

## Opinion

# Quantity and Quality of Carbohydrate Intake in Iran: A Target for Nutritional Intervention

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## Background

Obesity-related chronic diseases such as diabetes and cardiovascular disease are the leading causes of disability and death worldwide.<sup>1</sup> They account for nearly 60% of all deaths. Approximately 80% of non-communicable diseases occur in low and middle-income countries,<sup>2</sup> with increasing prevalence in developing countries such as Iran.<sup>3</sup> The mortality rate attributable to diabetes and cardiovascular disease has been estimated to be more than 400 per 100,000 in Iran.<sup>4</sup>

## Non-communicable diseases

Obesity is a multi-factorial, complicated condition which is the underlying factor for the high prevalence of non-communicable chronic diseases.<sup>5</sup> During the last decades, significant changes in lifestyle and dietary behaviors such as the consumption of energy-dense foods have contributed to the increasing prevalence of overweight and obesity, both in developed<sup>6</sup> and developing countries.<sup>7,8</sup> Such an increasing trend in obesity is concurrent with the high prevalence of type 2 diabetes and metabolic syndrome, even amongst the youth.<sup>9</sup> These rapid changes can be explained, at least in part, by nutrition transition in developing countries where people are getting away from healthy traditional food patterns with the desire to consume Western and so-called convenient foods. In Iran the phenomenon of nutrition transition began in the 1980s and its health consequences have emerged since the 1990s.<sup>10,11</sup>

## Carbohydrates and carbohydrate-rich foods in the Iranian diet

Carbohydrates are the main dietary component in Iran. The most important characteristic of the traditional Iranian diet is consumption of grains, particularly refined grains.<sup>10,12</sup> In a cross-sectional study of Tehranian adults, the average dietary intake of refined grains has been estimated to be  $201 \pm 57$  g/day, while whole grain consumption is  $93 \pm 29$  g/day, on the average.<sup>13</sup> White rice is recognized as the staple food of Iranians in most urban areas. However in small towns and particularly in rural districts, white bread

(namely lavash) is consumed as the main dietary component.<sup>10,12</sup> According to the National Food Consumption Survey, plant foods are the major source of energy intake among Iranians. More than 60% of their calories are obtained from carbohydrates. In other words, the dietary intake of carbohydrates (solely from breads and cereals) among Iranians is 450 g per day (rural areas: 413 g/d and urban areas: 518 g/d).<sup>12</sup> In descending order, the mean intake of the following foods in Iran are: bread (320 g/day), white rice (110 g/day), potatoes (58 g/day), and spaghetti (14 g/day). The average intake of refined sugar (in the form of sugar and sugar cubes) has been estimated to be 51 g/day.<sup>12</sup> These data indicate that consumption of refined carbohydrates in Iran is among the highest levels in the world while dietary intakes of fiber, fruits, vegetables, legumes and nuts are lower than the recommendations of the Food Guide Pyramid.<sup>12</sup>

Whole-grains contain higher amounts of dietary fiber, magnesium, antioxidants, vitamin E and phytoestrogens than do refined carbohydrates. The protective effects of these nutrients against the risk of chronic diseases are wellknown.<sup>14,15</sup> Also due to their physical structure and dietary fiber content, whole-grains are categorized as low-glycemic index foods. Besides the quantity of dietary carbohydrates, its quality also deserves attention. Carbohydrate quality is usually assessed by glycemic index (GI) and glycemic load (GL). In 1981, the concept of the GI was introduced by Jenkins et al.<sup>16</sup> to quantify the glycemic response to carbohydrates in different foods. GL, the mathematical product of the GI of a food and its carbohydrate content has been proposed as a global indicator of the glucose response and insulin demand induced by a serving of food.<sup>17</sup>

As mentioned earlier, most of the dietary carbohydrate intake in Iran is in the form of refined grains which usually have higher amounts of GI and GL. The estimated amount of GI for white bread is 69, whereas for rice it is 60.<sup>18</sup> Previous studies have demonstrated the associations between dietary GI, GL and risk of chronic disease.<sup>17,19</sup> Although no information is available about such associations in Iran, data on the associations between whole and refined-grain intakes and risk of chronic disease have even been published from Iran. The major findings of such studies are in line with those published from other parts of the world indicating that whole-grain consumption is associated with lower risk of metabolic syndrome,<sup>13,20</sup> hypertriglyceridemic waist phenotype,<sup>21</sup> obesity and central adiposity,<sup>22–24</sup> cardiovascular disease,<sup>25</sup> hypertension,<sup>13</sup> and hypercholesterolemia.<sup>13</sup> Conversely, refined-grain intake has been related to the increased risk of these conditions. Such associations can be partly explained by the GI and GL values of these types of cereals.

On the other hand, unfavorable carbohydrate quantity and qual-

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ity might contribute to the increased levels of serum triglycerides and decreased levels of serum HDL-cholesterol. Elevated levels of serum triglycerides in conjunction with reduced levels of serum HDL-cholesterol, namely atherogenic dyslipidemia, are highly prevalent among Iranians. For instance, decreased serum HDL levels have been found among 69% of Iranian adults,<sup>26</sup> while this figure for American adults is in the range of 30%–35%.<sup>27</sup> Although genetic susceptibility,<sup>28</sup> physical inactivity,<sup>29</sup> air pollution,<sup>30</sup> and psychological factors<sup>31</sup> could play a role, we believe that such an enormous discrepancy can mostly be explained by the differences in the quantity and quality of dietary carbohydrates.

## Conclusion and recommendations

Therefore, it seems that both the quantity and quality of dietary carbohydrates in Iran deserve great attention by health authorities. This is particularly important given the high prevalence of cardiovascular disease in Iran. Although a recent study has shown the decreasing trend of cereal consumption in Middle-Eastern countries from 1961 through 2007, the data has been based on food balance sheets that do not provide reasonable estimates of usual dietary intakes.<sup>32</sup> In addition, the high intake of refined grains has been associated with a sedentary lifestyle among Iranians making the deleterious effects much more important.<sup>13</sup> We believe that increment in both the availability and consumption of whole-grain products would help curb the obesity and metabolic syndrome epidemics in Iran. A change in the quantity and quality of dietary carbohydrates in Iran can be used as a preventive approach to reduce the burden of chronic disease.

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