

Feeding behavior of patients with type 2 diabetes living at Cotonou, Benin

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ABSTRACT

Objectives: The objective of the study is to assess the feeding behavior of diabetic patients.

Methodology: This is a cross-sectional and descriptive study that was conducted among type 2 diabetes followed at the screening, monitoring and treatment center in Cotonou. Eating behavior was assessed through the food diary for 72 h.

Results: In total 107 patients were included in the study. Sex ratio was 0.52. The mean age of the target population was 53.95 ± 11.36 years. Energy intake is high in 19 patients (17.75%). Fruit and vegetable consumption was normal in only 6 patients (5.61%) and 68 patients (63.55%) acceptable food consumption score.

Conclusion: Analysis of the feeding behavior of type 2 diabetes noted deficiencies. Improve nutrition through patient education is needed.

Introduction

Diabetes mellitus is a public health problem because of its increasing prevalence and its complications. The number of diabetes is increasing. In 2015, 415 million people suffer from diabetes worldwide. Projections for 2035 and 2040 are, respectively, 592 million and 642 million according to the International Diabetes Federation. The people living in Africa south of the Sahara who has fewer resources to control diabetes will see her population of diabetics increased from 19.8 million in 2013 to 41.4 million in 2035 [1]. Faced to this exponential increase in number of diabetics, the challenge is to ensure good management of diabetes mellitus to delay complications and reduce mortality from this chronic disease. Identify individuals in early stages of diabetes mellitus is fundamental in order to potentially prevent the occurrence of DM and its related, systemic complications according to Ciccone et al. [2]. Study Good

glucose control in diabetics includes the use of anti-hyperglycemic agents and also lifestyle modifications [3]. A good diet combined with regular physical activity is one of the fundamental elements in the management of diabetes [4]. It is effective and free ways that should be known and adopted by all diabetes especially in developing countries like Benin where the prevalence of diabetes increases like other countries. This study aims to assess the feeding behavior of diabetic patients and identify areas for improvement. The results of this study will be used as parts of an effective therapeutic nutrition education into account the realities of Benin.

Patients and methods

This is a cross-sectional and descriptive study that was conducted among type 2 diabetes followed at the screening, monitoring and treatment center in Cotonou. Diabetics under

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KEYWORDS

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- diabetics
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18 years with impaired general condition or unable to respond questions were excluded to the study. Energy intake was assessed by a food diary for 72 h with 2 working days and one day on weekends. Energy requirements were calculated by the formula of Harris and Benedict. Energy intake was considered normal if it's equal to ± 200 kcal of energy requirements; low if less than 200 kcal and high if exceeds 200 kcal energy requirements. The lipids intake was considered normal if it's between 20% and 35% of energy, low if less than 20% and higher if greater than 35%. The protein intake is considered normal if it's between 15% and 20% of energy requirements, low if less than 15% and high if greater than 20%. The carbohydrate intake is considered normal if it's between 45% and 60% of energy requirements, low if less than 45% and high if greater than 65%. Alcohol intake is harmful if it's exceeds 20 g per day for men or 10 g in women. Less than 5 servings of fruits and vegetables daily were considered low consumption. Meal with starches, vegetables, meat and alternatives, and fruit is considered balanced. The dish is balanced when all three main meals (breakfast, lunch and dinner) are balanced. The food consumption score is considered as acceptable when it's greater than or equal to 45 and was calculated by the following formula:

$$\begin{aligned} & \text{starchy} \times \text{xi}_{\text{starchy}} + \text{ai}_{\text{legumes}} \times \text{xi}_{\text{legumes}} + \text{ai}_{\text{vegetables}} \times \text{xi}_{\text{vegetables}} + \\ & \text{ai}_{\text{fruit}} \times \text{xi}_{\text{fruit}} + \text{ai}_{\text{animal}} \times \text{xi}_{\text{animal}} + \text{ai}_{\text{sugar}} \times \text{xi}_{\text{sugar}} + \\ & \text{ai}_{\text{milk}} \times \text{xi}_{\text{milk}} + \text{ai}_{\text{oil}} \times \text{xi}_{\text{oil}} \end{aligned}$$

ai is the weight attributed to the food group and xi the number of days per week of consumption on each food group. The weight given to different food groups is indicated in **TABLE 1**.

The nutritional status of patients was assessed by body mass index. Waist circumference is normal when it's below 80 cm for women and 94 cm for men. Subjects practicing less than 30 min of brisk walking per day are considered sedentary. The data will be entered and analyzed using the Statistical Package for Social Sciences (SPSS) Version 20.0.

Results

In total 107 patients were included in the study. Women were mostly represented 70 against 37 men respectively 65.42% against 34.58 % with sex ratio of 0.52. The average age was 53.95 ± 11.36 years. The majority of the subjects were the diabetics (age ≥ 40) and represented 90.65% of the study population. The diabetes

screening average was 5 ± 1.13 years. High blood pressure was observed in 45 patients (42%). Body mass index (BMI) was 28.54 ± 6.12 kg/m². Overweight and obesity were observed respectively in 34 (31.77%) and 40 (37.38%) patients. Physical inactivity was observed in 75 patients (70%). Most patients (94.39%) used oral ant diabetic as anti-hyperglycemic therapy. **TABLE 2** shows the general characteristics of diabetic patients in this study.

Energy intake is high in 19 patients (17.75%), the carbohydrate is high in 80 patients (74.76%), the protein is high in 18 patients (16.83%) and the lipid is high in 44 patients (41.12%). Only 11 patients (10.28%) consumed alcohol; among these 7 (63.63%) had a harmful consumption. Fruit and vegetable consumption was normal in only 6 patients (5.61%), 13 patients (12.15%) had a balanced attitude and 68 patients (63.55%) acceptable food consumption score. The feeding behavior of diabetics is mentioned in **TABLE 3**.

Discussions

This study describes the feeding behavior of type 2 diabetes in the city of Cotonou. The diabetic population of this cohort of adults have an average age of 53.95 ± 11.36 years and female predominance. The average age was similar to that reported by Shadman et al. [4] and Sebbani et al. [5] respectively 55 ± 10 and 56.8 ± 10.3 years. The female predominance was also reported by Sayad et al. [6]. The appreciation of the diabetic diet is made in accordance with nutritional recommendations. [7] The food diary for 72 h with 2 working days and one day for the weekend is an acceptable dietary assessment method. It provides a reliable average of daily food intake. Diabetics should adopt a varied and balanced diet not only providing macronutrients and micronutrients necessary for the proper functioning of the body but also allowing good glycaemia control and prevention of complications of diabetes and cardiovascular diseases. A good nutritional intervention must respect the socio cultural, religious, economic and eating habits of diabetics. Energy intake was abnormal in most patients, less than 20% of patients had normal energy intake. This may encourage under nutrition in the case of insufficient energy intake with consequent susceptibility to infection, slow wound healing and low muscle. When energy intake is high, it can promote overweight who is a risk factor and poor control of diabetes. In the study of Sayad

et al. [6] energy intake was high in 66.66% patients. The anomaly of energy intake observed in this study is the result of inadequate intakes of macronutrients such as carbohydrates, proteins and lipids. Nearly 3 out of 4 patients (74.76%) have a high carbohydrate intake. This reflects the Beninese diet. The Beninese diet contains high level of carbohydrate which can promote poor control of diabetes mellitus because of postprandial hyperglycemia. The high intake of carbohydrate was also reported by Sayad et al. [6] in 50% of diabetic cohort of their study. Some patients have a low carbohydrate diet due to their effect on blood sugar. This behavior can promote hypoglycemia, malnutrition and impaired concentration. In the study of Balk et al. [8], the carbohydrate intake of diabetics was low and represented 42.3% of total energy intake. Regarding other macronutrients, 77% and 90% respectively have an abnormal intake of protein and lipid. In the study of Li-Jun et al. [9], the average intake of lipid is high and represents 40.4% of total energy intake, while protein intake is low (10.4% of energy intake). Consumption of alcohol should meet the general recommendations; alcohol is not forbidden and must be taken moderately if consumed. However diabetics on insulin, sulfonylurea or having degenerative complications such as neuropathy or erectile dysfunction should abstain. In this study, few patients consume alcohol; among the minority of patients who consumes, two thirds have harmful consumption. A reduction in alcohol consumption is necessary for these patients to reduce the harmful effects of alcohol. The harmful use of alcohol was also reported by Kang et al. [10], with a mean of 24.6 ± 2.6 g per day exceeding the recommendations (10 g for women and 20 g for men). Fruits and vegetables are rich in minerals, vitamins, antioxidants and fiber. These various constituents of fruits and vegetables are beneficial to health especially in diabetics. The carbohydrates in fruit are fructose and have no impact on blood sugar when consumed moderately. Despite the beneficial effects of fruit and vegetable, their consumption was lower in the diabetic population of this cohort; only 5.61% had normal consumption. This low consumption of fruits and vegetables is due to the sweet taste of fruit that has contributed to their abandonment of fear of having hyperglycemia and inaccessibility reported vegetables while they are available all year and cost. Insufficient consumption of fruits and vegetables has been reported by other studies. In the study of Jacks

Table 1. Weight assigned to different food groups.

Food groups	Weight
Starchy	2
Legumes and nuts	3
Oil	0,5
Vegetables	1
Fruits	1
Meat and fish	4
Milk	4
Sugar	0,5

Table 2. General characteristics of type 2 diabetes patient followed in the screening, monitoring and treatment center of Cotonou in 2014 (n=107).

Variables	n (%)
Sex	
Female	70 (65,42)
Male	37 (34,58)
Age	
<40 years	13 (12,14)
≥ 40 years	94 (81,86)
Seniority of diabetes screening	
<1 year	29 (27,10)
≥ 1 year	78 (72,90)
HTA presence	
Yes	45 (42,05)
No	62 (57,95)
MUAC	
<21 cm	2 (1,87)
≥ 21 cm	105 (98,13)
Nutritional status	
Undernutrition	2 (1,87)
Normal	31 (28,97)
Overweight	34 (31,77)
Obesity	40 (37,38)
Waist size	
Normal	15 (14,01)
High	92 (85,99)
Activity level	
Sedentary	88 (82,24)
Assets	19 (17,76)
Type of anti-hyperglycemic	
Oral antidiabetic	101 (94,39)
Insulin	6 (5,61)

et al. [11], 32 % of patients do not eat fruits and in the study of Arques-Vidal et al. [12], only 1.5 vegetable serving is consumed per day. In the study of Glabska et al. [4], only 40% of diabetics had normal consumption of fruit and vegetables. Sucrose and sucrose-containing drinks promote hyperglycemia in diabetics. Sucrose a dispensable nutrient whose consumption should be moderate (less than 10% of energy intake). Sucrose-related recommendations are observed in diabetes in this study where its consumption is observed in only 7.47% of patients. In the

Table 3. Feeding behavior of diabetic type 2 patients followed in the screening, monitoring and treatment of Cotonou in 2014 (n=107).

Variables	n (%)
Energy intake	
Low	69 (64,50)
Normal	19 (17,75)
High	19 (17,75)
Carbohydrate intake	
Low	13 (12,15)
Normal	14 (13,09)
High	80 (74,76)
Protein intake	
Low	65 (60,74)
Normal	24 (22,43)
High	18 (16,83)
Lipid intake	
Low	53 (49,53)
Normal	10 (9,35)
High	44 (41,12)
Harmful use of alcohol (n=11)	
Yes	7 (63,63)
No	4 (36,37)
Fruits and vegetables consumption	
Low	101 (94,39)
Normal	6 (5,61)
Sucrose consumption	
Yes	8 (7,47)
No	99 (92,53)
Sugary soft drinks consumption	
Yes	7 (6,54)
No	100 (93,46)
Use sugar substitutes	
Yes	16 (14,95)
No	91 (85,05)
Balanced plate	
Yes	13 (12,15)
No	94 (87,85)
Food consumption score	
Acceptable	68 (63,55)
Insufficient	39 (36,45)

study Gajda et al. [13], sucrose consumption was observed in 9% of diabetics; a proportion comparable to that of the present study. Sugar substitutes have no significant effect on blood sugar and replace sucrose with their sweetness. Their use remains low among diabetics in this study. In the study of Arques-Vidal et al. [12] sweeteners are consumed by diabetics once per day. The Balanced Plate allows diabetics to have a varied and balanced diet but also promotes a low glycemic index and carbohydrate load diet promotes good postprandial glucose profile. Only 12.15% of diabetics in this study have a balanced dish compromising the food consumption score which is still low at 36.45%. The eating habit of diabetics with a corn-based cream in the morning partly explains the low proportion of the plate balanced and low food consumption score. In the study of Glabska et al. [4], food diversification is observed in 44.2% of diabetics.

Conclusion

The feeding behavior of type 2 Diabetes is characterized by an abnormal energy intake, low consumption of fruits and vegetables, unbalanced plate and harmful alcohol consumption in certain patients. Therapeutic nutrition education taking into account the different insufficient in type 2 diabetics is needed.

Conflicts of study

This study has limits cause of limit number of diabetics of the study. Another study on a grand scale includes all diabetics of the country would be necessary.

References

- Kyari F, Tafida A, Sivasubramaniam S *et al.* Prevalence and risk factors for diabetes and diabetic retinopathy: results from the Nigeria national blindness and visual impairment survey. *BMC. Public. Health.* 14, 1299-310 (2014).
- Ciccone MM, Scicchitano P, Cameli M *et al.* Endothelial function in pre-diabetes, diabetes and diabetes cardiomyopathy: a review. *J. Diabetes. Metab.* 5(4), 1-10 (2010).
- Shadman Z, Khoshniat M, Poorsotan N *et al.* Association of high carbohydrate versus high fat diet with glycated hemoglobin in high calorie consuming type 2 diabetics. *J. Diabet. Metabol. Disord.* 12, 27-35 (2013).
- Glabska D, Wlodarek D. Analysis of the declared nutritional behaviors In a group of diabetology nurses educating patients about diabetes diet therapy. *Rocz. Panstw. Zakl. Hig.* 66(4), 345-351 (2015).
- Sebbani M, El Ansari N, El Mghari G *et al.* Apports alimentaires durant le mois de ramadan chez le patient diabétique de type 2 marocain. *La Revue. de. Santé. de. la. Méditerranée. orientale.* 19(3), 276-281 (2013).
- Sayad N, Ridouane S, Essadouni L. Comportement alimentaire chez les diabétiques de type 2 à Marrakech (Maroc). *Médecine. des. maladies. Métaboliques.* 3(5), 544-546 (2009).
- Ley SH, Hamdy O, Mohan V *et al.* Prevention and management of type 2 diabetes: dietary components and nutritional strategies. *Lancet.* 383, 1999-2007 (2014).
- Balk SN, Schoenaker D, Mishra GD *et al.* Association of diet and lifestyle with glycated haemoglobin in type 1 diabetes participants in the EURODIAB prospective complications study. *Eur. J. Clin. Nutr.* 70, 229-236 (2016).
- Li-Jun Y, Sheng J, Shi-An S *et al.* Comparison of dietary energy and macronutrient intake at different levels of glucose metabolism. *Int. J. Clin. Exp. Med.* 8(8), 12942-12648 (2015).
- Kang H, Kim D. Total Energy Intake May Be More Associated with Glycemic Control Compared to Each Proportion of Macronutrients in the Korean Diabetic Population. *Diabetes. Metab. J.* 36, 300-

- 306 (2012).
11. Jaacks LM, Du S, Mendez MA *et al.* Comparison of the dietary intakes of individuals with and without type 1 diabetes in China. *Asia. Pac. J. Clin. Nutr.* 24(4), 639-649 (2015).
 12. Arques-Vidal P, Vollenweider P, Grange M *et al.* Dietary intake of subjects with diabetes is inadequate in Switzerland: the CoLaus study. *Eur J Nutr.* 1, 1-9 (2016).
 13. Gajda K, Sulich A, Hamulka J *et al.* Comparing diabetic with non-diabetic overweight Subjects through assessing dietary intakes and key parameters of blood biochemistry and haematology. *Rocz. Panstw. Zakl. Hig.* 65(2), 133-138 (2014).