Evaluation of a diabetes knowledge and behaviour (DKB) questionnaire

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The primary prevention of type 2 (non-insulin-dependent) diabetes is now considered possible through adopting lifestyle changes. Population strategies for preventing diabetes are now being developed. The South Auckland Diabetes Project has developed a questionnaire to assess the impact of a diabetes awareness, exercise/healthy eating programme in the local communities. The questionnaire was evaluated among local adult Europeans (n=127), Maori (n=60) and Pacific Islands people (n=167). The questionnaire is interviewer-directed and takes approximately 30 min to administer. Diabetes knowledge was assessed using four open questions and 31 closed true/false questions which had good reliability (Cronbach's α = 0.59–0.90), reproducibility (Pearson's r range: 0.39–0.74) and external validity (r range: 0.28–0.56) among all ethnic groups. Median scores increased by 7–13% on re-testing. The open and closed question scores were 7–13% and 10–26% higher respectively among those with diabetes or a family history of diabetes (n = 78).

Important dietary habits were assessed using four tools: (1) a seven-item food preparation/portion control ‘fat index’, (2) a four-item high-fa/high-refined carbohydrate score had good reliability (Cronbach's α = 0.31–0.74), reproducibility (r = 0.37–0.70) and external validity when compared with a dietary assessment (total fat r = 0.44–0.90); (3) a 12-item food frequency questionnaire based on standard portion sizes also showed good reproducibility (Pearson’s r = 0.43–0.52) and correlated well with the dietary assessment of total calories (r = 0.48–0.64) and of calories due to fat (r = 0.41–0.65); and (4) a simple question related to the frequency of fruit consumption correlated negatively with the fat index in Europeans (r = −0.23, P<0.05) and Maori (r = −0.33, P<0.01). While the questionnaire does not give a quantitative assessment of nutritional habits, it does offer a speedy tool for evaluating population-based lifestyle and diabetes awareness interventions directed at the prevention and control of type 2 (non-insulin-dependent) diabetes.

Introduction

The population of South Auckland (303 513 in 1991) includes a high proportion of Polynesian and European (50 589) and Pacific Islands (47 436) descent. These populations have an age-adjusted prevalence of diabetes that is up to fourfold higher than that of New Zealand Europeans. In view of this, a diabetes awareness and education programme is being developed in an attempt to control the predicted increase in numbers of people with diabetes and its tissue damage. To evaluate the programme and its pilot studies, a rapid and simple tool was needed to assess the impact of any interventions on diabetes knowledge and lifestyle among the general population and target groups. Of particular importance was the need to ensure that the final validated questionnaire was understandable, easy to use and culturally appropriate.

We now describe the design, reliability and validity of the diabetes knowledge, nutrition, television watching habits and alcohol sections for use in a population with a high prevalence of diabetes.

Method

Development of the questionnaire

The questionnaire included eight components: demographic and socioeconomic details, diabetes knowledge, key dietary habits, exercise, smoking and alcohol habits, perceived weight and ideal weight, and anthropometric measures (weight, height, waist, hip). After the evaluation of the questionnaire, one further measure relating to ‘happiness’ was added. This had been validated elsewhere. The exercise questions were replaced by a separate set that had previously been validated in another New Zealand population. These are not reported here.

The questionnaire was interviewer-directed. The assessment of diabetes knowledge was piloted with five open questions (including those previously described), a four-point and a five-point Likert scale and 47 closed questions derived from other published diabetes knowledge questionnaires. Questions were grouped under 10 stems with 3–6 true/false responses. The suitability of these sets of questions was discussed with members of the Maori and Pacific Islands communities prior to testing.

The final questionnaire included four open questions relating to the nature, symptoms, complications and treatment of diabetes, together with a four-point Likert scale question relating to the degree of damage (and death) caused by controlled diabetes. The coding for the open questionnaire has been described previously. A further 31 closed questions from several stems covered the nature, symptoms, complications, risk factors and prevention of diabetes, and included identification of high fat and high sugar foods (see Appendix 1). In the development stage, an obvious tendency for guessing the closed questions was observed, in spite of reassurance.

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that the response ‘don’t know’ could be used. In view of this, for the definitive application, incorrect answers were assigned a negative score of −1. Correct answers were scored +1, and ‘don’t know’ was scored 0. The total score was converted into a percentage with all negative totals scored as 0%. The dietary questions were intended to identify changes in the type, cooking, general preparation, and frequency of a number of key foods. The initial section described qualitative habits associated with a high-fat diet, while the second section was a 12-item food frequency questionnaire designed to reflect not only the total calorie intake but also the degree to which a low-fat, low-refined-carbohydrate diet was consumed vs. a high-fat, high-refined-carbohydrate diet. Important high-fat foods and other key foods were identified through discussion with four dietitians and two nutritionists with extensive experience in the clinical assessment and management of the dietary practices of the local Polynesian communities. The items were further discussed with Maori and Pacific Islands community workers. Certain foods were important only for one or two ethnic groups.

Choose, while a major source of dietary fat among Europeans, was rarely consumed by Pacific Islands people. The complex carbohydrates consumed also differ greatly between ethnic groups (eg kimura among Maori, green bananas and taro among Pacific Islands people). Key indicators of fat consumption, likely to be of use in the evaluation of interventions were assessed with seven questions. A simple ranking system was adopted for each item ranging from 0 (recommended ie lowest fat content) to 2 (ie high fat) and a ‘fat index’ calculated as the sum of the ranks expressed as a proportion of the total number of items included. The denominator was doubled because the top rank in the numerator items was 2. As a number of subjects did not eat some of the foods, their ‘fat index’ was calculated by excluding the item from both denominator and numerator. The ‘fat index’ was expressed as a percentage.

From the 12 items chosen for the food frequency questionnaire, three measures were derived: (1) pieces of fruit eaten per week; (2) a high-fat/high-refined-carbohydrate score (HFHRC score) taken as the number of times per week any one of the following four foods were consumed: chocolate bars, sections of ice cream, biscuits, small cake or piece of cake, and (3) relative total calories consumed per week, taken from the estimated caloric value of these eight items and from food frequency questions for eggs, chops, potatoes and slices of bread. Questions relating to alcohol consumption were developed from previous questionnaires. The question relating to the number of hours of television watched was developed by the authors.

**Item selection**

The resulting questionnaire was piloted among 55 European, Maori and Pacific Islands volunteers from the local community, including students (n=14), diabetic patients (n=12) and clinic staff (n=8). Following the pilot, the questionnaire was found to take longer than the 20-30 min intended. Questions felt to be of least importance were therefore deleted. Problem areas within the questionnaire were identified and final modifications made. The draft and final versions were both assembled into a ‘user friendly’ booklet format, which included a comprehensive patient explanation, consent form and assessment of the need for an interpreter (never needed).

**Validation studies**

Volunteers for the reproducibility, reliability and internal validation studies were recruited either from the domestic staff (ie cleaners, orderlies) of a local hospital or through acquaintances of 28 previously unemployed local residents on work-based training courses at the local Polytechnic. Questions were asked by a trained interviewer using the first language of the subject. Subjects were asked not to read anything about diabetes until after the second visit which was at least 3 months after the first visit. Volunteers for the external validation of the dietary questions were recruited from the workforces of two local manufacturing companies. Volunteers were randomly assigned to receive either a dietary assessment or the DKB questionnaire first. The dietetic assessments were made by a registered dietitian using the method of Burke and Smart.

**Statistical analyses**

Analyses were carried out using SPSS-PC (SPSS Inc, Chicago, IL, USA). Internal consistency was assessed using Cronbach’s alpha and stability by Pearson correlations. Comparisons of categorical variables was by χ², and normally distributed continuous variables by analysis of variance. Non-normally distributed variables (eg knowledge scores) were compared by Mann–Whitney test (unpaired) or Wilcoxon’s test (paired). For allocation of caloric value to the items in the short food frequency questions, standard portions were assumed according to New Zealand Dietetic Association guidelines. Internal validity for the subjects responses was assessed by comparing scores from those with and without diabetes or a family history of diabetes. The hypothesis tested was that the former would know more about diabetes.

**Results**

**Subjects**

Characteristics of the 350 subjects involved in the reliability studies are shown in Table 1. Overall, 69% agreed to complete a repeat questionnaire. The proportion agreeing to repeat the questionnaire was lowest among Maori and Pacific Islands subjects. Within each ethnic group, subjects repeating and not repeating the questionnaire were similar with regards to sex, age, educational level achieved, family history of diabetes and language at home. Only 0.5% of subjects ate no meat, 2.7% ate no bread and 5.2% no potatoes.

**Reliability and validity of knowledge questions**

Table 2 shows the characteristics of the closed and open knowledge questions. Good reliability and stability are demonstrated. Reproducibility of both the open and closed questions was acceptable, although the repeat score was always significantly higher than the initial score. This was particularly the case for the open questions among Pacific Islands subjects. While Maori and Europeans had similar closed scores, Maori had lower open scores. The scores for the seven stems in the closed knowledge questions correlated significantly (P<0.001) with the total scores in each ethnic group (Pearson’s r European 0.46–0.83; Maori 0.53–0.84; Pacific Islands 0.57–0.80). Similarly, the scores for each of the four open questions correlated significantly (P<0.001) with the total open score (Pearson’s r European 0.68–0.83; Maori 0.68–0.83; Pacific Islands 0.69–0.83).
that the response 'don't know' could be used. In view of this, for the definitive application, incorrect answers were assigned a negative score of -1. Correct answers were scored +1, and 'don't know' was scored 0. The total score was converted into a percentage with all negative totals scored as 98%.

The dietary questions were intended to identify changes in the type, cooking, general preparation, and frequency of a number of key foods. The initial section described qualitative habits associated with a high-fat diet, while the second section was a 12-item food frequency questionnaire designed to reflect not only the total caloric intake but also the degree to which a low-fat, low-refined-carbohydrate diet was consumed vs a high-fat, high-refined-carbohydrate diet. Important high-fat foods and other key foods were identified through discussion with four dietitians and two nutritionists with extensive experience in the clinical assessment and management of the dietary practices of the local Polynesian communities. The items were further discussed with Maori and Pacific Islands community workers. Certain foods were important only for one or two ethnic groups.

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From the 12 items chosen for the food frequency questionnaire, three measures were derived: (1) pieces of fruit eaten per week; (2) a high-fat/high-refined-carbohydrate score (HFHRCS score) taken as the number of times per week any one of the following four foods were consumed: chocolate bars, servings of ice cream, biscuits, small cake or piece of cake; and (3) relative total calories consumed per week, taken from the estimated caloric value of these eight items and from food frequency questions for eggs, chops, potatoes and slices of bread. Questions relating to alcohol consumption were developed from previous questionnaires. The question relating to the number of hours of television watched was developed by the authors.

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Table 2 shows that the open and closed scores were generally able to detect this. Neither open nor closed knowledge measure was correlated with age within any ethnic group. Among Europeans, those with education above form 6 had a higher 'knowledge index' than those with less education (29% vs 43%, P<0.01).

Using the Likert scale question, diabetes was seen as 'very damaging and can kill you' (the highest score) by the majority of people (European, Maori, Pacific Islands respectively: initial 79%, 83%, 68%; repeat 90%, 90%, 70%). As very few subjects had lower scores, Pearson's correlations could not be calculated. However, there was no significant difference in score between initial and repeat testing. Among Pacific Islands people, those with diabetes or a family history of diabetes had a significantly higher score than the others (P<0.02).

Reliability and validation of a 'fat index'

Table 3 shows that within each of the seven items, the 'fat index' was ranked highest in the 'high-fat' group and lowest in the 'low-fat' group. This correlation held true both overall and within each ethnic group. Reliability and reproducibility of the questions were acceptable both overall and within ethnic group as shown in Table 5. Over 90% of subjects from all ethnic groups ate a high-fat spread. The item relating to this was least reliable with an increased Cronbach's α on its removal (increasing overall to 0.62, Europeans to 0.54, Maori to 0.63, Pacific Islands to 0.63). The external validation of the 'fat index' (Table 4) demonstrated a significant correlation with the total fat consumed overall and within ethnic group.

The 12-item food frequency questionnaire

The reliability of the four-item HIFRC score was acceptable as shown in Table 4. The reproducibility studies and external validation for the HIFRC score and food frequency calories were acceptable (Table 4). The fruit frequency question was reproducible (Table 4). Among Europeans in the external validation study, the fruit frequency question correlated negatively with the total fat consumed (r=-0.66, P<0.01) and total protein consumed (r=-0.62, P<0.05). A variable degree of internal validation for the 'fat index' and three food frequency scores was provided through correlations with each other (Table 4). The fat index and food frequency calories were negatively correlated with age among Maori (r=-0.23,-0.27 respectively, P<0.05) and Pacific Islands subjects (r=-0.24, P<0.01,-0.29, P<0.001 respectively) but not Europeans. The fat index and HIFRC were not correlated. Dietary measures did not differ significantly with educational level achieved or with diabetes status.

Results for other questions

Regular alcohol consumption was reported in minority of subjects (43% Europeans, 32% Maori, 19% Pacific Islands). In midial alcohol consumption was 0 units. The reports number of units consumed correlated on the first and second occasions (r=0.70) and between dietitian and questionnaire (r=0.88). Television was watched regularly by 48% Europeans, 57% Maori and 62% Pacific Islands subjects. Reproducibility of the number of hours of reported watching was good (Overall r=0.43, P<0.001; Europeans 0.48 P<0.001, Maori 0.71, P<0.005, Pacific Islands 0.26, P<0.01).

Discussion

The primary prevention of type 2 (non-insulin-dependent) diabetes is now being considered and attempted through a variety of changes in lifestyle (particularly through diet and exercise) in children. While similar studies for the prevention of heart disease in populations have been assessed, none have yet been reported for type 2 diabetes. While the success of such population strategies is ultimately shown in reduced incidence of the disease and mortality, during the early stages it is necessary to develop the prevention package and tailor it to each population. The DKB questionnaire is a tool for evaluating community-based diabetes control programmes within very different population groups. With the numbers involved, the need is not for quantitative accuracy but rather for an ability to demonstrate rapidly that, when compared with a control group, an intervention group has increased their diabetes knowledge, reduced their weight, fat and total calorie intake, all without a relative reduction in 'happiness'. The current evaluation demonstrates that the DKB questionnaire is a valid and reliable tool to assess these attributes in the three major ethnic groups in Auckland.

The problems with questionnaire for assessing knowledge and lifestyle are well known. Open diabetes knowledge questions can reflect verbal ability and recall memory, while expected responses to multiple choice and true/false questions can be 'guessed'. Questionnaires that are posted can be answered following consultation with other sources of information (eg other family members/literature). Testing realliability for such questionnaires is particularly difficult as subjects will either actively or passively increase their knowledge by the time of the next test. In the present study, the increase was by 7-13% for both open and closed questions. Similar studies have not reported reproducibility in Diabetic Knowledge and Behaviour (DKB) Questionnaire.
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Table 3. Qualitative indicators of fat consumption: the ‘fat index’.

<table>
<thead>
<tr>
<th>How do you usually use/cook:</th>
<th>High-fat (2)</th>
<th>Medium-fat (1)</th>
<th>Low-fat (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>Dark blue/silver</td>
<td>Light blue</td>
<td>Green/trim</td>
</tr>
<tr>
<td>Eggs</td>
<td>Fried/scrambled</td>
<td>Fry/pan roast</td>
<td>Boil/grill/microwave/boil</td>
</tr>
<tr>
<td>Chops</td>
<td>Chicken</td>
<td>Roast on rack</td>
<td>Roast on rack</td>
</tr>
<tr>
<td>Beef</td>
<td>Never/sometimes</td>
<td>Usually</td>
<td>Always</td>
</tr>
<tr>
<td>Fish</td>
<td>Never/sometimes</td>
<td>Usually</td>
<td>Always</td>
</tr>
<tr>
<td>Liver</td>
<td>Dripping/butter</td>
<td>low fat</td>
<td>margarine</td>
</tr>
</tbody>
</table>

Table 4. Test characteristics of dietary questions

<table>
<thead>
<tr>
<th>European</th>
<th>Maori</th>
<th>Pacific Is</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat index</td>
<td>Fat frequency vs HIFRC</td>
<td>Fat index vs fat frequency</td>
<td>Reproducibility (Pearson’s r)</td>
</tr>
<tr>
<td>0.51**</td>
<td>0.53**</td>
<td>0.67</td>
<td>0.74</td>
</tr>
<tr>
<td>0.79**</td>
<td>0.46**</td>
<td>0.37**</td>
<td>0.56**</td>
</tr>
<tr>
<td>0.61**</td>
<td>0.49**</td>
<td>0.37**</td>
<td>0.56**</td>
</tr>
<tr>
<td>0.41</td>
<td>0.53</td>
<td>0.56</td>
<td>0.51</td>
</tr>
</tbody>
</table>

EVALUATION OF A DIABETES KNOWLEDGE AND BEHAVIOUR (DKB) QUESTIONNAIRE

The problems with questionnaire for assessing knowledge and lifestyle are well known. Open diabetes knowledge questions can reflect verbal ability and recall memory, while expected responses to multiple choice and true/false questions can be 'guessed'. Questionnaires that are posted can be answered following consultation with other sources of information (eg other family members/literature). Testing repeatability for such questionnaires is particularly difficult as subjects will either actively or passively increase their knowledge by the time of the next test. In the present study, the increase was by 7–13% for both open and closed questions. Similar studies have not reported reproducibility. In spite of these problems, the two components used in the DKB
questionnaire were valid, reliable and reproducible. The questionnaire is one of the first diabetes knowledge questionnaires applicable to predominantly non-diabetic subjects21, 26. It was precise enough to detect differences in knowledge between those with and without a history of diabetes. There was an expected difference in score among those with more education, but not in age. Whether this reflects more knowledge or more expertise is difficult to predict.

Problems with dietary questionnaires are even more pronounced. There is still no gold standard for assessing indi-

vidual dietary intake21, 28. It is not necessary to use a 24-hour recall as an external validation for the three 'indices' (fat index, food frequency and HFIHRC). The overall result was better than expected with significant correlations overall and also each of the three ethnic groups. The fat index in particular was significantly correlated with both total and fat calories among the small group of Pacific Islands subjects. Subjects in the external validation (mainly workers at local manufacturing companies) were similar in terms of education with Maori and Pacific Islands subjects in the reproducibility, reliability and internal validation studies. In Europeans, while the reproducibility, reliability and validity (internal and external) has been shown in those educated to secondary education or less, a low proportion of subjects in the external validity study were educated to Form 6 or above. However, no difference in the other evaluation results were found with educational level and hence it is unlikely that the questionnaire is any less valid in those educated to a higher level.

The fat index correlated only weakly with the food frequen-
cy calorie scores, not at all among Pacific Islands subjects, and not at all with the HFIHRC. As these relationships were weak in all ethnic groups, it is likely that the low correlation coefficients were due to differences in what the measures were actually quantifying. Also due to cultural differences in the validity of the tool. An increase in fruit (and vegetable) consumption associated with a reduction in fat consumption remains one of the recommendations for 'healthy eating'. The fruit frequency correlated negatively with the fat index in Europeans and Maori but not in Pacific Islands subjects. This is possibly due to cultural differences in eating practices relating to fruit.

The reproducibility of all the scores was acceptable28, although Europeans had a lower food frequency calorie score on the re-test. This is difficult to explain but could be due to changes with time. The alcohol score and TV watching question-

Appendix 1 Closed diabetes knowledge questions

1 Which of these is/are true?
   A person with diabetes will have for the rest of his/her life:
   The body of a person with diabetes can handle sugar properly
   Diabetes can be controlled
   A person with diabetes has too much sugar in the blood
   A person with diabetes can be harmed if the diabetes is not controlled

2 Which of these are symptoms of uncomplicated diabetes?
   Feeling very thirsty
   Having lots of energy
   Needing to go to the toilet a lot
   Putting on weight

3 Which of these can be damaged in uncomplicated diabetes?
   Eyes
   Ears
   Lung
   Kidney
   Feet
   correct answer.

4 Which of these foods have a lot of sugar in them?

   Fruit juice
   Chocolate bars
   Potatoes
   Artificial sweeteners (equivalent sugar)

5 Which of these foods have a lot of fat in them?

   Butter
   Brown bread
   Margarine
   Takeaways

6 Which of these put you at risk of getting diabetes?

   Being overweight
   Being European
   Not doing exercise
   Having someone in your family with diabetes

7 Which of these things can help you avoid diabetes?

   Losing weight
   Drinking alcohol
   Eating fried food
   Doing regular exercise

28. Simmons D, Meadow K, Williams DRK. Knowledge of diabetes in

29. McDowell KA, Fromson B, Gillingham C, Wise PF. Development, vali-
   dation and application of computer based knowledge questionnaires in

30. Shih B, Shantes BJ, Cutler JA, Keller LH. Alcohol use and mor-
questionnaire were valid, reliable and reproducible. The questionnaire is one of the first diabetes knowledge questionnaires applicable to predominantly non-diabetic subjects.

It was precise enough to detect differences in knowledge between those with and without a history of diabetes. There was an expected difference in score among those with more education. However, whether this reflects more knowledge or more expertise is difficult to predict.

Problems with dietary questionnaires are even more pronounced. There is still no gold standard for assessing individual dietary intake.

In view of this, the comparison with the traditional method of Burke and Stewart used here was considered too rigorous as an external validation for the three "indices" (fat index, food frequency calories and HFBHC). The overall result was better than expected with significant correlations overall and also within each of the three ethnic groups. The fat index in particular was significantly correlated with both total and fat calories among the small group of Pacific Islands subjects. Subjects in the external validation (mainly workers at local manufacturing companies) were similar in terms of education with Maori and Pacific Islands subjects in the reproducibility, reliability and internal validation studies. In Europeans, while the reproducibility, reliability and validity (internal and external) has been shown in those educated to secondary education or less, a low proportion of subjects in the external validation study were educated to Form 6 or above. However, no difference in the other evaluation results were found with educational level and hence it is unlikely that the questionnaire is any less valid than those educated to a higher level.

The fat index correlated only weakly with the food frequency calories, not at all among Pacific Islands subjects, and not at all with the HFBHC. As these relationships were weak in all ethnic groups, it is likely that the low correlation coefficients were due to differences in what the measures were actually quantifying due to cultural differences in the validity of the tool. An increase in fruit (and vegetable) consumption associated with a reduction in fat consumption remains one of the recommendations for 'healthy eating'. The fruit frequency correlated negatively with the fat index in Europeans and Maori but not in Pacific Islands subjects. This is due possibly to cultural differences in eating practices relating to fruit.

The reproducibility of all the scores was acceptable, although Europeans had a lower food frequency calorie score on the re-test. This is difficult to explain but could be due to changes with time. The alcohol score and TV watching questions had high reproducibility. However, these are not to be the targets of direct public health messages. The former may change with alterations in health awareness, while the latter may decline with increased exercise.

A fat score was recently validated in Newcastle, Australia. This assessed type of spread and milk consumed and applied categorical values to semi-quantitative data such as the amounts consumed of milk, eggs, fat left on meat, ice cream, cheese and chocolate. The New York State Healthy Heart Programme has also developed a 13-item fat intake screening tool and a 17-item nutrition screen for use in a population with white, black and Hispanic subjects. The main contributors (52%-72% of total) to cholesterol/saturated fat were eggs, whole milk, cheese, beef and butter

margarine and it was suggested that these five items be the focus of public health campaigns.

While the sampling of this study does not allow ethnic group comparison, it is interesting to note that although the fat index was similar between Europeans and Pacific Islands people (and high in Maori), the food frequency calories were highest in Pacific Islands people. Although major Pacific Islands staples and coconut cream were omitted from the food frequency calorie score, the 12 items used seem to adequately reflect the large quantities of food consumed by Pacific Islands people. The high fat intake of the Maori has also been previously reported and provides another external validation of the questionnaire.

In conclusion, the DKB questionnaire is a valid and reliable tool for evaluating diabetes control programmes in a multi-ethnic community setting. Its usefulness now needs to be tested in specific studies.

Acknowledgements - We would like to thank Alison Wagstaff for dietetic assessments, the nutritionists and dietitians for their advice and the members of the Maori and Pacific Islands communities for their guidance. The South Auckland Diabetes Project is supported by the Health Research Council of New Zealand.

References


Appendix I Closed diabetes knowledge questions

1 Which of these is/are true?

A person with diabetes will have for the rest of his/her life:

1. The body of a person with diabetes can handle sugar properly
2. Diabetes can be controlled
3. A person with diabetes has too much sugar in the blood
4. A person with diabetes can be harmed if the diabetes is not controlled

2 Which of these are symptoms of uncontrolled diabetes?

1. Feeling very thirsty
2. Having lots of energy
3. Needing to go to the toilet a lot.
4. Putting on weight

3 Which of these can be damaged in uncontrolled diabetes?

1. Eyes
2. Ears
3. Longs
4. Heart
5. Kidneys
6. Feet

4 Correct answer.

糖尿病知識和行問卷（DKB）的評估

摘要

目前認為可能通過生活方式的轉變對Ⅱ型（非胰島素依賴型）糖尿病進行初級預防。目前已有對人群預防糖尿病的策略。新西蘭南奧克蘭市（South Auckland）糖尿病科研項目已研究了一份問卷來評估當地社會的糖尿病覺察、運動／健康飲食計劃的效果。這份問卷已用來評估當地成人包括歐洲（n=127）、毛利（n=103）和太平洋島成人（n=167）。問卷用以直接探討並約需30分鐘。糖尿病知識用4個問卷問題和31個問卷正／負題評估，這些問題在所有種族中都獲得良好的可靠性（Cronbachs α範圍0.59～0.90）、重複性（Persons r範圍0.39～0.74）和客觀的真實性（r範圍0.28～0.56）。再測試中增加7～13%。在那些患有糖尿病或有糖尿病家族史的人中，問卷和問卷問題分數分別高達7～13%和10～26%。作者用四種方法來評估重要的飲食習慣：（1）七項食物製備／脂肪含量「脂肪指數」，（2）四項高膽／高膽固醇脂肪合物，當與膳食評估相比較（總脂肪：r=0.44～0.90）、有良好可靠性（Cronbachs α範圍0.51～0.74）、重複性（r=0.37～0.70）和客觀的真實性（r=0.28～0.64）和脂肪含量（r=0.41～0.65）的膳食評估有良好相關。（4）一個簡單的與水果進食頻率有關的問題與歐洲人（r=0.33, p<0.05）和毛利人（r=0.33, p<0.01）的脂肪指數和負相關，該問卷並不是對營養習慣進行定量評估，但它們提供了一個迅速的方法，去評估和指標Ⅱ型（非胰島素依賴型）糖尿病的控制和預防。

Nutritional aspects of palm oil: an introductory review

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Introdution

Although palm oil has been consumed for 5000 years in Africa, where the palm tree originated, its significance as a dietary fat world-wide was not realized until 1984, when it became the largest selling edible oil in the export trade of oils and fats. Since 1991 its share of the trade had risen to 33%. More than 90% of palm oil traded is used for food applications, where its versatility and stability are very advantageous. For example, in margarine and shortenings palm oil can stabilize beta prime crystals and this property will ensure a pleasant texture in these products.

As palm oil is mainly used in foodstuffs, interest in nutritional research on the oil naturally arose, and this was further stimulated and accelerated as a result of the anti-palm oil and anti-tropical oil campaign. Several research groups all over the world have examined this problem and their findings have been published in respected international journals such as the American Journal of Clinical Nutrition and Nutrition Research. There has been a move towards using partially hydrogenated fat in place of palm oil, particularly in the USA. However, recent findings on hydrogenated fat indicate that the trans fatty acids which are formed during the partial hydrogenation of oils and fats may have adverse effects on the human blood lipid profile.

Because of the growing importance of palm oil in the human diet, and also because of the questions arising in regard to the use of hydrogenated fats as an alternative to it, it seemed useful and timely to prepare this summary of recent research findings on palm oil in relation to human nutrition. It differs in style and layout from a formal review, since the intention is to present the essential facts simply and succinctly. The excellent review by Elton provides further reading in greater detail.

The nutritional attributes of palm oil

Palm oil in the codex alimentarius

Palm oil is one of the 16 edible oils possessing an FAO/WHO Food standard under the Codex Alimentarius Commission Programme.

The Codex Alimentarius Commission (Codex 125-1981) comprises 122 member countries. The primary purpose of the Commission programme is to protect the health of consumers and ensure fair practices in the food trade.

Palm oil in history

Palm oil has been used as a foodstuff for over 5000 years. The palm itself is native to Western Africa and is a traditional source of food. The oil must also have been traded in ancient times since it was found among grave goods in a 5000 year old tomb at Abydos in Egypt. Chemical analyses of a number of products recovered during the excavation of this tomb were reported in the French journal Comptes Rendus in 1897. The analyst, M.C. Frield, found that one sample of several kilogrammes, stored in an earthenware jar, had the composition expected of palm oil that had deteriorated during prolonged storage.

Palm oil in the contemporary food industry

At present palm oil is consumed world-wide as a cooking oil, and in margarine and shortening, and is also incorporated into fat blends and a wide variety of other food products around the globe. Its versatility is widely appreciated, as shown by trade statistics. Over 90% of Malaysia’s annual production, currently over 6 million tonnes, is being exported to some 90 countries. The fatty acid composition of palm oil and its content of natural antioxidants gives it an exceptional stability at high temperature. This property has been widely recognized and as a result palm oil is used for frying industrially and in homes throughout the world.

Fatty acid composition

Palm oil contains an equal proportion of saturated and unsaturated fatty acids, with about 44% palmitic acid, 5% stearic acid, 3% oleic acid (monounsaturated), 10% linoleic acid and 0.4% alpha linolenic acid (both polyunsaturated). Since most commercial palm oil is produced from similar high-yielding hybrids, whatever its source, the chemical composition of different samples is very similar, and is well represented by the round figures just quoted, which are from the Horticultural Handbook, published in the US by the Department of Agriculture, Science and Education Administration, an official American publication.

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