider them misleading, which can influence the perception of food and eating practices.

4.3.2 Self-reporting bias in the context of food acquisition and consumption

Relying on memory and subjective perception, methods based on self-reporting can be affected by memory errors, under-reporting or over-reporting of food, and difficulties in correctly estimating the portions consumed, in addition to being a complex system for people with a low level of literacy and socioeconomics, which usually occurs in most cases, and which coincides in the most vulnerable immigrant population group.

4.3.3 Interpretation of anthropometric parameters

Due to differences in body composition and other factors, it is necessary to use cut-off points adapted to different ethnicities in the interpretation of anthropometric parameters for the diagnosis of obesity and malnutrition.

4.4 Lack of longitudinal data

The lack of studies with follow-up over time limits the ability to analyse the evolution of dietary intake and nutritional status based on residence time and the process of adaptation to the new environment. This prevents a full understanding of how migration influences eating habits in the medium and long term.

4.5 Insufficient consideration of contextual variables

4.5.1 Socio-economic and access factors

Aspects such as income level, education, access to healthy food and language barriers can significantly influence diet and nutritional status, but are not always adequately controlled in studies. This can also lead to scarcity, veracity or omission of key information that can condition the results of such studies.

4.5.2 Migration environment and policies

Adequate nutrition and food must be considered within a more global concept of health, so the environment of the destination country, integration policies and the availability of health services or support programs can play a crucial role, and their omission may limit the interpretation of the findings, since the cost of medical care, either directly or indirectly related or otherwise, to the cost of food, can negatively affect the quality of dietary choices in disadvantaged immigrant populations.

4.6 Partial evaluation of dietary quality

Many studies focus on quantitative aspects, such as caloric intake or the distribution of macronutrients, without comprehensively analysing the quality of the diet. The absence of detailed assessments of food diversity and micronutrient intake can lead to incomplete conclusions regarding actual nutritional status.

Conclusions of the Scientific Committee

The scientific literature regarding the dietary intake and nutritional status of immigrants residing in Spain, compared to the native population, is very scarce and has limitations that make it difficult to have complete and adequate information on this issue:

1. The studies show a generally very small sample size, limited to specific geographic areas and environments, and with a limited representativeness of the population under study.
2. The approach used shows great differences between the studies, which have been fundamentally cross-sectional or cases-controls studies, with very little evidence of possible changes over time and a lack of cultural adaptation of the tools used.
3. The country of origin, length of residence in Spain, integration policies, accessibility, sociocultural and economic situation, and language barriers, among other factors, have not always been taken into account.
4. Nor has ethnicity been taken into account for the evaluation of anthropometric measures.
5. There is little evidence regarding the role of physical activity as a factor that may modulate the relationship between dietary intake and nutritional complications, especially obesity.
6. The scientific evidence in the immigrant population in Spain is, in general, more limited than that of other countries in our environment.
7. In conclusion, research on dietary intake and nutritional status of immigrants faces significant challenges, ranging from population heterogeneity and problems in study design to the use of non-adapted measurement instruments and the omission of key contextual variables.

Revised scientific evidence suggests that:

1. The dietary intake of the immigrant population residing in Spain is diverse and is determined by a variety of cultural, ethnic, economic and food accessibility factors.
2. A lower adherence to healthy dietary recommendations leads to a higher risk of obesity and its complications, such as type 2 diabetes or a higher cardiovascular risk, which may occur more frequently in some immigrant population groups.
3. Some studies show a decrease in the intake of fibre and certain nutrients, with differences depending on the country of origin.
4. A lower adherence to healthy dietary recommendations also increases the risk of micronutrient deficiencies, such as vitamin D, iron, or vitamin B12, especially in at-risk populations, such as women during pregnancy. Thus, deficiencies of certain micronutrients are more frequent in the immigrant population than in the native population.
5. Information on the risk of malnutrition in the immigrant population is very limited and does not allow a concrete conclusion to be drawn.

The Scientific Committee proposes the following actions:

1. To promote, together with experts in the field of immigration in Spain, the conduct of studies to characterise the nutritional status of this population group, taking into account the dietary patterns in second and successive generations, and in the adolescent population, and the age of arrival in Spain.
2. The studies to be carried out should overcome the limitations of previous studies. This implies adopting longitudinal methodologies adapted to each ethnic group, ensuring the cultural validity of the assessment instruments and paying special attention to the diversity and complexity of the migration experience, in order to obtain a more accurate and complete picture of the impact of migration on nutritional health.
3. The consumption of foods rich in the nutrients that immigrant populations from different countries are usually deficient in should be promoted, in order to improve the quality of their diets. To achieve this, it will be crucial to count on the collaboration of Public Authorities, the food industry and the scientific community. It is important to facilitate access to healthy food to improve the health and well-being of the immigrant population living in Spain.
4. To promote nutritional education, especially aimed at immigrants with a shorter residence time, taking into account the particular cultural and socioeconomic conditions for each group, paying special attention to people with seasonal activity.

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