Original Article

Social Awareness of Whole Grains and the Feasibility of Replacement with Refined Grains: A Qualitative Study

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Abstract

Background: A correlation between type 2 diabetes and refined carbohydrates has been proven, while several studies have indicated that Iranian daily diets are poor in term of proper carbohydrates. It was thus considered absolutely critical to conduct a qualitative study in terms of people's attitudes toward whole grains, and the feasibility of their replacing existing refined carbohydrates in their diets. The aim of this study is to probe Iranian awareness of whole grains, to explore barriers to refined-grain substitution with whole grains and legumes, and to assess whole-grain sensory perceptions. **Methods:** Focus group discussions (FGDs) and taste tests conducted between July 2016 and March 2017 in urban and rural areas of Kurdistan, Yazd, and Tehran provinces in Iran. A total of 96 healthy men and women (aged 40-65, BMI ≥25 kg/m^2) were selected through purposive sampling with maximum variation. FGDs were categorized by content analysis method. As for taste test, ANOVA analysis with Bonferroni post-hoc was used to determine significant differences ($P < 0.05$). **Results:** Four themes and 11 sub-themes emerged. Cultural beliefs, traditional eating patterns, sensory properties, and familial acceptance were the most influential factors in choosing the type of bread and rice. Simultaneously they are the most prominent barriers to consuming whole grains and legumes. Plain cooked brown rice had the lowest mean sensory attribute score and traditional whole-wheat flatbread was the highest. **Conclusions:** There was a higher acceptance tendency toward using traditional whole-wheat flatbread rather than refined grains, as it was consistent with preference and priority. However, low availability was the largest substitution problem.

Keywords: *Bread, focus groups, oryza, qualitative research, whole grains*

Introduction

One of the most important underlying risk factors in non-communicable diseases is poor-quality carbohydrates intake, including refined grains.[1-4] Over 50-55% of Iranian daily calories are provided by carbohydrate consumption, including refined wheat bread and white rice.[5,6]

Wheat flatbread is traditionally the cheapest, most popular and most widely available staple food for Iranians, and is important to all social classes.[7] White rice is the second staple food, eaten at least once a day by most individuals.[8] Unlike whole-wheat flatbread, brown rice and industrial voluminous whole breads are a relatively new concept, and have not been widely accepted by Iranian population yet. Traditionally, a number of dishes consist of bread and rice with legumes (e.g., rice/lentil mixture called "*Adaspolo*"). However, legume consumption is below recommended daily amounts yet.[9,10]

Since many recent studies have indicated that Iranian diet are suboptimal for proper carbohydrate consumption, a reform has widely been recommended in this regard.[4,5,11,12] It is thus absolutely critical to conduct a qualitative study, firstly in terms of people's attitudes toward whole grains, and secondly, into the feasibility of their replacing the existing refined carbohydrates in their diets. Two studies on healthy dietary patterns have indicated that the biggest barriers to adopting healthy diets in Iran consist of poor healthy food accessibility, and existence of traditional habits.[13,14] However, those studies did not provide any information on whole grains and legumes consumption, and only focused on urban populations. A study carried out in Costa Rica has shown that the sensory properties of foods and people's traditional fixations on certain diets are other major parameters in choosing refined-grain foods, and considerable barriers to their replacement with whole grains or beans.[15] In

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Tanzania, India, and China, on the other hand, the sensory properties of foods were found to be the major preference parameter.[16-18]

Considering the fact that interventions for dietary improvements are directly or indirectly influenced by cultural and social-economic factors, quantitative studies must be carried out within local cultures. The findings can thus provide data for nutritionists and policymakers to implement effective interventions to improve and increase the quality of carbohydrates, thus reducing type 2 diabetes risks. The aim was to assess Iranians' awareness with regard to brown rice and whole-wheat bread, as well as potential strategies for replacing refined grains with whole-grain equivalents, and the barriers faced. It also aimed to assess the sensory perception of whole-grain food preparations.

Methods

This qualitative study was designed based on a content analysis method, using focus group discussions (FGDs) and taste tests as the method triangulation approach to increase the validity of the study findings.[19] Data collection took place between July 2016 and March 2017 in the Kurdistan, Yazd, and Tehran (the capital) provinces of Iran.

The study was reported based on the standard for Reporting Qualitative Research (CQREQ).[20]

Volunteers were selected from community health center visitors and office employees in selected cities and villages through a targeted sampling method with maximum variation through sequential visits. If the potential participants agreed to join in the sessions, they then filled out a self-questionnaire, and then were screened based on inclusion criteria. After a comprehensive explanation of the study (aims and the procedure), the participants' written consent was obtained. The inclusion criteria were healthy women and men, aged 40 to 65 years old, with a body mass index (BMI) ≥25 kg/m^2. Those with a history of cardiovascular disease, type 2 diabetes, hypertension, and cancer, or on a weight-loss diet, were not been included.

The FGDs of every province were performed in the same province; the FGDs were homogeneous in term of gender and area (rural vs. urban). FGDs were conducted based on guiding questions based on FGD study objectives and article reviews. The FGD sessions and the food sensory test took approximately 2-3 hours. Each session had a trained facilitator, along with a skilled expert in FGD functioning, as supervisor and note-taker. Group discussions were conducted in quiet environments within urban and rural health centers. The facilitator and participants sat in a circle. FGDs continued until saturation, when no more themes emerged. In order to ensure accuracy of participants' comments, the facilitator then repeated them.

At the beginning of the session, the facilitator explained the goals and also the fact that the discussions were being taped, while assuring participants of the confidentiality of the whole process. Each FGD content was consisted of: an initial focus group discussion, a food sensory test, and a second focus group discussion. All sessions were held consecutively on the same day with the same participants. The recorded statements for each FGD session were transcribed verbatim in Farsi on the same day, and the note-taker's notes were used to complete the session report.

In the first session, the factors affecting rice and bread consumption were discussed, as well as people's perceptions of whole grains and legumes. The second part was the food sensory test, in which the study group tasted prepared foods. These consisted of traditional whole-wheat flatbread, industrial voluminous barley bread, Lavash bread (a popular refined-wheat flatbread),[7] plain cooked brown rice, plain cooked white rice, a mixture of lentils and cooked brown rice with a ratio of 1:2, and a mixture of lentils and cooked white rice (*Adaspolo*) with a ratio of 1:2. Recipes were prepared using traditional methods, standardized to maintain consistency and prepared by the same chef on the test day. Breads were bought at local bakeries on the test day. Portions were equivalent to 1/2 serving of bread or rice (15 g), served along with water. Yogurt was served to remove taste residues from palates; participants were trained how to conduct the evaluation, and later rated sensory attributes on a 10-point Likert scale.

Having finished the food sensory session, a second FGD was conducted for participants to comment on barriers concerning wholegrain consumption, as well as strategies for replacing refined grains.

At the end of the session, body weight was measured using a Seca digital scale with participants wearing light clothes. Height was measured using a standard metric measuring tape, with participants wearing no shoes. Then, a self-administered socio-demographic questionnaire was filled out. At the completion of the sessions, a bag of brown rice (700 g) was given to participants as an incentive.

Data analysis

Data analyses of FGDs used a content analysis method with a convenience approach.[21] In the current study, the content analysis consisted of 3 steps. At first, each discussion was reviewed several times, analyzing every word, and finally words were coded. Then, each transcription was entered into MAXQDA10 software to be coded systematically.

Finally, codes with the same meaning were listed in one column under one topic.[22] Those final topics consist of awareness, perception to each food, the barriers for accepting each food, and strategies recommended by FGD participants.

After 12 sessions, all the discussions were reviewed and coded again, and the outcomes compared. The saturation data in each topic was reviewed and confirmed by the study team, and the FGD was discontinued then. The team consist of specialists in qualitative studies and nutritional sciences.

In order to prevent subjective conclusions, the coding process was discussed with the team members. If conflicting results were detected, the team members used to discuss the issue to finally reach a consensus.

As for Sensory Analysis, the participants were rated from 0-10 points based on LIKERT scale for Sensory attributes including smell, taste, color, appearance, texture, and softness for each food. The sensory analysis of the foods was carried out using descriptive analysis methods. One-way ANOVA analysis with Bonferroni post-hoc was used for comparison between foods; i.e., the mean points for taste or the smell of different breads and rice. Statistical significance was set at $P < 0.05$, with 80% power, and all statistical analyses were performed using STATA software version 12 (STATA Corporation, College Station, TX, USA).

Validity of data

Due to Linkolna and Goba methodology, to determine the validity of a qualitative study, dependability, credibility, transferability, and confirmability of the data has to be reached.[23] Dependability was attained by taking notes during every session as well as tape recording them using a high quality recorder, and data was independently coded by two researchers through MAXQD 10 software. For credibility, a sampling method with maximum variation was used. In addition, probe questions have been asked to depth contributors' responses and also the member-check method was used. Furthermore, opinions were sought from experts in the field of qualitative research. For transferability, we have tried to explain all our research methods and to describe the quality of data collection in this article. Due to the regular collection of data and the accurate recording of different stages of the research, confirmability was achieved. The confirmability of the study was proved by a committee of specialists. Thus, the research process was reviewed by professors and experts in the field of qualitative research to ensure the validity of the study.

Results

Twelve FGDs were carried out, generally attending 6-8 participants each session. There were 77 participants in total (34 men and 43 women), with a mean (SD) age of 48 ± 7 years old and a mean BMI of 30 ± 4 (kg/m^2). Table 1 shows general characteristics.

Theme derived from focus group discussions

Four themes and 11 subthemes emerged from participant statements, which are presented in Table 2. Following we explained those themes.

Theme 1: Determining factors of buying breads and rice

Preference and priority: all participants in both genders and both areas (rural and urban) in the three provinces repeatedly commented that cultural beliefs, traditional eating patterns, and sensory properties were the most important factors in choosing bread and rice: "It's a lifetime habit to eat things that taste good." (51-year-old man living in rural area).

Family acceptance was also critical: "It makes no difference to us. Children are more important." (45-year-old woman living in rural area).

Availability: Convenience and time constraints were directly influential factors, remarked by all the participants in both rural and urban areas of both genders across three provinces: "Lack of time and the ease of providing Lavash sold at the supermarket makes me do so." (46-year-old man living in urban area). Digestive problems, food safety, cost, and the geographical area where the rice came from, were other factors discussed by some participants.

Theme 2: People's knowledge/perspective towards wholegrains (whole bread/brown rice) and legumes

Most participants of both genders across 3 provinces in rural and urban areas considered white rice and white bread, and decreased legumes, as culprits in obesity and chronic disease, while mentioning that bran can help to prevent many diseases: "The bread that hasn't lost its bran is much better for the stomach, and is less harmful in terms of diabetes." (Man, 59, rural area)(59-year-old man living in rural area).

As for whole bread, 70% of rural and urban participants (both genders) in three provinces believed that whole-wheat flatbread made in a traditional way was healthier and more pleasant.

As for brown rice, 58% of participants had heard nothing about it; 35% learnt it through media or relatives. Only 7% had eaten it previously. One participant: "I ate brown rice but didn't like it. Maybe that's because I've always consumed white rice. I didn't find it appealing. Its appearance wasn't good, either." (47-year-old woman living in rural area). Only three people in total occasionally consumed it as part of a healthy-food diet to prevent certain diseases.

As for legumes, the majority of the participants (80%) believed that legumes consumption had decreased compared to 20 years ago, which they believe it was a

Table 1: Sociodemographic Characteristics of the Study Population (*n*=77) in the Focus Group and Taste Test

	Gender		*P*	Province			*P*
	Men (*n*=34)	Women (*n*=43)		Kurdistan (*n*=19)	Tehran (*n*=30)	Yazd (*n*=28)	
Age (years)	50 (7)	46 (7)	0.035	46 (1)	49 (6)	48 (6)	0.572
BMI (kg/m^2)	30.0 (4.6)	30.8 (4.5)	0.440	28 (3)	31 (4)	30 (4)	0.058
Household	3.8 (1.1)	4 (0.9)	0.340	3.8 (0.9)	3.8 (1.0)	4.1 (1.0)	0.448
Region (%)							
Urban Area	47.5	52.5	0.539	27.5	37.5	35	0.836
Rural Area	40.5	59.5		21.6	40.5	37.8	
Marital status (%)							0.598
Single	2.9	2.3	0.440	5.3	3.3	0	
Married	97.1	93.1		89.5	93.3	100	
Other	0	4.7		5.3	3.3	0	
Education Level (%)							
Illiterate	2.9	7.0	0.861	5.3	6.7	3.6	0.001
Elementary School	26.5	34.9		21.1	20	50	
Some Years at High School	26.5	16.3		15.8	13.4	32.2	
High School Diploma	17.6	18.6		0	40	7.1	
A. A.	2.9	4.7		5.3	6.7	0	
B.S.	17.6	14		42.1	6.7	7.1	
M.S. and Higher	5.8	4.7		10.6	6.7	0	
Family Income (%)							
Level1[a]	14.7	16.3	0.988	15.8	16.7	14.3	0.143
Level2[b]	44.1	41.9		68.4	30	39.3	
Level3[c]	35.3	37.2		15.8	43.3	42.9	
Level4[d]	5.9	4.7		0	10	3.6	

Besides "home," there were nine other items, each of which had 1 score (Car, Hand-woven carpet, Side-by-side refrigerator, Automatic washing machine, Dishwasher, Microwave oven, Computer/laptop/tablet, LED/LCD TV, Camcorder or camera). Based on the participants scores, they would be classified into 4 different levels. [a]Level 1: people with private home and a score between 7-9. [b]Level 2: people with private home and a score between 4-6, or those with no private homes but a score between 7-9. [c]Level 3: people with private home and a score between 0-3, or those with no private homes but a score of 4-6. [d]Level 4: people with no private home and a score of 0-3

factor responsible for the increase of disease. "It would be great to eat legumes. I feel that health problems would be reduced." (51-year-old woman living in rural area).

After the taste test, the second FGD session asked further questions regarding barriers to consumption.

Theme 3: Barriers to whole-grains and legumes

Preference and priority: the urban and rural participants of both genders in all three provinces repeatedly expressed that the toughest barrier to brown rice was the "whiteness" of rice for Iranians. In other words, rice being white is ingrained in Iranian culture. Other unappealing properties of cooked brown rice, such as smell, dark-brownish color, chewy texture, and its appearance when is ready for eat, were barriers to its use: "We are used to the color of white rice, and if we see brown rice, we might confuse it with cooked barley." (42-year-old man living in urban area).

Despite the fact that almost all participants believed that whole bread was healthy, some said that its dark color was reason for not consuming it: "Appearance is important to people. The bran in whole bread affects its look, and does not tempt people to buy it, but since white flour looks better, people are more inclined to get it." (48-year-old woman living in urban area). As for industrial voluminous whole bread: "I tried it but it wasn't that tasty. The taste of barley bread does not go well with some foods, such as *Abgoosht* (an Iranian stew) or breakfast foods." (45-year-old woman living in urban area).

Family reluctance was another barrier: "I won't replace white rice with brown rice, because my husband won't eat it. He really won't." (42-year-old woman living in urban area). All men and women in the rural and urban areas in the three provinces mentioned the non-cooperation of their children as a major obstacle for adopting wholegrains, especially brown rice and legumes: "Children love to eat rice. No one likes *Ash* with legumes. When I cook them, they don't touch it and prefer to eat macaroni or white rice instead." (46-year-old woman living in rural area)

Availability: Scarcity or low accessibility, time constraints, and inconvenience in most urban or rural areas were other important barriers, as remarked on by the majority of participants: "Everyone is looking for convenience in life. For example, legumes must be soaked a few hours before cooking; preparing it takes a long time and cooking it needs patience." (50-year-old woman living in urban area).

Another barrier was high prices, especially regarding

Table 2: Themes, Subthemes, and Codes Derived from 12 Focus Group Discussion

Themes	Subthemes	Codes
The criteria to consider when buying rice or bread	Preference and priority	Cultural beliefs
		Traditional eating patterns
		Sensory properties
		Family acceptance
	Availability	Convenience
		Time constraints
		Cost
Opinion about whole grains and legumes	Whole bread	Healthy and more pleasant bread that is not available anymore.
	Brown rice	Few participants had eaten previously. They were reluctant to buy it, except for 3 people that rarely use it as a health food diet
	Legume	Reducing consumption of legumes is responsible factor in the increase of diseases.
The barriers of substituting refined grains with whole grains and increasing legumes	Preference and priority	Conflicting with cultural beliefs
		Inconsistent with traditional eating patterns
		Unpleasant sensory properties
		Lack of family acceptance
	Availability	Inconvenience
		Time constraints
		Low accessibility
		High price
	Lifestyle changes	Working women
		Increased accessibility of chicken and rice
		Increased fast food
		Following Western diets
Strategies for better introduction of whole grains and increasing legumes	Raising public awareness and familiarity	Advertising in mass media
		Familiarizing people's palates
		Providing as a meal in schools or organizations
	Increasing accessibility	Cost reduction
		Increasing accessibility
	Increasing knowledge and skill	Teach mothers and children as key people
		Teach recipes
		Raising health & nutrition information levels

brown rice and legumes. One participant mentioned, "I myself won't buy brown rice at this price, even if I know it is useful. I would provide fiber from another source." (46-year-old woman living in urban area).

Lifestyle Changes: Transformations in lifestyles, especially among women, was mentioned as another factor: "Unfortunately, these days, women don't spend time cooking healthy meals as mothers did in the old days." (52-year-old man living in urban area). They also blamed the younger generation's inclination toward western cuisine and fast food. In addition, other environmental factors were mentioned, including: abundance, low prices, speed and ease of cooking chicken and white rice, greater satiety, and higher preference among children: "Well, there is a greater tendency towards eating rice and chicken, which were not so widely eaten in the past. No one wants legumes anymore." (48-year-old man living in urban area).

Other factors which might play a role in the reluctance towards wholegrain substitution and legume consumption increase included: the lack of experience and skill in cooking traditional legumes-based meals or brown rice; the lack of popular knowledge about the nutritional value of whole grains and legumes; their low quality; abdominal distension.

Theme 4: Strategies for substituting wholegrains for refined grains, and raising legumes consumption

Raising public awareness and familiarity: Media commercials on popular programs, including showing movie stars eating whole grains and legumes instead of fast foods were among the effective strategies repeatedly suggested: "The media can be very influential. People get attracted to the things they see on TV or hear on radio advertisements." (48-year-old man living in urban area).

Familiarizing people with whole grains and legumes was another suggestion. Offering cooked brown rice as

promotional advertisements in places such as markets and stores could help familiarize people with its flavor and taste outside of domestic environments: "Well, people tasted it. Tasting a new food is more important than hearing facts about it." (43-year-old woman living in urban area). Eating out is also a popular pastime, so including foods containing brown rice or more legumes in menus or at self-service restaurants might offer opportunities: "This rice should be served in public eateries, so that those who haven't seen it before and have no access to it, are at least able to see and try it. People's tastes will get used to it." (56-year-old woman living in urban area).

Almost all participants in all areas of the three provinces commented that serving brown rice or dishes with legumes in school canteens or in offices would help people become familiar with them. This could be effective, since people follow their peers: "When my daughter was going to primary school …they decided to give kids cooked lentils three times a week … The kids started liking them very much and when back home from school, asked parents to cook them lentils." (43-year-old man living in urban area).

Increasing accessibility: raising accessibility and reducing prices might increase consumption. Most participants maintained that subsidizing whole bread, brown rice, and legumes in order to reduce prices were important: "Legumes must become more affordable… I think they are very pricy for the younger generation, who have to pay high rent and utilities bills." (52-year-old woman living in urban area).

Increasing knowledge/skill: Some participants in both the rural and urban areas of all three provinces acknowledged that raising people's knowledge about the nutritional values of wholegrains (brown rice/whole bread) and legumes and their role in preventing chronic diseases would have a big impact on consumption, especially if people learn from trusted individuals and centers, such as doctors and nutrition specialists: "If doctors talk about traditional whole-bread and encourage people to eat it, this problem will get solved more easily." (51-year-old man living in rural area).

Educating mothers and children as a specific target group was mentioned by almost all male and female participants: "I found out brown rice is beneficial to my heart and my blood circulation, so I try to consume it at least twice a week. When I do this, naturally my children get curious as to what I am eating and want to try one or two spoonful." (48-year-old woman living in urban area).

Teaching recipes or cooking methods to enhance sensory attributes: "The Agriculture Department tried to make fish a part of family meals, so started giving cooking lessons. If you hold cooking classes and teach us how to make meals with this rice, we could accept it much faster." (43-year-old woman living in urban area).

The results of food sensory testing

The ANOVA results indicate that the type of food prepared significantly affected sensory properties, including taste ($F(6,492) = 11.8$, $P < 0.001$), smell ($F(6,492) = 13.07$, $P < 0.001$), softness ($F(6,492) = 11.4$, $P < 0.001$), appearance ($F(6,492) = 31.48$, $P < 0.001$), texture ($F(6,492) = 17$, $P < 0.001$), and color ($F(6,492) = 20.93$, $P < 0.001$) [Table 3].

Plain cooked brown rice was given a significantly lower score in terms of taste, smell, color, appearance, texture, and softness, compared to all other types of rice and all types of bread. The addition of lentils to brown rice improved all its sensory properties, and especially increased its taste score significantly ($P < 0.005$) [Table 3].

Among the three types of bread (refined wheat flatbread, whole-wheat, barley), refined wheat flatbread had the lowest grade in taste and smell, softness, and texture. The score of taste and smell of refined wheat flatbread was significantly lower than traditional whole flatbread ($P < 0.005$). Barley bread (industrial) had the lowest score in color and appearance. Besides, the taste, smell and appearance of barley bread were also significantly lower than the traditional whole bread ($P < 0.005$) [Table 3]. There was higher acceptance of traditional whole-wheat flatbread, scoring high in terms of pleasantness [Figure 1].

Discussion

By starting the current study and due to our search, this has been the first qualitative study with a FGD approach and food sensory taste carried out to probe Iranian families' attitudes to whole grains, their interest, the provisional barriers, and their strategy for including them in their daily diet instead of refined grains. The findings were classified based on four themes that emerged from the FGD, namely: 1) factors in choosing bread and rice; 2) perspectives towards wholegrains (whole-bread/brown rice) and legumes; 3) barriers to replacing refined grains with wholegrains and increasing legumes; 4) strategies to achieve this substitution, and ways to increase legumes

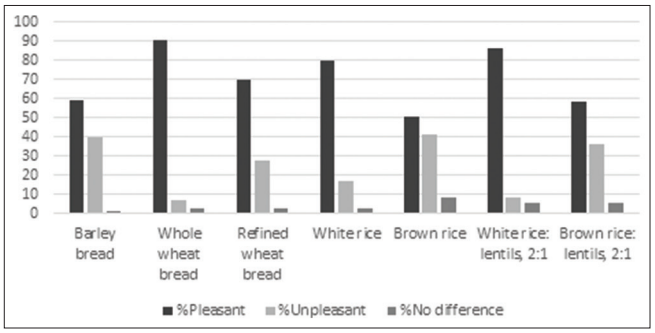

Figure 1: Pleasantness ratings for each food preparation included in the food sensory test. 'Unpleasant' was defined as preparations scored as 1-4 points, 'No difference' as 5-6 points, and 'Pleasant' as 7-10 on the Likert scale

Table 3: Mean scores for sensory attributes as assessed by LIKERT scale for each prepared food preparation in the taste test

Food Preparation	Taste	Smell	Softness	Color	Appearance	Texture
Plain brown rice	5.01[a,e]±2.92	4.69[a,e,h]±2.99	5.67[a,e,h]±3.24	4.69[a,b,e,h]±2.89	4.04 [a,b,e,h]±2.67	4.83[a,b,e,h]±2.80
Plain white rice	7.07±2.58	7.05±2.81	8.30[b]±2.33	8.18±2.29	7.74±2.26	7.50±2.42
Brown rice: lentils, 2:1	6.40[c,e]±2.83	5.79[d,e]±2.94	6.95[a,d]±2.74	5.80 [a,b,d,e]±2.79	5.13[a,b,d,e,h]±2.77	6.09[d,e]±2.63
White rice: lentils, 2:1	7.60[b,c]±2.15	7.32[b,c]±2.43	8.41[b,c]±1.72	7.63[c]±2.04	7.75[c]±1.82	7.74[c]±1.75
Barley bread	6.27±3.17	6.22±2.92	8.07±2.30	7.08±2.77	6.86±2.77	7.25±2.30
Whole wheat bread	8.17[h]±2.11	8.01[h]±2.34	7.75±2.23	8.43[h]±1.87	8.50[h]±1.89	8.21±1.85
Refined wheat bread	5.78[c]±2.90	5.34[e]±2.85	6.68±2.88	7.36±2.57	7.27±2.60	6.81±2.60

Values presented as mean±SD score from LIKERT scale using ANOVA analysis with Bonferroni *post hoc*. [a]significantly different from plain white rice, $P<0.05$. [b]significantly different from Refined wheat-bread, $P<0.05$, [c]significantly different from brown rice, $P<0.05$. [d]significantly different from White rice: lentils, 2:1, $P<0.05$. [h]significantly different from barley, $P<0.05$. [e]significantly different from Whole wheat bread, $P<0.05$

consumption. These findings showed that cultural beliefs, traditional eating habits, and sensory properties were the most important factors affecting choices of bread and rice, and provided key barriers to replacing refined grains.

There is a prevalent Iranian belief that bright golden flatbread and bright white rice indicate premium quality, while darkness shows low quality. The results of the sensory test were in line with these believes. White rice and whole-wheat flatbread had the highest sensory property results. Furthermore, the first barrier was the dark color of the brown rice and barley bread, which were not consonant with participants' habitual eating patterns, thus kept them in an unpleasant category. Food patterns stem from cultural believes and traditional eating patterns. Moreover, eating habits passed from generation to generation probably remain longer and are more challenging to change.[24] The effect of traditional habits in choosing foods has seen in other cultures, such as India,[16] Costa Rica,[15] Puerto Rico,[17] and China.[18] Also, the findings are consistent with other studies on healthy Iranian diets.[13,14]

As participants noted, enhancing the sensory attributes of cooked brown rice with proper herbs and spices in traditional recipes is one effective way of encouraging people to accept it. This is in line with the Costa Rican study, where participants suggested that cooking brown rice in traditional recipes would inspire people to eat it. Consistent with these comments, the taste test results indicated that participants preferred a mix of brown rice with lentils ("*Adaspolo*"), rather than plain cooked brown rice.

In line with other studies, convenience and time constraints were important factors in purchasing and preparing food. However, these factors were eclipsed by other main factors. For instance, in spite of voluminous whole barley bread being widely available in urban areas, people there rarely bought it. As they commented, they did not like its sensory properties as well as it not being consistent with their traditional food patterns. Also, in terms of brown rice, accessibility was only considered as an indirect or marginal factor for dietary inclusion.

Family members' acceptance was another key factor that directly affected the choice of grains when buying. Similar findings had previously been noted as a great concern, both in Iran[13,14] and other countries.[15,16] Participants of both genders emphasized that women were the main decision-makers and were responsible for purchasing or preparing foods. They also stated that maintaining family relationships was crucial, and prepared meals based on their preferences. Even when women understood the benefits of healthy food, the husbands' and children's interests were more important. Other studies in Iran[13] and other developing countries[15,25] have shown similar attitudes among women. In line with this result, previous studies have indicated that presenting new foods might encounter family resistance and conflict.[24,26]

To address this issue, participants suggested including healthy foods such as brown rice or more legumes in lunch menus in school and office dining canteens. The same strategy was proposed by Indians, Tanzanians, and Costa Ricans. All believed that if whole grains were served as part of school lunch, children would get used to them. The literature also supports the impact of friends and peers on eating behaviors.[27-29]

Additionally, participants brought up the impact of reputable people's advocacy, such as movie stars and athletes, similar to an Indian study.[16] In other words, advertising could directly affect people's choice of food,[30,31] and might pave the way for educating healthy eating habits.

Introducing health foods and teaching their use is insufficient if people cannot access and/or afford them. Participants suggested that strong governmental support would bring efficient changes by supporting farmers and bakers who provide whole flatbreads, and subsidizing whole-bread, brown rice and legumes.

The strengths of the present study were using a focused group discussion for surveying people's attitudes, preferences and behaviors, and sensory tests at the same time. Simultaneous reporting on women and men, as well as on different cultural backgrounds, gives the study a good comparison in terms of

barriers and views. Another strength of the current study was lack of specific services and equipment, and the ability of skilled experts to carry out a qualitative study as an observer, which made it a cost-effective study. One limitation was the lack of adolescent groups, who are effective in shaping family food patterns.

Conclusions

The results of this study indicated participants' perspectives, barriers, and strategies for introducing wholegrains and increasing legumes consumption in replacing refined grains. The findings show that Iranian preferences in choosing foods are based on cultural believes, traditional food patterns, and the food's sensory features. Key barriers included a lack of adaptability towards brown rice and industrial voluminous whole bread, and difficult access to wholegrains and legumes. Higher acceptance tendencies were seen toward traditional whole-wheat bread instead of refined grains, as this was consistent with preference and priority. However, low availability was the largest substitution problem.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflict of interest

The authors declare no conflicts of interest.

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