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## Original Research

# Knowledge about dietary fibres (KADF): development and validation of an evaluation instrument through structural equation modelling (SEM)



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## ABSTRACT

**Objectives:** Because there is scientific evidence that an appropriate intake of dietary fibre should be part of a healthy diet, given its importance in promoting health, the present study aimed to develop and validate an instrument to evaluate the knowledge of the general population about dietary fibres.

**Study design:** The present study was a cross sectional study.

**Methods:** The methodological study of psychometric validation was conducted with 6010 participants, residing in 10 countries from three continents. The instrument is a questionnaire of self-response, aimed at collecting information on knowledge about food fibres. Exploratory factor analysis (EFA) was chosen as the analysis of the main components using varimax orthogonal rotation and eigenvalues greater than 1. In confirmatory factor analysis by structural equation modelling (SEM) was considered the covariance matrix and adopted the maximum likelihood estimation algorithm for parameter estimation.

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Scale validation  
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**Results:** Exploratory factor analysis retained two factors. The first was called dietary fibre and promotion of health (DFPH) and included seven questions that explained 33.94% of total variance ( $\alpha = 0.852$ ). The second was named sources of dietary fibre (SDF) and included four questions that explained 22.46% of total variance ( $\alpha = 0.786$ ). The model was tested by SEM giving a final solution with four questions in each factor. This model showed a very good fit in practically all the indexes considered, except for the ratio  $\chi^2/df$ . The values of average variance extracted (0.458 and 0.483) demonstrate the existence of convergent validity; the results also prove the existence of discriminant validity of the factors ( $r^2 = 0.028$ ) and finally good internal consistency was confirmed by the values of composite reliability (0.854 and 0.787).

**Conclusions:** This study allowed validating the KADF scale, increasing the degree of confidence in the information obtained through this instrument in this and in future studies.

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## Introduction

Dietary fibre has been introduced via vegetable intake from the beginning of time and has been recognised as having a low caloric value but providing important health benefits.<sup>1</sup> In fact, dietary fibre has been associated with improved health functions and, therefore, plant-based foods with dietary fibre and bioactive compounds in the past years have been the object of much interest both in academia and industry.<sup>2</sup> Many prospective cohort studies have unquestionably demonstrated the significant health benefits of dietary fibre.<sup>3–5</sup>

Dietary fibre is composed of a mixture of compounds that include carbohydrate polymers as well as non-carbohydrate components,<sup>6</sup> including cellulose, hemicelluloses, pectins, gums, mucilages and lignin. The American Association of Cereal Chemists in 2001,<sup>7</sup> defined dietary fibre as ‘the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Dietary fibre includes polysaccharides, oligosaccharides, lignin, and associated plant substances’.<sup>8</sup>

Dietary fibre can be categorised into soluble and insoluble, according to its solubility in water, and both types are present in most plant foods.<sup>9</sup> Cellulose and lignin, which are the structural parts of plants, belong to the category of insoluble fibre because they do not dissolve in water and are not metabolised by intestinal bacteria. On the other hand, pectins, gums and mucilages, which exist within and around the plant cells, belong to the soluble fibre since they are water soluble (acquiring a gel-like structure) and fermentable by colonic bacteria.<sup>10</sup>

Dietary fibre, as seen previously, includes a variety of macromolecules presenting different physical–chemical properties, and consequently having different metabolic and physiological effects. For example, the viscosity and ion exchange capacity are strongly associated with metabolic effects such as glucose and lipid metabolisms, while fermentation characteristics, bulking effect and particle size are involved in the functions of the colon.<sup>11</sup> Hence, dietary fibre has an impact

on all aspects of gut physiology and therefore is vital in a healthy diet.<sup>12</sup>

There is evidence that an appropriate intake of dietary fibre significantly diminishes the risk of developing coronary heart diseases, strokes, hypertension, diabetes, obesity, as well as many gastrointestinal diseases.<sup>9,13–15</sup> Dietary fibres determine faecal bulking and reduce the transit time, which allows a minimal exposure of the colonic mucosal wall to mutagens and carcinogens. The binding ability of dietary fibres from cereals, fruits and vegetables to food mutagens is well documented.<sup>16</sup> There is scientific evidence that fibre plays an important role in preventing and even treating bowel cancer or breast cancer.<sup>17–20</sup>

Dietary fibre is capable of exchanging many cations, particularly some toxic cations, thus helping to excrete them with the faeces. Dietary fibre can also absorb some of the harmful substances which may cause disease.<sup>8</sup>

The scientific evidence that vegetables, fruits, and whole grains reduce the risk of chronic diseases is currently assumed and evidenced by multiple scientific studies.<sup>21–23</sup> Diseases of public health significance such as obesity, cardiovascular disease, type 2 diabetes or constipation can be reasonably prevented or even treated by an adequate consumption of fibre rich foods throughout the lifecycle, from childhood to senior age.<sup>24</sup>

Given the importance of dietary fibre in the diet, a question was pointed out about the type of knowledge that people would have concerning food fibres. Therefore, because no validated instruments were found to evaluate specifically the knowledge about food fibres, the present study was undertaken to develop such an instrument: ‘knowledge about dietary fibres’, abbreviated by KADF. The instrument was then studied, by means of exploratory and confirmatory analyses.

## Methods

### Sample

The methodological study of psychometric validation was conducted with 6010 participants, from which 65.7% were

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