

## **Changes in food choices of recently diagnosed insulin-dependent diabetic patients**

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Current food use and habitual food use prior to the diagnosis of diabetes were measured using a food frequency questionnaire in a group of recently diagnosed insulin-dependent diabetic patients. Patients (51 m, 29 f) were between the ages of 20 and 40 years and had been diagnosed as insulin-dependent diabetics less than 6 months prior to the study. The results show that patients after the diagnosis of diabetes reduce their consumption of foods and beverages with high sugar content, of snacks and of foods from the dairy and meat group with high fat content, and incorporate foods with low fat content into their pattern of food consumption. Some of the changes have been less favourable from a nutritional perspective such as the increased consumption of diabetic speciality foods, the reduced consumption of pulses, and the lower overall food variety. In conclusion, patients are able to change their food use after the diagnosis of the insulin-dependent diabetes; however the extent to which patients will change their food choices on a long-term basis remains to be determined.

Over the last decade the dietary recommendations for diabetic patients have been subjected to changes. Current recommendations for insulin-dependent diabetics include consistency in timing of meals and in the amount of carbohydrates consumed with each meal. Furthermore diabetologists and national diabetic associations tend to recommend an increased carbohydrate intake of up to approximately 50 per cent of the total energy intake, preferably by inclusion of foods rich in carbohydrates, foods with high fibre content and low glycaemic index foods (Crapo, 1986; Mann, 1986; American Diabetes Association, 1987). They also advise to restrict fat intake, to replace saturated fats by unsaturated fats and to lower cholesterol intake in order to reduce

the onset of complications of diabetes. In the Netherlands patients have been advised to follow additional guidelines from the National Nutrition Council for a prudent diet which recommend eating a variety of foods, with lower salt intake and reduced alcohol consumption. For a long time sucrose was forbidden in the diabetic diet. Today it is recognized that there is no evidence that moderate amounts of sucrose (up to 50 g/d) produce deterioration of glycaemic control or blood lipid levels in insulin-dependent diabetic patients, provided that an isocaloric quantity of carbohydrate is removed from the calculated daily energy requirement.

Evidence from the literature shows compliance with the diabetic diet to be generally low (West, 1973; Glanz, 1985);

diet has been described as the most difficult aspect of the diabetic regimen (Jenny, 1984; Ary *et al.*, 1986; Glasgow, McCaul & Shafer, 1986; House, Pendleton & Parker, 1986; Jenny, 1986). Compliance with the guidelines often demands change in food choices. The extent to which diabetic patients will be able to change their food choices according to the dietary guidelines has been disputed. Studies on patients with coronary heart disease showed a change in nutrient intake on both a short- and more long-term basis (Reid *et al.*, 1984; Thuesen, Hendriksen & Engby, 1986; Reig & Mulcahy, 1987).

The purpose of the present study was a documentation of the differences in the use of individual foods before and after the diagnosis of insulin-dependent diabetes in a group of young adults, and an assessment of the concomitant nutritional implications resulting from these changes. In this type of study food use before the diagnosis of the disease can only be assessed retrospectively. The value of retrospective dietary data depends on the validity and reproducibility of dietary assessment methods; validation of retrospective data is rarely possible, reproducibility can be evaluated. Therefore, we decided to investigate the reproducibility of the retrospectively obtained dietary data.

## Subjects and methods

### Population

The two criteria for selecting respondents were: age ranging between 20 and 40 years, and a diagnosis of insulin-treated diabetes no longer than 6 months prior to the study. Individuals were recruited from the patient-members of the Dutch Diabetes Association (DDA). As the data base of the DDA did not contain any information regarding the type and duration of the diabetes, all new members aged between 20 and 40 years joining the DDA in the 3 months prior to the study were approached for willingness to participate. We received a response from 176 out of 187 patients approached (94 per cent). Eighty-four of those did not meet the selection criteria and were excluded from the study. From 92 persons meeting the

selection criteria 84 (91 per cent) were willing to participate.

### Food use

The aim of the study was an assessment of the changes in the use of foods, therefore the same dietary assessment method must be used to measure food use before and after the diagnosis of the diabetes. As the interest lay in the use of foods, a food frequency was used. A food frequency questionnaire consists of a list of foods and a set of frequency response options to indicate frequency of consumption of each food during a given time period. The food list represented a cross-section of foods commonly available in the Netherlands and foods known to be used by diabetic patients (Niewind *et al.*, 1988). It contained foods which the frequency of use by diabetic patients was expected to be changed after the diagnosis of diabetes. Therefore, low- and high-fat items were included as well as products with varying amounts of fibre.

The food list contained 177 foods subdivided into eight groups. The bread and cereal group as well as the dairy group both included 21 items. The meat and alternative group contained 27 items, and the fruit and vegetable group 43 items. Also on the list were 14 foods with high-sugar content and 15 beverages. Twenty-one snack and miscellaneous items were included. In addition, the use of 15 diabetic special foods was assessed. Furthermore, we asked respondents how often they used fried or grilled meats, fried or boiled fish and fried or boiled eggs. The use of each food was assessed by means of a 9-point food frequency scale. The points of the scale were: > 3 times a day, 2-3 times a day, once a day, 4-6 times a week, 2-3 times a week, once a week, 2-3 times a month, or a month and less than once a month.

Respondents were also asked which type of sweetener they used in their tea and coffee and the type of spread they used on breads: butter, margarine, low-fat margarine or margarine with high amount of poly-unsaturated fatty acids. Also which type of fat was used for frying: butter, margarine, low-fat margarine, margarine

with high amounts of poly-unsaturated fatty acids or oil. The use of these items was recorded by means of a dichotomous variable with answer categories yes/no.

#### Data collection

We contacted all 84 participants, explained the study to them and sent them a self-administered questionnaire to obtain demographic data. Interviewers, trained in standardized interview techniques, and instructed to avoid value judgments about respondents' food use, collected the demographic questionnaires which they checked for missing data while at the same time they collected information on food use at the participants' homes. According to Axelson & Csernus (1983) simultaneous recall of present and retrospective intake for each food has the advantage that although respondents may not be able to remember the exact frequency of use for each time period, the relative frequency for the two periods would indicate changes that did occur in the use of foods. Therefore, for each food subjects indicated the consumption of April 1987, that is after the diagnosis of the diabetes and subsequently their intake in the corresponding month of the previous year. This latter data had been chosen to avoid inaccurate data due to seasonal effects on food use. To improve respondent's recall of this period, we mentioned some major political and social issues which had occurred in the recall period of 1986.

#### Data analysis

The large sample approximation of the Wilcoxon matched pair test with corrections for tied differences was used to assess the differences in use between 1986 and 1987 for each individual food. For zero differences the midrank  $\{(p + 1)/2\}$  was assigned,  $p$  being the number of zero differences. Half the differences received a positive midrank, half a negative midrank. The distribution of the computed  $Z$ -values approaches the standard normal distribution (Marascuilo & McSweeney, 1977).

A chi-square test for homogeneity of proportions for correlated dichotomous variables, the McNemar test, was used to

analyse changes in the use of sweeteners in tea and coffee and for the type of spread used on breads and the type of fat used for frying (Marascuilo & McSweeney, 1977).

#### Reproducibility of retrospective dietary data

To test the reproducibility of retrospectively obtained dietary data, we contacted all respondents one year later (1988) and asked them to retrospectively report their food use of 1987. The 1988 retrospective report of 1987 and the baseline data of 1987 allowed examination of the reproducibility. Reproducibility was defined as agreement between baseline and retrospective report of 1987. The percentage exact agreement within one category between the 1988 retrospective reported food use frequency data of 1987 and the baseline data of 1987 was assessed for each food. Reproducibility was calculated using weighted Kappa statistic (Cohen, 1968). Systematic differences between baseline and retrospective data were assessed by means of the Wilcoxon matched pair test with corrections for tied and zero differences.

## Results

### Participants

From the respondents willing to participate four persons were excluded from the study. Of these three were pregnant and one person had a history of glucose intolerance. Therefore, 80 patients participated in the study, 51 males and 29 females. Their age in years was  $29.1 \pm 5.7$  (mean  $\pm$  s.d.). At the time of the interview the duration of the diabetes in years had been  $0.33 \pm 0.09$  (mean  $\pm$  s.d.). Twenty-three per cent of the participants had an elementary school education, 40 per cent had finished high school education and 35 per cent had university education. For two respondents no information regarding education was available. For 92 per cent of the respondents insulin-dependent diabetes was the only disease they were treated for.

### Food use

Figure 1 illustrates the changes in food use. For 64 foods (36 per cent) a significant decrease was found ( $P \leq 0.01$ ). For 27 foods (15 per cent) a significant increase in

Table 1. Differences in the use of 177 foods by 80 insulin-dependent diabetic patients pre and post the diagnosis of diabetes<sup>a</sup>

	Food group							Diabetic speciality foods
	High-sugar foods	Snacks, miscellaneous	Meats and alternates	Beverages	Bread and cereals	Dairy	Vegetables and fruits	
Foods used less frequently post diagnosis of diabetes	fruit pies yoghurt pies tarts cakes rolls small pastries <sup>b</sup> biscuits chocolates candy bars jams, jellies chocolate spread honey sweets	toast snacks, deep-fried soups sausage rolls potato salad pizza quiche soup, beans peanut butter potato chips nuts salted crackers mayonnaise dip sauces vegetable sauces	minced meat, regular beef, fat wieners saté bacon pork pork chops fish, canned fish, fried fish, fat bologna, salami	lemonade beer liqueurs wine, sweet juices	bread, white buns, white currant bread pancakes rice pasta	milk, whole chocolate milk desserts whipping cream ice cream	beans beans in tomato sauce potatoes, fried potatoes, matched with carrots french fries hotch-potch canned fruits bananas apple sauce	
Foods used more frequently post diagnosis of diabetes		vegetable snacks broth	beef, smoked cold cuts, lean beef, lean	mineral water	bread, whole wheat bread, brown crackers biscuits <sup>c</sup>	milk, low fat yoghurt, skim cottage cheese	salads apples oranges	ice cream desserts chocolate spread sweeteners jam lemonade soft drinks chocolate cakes biscuits sweets

<sup>a</sup> Only foods with Z-values at  $P \leq 0.01$  are reported.<sup>b</sup> Typical Dutch foods, such as almond-filled shortbread.<sup>c</sup> Typical Dutch foods, such as Evergreens and Liga.

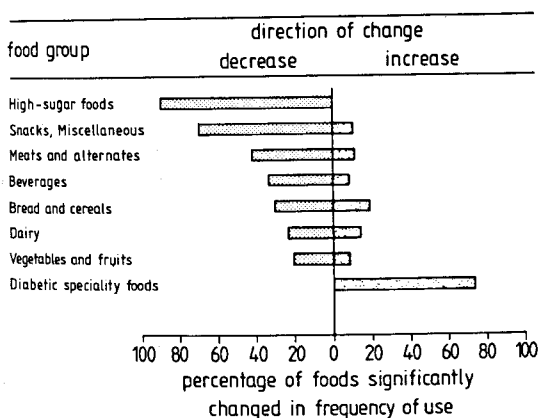


Fig. 1. Percentage of foods within eight food groups changed in frequency of use post diagnosis of insulin-dependent diabetes. Only foods with Z-values at  $P \leq 0.01$  are reported. ( $N = 80$ ).

frequency of consumption had occurred ( $P \leq 0.01$ ). Foods with statistically significant Z-values between the frequency before and after dietary treatment are shown in Table 1.

The use of nearly all foods high in sugar (93 per cent) showed a significant reduction in use after the diagnosis of the diabetes. Table 2 shows the percentage of the

Table 2. Percentage use<sup>a</sup> of foods high in sugar by 80 insulin-dependent diabetic patients pre and post diagnosis of diabetes.

High-sugar foods	% use	
	Pre diagnosis	Post diagnosis
Cakes	87	27
Biscuits	82	22
Sweets	77	17
Chocolates	75	17
Fruit pies	67	17
Tarts	67	19
Jams/jellies	66	24
Candy bars	66	10
Chocolate spread	65	12
Rolls	52	2
Honey	47	7
Yoghurt pies	27	10
Small pastries	24	6
Home-made jams, jellies	14	6

<sup>a</sup> More than once a month.

population consuming foods with high-sugar content before and after the diagnosis of diabetes. Foods showing the highest decrease in use are: cakes, biscuits, sweets, chocolates and candy bars. Seventy-one per cent of the snack and miscellaneous items saw a reduced use after the diagnosis of diabetes. Nearly all these foods have high-fat and/or high-salt contents. In the meat and alternates group the frequency of use of many foods with high-fat content diminished. The same was found for beverages with high-sugar and/or alcohol level. In the bread and cereal group a drop was found in frequency of use of products with a low fibre content. Patients also reduced the frequency of use of fat and/or sweet dairy products. From the fruit and vegetable group, pulses, fried potatoes, french fries and potato dishes were consumed less often as well as bananas, canned fruits and apple sauce.

The largest increase occurred in the use of diabetic speciality foods. None of these foods, except sugar-free chewing gum, were used more than once a month before the diagnosis of the diabetes. However for 73 per cent of the diabetic speciality foods a significant increase in frequency of use was found. Artificial sweeteners, diabetic lemonade, jams, chewing gum and sweets were used daily by 39, 38, 21, 16 and 15 per cent of the population respectively. For the meat, dairy and snack groups an increased use of foods with low-fat and low-sugar content was found. Within the bread and cereal group the use of whole wheat and brown bread was increased as well as the use of crackers and Dutch biscuits. As for vegetables and fruits we found an increase in the use of salads, apples and oranges. Finally the use of mineral water was increased.

For 49 per cent of the foods no significant change in use occurred. For some foods this was owing to the fact that some patients had increased the use of these foods after the diagnosis of the diabetes, while others had decreased it. The foods listed in Table 3 had changed for one category of the food frequency scale minimally by at least 35 per cent of the population. Half of these foods were foods with high-fat content from the dairy and meat group, while gingercake,

**Table 3.** Percentage increased and decreased use of foods post diagnosis of insulin-dependent diabetes by 80 patients<sup>a</sup>.

Foods	Increased use post diagnosis of diabetes	Decreased use post diagnosis of diabetes
	%	
Cheese/meat snacks	24	22
Eggs	15	28
Rusk	29	14
Ginger cake	11	30
Tea	26	13
Ham	23	16
Biscuits, whole wheat	28	10
Cheese, fat	22	14
Spirits	10	26
Yoghurt, fat	14	21

<sup>a</sup> Changing the frequency of use for one category of the food frequency scale minimally.

whole wheat biscuits, rusk, tea and spirits were also in this category.

#### Food preparation

With regard to food preparation no change was observed in the frequency of use of fried and grilled meats or fried and grilled fish. Patients decreased the use of fried eggs ( $P \leq 0.01$ ) while the use of boiled eggs did not change.

A significant increase in the use of artificial sweeteners in both coffee ( $P \leq 0.01$ ) and tea ( $P \leq 0.01$ ) was observed. Consequently the frequency of use of sugar in these beverages was significantly decreased (both  $P \leq 0.01$ ).

For the type of spreads used on bread a significant increase in the use of margarine with poly-unsaturated fatty acids ( $P \leq 0.01$ )

was observed with a simultaneous decrease in the use of margarine and butter (both  $P \leq 0.01$ ). The type of fats used for frying food changed in the same way: margarine was used less ( $P \leq 0.01$ ) while margarines with poly-unsaturated fatty acids were used more frequently ( $P \leq 0.01$ ).

#### Reproducibility

Results of the reproducibility study are presented in Table 4. For every food group except for snacks and diabetic speciality foods, more than 50 per cent of the food had a percentage exact agreement within one category higher than 81 per cent. According to the classification of Landis & Koch (1977) for Kappa statistic the reproducibility was fair to very good for 72 per cent of the foods. For 13 foods (7 per cent) significant

**Table 4.** Percentage exact agreement within one category for 177 foods between the 1988 retrospectively reported food use frequency data of 1987 and the baseline data of 1987.

Food group	N	Percentage exact agreement					
		< 50	51-60	61-70	71-80	81-90	91-100
		% of foods					
Bread and cereals	21	-	5	10	33	38	14
Dairy	21	-	-	14	29	29	29
Meats and alternates	27	-	-	22	15	30	33
Vegetables and Fruits	43	-	5	14	14	37	30
High-sugar foods	14	-	-	-	7	43	50
Beverages	15	-	7	7	7	27	53
Snacks, miscellaneous	21	-	5	19	29	29	19
Diabetic speciality foods	15	-	-	31	31	38	-
Total		-	3	15	20	34	29

differences between baseline and retrospective data were found ( $P \leq 0.01$ ). For all 13 foods the retrospective data were lower than the baseline data.

## Discussion

In this study we investigated the food choices of recently diagnosed insulin-dependent diabetic patients. To these patients, all between 20 and 40 years of age, the development of a chronic life-threatening illness is a major disruptive experience. As the diet is a means to control to a certain extent the long-term and short-term complications of this disease, patients recently confronted with this disease, change their food choices. For 51 per cent of the foods included in the food frequency food list, we found a significant change in the frequency of use.

The changes in the food use of these patients have both positive and negative nutritional implications. A decrease in the use of foods high in saturated fats and replacement of high-fat dairy and meat products by low-fat items is in accordance with the latest dietary guidelines. This also goes for the increased use of margarines with poly-unsaturated fatty acids (Crapo, 1986; Mann, 1986; American Diabetes Association, 1987). A change less favourable from a nutritional point of view is the high consumption of diabetic speciality foods, which might contradict the decreased use of foods with high fat content as some of these foods contain rather large amounts of fat.

The observed reduction in the consumption of foods rich in carbohydrates such as pulses and pasta is in contradiction to the official recommendations which advise patients to increase their intake of foods rich in carbohydrates and foods with a low glycaemic index. This phenomenon may be explained as follows. The amount of carbohydrates allowed in a meal is prescribed in the diabetic diet. Exchange of foods is possible and based on the chemically determined amount of carbohydrates present in a food rather than on its glycaemic index. In the case of

legumes and pasta, however, the portions allowed at each meal are very small. As a consequence patients tend to omit these foods from their diets.

Another negative development is that the number of foods that are decreased in use surpass the number of foods that are increased in use. Firstly, this will result in a lower food variety. All current dietary guidelines emphasize that eating a variety of foods is the key to optimal nutrition, although the optimal dietary variety in food use has not yet been defined. Also humans have a need for a variety in food use while palatability declines with food patterns low in overall food variety (Siegel & Pilgrim, 1985; Kamen & Peryam, 1961). Secondly, this suggests that a reduction in energy intake may have occurred. As we used a food use frequency method it is impossible to calculate the exact energy intake before and after diagnosis of the diabetes. Interestingly, many patients mentioned during the interview that after the diagnosis of the diabetes they eat less than before, some even indicated that they had lost weight, although they had normal body weight.

The reduction in use of nearly all foods rich in sugar is not necessarily beneficial to the nutritional status of the insulin-dependent diabetic patient. This reduction is not necessary according to current scientific insights which allow modest amounts of sucrose in the diabetic diet (Crapo, 1986; Mann, 1986, 1987; American Diabetes Association, 1987). The reduction in high-sugar foods leads to the use of diabetic speciality foods and may decrease the palatability of the food pattern to the diabetic patient. These implications of the reduced consumption of foods high in sugar are not favourable.

It is remarkable that, although the consumption of many foods changed, no change was reported in the preparation of meat and fish. Changing from frying meat to grilling could imply a considerable reduction in fat intake. Although the use of margarine with poly-unsaturated fatty acids for frying has increased, no change was observed for the use of oil for frying. This suggests that patients are more likely to change the type

of food they eat instead of the way of preparing these foods.

The observation that some patients have increased the frequency of use of some foods while others decreased it, suggests that patients have different ideas about the characteristics of these foods. Cheese/meat snacks, eggs, ham, cheese (fat) and yoghurt (fat) all have both positive and negative health characteristics for diabetic patients. These foods contain saturated fats, which is a reason for the lower frequency of use. However patients may increase the use of these foods because they contain small or negligible amounts of carbohydrates. Whole wheat biscuits and rusk are foods some patients may use as a carbohydrate snack. However they also contain monosaccharides resulting in rejection by others. Patients' perceptions of the health characteristics of this category of foods warrants further attention.

In this study a food frequency questionnaire was used to assess both current and retrospective food use. Although the reproducibility was generally fair to very good, studies show that retrospective data are influenced by current measures (Beyers *et al.*, 1983; Rohan & Potter, 1984; Møller Jensen *et al.*, 1984; McKeown-Eyssen, Sing Yeung & Bright-See, 1986; Thompson *et al.*, 1987; Van Staveren *et al.*, 1986; Bakkum *et al.*, 1988). This finding applies to situations in which the changes in food use are relatively minor. Assessing the current and the retrospective data at the same time, implies that only the changes respondents are aware of will be reported, leading to an overestimation of the stability of the dietary pattern. However for the recall period in this study, 1986–1987, a different situation applies as during that period patients consciously changed their diets. McKeown-Eyssen *et al.* (1986) have shown that respondents who did change their food use for health reasons have a better recall of their retrospective food use than those who did not. It is impossible to assess to what extent the changes in food use are a result of

inaccurately reported 1986 data. However it is likely that the retrospective report of 1986 is at least as good as that of 1987 although an underestimation of the change in food use during 1986–1987 may have occurred.

Changes in food use might have been overestimated as respondents have given information about food use after the diagnosis of the diabetes more on the basis of the prescription given to them than on actual dietary intake. We tried to minimize this problem by interviewing the patients about their food use rather than using a self-administered food frequency questionnaire. We also instructed interviewers to avoid value judgments at all times. In addition, we used an extensive and specific food list. While patients give information about food use more on the basis of the prescription than on actual dietary intake, it is unlikely that they recall this information 1 year later. The reproducibility of the 1987 data was to very good for 72 per cent of the foods; this implies that it is unlikely that patients have recalled their dietary advice.

The overall conclusion of this study is that recently diagnosed insulin-dependent diabetic patients do make dietary changes. Some of these are consistent with dietary guidelines for diabetic patients while others are less favourable from a nutritional perspective. The extent to which patients will change their food use on a long term basis and whether they will be able to maintain the lower use of foods high in fat will be the subject of a follow-up study in the same population.

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