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# New food composition data on selected ethnic foods consumed in Europe

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**Background:** Reliable data on the composition of foods is needed to better understand individual diets, measure nutrient intakes and provide nutritional guidance for improving the health of the populations. Ethnic foods are becoming increasingly popular among all European consumers, and are the main source of nutrients in the diets of ethnic groups. However, there is limited information on the nutrient composition of ethnic foods in Europe. The objective of this study therefore was to generate new and reliable data on ethnic foods using harmonised methods for chemical analyses.
**Methods:** New data on 128 ethnic foods were generated for inclusion in the national databases within the European Food Information Resource Network of Excellence through participants from France, Israel, Spain, Denmark, Italy, The Netherlands, Belgium and the United Kingdom. In each selected country, the list of prioritised foods and key nutrients, methods of analyses and quality assurance procedure were harmonised.
**Results:** This paper presents the nutrient composition of 40 ethnic foods consumed in Europe. The nutrient composition of the foods varied widely because of the nature and variety of foods analysed, with energy content (kcal) ranging between 24 (*biteku-teku*, Blegium) and 495 (*nachos*, Italy) per 100 g of edible food. Polyunsaturated and monounsaturated fatty acids were generally higher in most ethnic foods consumed in Italy and Spain compared with ethnic foods of other countries.
**Conclusions:** The new data were scrutinised and fully documented for inclusion in the national food composition databases. The data will aid effective diet and disease interventions, and enhance the provision of dietary advice, in all European consumers.
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**Keywords:** ethnic foods; nutrients; food composition; analysis and Europe

## Introduction

Over the last 30 years, a number of European countries, including the United Kingdom, Germany, France and The Netherlands, have seen considerable increases in the popularity of ethnic food products in supermarkets, restaurants and takeaways, and for home consumption. The ethnic food market in Western Europe was estimated to be worth over 4 billion Euros during 2006 (Leatherhead Food International, 2007). Ethnic foods, therefore, make an important contribution to the dietary intake of both migrant and mainstream populations.

Prevalence rates of diet-related diseases are increasing worldwide. Ethnic groups suffer from similar diet-related diseases that are common in the mainstream population, including obesity, cardiovascular disease and diabetes, but the risk has been reported to be higher in immigrants as compared with the host population. For instance, African Caribbeans living in the United Kingdom are three times more likely (Sproston and Mindell, 2004) and South Asians

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resident in the United Kingdom are five times more likely (Cleland and Sattar, 2006) to suffer from diabetes than are Caucasians. Changes in dietary patterns are important determinants of health outcomes because of resultant changes in nutrient intakes, including energy, fat and other essential nutrients (Gilbert and Khokhar, 2008). Information on food composition is required for the provision of accurate dietary advice and for planning intervention studies to reduce rates of diet-related diseases and to improve overall health and well-being. Currently, in Europe, there is limited availability of food composition data on ethnic foods consumed by both mainstream and ethnic populations. As a direct response to this situation, one of the objectives of the Ethnic Food work package within the European Food Information Resource (EuroFIR) project was to generate new and reliable data on the composition of ethnic foods for inclusion in national food composition databases. For this study, the most popular ethnic cuisines in selected European countries were identified as South Asian (United Kingdom), North African (France), Turkish and Pakistani (Denmark), Congolese (Belgium), Romanian (Italy), Mediterranean and Ethiopian (Israel), Latin American (Spain) and Surinamese (The Netherlands).

## Methods

Methods for sampling, analysis, data scrutiny and documentation were agreed upon within the EuroFIR Network of Excellence and were based on the harmonised approaches reported by Khokhar *et al*. (2009).

*Prioritisation of food list*
A total of 40 foods, five foods from each country (Belgium, Denmark, France, Italy, Spain, The Netherlands, United Kingdom and Israel), were considered for analysis. To ensure that the data are representative of foods consumed, the most commonly consumed ethnic foods were prioritised according to defined criteria reported previously by Khokhar *et al*. (2009).

*Sample collection and preparation*
Sampling for *authentic ethnic foods* (authentic ethnic food was defined as 'a food from countries other than the home market contributing to a different food culture than the traditional cuisine of the host country') and *modified ethnic foods* (modified ethnic food was defined as 'a commercially modified version of food as prepared in an immigrant's country to suit the taste and preference of the host country') was carried out using harmonised approaches. For the modified ethnic foods, primary samples were collected from sources including supermarkets, takeaways/restaurants and ethnic food stores, with sample number varying between 1 and 12 for each food. Authentic ethnic foods were collected from households following preparation by members of relevant ethnic groups (up to six primary samples).

*Nutrient analysis*
Nutritional analysis was carried out at laboratories that were accredited (ISO-17025), routinely participated in proficiency testing schemes (FAPAS) and complied with the joint code of practice for quality assurance in research. The analytical methods used have been previously reported by Khokhar *et al*. (2009). In addition, total carbohydrates were calculated: $100 - (\text{water} + \text{ash} + \text{protein} + \text{fat} + \text{fibres})$, or $100 - (\text{water} + \text{ash} + \text{protein} + \text{fat})$, or by summation of total sugar and starch content in food. Energy values in kilojoules were calculated using the following formula: $(17 \times \text{protein} + 17 \times \text{total carbohydrates} + 37 \times \text{fat})$ or by multiplying kcal by factor 4.18.

## Results and discussion

The data on macronutrient composition of 40 ethnic foods consumed in seven European countries and Israel are presented as per 100 g of edible portion (Tables 1 and 2). Generally, the content of the macronutrients analysed varied between the different ethnic foods.

*Carbohydrates, total fat, protein and energy*
Water content of the analysed foods ranged from 2.3% (in *nachos* and *brik* pastry sheet) to 91.2% in buttermilk. Most foods analysed in this study contained $<10$ g of total fat per 100 g of edible food with a few exceptions. All foods that contained more than 20/100 g of protein were meat-based dishes and meat products, including lamb *kebab* (22.5 g), *mkayabo* (24.1 g), salted meat (27.4 g) and *kebab* (29.7 g) from the United Kingdom, Belgium, The Netherlands and Italy, respectively. Vegetarian dishes such as commercial soy patty (from Israel) and *durum rolls* (Denmark) contained 15.7 and 12.6 g protein per 100 g, respectively. The calculated energy values varied between 24 kcal (0.1 g carbohydrates, 3.6 g protein and 1 g total fat) in *biteku-teku* from Belgium and 495 kcal (58.5 g carbohydrates, 6.5 g protein and 26.1 g fat) per 100 g in *nachos* consumed in Italy.

A protein intake of 15–30% total daily energy has been suggested to increase satiety and suppress food intake more than fat or carbohydrate, thereby preventing weight gain (Anderson and Woodend, 2003; Anderson and Moore, 2004; Weigle *et al*., 2005; Arciero *et al*., 2008; Beasley *et al*., 2009), and has been shown to be inversely associated with obesity, morbidity and mortality (Merchant *et al*., 2005). However, only 6 of the 40 foods contained an appreciable quantity of protein. Thus, extending food composition data to include the protein content of commonly consumed ethnic foods in Europe would provide adequate guidance on protein intake.

**Table 1** Macronutrient composition per 100 g edible portion of ethnic foods commonly consumed in Europe

| *No.* | *Country/organisation* | *Food* | *Water (g)* | *Ash (g)* | *Carbohydrate (g)* | *Energy value* | | *Total nitrogen (g)* | *Protein (g)* | *Fat (g)* |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *kJ* | *kcal* | | | |
| | *France/AFSSA* | | | | | | | | | |
| 1 | | Brik pastry sheet, baked | 2.3 | 4.8 | 78.2 | 1562 | 368 | 1.45 | 8.3 | 2.5 |
| 2 | | Harissa sauce | 77.9 | 4.3 | 12.2 | 305 | 73 | 0.45 | 2.7 | 2.9 |
| 3 | | Buttermilk, cultured, low fat, plain | 91.2 | 0.9 | 4.6 | 151 | 36 | 0.55 | 3.3 | 0.5 |
| 4 | | Frik, dry | 11.0 | 1.7 | 56.2 | 1192 | 281 | 1.58 | 9.2 | 2.2 |
| 5 | | Meloukhia sauce | 67.7 | 1.6 | 1.2 | 814 | 198 | 0.18 | 1.1 | 21.0 |
| | *Israel/BGU* | | | | | | | | | |
| 6 | | Falafel | 45.2 | 3.2 | 29.7 | 1141 | 273 | — | 8.6 | 13.3 |
| 7 | | Dark bread | 37.2 | 1.8 | 47.9 | 1016 | 243 | — | 9.1 | 2.3 |
| 8 | | Commercial soy patty | 53.2 | 2.4 | 9.8 | 911.2 | 218 | — | 15.7 | 12.3 |
| 9 | | Injera | 43.6 | 1.4 | 43.5 | 890 | 213 | — | 6.4 | 1.9 |
| 10 | | Industrialised hummus | 53.3 | 1.9 | 15 | 1250 | 299 | — | 6.7 | 25.8 |
| | *Spain/CESNID* | | | | | | | | | |
| 11 | | Spring roll | 56.4 | 1.8 | 20.3 | 875 | 209 | 0.88 | 5.5 | 11.8 |
| 12 | | Rice 3 delight | 59.5 | 1.3 | 20.9 | 824 | 197 | 1.06 | 6.6 | 9.6 |
| 13 | | Gucamole | 80.2 | 2.1 | 7.1 | 383 | 92 | 0.30 | 1.9 | 6.2 |
| 14 | | Mexican salsa | 88.2 | 2.4 | 5.8 | 130 | 25 | 0.26 | 1.6 | 0.2 |
| 15 | | Ceviche | 81.3 | 1.8 | 4.2 | 309 | 73 | 1.50 | 9.4 | 2.1 |
| | *Denmark/DTU* | | | | | | | | | |
| 16 | | Dürüm rolls | 53.0 | 2.1 | 22.0 | 963 | 317 | — | 12.6 | 19.9 |
| 17 | | Pita sandwich with kebab | 63.9 | 1.4 | 18.0 | 738 | 265 | — | 9.1 | 17.4 |
| 18 | | Sandwich with kebab | 55.0 | 1.7 | 25.0 | 920 | 217 | — | 8.5 | 9.3 |
| 19 | | Sandwich with falafel | 54.0 | 1.7 | 29.0 | 943 | 226 | — | 6.2 | 9.5 |
| 20 | | Kebabmix | 44.4 | 2.4 | 27.0 | 1255 | 303 | — | 8.9 | 17.6 |
| | *Italy/INRAN* | | | | | | | | | |
| 21 | | Cantonese rice | 58.2 | 1.7 | 25.8 | 818 | 195 | — | 5.5 | 7.8 |
| 22 | | Nachos | 2.3 | 1.6 | 58.6 | 2072 | 495 | — | 6.5 | 26.1 |
| 23 | | Falafel (Italy) | 61.7 | 2.2 | 14.5 | 719 | 172 | — | 7.1 | 9.5 |
| 24 | | Kebab | 49.9 | 3.4 | ND | 1126 | 269 | — | 29.7 | 16.7 |
| 25 | | Sarmale | 78.0 | 1.8 | 7.4 | 415 | 99 | — | 5.7 | 5.2 |
| | *The Netherlands/RIVM* | | | | | | | | | |
| 26 | | Roti | 31.4 | 0.3 | 50.8 | 1315 | 312 | — | 7.6 | 8.7 |
| 27 | | Salted meat | 45.4 | 8.2 | 0 | 1130 | 271 | — | 27.4 | 17.9 |
| 28 | | Tayer leaves | 88.0 | 2.1 | 0.9 | 132 | 31 | — | 4.6 | 1.1 |
| 29 | | Pomtayer | 69.7 | 1.5 | 17.2 | 360 | 85 | — | 3.4 | 0.3 |
| 30 | | Yellow split peas | 65.2 | 0.8 | 18.6 | 481 | 113 | — | 8.4 | 0.6 |
| | *Belgium/UGhent* | | | | | | | | | |
| 31 | | Mkayabo | 66.4 | 6.7 | 0 | 467 | 110 | — | 24.1 | 1.6 |
| 32 | | Saka-saka | 83.0 | 0.9 | 0.3 | 144 | 34 | — | 5.4 | 1.3 |
| 33 | | Chikwangue | 61.9 | 0.3 | 33.3 | 590 | 139 | — | 0.7 | 0.3 |
| 34 | | Mbinzo worms | 71.0 | 0.9 | 0.7 | 584 | 139 | — | 18.5 | 7.0 |
| 35 | | Biteku-teku | 89.2 | 1.6 | 0.1 | 99 | 24 | — | 3.6 | 1.0 |
| | *UK/UL* | | | | | | | | | |
| 36 | | Chicken bhuna | 72.9 | 1.5 | 3.2 | 609 | 146 | 2.20 | 13.7 | 8.7 |
| 37 | | Lamb kebab | 54.5 | 2.3 | 5.0 | 1048 | 251 | 3.60 | 22.5 | 15.7 |
| 38 | | Aloo Bombay | 78.1 | 1.5 | 13.1 | 459 | 110 | 0.30 | 1.7 | 5.6 |
| 39 | | Rasmalai | 65.9 | 0.9 | 17.2 | 692 | 165 | 1.50 | 9.6 | 6.4 |
| 40 | | Chicken Rogan Josh | 76.1 | 1.4 | 5.1 | 525 | 126 | 1.65 | 10.3 | 7.1 |

Abbreviations: AFSSA, Agence Française de Sécurité Sanitaire des Aliments; BGU, Ben-Gurion University of Negev; CESNID, Centre for Superior Studies on Nutrition and Dietetics; DTU, Technical University of Denmark; INRAN, National Institute for Food and Nutrition Research; ND, not determined; RIVM, Institute of Public Health and Environment; UGhent, Ghent University; UK, United Kingdom; UL, University of Leeds.
— Implies nutrient not prioritised for analysis because the selected food was not considered an important source of this nutrient.

**Table 2** Lipid, carbohydrate and dietary fibre composition per 100 g edible portion of ethnic foods commonly consumed in Europe

| No. | Food | Fatty acids (g) | | | Starch (g) | Total sugars (g) | Individual sugars (g) | | | | | | Dietary fibre (g) | | Cholesterol (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SFA | MUFA | PUFA | | | Glucose | Fructose | Galactose | Sucrose | Maltose | Lactose | NSP | AOAC | |
| | *France/AFSSA* | | | | | | | | | | | | | | |
| 1 | Brik pastry sheet | — | — | — | 50.1 | 7 | 7 | <0.5 | 0 | <0.5 | <0.5 | <0.5 | — | 3.2 | 0 |
| 2 | Harrisa sauce | — | — | — | 0.5 | 8.4 | 6.5 | 1.9 | 0 | <0.5 | <0.5 | <0.5 | — | 5.1 | 0 |
| 3 | Buttermilk | 0.3 | 0.1 | 0 | 0 | 4.6 | <0.5 | <0.5 | 0 | <0.5 | <0.5 | 3.3 | — | 0 | Trace |
| 4 | Frik, dry | — | — | — | 45.0 | 0 | <0.5 | <0.5 | 0 | <0.5 | <0.5 | <0.5 | — | 19.3 | 0 |
| 5 | Meloukhia sauce | — | — | — | <0.5 | 1.2 | 1.2 | <0.5 | 0 | <0.5 | <0.5 | <0.5 | — | 8.4 | 0 |
| | *Israel/BGU* | | | | | | | | | | | | | | |
| 6 | Falafel | 2.1 | 3.7 | 7.5 | 19.4 | 0 | <0.5 | <0.5 | 0 | 0.8 | <1 | 0 | — | 8.8 | 0 |
| 7 | Dark bread | 1.1 | 0.7 | 1.6 | 23.5 | 0 | <0.5 | 0.6 | 0 | <0.5 | 2.6 | 0 | — | 3.2 | 0 |
| 8 | Commercial soy patty | 2.0 | 2.9 | 7.4 | 10.7 | 0 | <0.5 | <0.5 | 0 | 0.5 | 3.2 | 0 | — | 5.4 | 0 |
| 9 | Injera | 0.4 | 0.5 | 1.0 | 33.2 | 0 | <0.5 | <0.5 | 0 | <0.5 | <1.0 | 0 | — | — | 0 |
| 10 | Industrialised hummus | 4.3 | 7.8 | 13.7 | 7.0 | 0 | <0.5 | <0.5 | 0 | <0.5 | <0.5 | 0 | — | 8.3 | 0 |
| | *Spain/CESNID* | | | | | | | | | | | | | | |
| 11 | Spring roll | 1.9 | 5.3 | 4.6 | 8.2 | — | 0.5 | 0.6 | 0 | 0.5 | <0.5 | <0.5 | — | 4.2 | 30 |
| 12 | Rice 3 delight | 1.6 | 4.6 | 3.4 | 20.2 | — | <0.5 | <0.5 | 0 | <0.5 | <0.5 | <0.5 | — | 2.1 | 52 |
| 13 | Gucamole | 1.7 | 3.1 | 1.3 | 2.1 | — | 0.7 | 0.6 | — | 0.8 | <0.5 | <0.5 | — | 2.5 | 2 |
| 14 | Mexican salsa | — | — | — | 0.7 | — | 1.6 | 1.8 | — | 0.6 | <0.5 | <0.5 | — | 1.8 | <1 |
| 15 | Ceviche | 0.4 | 0.8 | 0.8 | 1.4 | — | 0.9 | 0.5 | 0 | <0.5 | <0.5 | <0.5 | — | 1.2 | 46 |
| | *Denmark/DTU* | | | | | | | | | | | | | | |
| 16 | Dürüm rolls | 2.7 | 4.0 | 1.5 | — | — | — | — | — | — | — | — | — | — | — |
| 17 | Pita sandwich with kebab | 1.8 | 2.5 | 2.0 | — | — | — | — | — | — | — | — | — | 1.6 | — |
| 18 | Sandwich with kebab | 2.1 | 3.2 | 12.9 | — | — | — | — | — | — | — | — | — | 1.7 | — |
| 19 | Sandwich with falafel | 1.4 | 4.3 | 2.0. | — | — | — | — | — | — | — | — | — | 2.85 | — |
| 20 | Kebabmix | 4.4 | 7.6 | 3.3 | — | — | — | — | — | — | — | — | — | — | — |
| | *Italy/INRAN* | | | | | | | | | | | | | | |
| 21 | Cantonese rice | 1.2 | 2.6 | 3.0 | 24.7 | 1.1 | 0.3 | 0.2 | — | 0.5 | <DL | 0.1 | — | 1.6 | 29 |
| 22 | Nachos | 10.4 | 8.8 | 3.0 | 57.8 | 0.8 | <DL | <DL | — | 0.8 | <DL | <DL | — | 5.7 | 0 |
| 23 | Falafel (Italy) | 1.0 | 2.7 | 4.8 | 13.5 | 01.0 | 0.1 | 0.1 | — | 0.8 | <DL | <DL | — | 4.9 | 0 |
| 24 | Kebab | 5.7 | 6.9 | 3.2 | 0 | — | — | — | — | — | — | — | — | 0 | 102 |
| 25 | Sarmale | 1.7 | 2.4 | 0.3 | 5.7 | 1.7 | 0.6 | 0.7 | — | 0.2 | <DL | 0.2 | — | 1.9 | 13 |
| | *The Netherlands/RIVM* | | | | | | | | | | | | | | |
| 26 | Roti | 1.0 | 1.8 | 5.3 | 47.3 | 3.5 | — | — | — | — | — | — | — | 1.4 | 0 |
| 27 | Salted meat | 8.8 | 9.4 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | — | — | 50 |
| 28 | Tayer leaves | — | — | — | 0.9 | 0 | 0 | 0 | — | 0 | 0 | 0 | — | 3.4 | — |
| 29 | Pomtayer | — | — | — | 17.2 | — | 0 | 0 | — | 0 | 0 | 0 | — | 7.2 | — |
| 30 | Yellow split peas | — | — | — | 18.6 | 0 | 0 | 0 | — | 0 | 0 | 0 | — | 6.4 | — |
| | *Belgium/UGhent* | | | | | | | | | | | | | | |
| 31 | Mkayabo | 0.4 | 0.3 | 0.9 | 0 | — | 0 | 0 | — | 0 | 0 | 0 | — | — | — |
| 32 | Saka-saka | — | — | — | 0 | — | 0 | 0 | — | 0 | 0 | 0 | — | 9.2 | — |
| 33 | Chikwangue | 0.1 | 0.1 | 0.1 | 32.3 | — | 0 | 0 | — | 0 | 0 | 0 | — | 3.5 | — |
| 34 | Mbinzo worms | 2.2 | 0.5 | 2.5 | 1.0 | — | 0 | 0 | — | 0 | 0 | 0 | — | 2.0 | 31 |
| 35 | Biteku-teku | — | — | — | 0 | — | 0 | 0 | — | 0 | 0 | 0 | — | 4.5 | — |
| | *UK/UL* | | | | | | | | | | | | | | |
| 36 | Chicken bhuna | 1.3 | 2.7 | 4.1 | <0.5 | — | 0.9 | 0.5 | <0.2 | <0.2 | <0.2 | <0.2 | 1.8 | 2.1 | 47 |
| 37 | Lamb kebab | 4.8 | 6.4 | 2.8 | 3.6 | — | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 2.3 | 3.4 | 108 |
| 38 | Aloo Bombay | 0.4 | 3.2 | 1.6 | 6.3 | — | 1.8 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 1.8 | 3.5 | 2 |
| 39 | Rasmalai | 3.9 | 1.5 | 0.2 | 1.8 | — | <0.2 | 2.0 | <0.2 | 0.2 | <0.2 | 5.5 | — | — | 31 |
| 40 | Chicken Rogan Josh | 1.1 | 2.2 | 3.3 | 0.8 | — | 2.0 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 2.1 | 2.3 | 29 |

Abbreviations: AFSSA, Agence Française de Sécurité Sanitaire des Aliments; BGU, Ben-Gurion University of Negev; CESNID, Centre for Superior Studies on Nutrition and Dietetics; DTU, Technical University of Denmark; INRAN, National Institute for Food and Nutrition Research; MUFA, monounsaturated fatty acid; PUFA, polyunsaturated fatty acid; RIVM, Institute of Public Health and Environment; SFA, saturated fatty acid; UGhent, Ghent University; UK, United Kingdom; UL, University of Leeds; < and <DL, quantity of the nutrient was less than detectable level.
— Implies nutrient not prioritised for analysis because the selected food was not considered an important source of this nutrient.

The recommended energy intake from carbohydrates for men and women is between 50 and 75% of total energy intake (FAO, 2003). However, studies have demonstrated that carbohydrate intake exceeding 60% of total daily energy intake may increase fasting serum triglyceride concentration, reduce serum high-density lipoprotein cholesterol levels and decrease glucose metabolism, and therefore might increase risk of cardiovascular diseases, type 2 diabetes and metabolic syndrome, especially in South Asians who tend to be at higher risk of these diseases (Fletcher *et al*., 2005; Forouhi *et al*., 2005; Hussain *et al*., 2006). For most European countries, dietary recommendations for total fat are typically intakes of <30% of daily energy intake and for saturated fatty acids the recommendation is <10% of daily energy intake (WHO, 2003).

*Fatty acids and cholesterol*

Data on the content of saturated fatty acid, monounsaturated fatty acid and polyunsaturated fatty acid varied among the foods analysed. The lowest amounts of saturated fatty acids were found in *chikwangue* (Belgium; 0.1/100 g) and the highest amounts in *nachos* (Italy; 10.4/100 g). Monounsaturated fatty acid ranged between 0.1 g (*chikwangue*, Belgium) and 8.8 g (*sarmale,* Italy) per 100 g of edible food, whereas polyunsaturated fatty acid was highest (13.7/100 g) in manufactured hummus (Israel). Among all the foods, *kebab* and lamb *kebab* (from Italy and the United Kingdom, respectively) contained the highest levels of cholesterol (102 and 108 mg per 100 g, respectively), indicating that some ethnic foods across Europe may be comparable for some analytes, allowing exchange of data for future dietary intake studies, joint intervention studies and nutrition education.

Information on the concentration of different fatty acids is important, in particular, data on polyunsaturated fatty acid and monounsaturated fatty acid, which have been associated with improved serum lipid concentrations and reduced risk of cardiovascular diseases and associated metabolic conditions (Hu *et al*., 2001; Müller *et al*., 2003). Food composition data for cholesterol are required to provide accurate dietary advice for reducing dietary cholesterol intakes in population groups suffering from hypercholesterolaemia. Several studies have suggested that higher levels of dietary cholesterol are associated with cardiovascular diseases (Department of Health, 1994; Sharman *et al*., 2002; Fletcher *et al*., 2005).

*Starch, individual sugars and dietary fibre*

*Brik* pastry, *frik*, *nachos* and *roti* (or chapatti) were identified as the main starchy foods in this study and contained between 45 and 58 g starch per 100 g of edible food (*frik* (dry) and *nachos*, respectively). Analysis of total and individual sugars was not prioritised for all the foods because some of the foods were not expected to contain any significant levels. Among all the foods, *brik* pastry and *harissa* sauce contained the highest levels of sugar (7 and 8.4/100 g, respectively), most of which was present as glucose (7 and 6.5/100 g, respectively).

Most European countries recommend a sugar intake of <10% of daily energy (WHO, 2003) and the European Food Safety Authority recommends a dietary fibre (defined as non-digestible carbohydrates plus lignin, including non-starch polysaccharides, resistant oligosaccharides, resistant starch and lignin) intake of at least 25 g/day (EFSA, 2007). Other recommendations include a minimum of 30 g/day of dietary fibre for Germany, Austria and Switzerland (D-A-CH, 2008) and 18 g/day of non-starch polysaccharides for the United Kingdom (Department of Health, 1991), whereas the WHO recommends a minimum of 20 g/day of non-starch polysaccharides (WHO, 2003). Studies have also reported that increased intakes of fibre or non-starch polysaccharides favourably reduced total and low-density lipoprotein cholesterol concentration, as well as risk of coronary heart disease (National Cholesterol Education Program Expert Panel on Detection, 2001; Pereira *et al*., 2004; Fletcher *et al*., 2005). Foods that contained high amounts of dietary fibre (between 8 and 10/100 g) included *hummus*, *meloukhia* sauce, *falafel* and *saka-saka*. However, dry *frik* (roasted, immature wheat) had a fibre content of 19.3/100 g; its consumption might be encouraged through availability of new recipes. When compared with other data, the dietary fibre content of dark bread from Israel (2.3/100 g) and pita sandwich *kebab* from Denmark (1.6/100 g) was similar to foods such as toasted white bread (2.3/100 g) and hamburgers (1.6/100 g) (McCance and Widdowson, 2002).

Many ethnic foods are consumed because of perceived or real health benefits, including the medicinal effect of herbs and spices and presence of bioactive compounds. This emphasises the need for a more rigorous understanding of diet-related health effects. The importance of ethnic foods is increasingly being recognised by nutrition researchers and health professionals across Europe and the United States of America, as the popularity of such foods grows and evidence emerges about potential nutritional benefits or otherwise. Knowing the composition of ethnic foods is also important in studies on diet-related diseases. Furthermore, with increasing awareness of the health benefits of diets and nutrition, reliable food composition data on ethnic foods will help health professionals to advise consumers and support them to make healthier food choices. The new data generated have been documented for inclusion in national food composition databases in Belgium, Denmark, France, Israel, Italy, Spain, The Netherlands and the United Kingdom, and is also available from EuroFIR (http://www.eurofir.net). The validated data presented in this study will serve as an important tool in future national and international food consumption surveys. The data will also inform policy makers, the food industry and epidemiological research, and will enable the provision of reliable dietary advice to both mainstream and ethnic populations.

## Conflict of interest

The authors declare no conflict of interest.

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