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Dietary Management Practices for Diabetes by Dietitians in Public Hospitals in Limpopo Province, South Africa

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Abstract

The aim of the study was to investigate dietary management practices of dietitians for type 2 diabetic patients in public hospitals of Limpopo province. The study design was descriptive with an analytical component and used quantitative and qualitative methods. The sample consisted of 30 dietitians and 24 patients from 30 hospitals. Self-reported questionnaires were used for all participating hospitals, 12 of which were visited by the researcher for observation and to interview patients using a structured questionnaire. The researcher used checklist to record observations on menus and diet sheets. Thematic analysis was used to organise the responses from qualitative data following the spiral method described by Creswell. Frequencies and percentages were used to report quantitative data. The majority (71.4%) of dietitians did not use scientific sources and calculations when prescribing diets. Only 9.5% of dietitians used the glycaemic index concept, 52.4% used foods to avoid/allowed lists, 66.7% used food-service aids to prepare diabetic meals and 71.4% used the plate system for serving food. The dietitians used a variety of procedures when counselling patients and no standard nutrition educational materials existed in the province. In Limpopo province, dietitians employed different dietary management approaches in the dietary treatment of type 2 diabetic patients.

Introduction

Globally, 366 million people have diabetes and the International Diabetes Federation predicts this number to rise to 552 million by 2030 [1]. The greatest increase in diabetes is expected to be in Sub-Saharan Africa - it is predicted that the incidence of diabetes on this continent will have almost doubled by 2030, and reach 34.2 million by 2040 [2]. In South Africa, the prevalence of diabetes in adults nearly doubled from 5.5% to 9% between 2000 and 2009 [3]. It is estimated that another five million South Africans have pre-diabetes, a condition where insulin resistance causes blood glucose levels to be higher than normal but not high, enough to be classified as type 2 diabetes [4]. The highest prevalence of diabetes is among the Indian population in South Africa (11-13%) as this group has a strong genetic predisposition for diabetes, followed by 8-10%, 5-8% and 4% in the coloured, black and white communities respectively [4]. Diabetes mellitus in South Africa is the third leading cause of death according to 2015 mortality statistics, and number one cause of death in women [5].

The increasing prevalence of type 2 diabetes in South Africa [6] and the continuous nutrition transition [2,7], especially in the African population, require a focused diabetes intervention programme. Many black South Africans have migrated from rural to urban areas and rapid demographic and epidemiological transitions [2], is one of the consequences of such migratory movement [7]. It has been reported that the effects of urbanisation and an unhealthy lifestyle are important contributors to the rising prevalence of obesity and diabetes [4]. Thus, making it imperative to manage diabetes patients comprehensively in order to mitigate the economic consequences.

The main goal of diabetes treatment is to keep patients' blood-sugar levels within the normal range. Diabetes is a self-managed condition where weight reduction and increased exercise are essential. Management regimes that require change in lifestyle and behaviour can influence daily functioning and general wellbeing [8]. SEMDA has developed guidelines on how diabetic patients should be managed at all levels including primary care [9]. Upon diagnosis mostly at primary care level, patients are referred to regional or secondary hospitals. Once, the diagnosis is confirmed, they are placed on various treatment regimens ranging from diet only to insulin and diet. Diet alone, diet and drugs or diet and insulin are the three management approaches for type 2 diabetes. Furthermore, lifestyle modification aimed at reducing energy intake and increasing physical activity is the principal therapy for overweight and obese patients with Type 2 diabetes [10]. Nutrition education should therefore include all the necessary lifestyle changes and intervention should focus on fat intake, physical activity, fibre intake and alcohol consumption [4,11]. Once the blood glucose is controlled, follow-up is continued at primary care level including collection of medication.

At primary care level, the health professionals are expected to do an evaluation on coping and adherence, dealing with pertinent problems, glycaemic control and diabetes education [10,11]. Health professionals, including dietitians, need to continuously update themselves with the newest scientific evidence in order to plan appropriate dietary management for type 2 diabetes. According to Doede et al. inter-professional collaboration, knowledge and training are a necessity in rural clinics and may help close gaps in patient care and disease management for diabetes and hypertension [12]. The economic burden of managing non-communicable diseases, including diabetes mellitus, is immerse on a country. Patients are known to be mobile as indicated by the change in primary health

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care facilities where they collect their medications, therefore dietary management interventions need to be standardised for people living in same geographic areas or surroundings. Distiller and Brown asserts that the South African healthcare environment provides opportunity for integrated and holistic approaches to the management of the increasing burden of diabetes mellitus [11]. There is paucity of data in South Africa on standard nutritional management for diabetes by dietitians, especially in public hospitals. Therefore, the purpose of this study was to investigate the dietary management practices by dietitians for type 2 diabetic patients in the public hospitals of Limpopo province, in South Africa.

Materials and Methods

Design

The study design was descriptive with an analytical component and used quantitative and qualitative methods. Dietary management practices were defined as methods of dietary assessment, planning, types of nutrition education and content of nutrition education materials. Dietary assessment and planning included steps such as the referral system, the assessment of a patient's usual diet, the calculation of diet prescription, diet planning, food choices and food preparation methods, meal planning, feedback systems as well as the type of nutrition education and content of such materials used. The dietary management practices used for type 2 diabetes patients by dietitians were measured quantitatively using a self-reported questionnaire. This was complemented by qualitative assessment by direct observation, using a structured observation checklist, conducted on site by the researcher and a structured in-depth interview with patients. The instruments were validated during piloting using one of the hospitals.

Population and sample

Limpopo province had a population of 5.6 million, 95% living in rural areas, serviced by 40 public hospitals at the time of data collection [13], spread over an area of 125 754 km^2. The study population was all (40) public hospitals in Limpopo province of South Africa, of which 31 had dietitians in the employment during the study period. The inclusion criteria were a public hospital based in Limpopo province with at least one or more dietitian in the work force. The dietitians served as informants for providing information on dietary management practices in their hospitals. One of these hospitals, where the researcher worked, was used for piloting and thus excluded from the final sample. The total targeted sample, therefore, was 30 out of 40 public hospitals (78%) in the province, 12 of which were selected for physical visit using successive random sampling [14]. Thirty dietitians were purposefully selected, one from each hospital. Two type 2 diabetic patients in each of the 12 hospitals visited were randomly selected using ward diet lists, resulting in the selection of 24 patients.

Data collection procedures

For the 18 dietitians, the questionnaires were mailed and they were asked to self-report on dietary management practices used for type 2 diabetic patients using a validated questionnaire, with both close and open-ended questions. While the questionnaires were mailed to the remaining 12 dietitians and completed and/or collected on the day(s) of visit to the selected hospitals by the researcher.

A structured observation checklist, which was designed to be used by the researcher to document activities on the day of visit, was used to record the meals served to the patients and any other information relating to diabetic diets that was observed. The activities observed included availability of menus, portion servings and diet, kitchen system, copies of diet management sheets, menus and dietary information sheets from the hospital visited.

The selected patients were interviewed on the services they received from the dietitians using a structured questionnaire. The questionnaire was administered in the language of the patient by a multilingual fieldworker, who was a community-service dietitian, in the presence of the researcher.

Ethical clearance

Ethical clearance was obtained from the University of Venda Higher Degree and Ethics Committee. Permission to use public hospitals was obtained from the Limpopo Department of Health. Furthermore, cooperation and consent was requested from the management of each hospital and participating dietitians. Verbal consent was requested from each patient.

Data analysis

Thematic analysis was used to organise the responses following spiral method described by Creswell [14]. The researcher analysed data according to five steps [14], namely 1) organisation of details of data, 2) categorisation of data, 3) interpretation of single instances, 4) identification of patterns and 5) synthesis and generalisation. The responses from the questionnaires for dietitians were analysed in terms of themes and results counted for hospitals. The responses from observation were categorised and grouped into themes, while the responses from patients were reported verbatim. Frequencies and percentages were then used to give meaning to the findings. The evaluation and interpretation of dietary management practices were measured against standards published in the protocol for diabetes mellitus for adults [15]. The appropriateness of identified dietary management practices recommended for type 2 diabetes was assessed using the literature [4].

Results

The findings are presented and interpreted using themes since this was a mixed method study using qualitative and quantitative approaches in data collection. From the 18 dietitians who were recruited for self-reporting, nine questionnaires were returned through the post, i.e. the response rate was 50%. The nine remaining questionnaires were not returned despite efforts by the researcher (*having called the dietitians more than three times and having sent paid return envelopes*). For the 12 hospitals visited, all the dietitians completed the questionnaires and the researcher collected them (100% response rate). In total, data were gathered from 21 (70%) out of 30 hospitals initially selected. In addition, the researcher visited 12 of the 30 hospitals, to check the availability of menus, diet sheets, education materials and other observations.

Dietary management practices by dietitians

Dietary management practices for the purpose of this study refer to methods of dietary assessment and planning and types of nutrition

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education and content of nutrition education materials. The question on the referral system was asked only to dietitians at the 12 visited hospitals and an observation was made by the researcher. Table 1 illustrates the responses obtained from the quantitative self- reported questionnaire, confirmed by the observation and discussion with the dietitian.

Dietary management practices were established using the self-reported questionnaires. Table 2 illustrates the responses from the 21 dietitian/hospitals. Data shows variable practices were used.

The specific food composition of the snack meal was established. The data in Table 3 shows that most served a starch and/or protein and/or margarine fat spread and /or protein. This shows good planning.

Feedback from the diabetic patient's interviews

Fifteen type 2 diabetics (7 male, 8 female) were interviewed out of the planned 24 patients (63%) as there were no type 2 diabetes patients at some of the hospitals on the days of researcher visit. During the study period, the 40 hospitals in Limpopo province had an average of 0-1 type 2 diabetes patients admitted daily.

What the patients thought of the food served in the hospital was established by the question, "What do you think of the food you receive?" the responses were captured by tape recorder and transcribed. The remarks of the patients are reported verbatim as follows:

- "*The food is nice and looks appetizing" (n=1)*
- *"The food is sometimes good and sometimes not" (n=1)*
- *"The food is not nice; only eat it because of hunger" (n=1)*
- *"The food is fine" (n=2)*
- *"It depends on who cooked the meal from the kitchen, the one group cooks well and the other doesn't" (n=1)*
- *"The food is okay" (n=2)*
- *"Think the food of the hospital will help me" (n=1)*
- *"The food is unusual; just eat it because it is not my home" (n=1)*
- *"The food is okay, it is just the times they bring the food, we wait for very long periods before receiving the food" (n=1)*
- *"The food is too little, am not satisfied with the food, the bread is dry and the soft porridge is given without milk" (n=1)*
- *"Don't think much of the food, but believe the hospital will not give wrong food" (n=1)*

The happiness of the patients with the food was also determined by the question: "Are you happy about the food?" Out of 15 patients, 11 patients (73.3%) said '*yes*', they were happy, but three patients weren't and one patient didn't respond to the question.

Types of nutrition education and scientific sources of nutrition education materials

The type of nutrition education materials samples used were collected by the researcher at the 12 hospitals visited and received from other 9 hospitals via post. Table 4 below lists the types of nutrition education materials and the number of hospitals that used them. General guidelines and foods avoid/allowed lists were the most commonly used sheets.

Analysis of content of nutrition educational materials

The researcher obtained samples of the general and glycaemic index guidelines during observation and the lists received by mail from the hospitals. The analysis of content is summarised thematically below:

The general guidelines included the following:

- *Detailed information to reduce fat in the diet;*
- *Information to reduce simple sugars;*
- *To reduce the salt intake in the diet;*
- *Information on how to increase the fibre intake;*
- *The number of meals;*
- *Information on how to deal with hypo-glycemia or hyper-glycemia symptoms;*
- *Quantity of food;*
- *Water and liquid requirements;*
- *Reduction of cholesterol; and*
- *Information on exercise.*

The glycemic index guidelines included the following information:

- *Basic definitions;*
- *Influence of food on GI;*
- *Preparation influence on GI;*
- *The influence of nutrient composition on GI;*
- *Nutrient combination in a meal.*
- *Lists of low/medium/high GI foods*

This information was written in simple terms for easy reading by the users. The data show that both the general and glycaemic index guidelines were compliant with the norms and standards of principles of dietary management for Type 2 diabetics.

Table 1: Patient referral system/process.

Patient referral system	Specific question/theme	Responses from Dietitians who were visited (n = 12)
The patient referral system used in the hospitals between the doctors/wards and the dietitians was established by the question "**What referral system do you use?"**	Dietitians saw patients based on receiving referral from doctors.	4 (33.3%)
	Dietitians used doctors' referrals but also did ward rounds.	3 (25%)
	Dietitians did ward rounds, got doctor referrals but also identified patients from the ward diet lists.	2 (16.7%)
	Dietitians used casualty lists to identify patients.	2 (16.7%)
	Dietitians were informed telephonically by the ward about the patients.	1 (8.3%)

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Table 2: Responses from dietitians on Dietary management practices (Dietitian response denotes hospital practices).

Dietary assessment and planning method/technique	Specific question/theme	Responses for Dietitians who mailed their questionnaires (n = 9)	Responses from Dietitians who were visited (n = 12)	Total n = 21
Use of Scientific sources	I use Krause's Food, Nutrition & Diet therapy text book	4	2	6 (28.6%)
	I do not use Scientific sources	5	10	15 (71.4%)
Calculation of Diet	Do not calculate diet prescription	4	11	15 (71.4%)
	Use Basal Expenditure (BEE) formula	3	0	3 (14.3%)
	Use Harris-Benedict Formula	1	1	2 (9.5%)
	Use national Management Guideline for Diabetes Mellitus	1	0	1 (4.8%)
Meal frequency	Three meals per day	7	12	19 (90.5%)
	Four meals per day	2	0	2 (9.5%)
Snack meals	Two snacks per day	3	7	10 (47.6%)
	Three snacks per day	3	3	6 (28.6%)
	One snack per day	3	1	4 (19%)
	No snack meal	0	1	1 (4.8%)
Responsibility for meal preparation "Who prepares the special diets?"	Used cooks/special diet kitchen cooks/food-service aids to prepare these meals.	9	5	14 (66.7%)
	Used general cooks and the dietitian.	0	4	4 (19%)
	Used food service supervisors.	0	2	2 (9.5%)
	Used catering-company staff.	0	1	1 (4.8%)
Special cooking methods[1]	Used boiling/steaming/oven baking/stewing.	7	3	10 (47.6%)
	Cooked from the beginning in separate cookware and added no salt/fat/sugar.	0	5	5 (23.7%)
	Used the normal cooked food without adding salt.	0	3	3 (14.3%)
	Only used fish and chicken and no added fat/ salt	0	1	1 (4.8%)
	Used the normal cooked food, removed the fat from the meat, and added no sugar to the vegetables.	1	0	1 (4.8%)
	Did not comment on this question asked.	1	0	1 (4.8%)
The diet information system for the kitchen personnel	Received diet lists from the wards.	3	7	10 (47.6%)
	The dietitian pin-coded the patients identified on a board or on labels.	4	1	5 (23.8%)
	Did not respond to this question.	2	1	3 (14,3%)
	Received numbers from the wards.	0	2	2 (9.5%
	Received a book from the ward. (In this book, the bed numbers and type of diet needed were entered.)	0	1	1 (4.8%)
The serving system for the Type 2 diabetic diets in use[2]	Used the plate system.	6	9	15 (71.4%)
	Used the bulk dish-up system.	3	3	6 (28.6%)

[1]Meal preparation methods were observed and confirmed by the researcher for the visited hospitals.
[2]The information was obtained via self-reports from the dietitians visited and confirmed by observation by the researcher.

Table 3: Types of snacks given (self-reported by Dietitians).

Time	Type of Snack	Responses for Dietitians who mailed their questionnaires (n = 9)	Responses from Dietitians who were visited (n = 12)	Total n = 21
Mid-Morning Snacks	4 slices of bread, little margarine and peanut butter	0	2	2 (9.5%)
	2 slices dry bread	3	2	5 (23.7%)
	2 slices bread, little margarine and 1 slice of cheese	0	1	1 (4.8%)
	2 slices dry bread, cheese or peanut butter	0	1	1 (4.8%)
	2 slices bread and margarine	1	1	1 (4.8%)
	2 slices dry bread and cheese/polony	0	1	1 (4.8%)
	1 apple and provita	1	0	1 (4.8%)
	A fruit/juice	1	0	1 (4.8%)

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Afternoon snacks	2 slices bread, little margarine and peanut butter	0	1	1 (4.8%)
	2 slices dry bread	0	1	1 (4.8%)
	1 fruit (apple/pear/orange)	5	1	6 (28.6%)
	an apple and provita	1	0	1 (4.8%)
	a fruit or juice	1	0	1 (4.8%)
	Glucerna or provita	1	0	1 (4.8%)
Evening snacks	2 slices dry bread	4	3	7 (33.3%)
	2 slices bread and peanut butter and little margarine	0	2	2 (9.5%)
	2 slices dry bread and peanut butter	1	1	2 (9.5%)
	2 slices bread, margarine or peanut butter	0	1	1 (4.8%)
	2 slices bread and peanut butter or a fruit	0	1	1 (4.8%)
	2 slices bread, peanut butter/cheese and margarine	0	1	1 (4.8%)
	Glucerna or apple or a slice of bread with peanut butter	1	0	1 (4.8%)
	An apple and provita	1	0	1 (4.8%)
	A fruit/juice	1	0	1 (4.8%)

Table 4: Nutrition educational materials used.

Types of Nutrition Education	Responses for Dietitians who mailed their questionnaires (n = 9)	Responses from Dietitians who were visited (n = 12)	Total n = 21
Nutrition educational materials used			
Foods avoid/allowed lists	4	7	11 (52.4%)
General guidelines	4	6	10 (42.9%)
Sugar Association pamphlets	2	3	5 (23.8%)
Foods avoid/allowed picture list	1	3	4 (19%)
Glycemic Index sheet	1	1	2 (9.5%)
South Africa Diabetes Association Booklet	0	1	1 (4.8%)
Novo Nordisk healthy eating pamphlet	0	1	1 (4.8%)
Healthy diet pyramid	1	0	1 (4.8%)
Three food groups (Appendix 16)	1	0	1 (4.8%)
Hand-written meal plan	1	0	1 (4.8%)
Hand-made poster	1	0	1 (4.8%)
No counselling sheet	1	1	2 (9.5%)
Scientific sources used to compile nutrition education materials			
Information obtained during internship	3	5	8 (38.1%)
Text book: Krause's food, nutrition & diet therapy	4	2	6 (28.5%)
South African Diabetes Association	1	1	2 (9.5%)
Text book: "Nutrition and diagnosis related care"	1	0	1 (4.8%
South African Sugar Association information	0	1	1 (4.8%)
Manual: Trish van Rensburg 1995	1	0	1 (4.8%)
Lecture from University	1	0	1 (4.8%)
Lecture from University	1	0	1 (4.8%)

Counselling of diabetic patients

The majority of dietitians counselled patients either on admission or on the last day of the hospital stay. Table 5 tabulates the counselling approaches that were used by dietitians.

Furthermore, the following question was asked of the dietitians who were visited: "Do you hand out educational materials?" A similar question was asked to the patients: "Did you receive any educational materials?" The results were as follows:

- 66,7% (8 out of the 12 visited hospitals) dietitians reported that they gave educational materials and 33,3% (4 visited hospitals) reported that they did not.
- 80% patients (12 of the 15 patients seen at the 12 visited hospitals) reported that they did not receive nutrition educational materials from the dietitians and 20% patients reported that they received them.

The researcher observed that the majority of patients had already been in the hospital for a period of more than 3 days. The data revealed that what the dietitians reported in this regard did not correspond with responses of the patients. It was therefore unclear if patients were seen at all.

The procedure that the dietitians followed in counselling the patients was also determined. Table 6 below illustrates that procedures followed by dietitians when counselling Type 2 diabetes patients varied.

Procedures A, B, C and D include the explanation of the disease, discussion of the complications and the explanation of the diet or nutrition counselling and implies that most dietitians of Limpopo province dietitians follow this mentioned sequence of procedure. They were not asked if they start by assessing the literacy level of the patient, however it is assumed that all practitioners do so as they establish the rapport.

Information on the knowledge that the patients gained from the counselling was obtained by the question, "What did the dietitian

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Table 5: Counselling information.

Counselling of patients	Specific Theme	Responses for Dietitians who mailed their questionnaires (n = 9)	Responses from Dietitians who were visited (n = 12)	Total n = 21
The dietitians were asked the following question: "When do you counsel the patients?"	Counselled the patients between the first and last day of the hospital stay.	3	5	8 (38.1%)
	Counselled on the last day.	3	3	6 (28.6%)
	Dietitians counselled the patients on the day of admission.	2	2	4 (19%)
	They said that it depended on the situation and the workload.	1	1	2 (9.5%)
	Did not respond to this question.	0	1	1 (4.8%)

Table 6: Procedure for counselling of diabetic patients.

Procedure of counselling (in logical Sequence of actions)	Responses for Dietitians who mailed their questionnaires (n = 9)	Responses from Dietitians who were visited (n = 12)	Total n = 21
Procedure A a) explain the disease b) signs and symptoms c) take the diet history d) explain the diet e) discuss the long-term complications f) ask questions	2	4	6 (28.6%)
Procedure B a) explain the disease b) discuss the causes c) discuss the complications d) discuss the diet/treatment	1	3	4 (19%)
Procedure C a) explain the disease b) assessment c) take diet history d) explain the diet e) give nutrition education f) counsel the relative	2	1	3 (14.3%)
Procedure D a) explain the disease b) discuss the complications and symptoms c) explain the medication d) explain the diet	0	2	2 (9.5%)
Procedure E a) give education b) work out meal plan and explain	1	0	1 (4.8%)
Procedure F a) take the diet history b) explain the disease c) nutrition counselling	0	1	1 (4.8%)
No response to the questions	3	1	4 (19%)

tell you?" posed to the 15 patients. The feedback from the patients about the knowledge gained from counselling is summarised below. Patients reported the following:

- *"Not to eat oil or fried foods, to use no sugar or salt in the meal and to eat only mabele* (Sorghum) *porridge" (n=1);*
- *"Only received an information sheet without any counselling from the dietitian" (n=1);*
- *"Eat a lot of fruit and mabele porridge" (n=1);*
- *"Not to eat too much, to eat small frequent meals without fat and sugar" (n=1);*
- *"Wasn't seen by a dietitian" (n=11).*

The researcher observed that the 11 patients that had not been seen by a dietitian at the time had already been in the hospital an average of 10 days (3-21days).

Discussion

The study revealed that one-third of participating dietitians in Limpopo saw patients upon receiving referrals from physicians and 25% did so after physicians' referrals and ward rounds. In the South African health system, physicians are expected to refer patients to dietitians [16]. However, dietitians in hospitals could use other means to identify patients without depending on referrals. It has been stated [17] that specialists and other health professionals should aim their efforts at coordinating the care of patients and should identify aspects of high-quality care to result in better outcomes for patients. Better patient outcomes have been linked to coordinated efforts by specialists and other health professionals [18] who should use their knowledge to integrate information about a patient's clinical condition, eating and lifestyle habits and for establishing treatment goals in order to determine a realistic plan for nutrition therapy [18].

The best approach for diabetic diets is an individualised diet that relates to the patient's personal lifestyle, culture and socioeconomic status [19]. Treatment must be individualised to suit a patient's health status, capabilities, desire to control and resources [20]. The study revealed that more than two-thirds of dietitians did not use specific scientific sources to plan diet management on a regular basis. It is recommended that appropriate dietary prescriptions be done for good diabetes control [21]. Dietitians indicated the use of scientific sources for compiling nutrition educational materials, which form part of diet management. More than one-third compiled nutrition educational materials from information obtained from their training, whereas 28.5% used the available literature. The use of current scientific sources is critical, particularly regarding the use of the glycaemic index (GI) concept and glycaemic load of meals [22]. Unless dietitians continuously use up-to-date scientific sources, they are likely to miss new research regarding dietary management of type 2 diabetes. An individualised nutrition care plan that includes calculations and use of reference material as scientific sources is recommended [19,23].

The study revealed that the majority (90.5%) of participating dietitians in Limpopo served three main meals per day and 47.6% served two snacks per day, while 28.6% served three snack meals per day. Several studies have suggested that type 2 diabetic patients

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might benefit from increased meal frequency [15,21,23,24]. Frequent meals have been shown to reduce the insulin average, free fatty acids, glucose and urinary C-peptide excretion levels. The number of snacks usually recommended is three and participating dietitians gave three main meals and 2-3 snack meals a day. This indicates the adherence to the suggested increased meal frequency for type 2 diabetic patients [15]. The carbohydrate distribution for the diabetic is critical to prevent bouts of hypoglycaemia [15]. The carbohydrate load of each snack could not be calculated due to lack of information of quantities of food prescribed by the dietitians.

The study revealed that participating dietitians used a variety of dietary management approaches when treating type 2 diabetes. The majority of dietitians did not individualise the diets or menus of patients. They used adaptations to the usual menus, focusing on cooking methods and fat content, while ignoring total meal quantity and carbohydrate load. The number of meals (3) and snacks (2) given was in accordance with the recommendations [25]. On the other hand, the participating dietitians were giving two slices of bread where they might have substituted a slice of bread with a protein-rich food such as beans. Furthermore, they might have given the patients low-fat yoghurt or milk as protein sources along with the two slices of bread [26]. Most dietitians gave an apple, pear or orange (low-GI fruits) as per recommendation [25].

The study revealed that the majority of participating dietitians (85.7%) did not use a specific planned and compiled diabetic menu for type 2 diabetic patients in Limpopo hospitals. Health care facilities in general are expected to provide special or adapted menus, with clear quantities and meal plans for diabetic diets of various energy levels [19]. Jenkins et al. reported that a low-GI diet improves blood glucose control in type 2 diabetic patients (obese and non-obese) by diet alone, oral agents or insulin [27]. Others concurred after finding that a high-carbohydrate [28], low-fat diet resulted in increased triglyceride concentrations and decreased serum LDL and HDL cholesterol. This highlights the importance of menu planning and choosing food items and cooking methods that will result in low-fat, low-GI diets. In this study, the amount of carbohydrates in the diets could not be determined due to lack of specific quantities. Several studies have found improvement in glycaemic control with low-GI diets [27,29]. Diabetic patients on low-GI diets benefited from a reduction in glycosylated proteins, which indicated an improved glycaemic control [28].

The fact that few participating dietitians in Limpopo were using the GI concept could be due to lack of training on this concept and the lack of continuous education on the concept and its application. It was observed that most of these dietitians were afraid to use this concept and that each dietitian had a different understanding of the concept, which could be confusing for patients. One practice that was not taken into consideration was the use of deciduous fruit or berries, i.e. if the patient had a preference for an intermediate-GI fruit (e.g. banana) or a high-GI fruit (e.g. watermelon), it has to be combined with a low-GI fruit (e.g. pear, apple or orange) or with low-fat milk or yoghurt [26]. These observations showed that the GI concept was hardly used by participating dietitians. One good practice observed, however, was the use of educational materials, even though not all patients were counselled on time. Practices varied between participating hospitals and this may affect patients who are transferred from a district to a referral hospital or primary health care setting.

Considering the types of nutrition education and the content of educational materials, it was found that 38.1% of participating dietitians counselled patients between the first and last day of their hospital stay, 47.6% counselled patients on either the first or the last day, 38.1% used information obtained during internship and 28.5% used available literature to compile nutrition educational materials. In addition, 66.7% of participating dietitians reported giving nutrition educational materials to their patients, 76% reported counselling patients in their home language and 52.4% used foods to avoid/allowed lists when counselling type 2 diabetic patients.

In contrast, 80% of the participating patients reported that they had not received nutrition educational materials, 73.3% reported that a dietitian did not see them and most of them had already been in hospital for more than three days, while 66.7% of the dietitians reported having issued them. This raises concern about the accuracy of the dietitians' data. The dietitians' response could be a reflection of what they normally did, because only 20% of the patients who had been seen by the dietitians reported having received nutrition education material. This calls for urgent attention to be paid to individual and group activities in the hospitals, which must be planned by dietitians to achieve dietary knowledge, acquisition and integration in everyday eating patterns [30]. The dietitian must spend one hour with the patient on the first day of their hospital stay to develop a personalised dietary plan. In addition, the dietitian throughout a five-day hospital stay must plan two hour-long workshops [10,11]. Finally, the dietitian must train patients to diversify their eating habits and to accommodate changing daily-life settings [11,18]. A psycho-educational nutritional programme of one week has been reported to allow a significant improvement in the elementary behaviour of patients two years after intervention [31]. It was also recommended that the whole family be included in the dietary information session to optimise adherence to dietary changes [8,9,10,11,15]. Dietitians were not asked whether family members of patients were included, but this would have provided further insight on their approach to dietary management of diabetic patients in participating hospitals.

The procedures that the dietitians used when counselling patients also varied. Most procedures included an explanation of the disease, a discussion of the complications and an explanation of the diet or nutrition counselling. It has been suggested that glycaemic control of type 2 diabetic patients improved significantly, when meal-related self-monitoring of blood glucose in combination with the educational tools of an eating diary and a standardised counselling session were implemented [10,32]. The national programme for control and management of type 2 diabetes indicates that patient education should include diagnosis, explanation and recognition of diabetes symptoms [33], treatment of hypoglycaemia and recognition of hyperglycaemia symptoms, good dietary management, physical activity and awareness of complications. Counselling should include disease acceptance, reassurance of continuity of care, value of compliance and introduction of self-care [10,11,33].

The feedback of the patients (20% counselled, 4 of 15) on the knowledge that they gained from counselling revealed that they did

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not gain a great deal of knowledge. They mostly remembered that they must eat *mabele* (sorghum) porridge. Inadequate patient skills, knowledge and motivation about self-care have been reported as important determinants of adverse health outcomes [34]. This can be explained by the fact that 80% of patients (11 of 15) reported that a dietitian had not seen them at the time of data collection.

In conclusion, it is thus important that efforts should be put in place to ensure that all dietitians in the same province use similar dietary management approaches for type 2 diabetes. The South African guidelines for diabetes management [32] should be updated regularly to incorporate new scientific information. Furthermore, dietitians must regularly attend continuing professional development training sessions on diabetes management and other conditions. It has to be noted, however, that the study focused on dietitian practices rather than holistic management of type 2 diabetic patients, the mobility of patients between health facilities and the nutrient composition of meals was not determined due to lack of information on meal quantities.

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