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ORIGINAL ARTICLE

Food perceptions in terms of health among Norwegian-Pakistani women participating in a culturally adapted intervention

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Abstract
Objective To explore food perceptions in terms of health among Pakistani immigrant women, and if such perceptions could be altered through a culturally adapted intervention.
Methods The study is a culturally adapted lifestyle intervention aiming at reducing diabetes risk among Pakistani women, Oslo, Norway. There were 198 participants (25–62 years) recruited through a multi-recruitment strategy and randomly assigned into intervention and control groups. Data were collected through interviews with the help of a structured questionnaire with open-ended questions.
Results Baseline data showed that many women emphasised vegetables (87%) and fish (52%) as important in a healthy diet, and perceived that the consumption of sugar (66%), oil (60%) and hard fat (39%) should be limited. After intervention, there was an increased proportion of women in the intervention group who perceived that consumption of sugar ($p = 0.021$) and white flour ($p = 0.010$) should be limited, in line with the emphasis of the intervention.
Conclusions Food perceptions in terms of health were generally in line with public dietary advice, however, with large variation among the women. A culturally adapted intervention had the potential to alter such perceptions.

Keywords South Asian · Immigrant · Food perceptions · Intervention · Culturally adapted

Introduction

Lifestyle, including diet, plays a major role in the prevention of diabetes type 2 (T2D) (Tuomilehto et al. 2001; Knowler et al. 2002), as well as of other chronic diseases, such as coronary heart disease and some cancers (WHO/FAO 2003). Food choice is a complex process, affected by life course experiences, and influenced by personal factors, resources and social context (Furst et al. 1996). Thus, an interdisciplinary approach, including physiology, psychology, sociology and economics, as well as other disciplines, is necessary to capture a broad picture of the process. Food choice involves conscious and unconscious negotiations, taking into account sensory perceptions, monetary considerations, health and nutrition beliefs and concerns, convenience, social relationships and food quality decisions (Furst et al. 1996; Köster 2009). One important aspect of this process is the perceptions people have of foods. Knowledge about people's perceptions of food in terms of health is essential in order to understand how current nutritional advice is interpreted, and to develop meaningful health messages for the future (Paquette 2005). Knowledge about people's sources of information about healthy eating gives the opportunity to channel desired health messages through the most relevant media, and to make the use of media more efficient.

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Perceptions of foods in terms of health are fairly consistent across Western populations, with vegetables and fruit more or less universally mentioned as important in a healthy diet (Paquette 2005). However, regional differences in emphasis exist, due to variations in consumption patterns and nutrition education (Martinez-Gonzalez et al. 2000). Healthy eating is a dynamic concept, which may change over time. Immigrants' food perceptions are likely to be influenced by both traditions from home country and host culture. However, investigations of food perceptions in terms of health among South Asian immigrants in Western countries are scarce. In a qualitative study among Bangladeshi diabetics in the UK, traditional food classifications such as strong/weak and digestible/indigestible were commonly referred to (Chowdhury et al. 2000). A traditional account of a hot/cold classification of foods has also been reported among Pakistanis in Norway (Mellin-Olsen and Wandel 2005). Furthermore, Lawton et al. (2008) reported that British Pakistanis tended to view their traditional diet as unhealthy.

Pakistanis constitute one of the largest non-Western immigrant groups in Norway, and they are among those with highest risk of developing T2D (Kumar et al. 2006; Jenum et al. 2005). A culturally adapted intervention study with the aim to reduce diabetes risk by influencing established risk factors, such as diet and physical activity, has been carried out among women in this immigrant group in Oslo, Norway. The main dietary advice of the intervention was to reduce the intake of sugar and other refined carbohydrates, due to its effect on blood glucose, and exchange them with more fibre-rich carbohydrates, which have been shown to prevent diabetes (Bantle et al. 2008). Furthermore, reducing intake of sugar-rich drinks is important in the prevention of obesity, which is a risk factor for T2D and other chronic diseases (WHO/FAO 2003). The primary outcomes of the study were changes in fasting and 2-h plasma glucose. Among the secondary outcomes were food perceptions in terms of health, which are reported in the present article. Further, sources from which the women have got their information about healthy eating, and how these different sources are related to food perceptions in terms of health, are explored.

Methods

Design and sample

The intervention study was carried out in 2006–2008 in a suburban area of Oslo (Søndre Nordstrand), containing the highest proportion of Pakistani immigrants/children of immigrants (12%) in the city. Based on experience from working with South Asian populations it has been recommended to use a multi-recruitment approach, and additionally, to follow certain strategies for recruitment of South Asians: define the demographic and social profiles of the population to be included, consult representative community members to provide assistance in the study, and set eligibility criteria as wide as possible (Hussain-Gambles et al. 2004). These strategies were followed in the present study, and the multi-recruitment strategy included visits to mosques and other formal and informal gatherings in the local community, as well as word of mouth. Interested women were contacted by phone and given a verbal invitation to participate in the project and to come to an appointment at the local mother and baby health care centre where the intervention took place. Since many women in this group have a low level of literacy, oral communication secures more comprehensive information to potential participants and reaches a larger part of the population. An Urdu-speaking research assistant was in charge of the recruitment.

The inclusion criteria were: women living in Norway and born in Pakistan or born in Norway by two Pakistani parents, 25 years or older. Of the 245 women invited to the study, 47 were not included according to the following criteria: a history of T2D, close relative already in the project, pregnancy, heart disease, not fitting the inclusion criteria, lack of interest ($n = 9$) or other reasons ($n = 11$). In total, 198 women were included in the study and randomized to either intervention ($n = 101$) or control ($n = 97$) using a computerized block randomization list, set up by the trial statistician. A central telephone randomization system was used. The research assistant called the randomization telephone at an independent Research Unit to get information on which group the participant belonged to. The Research Unit stored information on ID number. This information was obtained and communicated to the participant after finishing the baseline measurements. The sample size was calculated on the basis of a presumed 10% reduction in 2 h plasma glucose, a significance level of 5%, and a power of 80%, with a calculated dropout on 15%. This resulted in an estimated need of 82 women in each group.

The intervention group was divided into nine subgroups of 10–12 women. Each subgroup had six group sessions, lasting 2 h each, during the 7 ± 1 month of the intervention. The group sessions were focused on the importance of diet and physical activity for blood glucose regulation. They aimed at helping the women to incorporate the knowledge acquired into their everyday lives, and to help the women obtaining positive expectancies for lifestyle changes. Culturally adapted materials were used and discussions were encouraged. All the teaching was translated into Punjabi, the preferred language of the participants. The participants were encouraged to reduce sugar and other

refined carbohydrates, and change to more fibre-rich carbohydrates, to eat more vegetables, beans and lentils in line with their traditional diet, and to eat more fatty fish. Fruits were recommended in small amounts. Carbohydrates were the main focus of the teaching. Less attention was given to protein and fat. However, the participants were encouraged to change the type of fat from butter/margarine/vegetable oil to olive- and rapeseed oil, and asked to measure the amount of oil used in cooking. In addition, they were given short individual feedback on diet and physical activity, based on their blood tests, after the first group session.

Variables

Data were collected and anthropometric measurements were taken at the local mother and child health clinic both before (baseline) and after (follow-up) the intervention. Interviews carried out by Urdu and/or Punjabi speaking interviewers with the help of a structured questionnaire with open-ended questions were used to collect data on food perceptions in terms of health. The questionnaire was developed based on previously conducted studies in this population (Kumar et al. 2006; Mellin-Olsen and Wandel 2005). Food perceptions in terms of health were assessed through the questions: 'If you decide to eat food which is good for your body (healthy), what do you emphasise?' and 'What do you think you should eat in limited amounts (unhealthy)?' The interviewer wrote down the answers. To ease the work, some expected answers were already written in the questionnaire (not read out loud), and the interviewer could tick one or more of those if the participant's answer fitted. The same procedure was followed for the question to assess the women's sources of information: 'From whom have you learned what is good to eat, what is healthy?' For logistic regressions, having mentioned one food item/source was coded as 1 and not having mentioned it as 0. The women were also asked when/on which occasions they were eating unhealthily. Items mentioned by >5% of the participants are reported here.

A pre-coded questionnaire was used to collect socio-demographic data: age, years lived in Norway, years of education (both from Pakistan and Norway), number of children born and self-reported command of Norwegian language. Command of Norwegian language was recoded from five response categories ('very good', 'good', 'average', 'quite poor' and 'poor') to 'good' (average–very good) and 'poor' (quite poor–poor). BMI was calculated from measured height and weight (kg/m^2), overweight defined as BMI $\geq$ 25 and obesity as BMI $\geq$ 30. The cut off of BMI $\geq$ 27.5, indicating high risk of T2D and cardiovascular disease for South Asians (Deurenberg-Yap et al. 2000) was also reported. A standardized oral glucose tolerance test (OGTT) was performed, i.e. 75 g glucose in 200 ml water was ingested and plasma glucose was determined at time zero (after 12-h fasting) and after 2 h. T2D was defined as by WHO (2006) plasma glucose $\geq$7.0 mmol/l fasting and/or $\geq$11.1 mmol/l after OGTT.

Analyses

The data were analysed using SPSS version 14.02. For the food perceptions, unhealthy eating situations and sources of information, proportions of women mentioning each item at baseline were reported. χ^2 tests were used to explore differences between groups at baseline and at follow-up, as well as differences in change from baseline to follow-up. McNemar tests were used to explore differences in change from baseline to follow-up within each group. Logistic regressions were carried out to explore associations between socio-demographic factors (age, years in Norway, years of education and command of Norwegian language) and food perceptions and changes in these perceptions. Logistic regressions were also carried out to explore relationships between sources of information and food perceptions in terms of health at baseline. These regression analyses were carried out as bivariate analyses with food items reported to be emphasised in a healthy diet or regarded as to be eaten in limited amounts as dependent variables (reference: those who did not mention the food item in question) and having mentioned an information source as independent variable (reference: those who did not mention the information source). Significance level was set to $p < 0.05$.

Ethics

The study is conducted in full accordance with the ethical principles as per the World Medical Association Declaration of Helsinki. All the participants gave a written informed consent. The Norwegian Data Inspectorate approved the study and it has been cleared by the Regional Committee for Medical Research Ethics.

Results

Characterization of the sample

The women were from 25 to 62 years old (average 41–42 years), and had been living in Norway from 0 to 35 years (average 18–19 years) (Table 1). Half of the women rated their command of Norwegian as (quite) poor and mean number of years of education was 9 (range 0–19 years). They had given birth to an average of 3.6 (intervention) and 3.3 (control) children each. The average BMI in the group was close to 30, and more than half had a

Table 1 Description of 198 Norwegian-Pakistani women participating in a culturally adapted intervention in Oslo, 2006–2008 (baseline data)

	Intervention ($n = 101$)	Control ($n = 97$)
Age, mean (SD)	41 (8.0)	42 (8.2)
Years in Norway, mean (SD)	18 (7.9)	19 (7.6)
Command of Norwegian		
(Quite) poor (%)	48.5	41.7
(Very) good (%)	51.5	58.3
Education (years) mean (SD)	9 (4.7)	9 (4.3)
Number of children born, mean (SD)	3.6 (0.2)	3.3 (0.2)
BMI, mean (SD)	29.4 (5.6)	29.8 (5.5)
Overweight (BMI $\geq$ 25) (%)	76.2	83.5
Obesity (BMI $\geq$ 30) (%)	38.6	40.2
High-risk South Asians (BMI $\geq$ 27.5) (%)[a]	59.4	62.9
T2D (%)	13.9	12.4

Difference between groups is non-significant for all variables

[a] Indicating high risk for T2D and cardiovascular disease for South Asians (Deurenberg-Yap et al. 2000)

BMI $\geq$ 27.5. None of the participants had known diabetes before the intervention. However, T2D was detected at baseline in 13.9 and 12.4% of the intervention and control group, respectively.

Food perceptions in terms of health

The women's baseline responses to the question 'If you decide to eat food which is good for your body (healthy), what do you emphasise?' are shown in Fig. 1. Vegetables were emphasised as part of healthy eating by most women, and fish was mentioned by half of the women. Salad/raw vegetables and chicken were emphasised by about one out of five women, followed by meat, oil/fat, legumes, fruit and various carbohydrate rich foods (including bread and rice). Most of those mentioning salad/raw vegetables, also mentioned vegetables. Eighty-nine percent of all women emphasised vegetables and/or salad as part of healthy eating. Six (3.2%) women did not know any food that was good for the body.

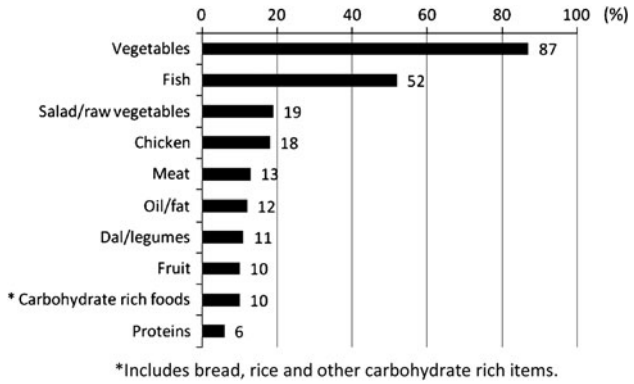

Fig. 1 Foods and nutrients emphasised as 'good for the body'/healthy at baseline (intervention and control group). The women were asked to mention as many foods as they could think of. No significant differences between the groups. Data from a culturally adapted intervention among Norwegian-Pakistani women in Oslo, 2006–2008

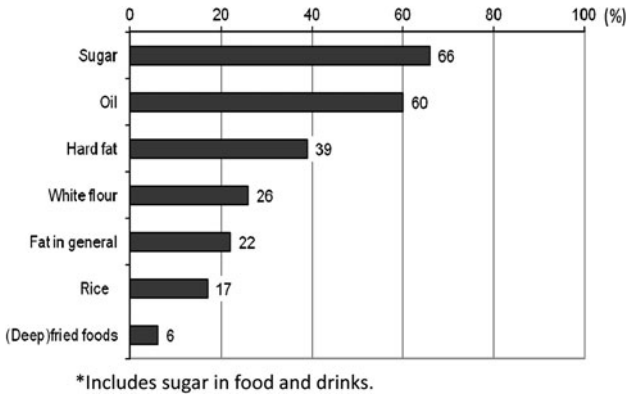

Fig. 2 Foods that the Pakistani women perceived should be eaten in limited amounts/unhealthy at baseline (intervention and control group). The women were asked to mention as many foods as they could think of. No significant differences between the groups. Data from a culturally adapted intervention among Norwegian-Pakistani women in Oslo, 2006–2008

Figure 2 shows the women's baseline responses to the question of what foods they perceived that they should eat in limited amounts. 'Sugar' was mentioned by about two-thirds, followed by 'oil', 'hard fat' 'white flour', 'fat in general', and 'white rice'. Altogether 83% of the women mentioned one or more types of fat as something they should eat in limited amounts. Four women (2.1%) did not know any foods to limit. The women were then asked about when/on what occasions they chose foods for which they meant that consumption should be limited. Such food items were commonly eaten when having visits/visiting others (72%) and in parties (52%). Weekend was mentioned by 10% of the women, and Eid (Muslim celebration) and other feasts by 5%. Some (6%) said that occasions of eating such foods were when they were following the wishes of their children.

The food perceptions in Figs. 1 and 2 were not significantly related to age, number of years in Norway, years of education or command of Norwegian language, with one exception; the likelihood of mentioning oil as something they should limit, increased with years of education (OR 1.07, $p = 0.049$).

Sources of information

The women had various sources of information about foods to include in healthy eating. Figure 3 shows these sources from the baseline data. Half of the women had their

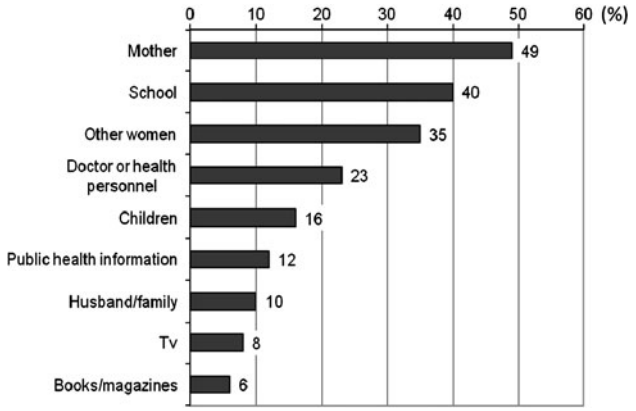

Fig. 3 Proportion of women mentioning different information sources about healthy eating at baseline (intervention and control group). Data from a culturally adapted intervention among Norwegian-Pakistani women in Oslo, 2006–2008

'mother' as a source of information, and 'school' was the second most frequently mentioned source. 'Other women' and 'doctor/other health personnel' were common sources, and some also acquired knowledge from 'children', 'other family members' and 'public health information', as well as 'television' and 'books/magazines'.

Sources of information in relation to food perceptions

Food perceptions in terms of health were related to sources of information. Logistic regressions were used to explore these relationships (Table 2). The women who had their mother as source of information were more likely than others to emphasise meat and less likely to emphasise chicken in healthy eating, whereas those receiving information from husband or other family members were more likely to mention chicken as good for the body. Getting information from other women reduced the odds for mentioning fat in general as something to eat in limited amounts, whereas having doctor/other health personnel as information source, gave higher odds for mentioning white rice as something to limit. Information through school increased the odds of mentioning salad as part of healthy eating, and to limit sugar in food and drinks. Those who acquired knowledge from public health information were more likely to perceive (deep) fried foods as something to limit and getting information from TV increased the odds of mentioning hard fat as something to eat in limited amounts.

Changes in the perceptions and knowledge

There were no differences between the intervention and control group in food perceptions in terms of health at baseline. However, there were significant changes in food

Table 2 The odds ratio (OR) for emphasising food items as 'good for the body' or 'something that should be eaten in limited amounts' when having different sources of information

	Emphasis			Limitation				
	Salad	Chicken	Meat	Sugar	White rice	Hard fat	Fat in general	(Deep) fried foods
Mother		0.36 (0.16 0.80)*	6.39 (2.10 19.43)**					
Other women							0.43 (0.19 0.97)*	
School	2.47 (1.18 5.18)*			2.80 (1.46 5.38)**				
Doctor/health personnel					4.33 (1.37 13.64)*			
Public health information								4.90 (1.31 18.30)*
Husband, family		3.21 (1.16 8.91)*						
TV						3.50 (1.15 10.69)*		

Results are from logistic regressions of intervention and control group at baseline. The values are expressed as OR (95% CI). Only food items with significant relationships to sources of information mentioned. Data from a culturally adapted intervention among Norwegian-Pakistani women in Oslo, 2006–2008

CI confidence interval

* p value < 0.05; ** p value < 0.01 for comparison with not mentioning food item

Table 3 Proportions at baseline and follow-up emphasising food items as 'good for the body' or 'something that should be eaten in limited amounts'

	Baseline (%)		Follow-up (%)		Change within intervention group[a] *p* value	Difference at follow-up[b] *p* value
	Intervention	Control	Intervention	Control		
Emphasis						
Salad/raw vegetables	20.0	18.3	36.3	17.3		0.014
Meat	16.7	9.7	7.5	8.2	0.039	
Limitation						
Sugar	65.3	67.0	83.8	80.8	0.021	
White flour	27.6	24.5	50.0	27.4	0.010	0.007
White rice[c]	21.4	12.8	32.5	17.8		

Only items with a significant change or difference at follow-up are shown. There were no significant changes from baseline to follow-up in the control group. Data are from a culturally adapted intervention among Norwegian-Pakistani women in Oslo, 2006–2008

[a] McNemar test for change from baseline to follow-up within intervention group

[b] χ^2 statistics for difference between intervention and control groups at follow-up

[c] χ^2 statistics for difference in change from baseline to follow-up between the groups, $p = 0.030$

perceptions from baseline to follow-up in the intervention group (Table 3). The proportions of women mentioning that sugar and white flour should be eaten in limited amounts increased and the proportion mentioning meat as part of healthy eating decreased after the intervention. The increase in proportion of women mentioning white rice as something to be eaten in limited amounts was larger in the intervention than in the control group. The differences between the groups at follow-up were significant for salad/raw vegetables and white flour. There were no significant changes from baseline to follow-up or significant differences between the groups at follow-up for the other food perceptions reported in Figs. 1 and 2.

Changes in food perceptions in terms of health in the intervention group were not significantly related to age, number of years in Norway, years of education or command of Norwegian language, with the exception that those with higher education were more likely to have changed the perception of legumes as good for the body (OR 1.13, $p = 0.010$).

Discussion

The baseline data showed that the majority of the women emphasised vegetables, and also fish, when choosing foods that they considered to be good for the body, and they listed sugar, oil and hard fat as something to be eaten in limited amounts. From baseline to follow-up, there was an increase in proportion of women who emphasised salad/raw vegetables in healthy eating and meant that consumption of refined carbohydrates should be limited, in line with the emphasis of the intervention.

The Pakistani population is difficult to reach with more conventional recruiting strategies, possibly due to low literacy, poor skills in host language and health beliefs and behaviours different from the host population (Hussain-Gambles et al. 2006). Thus, a multi-recruitment strategy was carried out, and the representativeness of the sample can therefore be questioned. However, the women in the present study were comparable to Pakistani women in a large population-based health study in Oslo (Kumar et al. 2006), with regard to prevalence of BMI above 25 (80%), years of education, years in Norway, and number of children.

Food perceptions at baseline

In Punjabi, there are no words for 'healthy' or 'unhealthy'. The Punjabi translation of the questions about food perceptions in terms of health was therefore: 'If you decide to eat food which is good for your body (healthy), what do you emphasise?' and 'What do you think you should eat in limited amounts (unhealthy)?' Even if the words 'healthy' and 'unhealthy' do not exist in the language of the participants, they did have concepts of what food items are good for the body and what is not. Thus, the concept was not new to them. The questions were open, in order not to limit the range of responses. Thus, responses could be overlapping. The distinction many women made between vegetables and salad probably reflects the position of these foods in a Pakistani meal. Vegetables are commonly cooked or fried in mixed dishes. Raw vegetables are served as salad, which is a side dish. The results suggest that salad is considered less important in a healthy diet than other vegetables, or regarded less relevant because it is eaten

more seldom. However, the high proportion of women perceiving vegetables as healthy is consistent with what is found in the Norwegian and other Western populations (Paquette 2005; Wandel and Fagerli 1999). In a Norwegian study (Wandel and Fagerli 1999), fish, fruit and potatoes were also viewed as important elements of a healthy diet. Fruit is not recommended in great amounts to people with diabetes. Since the prevalence of diabetes is high in the Pakistani community, many women may have heard that fruit consumption should be limited, and therefore not mentioned it as good for the body. Furthermore, the women were during the intervention recommended to limit the intake and to use fruit mostly as dessert.

There were large variations among the women in food perceptions in terms of health. However, socio-demographic differences were generally not significant. In a Norwegian study on perceptions of a healthy diet emphasis on foods rich in protein and fat decreased with education and younger age (Wandel and Fagerli 1999). The generally low level of education and narrow age range, are likely reasons for not finding similar associations among the Pakistani women. However, the influence of socioeconomic position and demographics on food perceptions in terms of health among Pakistani immigrants should be explored more thoroughly in future research.

In a qualitative study by Mellin-Olsen and Wandel (2005), Pakistani women told about three stages in changes of fat intake after migration. In the beginning they increased the use of butter and margarine, since these foods were culturally favourable and relatively cheap in Norway. Then, as a response to nutrition information received in Norway, they changed to oil. Finally, as the prevalence of overweight and obesity is high in this population, public health information to Pakistani immigrants emphasised reduction of the amount of oil for cooking, and some started to adapt to this advice. The fact that 83% of participants in the present study at baseline considered 'oil', 'hard fat' and/or 'fat in general' as something to eat in limited amounts, and even some more mentioned frying, indicates that these women have heard the public health information regarding fat.

Sources of information

Common sources of information about food and health were 'mother' (49%), 'school' (40%) and 'other women' (35%), as well as children and other family members. In a study among Norwegian women (Fagerli and Wandel 1999), 'mother' and 'other relatives and friends' were mentioned as sources of information by about 10%. Thus, having family and friends/acquaintances as important sources of information seems to be far more widespread among Pakistani than among Norwegian women. Furthermore, 'literature on diet' and 'TV' was the most common sources of information about food and health among Norwegian women. The low percentage of Pakistani women seeking information about healthy eating from these sources may be due to less use of these media, low level of literacy, poor Norwegian skills or that relevant literature or programs are not accessible in the mother tongue. However, the distinct use of sources may rather reflect cultural differences in what kind of information is regarded informative and trustworthy. The importance of family, friends and also health personnel as sources of information about healthy eating among Pakistani women implies that peer education may have a large effect. Peer education has shown good effects among South Asians in the UK (Farooqi and Bhavsar 2001; Davies et al. 2009).

The sources of information were related to some of the food perceptions. Having mother as a source of information increased the likelihood of perceiving meat as healthy. This may be due to more traditional ways of thinking about food and health, where meat is considered nourishing and strength giving (Dawes 2006). The likelihood of mentioning white rice as something to limit increased when having doctor/health personnel as source of information. Previous qualitative research among Pakistani immigrants with T2D (Fagerli et al. 2005) have shown that many experience dietary advice they get from doctors as inadequate to their food–cultural background, and often leaves them thinking that their traditional diet, which includes frequent consumption of white rice, is not good for health. The present study emphasised positive aspects of a traditional Pakistani diet, such as high intakes of legumes and vegetables, and the message was not to stop eating rice, but to eat smaller amounts of polished rice and rather exchange this with unpolished rice. A modest increase in the proportion perceiving white rice as something to be limited in the intervention group is likely to reflect this. As about one-fourth of the women mentioned doctor/health personnel as a source of information, it could be beneficial if health personnel focused their advice on healthy eating which is a part of the traditional Pakistani diet.

Changes in perceptions following intervention

The main focus of the intervention was blood glucose regulation, and the benefit of reducing refined carbohydrates, and especially the role of soft drinks, was emphasised. The significant increase in proportion of the intervention group mentioning to limit the intake of sugar (including soft drinks) and white flour indicates success in communicating this message. The focus on vegetables as important in a healthy diet is reflected in the higher proportion of the intervention group emphasising salad/raw vegetables at follow-up. The lack of significant change in

perceptions of oil/fat may be due to the fact that most women already at baseline perceived that consumption of these items should be limited, and that it was not the main focus of the intervention. The reduction in proportion of women in the intervention group perceiving meat as good for the body is most likely due to the strong focus on vegetables, lentils and fish during the intervention, which is exchangeable with meat in some dishes.

The use of open-ended questions to capture food perceptions in terms of health made the likelihood of 'desirability bias' low. However, we cannot rule out that some, after the intervention, have answered according to the recommendations in the group sessions, without being convinced.

In addition to food perceptions, there are many interacting factors in the food choice process (Köster 2009; Furst et al. 1996). In the present study, changes in perceptions to a large degree corresponded to previously reported changes in food intake in the intervention group (Johansen et al. 2010), namely an increase in intake of vegetables and fruit, and a decrease in intake of sugar-rich drinks and meat. However, the answer to the questions on in what occasions they ate unhealthily, implies that other factors, and especially social obligations, were important in food choice. This confirms previous research in this group (Dawes 2006; Mellin-Olsen and Wandel 2005).

Conclusions and recommendations

The majority of the women in the study emphasised vegetables in a healthy diet and they listed oil, hard fat and sugar as something to be eaten in limited amounts. The food perceptions in terms of health were in general in line with public dietary advice, however, there was large variation among the women. This study indicates that a culturally adapted intervention has the potential to alter food perceptions in terms of health. Lessons learnt from the present study may be used in developing new and needed strategies to communicate health information in this group. Family members and other women were important sources of information about food that is good for the body. Use of community members and peer education could therefore be beneficial. By focusing on various advice such as increasing intake of vegetables and legumes to immigrants of Pakistani origin, public health personnel can contribute to raise the awareness of healthy dietary practices in this population. Focus on the social barriers to putting knowledge on healthy eating into practice has to be continued in future interventions.

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Conflict of interest The authors declare that they have no conflict of interest.

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