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Estimating the nutrient composition of South Asian foods using a recipe calculation method

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ABSTRACT

Ten authentic and modified South Asian foods were prioritised from commonly-consumed foods in the UK [*puri* (white), *puri* (brown), *aloo palak*, Bengali chicken and potato curry, Bengali prawn *bhuna*, Pakistani *zarda*, *rasmalai*, chicken *bhuna, aloo* Bombay and lamb kebab] to estimate their nutrient composition. The recipe calculation procedure included additional parameters of water loss and fat uptake. Calculation of the recipes indicated loss of water (up to 24%) in all the dishes during cooking. Both types of *puris* had high levels of fat uptake during cooking [up to 18.4 g per 100 g of *puri*]. For most nutrients the calculated values exceeded those found by analysis. Differences between calculated and analytical data were smallest for protein, fat and carbohydrate. Other nutrients were less well estimated between calculated and analysed data especially for fibre, sodium, vitamin C, D, thiamin and riboflavin.

1. Introduction

Ethnic food encompass the foods ingredients and beverages from other countries that have a specific association with the land of origin, usually outside Europe. In addition, ethnic foods may be specific to a particular ethnic group (Klont & Mannion, 1996). An ethnic group is smaller in number than the controlling majority of the country. For example, the UK has an ethnic minority population of 7.9% [4.6 million], representing a 53% increase from 1991 to 2001. The largest ethnic group originates from the Indian sub-continent and includes around 2.3 million people or 4% of the total population (Office for National Statistics, 2001). This group comprises of Indians, Pakistanis and Bangladeshis, who are also known as South Asians. Foods commonly consumed by South Asians were selected in this study.

Whilst there is some data on South Asian food composition in the UK (Tan, Wenlock, & Buss, 1985; Food Standards Agency, 2002), there is a lack of up-to-date information on dishes and other prepared foods (Bognar & Piekarski, 2000), and, in general, on ethnic foods (Smith, Knight, Sahota, Kernohan, & Baker, 1993; Wharton, Eaton, & Wharton, 1984). More up-to-date South Asian food composition data is needed to fill gaps in current data. Data from recipe calculations is particularly important for characterising dietary intakes of individuals or populations (Buzzard, Price, & Warren, 1991), including ethnic groups. Such dietary information is needed to investigate relationships between diet and disease since there is a three- to six-fold increased prevalence in diseases such as diabetes (Bhopal et al., 1999; Greenhalgh, 1997) and obesity (Stanner, 2001; Williams, Bhopal, & Hunt, 1993) in South Asian groups compared to the mainstream population. Without this dietary information, effective provision of dietary advice to ethnic and mainstream groups is problematic (Judd, Kassam-Khamis, & Thomas, 2000).

Recipe calculation has been proposed as an alternative and less-expensive method than chemical analysis (Schakel, Buzzard, & Gebhardt, 1997; Vasilopoulou et al., 2003) and can be employed if there are difficulties accessing food samples for analysis, for example if they need to be transported over long distances (Powers & Hoover, 1989). Due mainly to its cost, chemical analysis is usually only carried out on commonly-consumed foods or for nutrients of particular interest. For foods which are less commonly consumed recipe calculations are regularly employed (Schakel et al., 1997).

In all there are seven recipe calculation methods available within the EU with the British method being most commonly used in the UK (Food Standards Agency, 2002). Recipe calculations take into account changes in weight and the nutrient contents during preparation and cooking. Recipe calculation procedures use edible portion, weight and nutrient changes also known as yield and retention factors (Reinivuo & Laitinen, 2006). The British method applies the yield factor at recipe level, it is applied to the whole weight of the dish, and the retention factor is applied at ingredient level, it is applied separately to the nutrient content of each ingredient. (Reinivuo et al., 2006).

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However, the British method does not apply retention factors to minor ingredients such as herbs and spices and fat uptake or loss is not taken into account (Reinivuo, et al., 2006). Only a few studies have corrected for fat uptake and Bognar and Piekarski (2000) emphasised the need for including the quantities of fat uptake in their guidelines for calculation of the nutrient composition in prepared dishes. This only applies to foods in which fat is the cooking medium (such as deep frying). By including fat uptake in the adapted British method and comparing calculated with analytical values, an assessment of accuracy in the calculated values can be made (Rodriguez-Palmero, Castellote-Bargallo, Lopez-Sabater, Torre-Boronat, & Rivero-Urgell, 1998). A number of studies have shown differences between analysed and calculated data in dietary nutrient intakes (Bailey, Finglas, Wright, & Southon, 1994; Rodriguez-Palmero et al., 1998; Southon et al., 1994) but few studies have been conducted on ethnic foods (Musaiger, 1994).

The aim of this study was to calculate and provide new data on the composition of ten commonly-consumed South Asian foods by taking into account the fat uptake and water loss (that is, using the adapted British method). In addition, a comparison of the calculated data with those obtained by chemical analysis was carried out.

This research was carried out in conjunction with the EU-funded Framework Programme 6 Network of Excellence, EuroFIR (European Food Information Resource); one of the aims is to provide new and reliable data on ethnic foods in 7 EU Member States (Belgium, Denmark, France, Netherlands, Italy, Spain, UK) and Israel for inclusion in national databases.

2. Materials and methods

2.1. Foods

Ten South Asian foods (dishes) were selected from a list of 30 commonly-consumed foods in the UK. These were all composite dishes representing different food groups (cereals, vegetables, meats, fish and sweets). The foods included; *puri,* white and brown (deep fried chapatti), *aloo palak* (*aloo* (potato) and *palak* (spinach) cooked with onions and spices), Bengali chicken and potato curry (a spicy curry with onions, garlic, ginger and potato), Bengali prawn *bhuna* (a spicy curry with prawns, onions, tomatoes and spices), Pakistani *zarda* (a sweet pudding made from rice, sugar, cardamom, nuts and dried fruits), *rasmalai* (milky dessert made with specialised milk powder, milk cream & cardamon), chicken *bhuna* (medium spiced curry with tomato, onion, garlic and fresh coriander), *aloo* Bombay (chunks of potato in a spicy, tomato & onion sauce) and lamb kebab (patties made with spiced minced lamb).

2.2. Criteria for the selection of ethnic recipes

The criteria used to select recipes included;

(i) recipes for commonly-consumed ethnic foods in the UK,
(ii) representative/standard recipes, and
(iii) recipes from best-selling ethnic cookery books and internet archives.

Recipes for Bengali chicken and potato curry, Bengali prawn *bhuna*, chicken *bhuna* and Pakistani *zarda* were selected from Judd et al. (2000), whilst *aloo palak*, *aloo* Bombay and *rasmalai* were selected from internet archives (Indian recipes, 2007; Sainsburys recipes, 2007; UKTV Food, 2007), *puris* from a recipe book (Dabhi, 2000) and lamb kebab from an authentic recipe provided by volunteers.

2.3. Ingredients, preparation and cooking method

Ingredients (salt, sugar, almonds, dried fruit and milk) were purchased from a local supermarket, and others such as spices, rice, chapatti flours, oil, vegetables and meat were purchased from an ethnic food store in Leeds. This was to ensure the ingredients were of similar composition to the country of origin of the recipe. Dishes were prepared and cooked in the food technology laboratory at the Department of Food Science, University of Leeds with the help of individuals experienced in South Asian cooking. The dishes were prepared according to the cooking method for the particular recipe. Three identical preparations of each dish were cooked and weighed.

Two types of *puris* were made with brown and white chapatti flour. The dough was prepared using a little oil to knead into a soft dough before dividing into small balls. Each ball was rolled into a 3½ inch round before deep frying in a deep frying pan for 15 s at approximately 190 °C.

The *aloo palak* was cooked in a saucepan by combining the spinach, garlic, ginger, onions and chilli for 5–10 min. The mixture was then pureed whilst the other ingredients [potatoes, turmeric and salt] were boiled in a pan until cooked. The spinach paste was fried in butter and the potato mixture, *garam masala* and cumin powder were added to the paste.

To prepare the Bengali chicken and potato curry, the onions, garlic, and ginger were fried, chicken and salt were added to it. In another saucepan, the spices, water and potatoes were boiled. Once cooked, the potatoes, meat and vegetables were mixed.

The Bengali prawn *bhuna* was cooked by frying the onions, spices and tomatoes in a pan over a medium heat before adding the prawns, and cooked together for a further 10 min.

The Pakistani *zarda* required boiling the rice and then frying the cardamom in vegetable oil until brown. Sugar and water were added and the mixture was boiled. Rice, nuts and dried fruits were added to the mixture which was then simmered until cooked.

Rasmalai was prepared by boiling milk, sugar and cardamom in a pan. The dough was then shaped into around 15 balls which were placed one at a time in hot milk and cooked for 15 min.

Chicken *bhuna* was prepared by frying garlic, ginger, bay leaf and fenugreek in sunflower oil. Onions, chicken and salt were added and the mixture was cooked for 5 min. The remaining spices and coriander were then added and the cooking continued for a further 12 min.

To prepare the *aloo* Bombay, onion was fried over a medium heat until softened, *garam masala* added and the frying continued for a further 1–2 min. Tomatoes and stock were added and brought to the boil. Potatoes were cut into cubes and added with the chilli. The pan was covered and the mixture left to simmer for 20–25 min or until tender.

To prepare the lamb kebab, minced lamb, onions, chillies, fenugreek leaves and coriander were blended in a food processor. The mixture was shaped into round balls, flattened and fried for 4 min on both sides.

2.4. Recipe recording

The raw ingredients for ten recipes and their amounts were recorded (Table 1). All ingredients were weighed and recorded in grams, before and after inedible parts [such as vegetable skins] were removed. The edible parts were recorded for the total raw weight and total cooked weights (Table 3).

2.4.1. Water loss

Weight change during cooking was recorded for total water loss (%) in all 10 dishes.