

Research Article

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Assessment of Nutritional and Physical Inactivity Risk Factors Related to The Management of Type 2 Diabetes in Bamako, Mali

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SUMMARY

Objectives: The prevalence of diabetes is increasing rapidly in sub-Saharan Africa. Lifestyle and dietary measures play a key role in controlling glycemic imbalance and cardiovascular complications of diabetes. The objectives of this study were to describe the nutritional factors of type 2 diabetic patients followed in the reference health centers of Bamako, to describe their dietary and physical exercise practices and to identify the factors influencing them.

Methods: This was a descriptive and analytical cross-sectional study that took place in 2021 in the health structures of Bamako. A total of 240 diabetics were included.

Results: The patients had an average age of 57 ± 10.86 years and had been diabetic for an average of 5.3 ± 4.9 (1 - 23) years. The main comorbidities were overweight (70%), high blood pressure (36.3%) and (22.5%) reported having nocturnal hypoglycemia. More than half of the patients, or 64.2%, said they had received recommendations from doctors – diabetes referents related to foods not recommended for diabetics. Regarding their eating habits, 73.3% did not skip meals and ate at fixed times and 60.8% ate out of the house. The foods most concerned were sweets (34.2%) and fatty and fried preparations (27.5%). Participants said (78.3%) that they exercised because of diabetes. The types of physical exercise practiced were (76.3%) for walking; 35.8% for climbing stairs. 37.5% said they practiced it at least 3 to 5 times a week and 16.3% more than 5 times a week.

In addition, the relationship between following the doctor's recommendations and normal BMI was statistically significant, as were glycemic control and the practice of physical activity ($P=0.003$).

Conclusions: Strengthening nutritional care and improving physical exercise through therapeutic education sessions is essential to improve the dietary practices of type 2 diabetics in Mali.

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Introduction

Non-communicable diseases, including diabetes, are beginning to weigh in low- and middle-income countries. They are still faced with the challenges of malnutrition due to deficiency and infectious diseases [1]. It is true that eating habits in West Africa have changed significantly in recent years. This development is rooted in strong urban growth and persistent economic difficulties.

The WHO thus defines the goal of therapeutic education by alluding to empowerment in its document on health promotion as “a process enabling people to increase their control over illness in order to improve their health [2]. The International Diabetes Federation (IDF) published in 2002 “the International Program

for the Education of Healthcare Professionals in Diabetes”, the version of which was updated in 2008 [3]. In the USA, a report containing recommendations and examples of good practice was soon followed by recommendations concerning the use of patient education models for diabetes [4]. The guidelines recommend that educational interventions reflect established principles of adult education and active learning. Diabetes experts have developed modules with input from educators around the world [5]. The effectiveness of the implementation of therapeutic education no longer needs to be demonstrated; evidenced by the decrease in the frequency of diabetic comas due to acidosis, amputations and health costs. In 1995, Franz et al. conducted a six-month study of 179 people with type 2 diabetes whose average duration of diabetes was four years [6]. Sixty-two people with similar characteristics constituted a control group [3]. The results of this

research showed that glycosylated hemoglobin decreased by 0.9% in six months (from 8.3 to 1.4%) in the group who received advice on nutritional practices compared to the control group without nutritional intervention in which HbA1c remained unchanged [3,6].

Our bibliography search identified eleven studies involving 1532 participants, which had demonstrated the beneficial effect of group education of patients concerning type 2 diabetes, respecting certain observations [3]. Analysis of food consumption in Mali wants the food day to be punctuated by three daily meals: breakfast, lunch and dinner. These last two are usually made up of a single dish. These meals are very complex and influenced by a combination of factors, including socio-cultural, economic and geographic. The therapeutic education process essentially comprises three stages: an “educational diagnosis” stage, aimed at defining needs. Based on this diagnosis, a definition of the skills to be acquired is made, from which flow the learning techniques that will be used. Finally, the evaluation aims to determine whether the skills have been acquired: this is appreciate “what the patient knows” [7]. The implementation of the diet must adapt to the lifestyles of diabetic patients and take into account the subject’s weight, physical activity, eating habits, possible prohibitions, cultural customs and professional constraints [8]. However, it is necessary to carefully assess the patient, his abilities and the risks involved. Assessing the patient’s motivation to change their behavior is an essential element of the success of the physical activity plan [9]. Nutritional therapy in the diabetic patient has a double objective: on the one hand, to contribute to the glycemic balance on an empty stomach and in the postprandial phase; on the other hand, to limit complications that are not strictly related to hyperglycaemia: arterial hypertension (HTA), renal insufficiency and neurological and ophthalmological complications [10]. Studies of randomized interventions and observations of medico-nutritional therapies for diabetes provided by registered dietitians have shown improvement in blood sugar with a drop in glycosylated hemoglobin (HbA1c) of the order of 1 to 2 units [6]. Thus, the three-month UKPDS study involving 3042 patients newly diagnosed with type 2 diabetes, shows that of 2595 patients who followed nutritional therapy (447 did not continue the study), hemoglobin glycosylated protein decreased by an average of 1.9% (from 8.9 to 7.0%) during the three months (UKPDS 1990) [11].

The nutritional recommendations for a diabetic subject do not differ significantly either in quantity or quality from those which are desirable for a non-diabetic subject of the same sex, age, weight and comparable physical activity, wishing to maintain good health. health (Monnier et al., 1995; ADA. 2003 and 2004 c) [12]. The differences lie in the regularity of carbohydrate intake from one day to another and in their distribution during the day, which varies according to the treatments administered and the glycemic results observed [11]. It has been recognized that the adoption of skills (ie the ability to learn how to perform an act, to perform a skill) by people with diabetes is necessary [13]. Effective management lies almost entirely in the hands of the patient. However, a professional approach to health, centered on the medical model, is still traditionally used [14]. Successfully promoting change in diet and in habits and lifestyle to meet nutritional recommendations is one of the greatest challenges for diabetes educators. A meal plan is not a diet, but rather a guide to good eating practices and healthy food choices. Many people with diabetes need a well-structured meal plan, which defines the types and amounts of food and the frequency of consumption [15]. The objective of each method is to help the diabetic to balance his food intake according to his nutritional needs [16].

A study was conducted in Mali in 2008. These results tested three diets and three bowls: the small bowl (250 ml), the medium bowl (460 ml) and the large bowl (600 ml). Given the constraints related to the use of several bowls, and in order to facilitate patient adherence to the proposed diet, an average standard bowl of 460 ml was selected under the instructions of CNLD doctors [17]. There is a food exchange system in Mali which enabled the implementation in 2008 of a food guide for diabetic patients [11]. Food equivalents were determined from the food composition table. It includes eight groups, with legumes representing a distinct group from that of meat and alternatives [18]. The prospects in terms of solutions to combat diabetes remain a public health issue. In this article we give ourselves the opportunity to study What benefit brings to a diabetic patient, the therapeutic education in terms of knowledge on the disease and in terms of clinical and biological results.

Objectives

The main objective of this work is to study the observance by diabetic patients of the recommendations of health professionals and to compare knowledge about the disease and the characteristics of diabetes in educated patients and in those who have not received any education.

Methodology

This study took place in the six reference health centers (CSREF) of the district of Bamako with 240 type 2 diabetic patients. It was an analytical cross-sectional study which took place over a period of six months. from February to July 2021. During the pre-survey stage, we sent an information and awareness letter by post to hospital structures targeting the managers of these structures, but also the diabetes referent doctors before us, to facilitate the collection of data from patients. We judged that this sample was representative of the active patient file followed in the CSREFs. It should be noted that we are leaning on the line of people with diabetes. Using this registry, we randomly selected study participants. The research project team conducted in-depth interviews with selected participants meeting the inclusion criteria who agreed to participate.

Course of the study

This phase was conducted with patients followed in consultation at the level of the six (06) CS Ref. The referring physicians were asked to pass on the information to the patients and thus facilitate the administration of the questions. Inclusion criteria: All confirmed type 2 diabetic patients who came for consultation during the study, agreeing to submit to our questionnaires. The non-inclusion criteria were type 1 diabetic and gestational patients. Sociodemographic, clinical and paraclinical parameters were recorded on the questionnaire. Then we carried out a semi-structured interview lasting about an hour, to complete the remainder of the questionnaire. The codified questionnaire was administered to most patients in the local Bambara language.

We explored the knowledge of our subjects as well as their daily practices in relation to diabetic diet using semi-open or open questions. We recorded the food consumed by each participant the day before using the 24-hour recall method. Because of its ease of administration, this method provides detailed information and is suitable for illiterate populations when the interview is conducted by an experienced person. In our study, the team asked participants to recall their food intake in the 24 hours prior to the interview. Subjects were asked to go back to the previous day if the 24 h preceding the interview was a special day.

Then, for each participant, we collected information on the foods consumed in the last month before the interview and during a typical year according to the seasons. The participants' knowledge and daily practices in relation to physical exercise were explored through semi-open or open-ended questions. This involved analyzing the ability of participants to understand, retain and apply the information (recommendations) prescribed to them by the doctor as part of their nutritional care, as well as the obstacles related to their application. This point was explored using semi-open or open-ended questions: for diet and physical exercise.

Data analysis

Globally and specifically, the analysis of our data was carried out using SPSS software exported to Excel. The data was collected on a survey form. They were then entered and analyzed using the SPSS software (Statistical Package for the Social Sciences) 23.0 French version. We used numerical values to code the answers to the questions. The results were presented in the form of a table, graphs in Excel and Word. We used Pearson's chi-square statistical test with a significance level ($P \leq 0.05$) to compare the different results.

Ethical consideration

Our research was the preparatory phase of a pilot study adapting the US CDC's "Power to Prevent" diabetes prevention program in Bamako, Mali. The overall goal was to provide these tools for use in other cities in Africa at high risk of diabetes and cardiovascular disease. We submitted to the Ethics Committee which was approved (appended).

Results

General Characteristics of Participants

A total of two hundred and forty (240) volunteers took part in the study, received in consultation in the 6 CS Ref of Bamako. The average age of the participants is 57 ± 10.86 years and 73.3% are women. 30% of the participants were out of school, and only 32% had reached the primary level. The majority of participants were married (80.4%) and 54.6% were housewives.

The average diabetes duration of the participants was 5.3 ± 4.9 years. 46.6% had HBA1C above the norm. 22.5% reported having nocturnal hypoglycaemia. 36% of participants had a comorbidity related to high blood pressure. More than a third (40%) of participants were overweight and 30% were obese. In total about 70% of our participants in this study were overweight/obese (Table 1).

Power Management

The majority of participants (64.2%) said they received recommendations on good dietary practices from the doctor. The recommendations insisted on less sugary meals (82.5%), less fatty meals (72.9%), more vegetables (71.3%). 73.3% of our participants said they didn't skip meals and ate at set times. 60.8% often took meals outside the home, the reasons mentioned for these were: social reasons (44.2%), work (14.2%), hunger (5%), pleasure (3.3%) (Table 2). The foods and drinks consumed at home by the participants during the last 24 hours preceding the interview are at breakfast, 70.4% ate non-recommended foods; at lunch, 38.4% ate non-recommended foods; at dinner, 25.8 ate non-recommended foods (Table 3). 35% of our participants did not eat snacks, 65% did. Types of snacks taken per day: one or two fruits per day (39.6%), sweet tea (34.2%), fried foods (27.5%). 52% of our participants ate fried foods outside the home (cakes, potatoes, fish, etc.), which are foods that are not recommended (Table 4).

Physical Exercise

Participants said (78.3%) that they exercised because of diabetes. The types of physical exercise practiced were (76.3%) for walking; 35.8% for climbing stairs. 37.5% said they practiced it at least 3 to 5 times a week and 16.3% more than 5 times a week (Table 5). 67.1 followed the recommendations most of the time even though the majority of the participants said **they understood little at 68.8% the recommendations made by the doctors. 32.9% failed to follow the diet recommendations made by the doctor most of the time. Recommendations that participants failed to follow include: measuring meals with measuring bowls (36.7%), not eating to fullness (30%), limiting oil intake (27.5%). Habits (46.7%), financial means (45%), common dishes (40.8%), hunger (26.7%), taste (16.3%) are the reasons most cited by the participants, why they fail to follow the doctor's dietary recommendations. The methods for following recommendations are grouped together: "I take the doctor's recommendations into account when buying food" (19.2%), "I take care of buying my food" (14, 6%), "I don't eat enough" (11.7%) (Table 6).**

Multivariate Analysis

The relationship between glycemic control and BMI and adherence to physician and patient recommendations was statistically significant ($P=0.003$) (Table 7 and 8). There is no significant association between meals away from home and glycemic control. ($P=0.056$) (Table 9).

Table 1: Characteristics of medical history (N=240)

Features	not	%	M ± Et (min - max)
Duration of diabetes			5.3 ± 4.9 (1 - 23)
• Less than 5 years	136	56.7	
• 5 to 10 years old	72	30	
• More than 10 years	32	13.3	
Fasting blood glucose			
• High (> 1.26 g/l)	120	50	
• Normal (between 0.80 and 1.26 g/l)	114	47.5	
• Low (< 0.80 g/l)	6	2.5	
HbA1c (done recently)			
• Normal (below 6.5)	39	16.3	
• High (greater than 6.5)	112	46.6	
• Not done	89	37.1	
Arterial pressure			
• Normal (between 100/60 and 130/80 mmHg)	153	63.8	
• Elevated (> or = 140/90 mmHg)	87	36.3	
Body Mass Index of participants			
• Thinness (<18)	4	1.7	
• Normal (between 18 and 24.9)	68	28.3	
• Overweight (between 25 and 29.9)	96	40	
• Obesity (30 and over)	72	30	

Table 2: Breakdown according to changes in dietary practices following the doctor's nutritional recommendations

Do you receive nutritional recommendations from your doctor?	not	%
• Yes	154	64.2
• No	86	35.8
If so, what are these changes?	not	%
• Less sweet meal	198	82.5
• Lower fat meals	175	72.9
• More vegetables	171	71.3
• Measure-Individual Meals/Meals	107	44.6
• Do not eat to satiety	99	41.3
• 3 meals a day and 2 snacks	82	34.2
• 1 to 2 fruits per day	71	29.6
• Light evening meal	70	29.2
• Dishes in the evening	38	15.8
How many meals do you take per day ?	not	%
• Three meals	232	96.7
• Two meals	8	3.3
Do you ever skip meals?	not	%
• No	176	73.3
• Yes	64	26.7
Do you ever eat outside the house?	not	%
• Yes	146	60.8
• No	94	39.2
If so, what are the reasons?	not	%
• Social reasons (marriage, baptism, etc.)	106	44.2
• Work	34	14.2
• Hunger	12	5.0
• Pleasure	8	3.3

Table 3: Breakdown by food consumed in the last 24 hours before the survey (N=240)

What did you eat for breakfast yesterday?	not	%
• Sweet meals (porridge, herbal teas, teas)	98	40.8
• Fried foods (cakes, omelettes, fries, etc.)	71	29.6
• Milk	25	10.4
• Fatty preparations (mayonnaise, spaghetti, red meat, etc.)	19	7.9
• Steamed boiled foods (yam, potato, cassava)	11	4.6
• Bread	27	11.3
What did you eat for lunch yesterday?	not	%
• Fatty preparations (Rice with fat, peanut paste, red meat, etc.)	84	35.0
• Cereals (rice, fonio, corn, millet, etc.)	79	32.9
• Vegetables (green beans, peas, salad, etc.)	34	14.2
• Steam-boiled foods (yam, potato, potato, etc.)	21	8.8
• Fruits (banana, orange, apple...)	13	5.4
• Sugary drinks	9	3.8
What did you eat for dinner yesterday?	not	%
• Vegetables (cucumber, lettuce, tomato, carrot...)	66	27.5
• Fried foods (potatoes, aloco, fish, etc.)	62	25.8
• Cereals (millet, rice, corn, etc.)	44	18.3
• Steam-boiled foods (potato, yam, egg, etc.)	28	11.7
• Fruits (apple, orange, banana...)	21	8.8
• Fatty preparations (mayonnaise, spaghetti, red meat, etc.)	11	4.6

Table 4: Breakdown of snacks and meals away from home during the last 24 hours before (N=240)

Do you think snacks?	not	%
• Yes	156	65%
• No	84	35%
If yes, what type of snack?	not	%
• One fruit or 2 fruits per day	95	39.6
• sweet tea	82	34.2
• Fries (donut or aloco, or potato...)	66	27.5
• Juice/against	14	5.8
• Peanut	13	5.4
• A glass of milk	11	4.6
• Cakes/cookies	7	2.9
• Candy/chocolate	3	1.3
• Cola	2	0.8
What did you eat outside the home during the day yesterday?	not	%
• Fried foods (cakes, potatoes, fish, poultry, etc.)	52	21.7
• Grill (meat, fish, etc.)	38	15.8
• Cereals (Rice, fonio peanut paste, millet, etc.)	29	12.1
• Bean	11	4.6
• Atieke	7	2.9
• Spaghetti	7	2.9
• Djouka (fonio)	4	1.7
• Fruit (apple, orange)	4	1.7
• Sugary drinks	4	1.7

Table 5: Distribution of participants' physical exercise practices

Do you do physical activity?	not	%
• Yes	195	81.3
• No	45	18.8
If so, do you do it regularly?	not	%
• Yes	139	57.9
• No	101	42.1
Why do you do physical activity?	not	%
• Because of diabetes	188	78.3
• For pleasure	36	15.0
• For the well-being	16	6.7
What type of physical activity do you do?	not	%
• Market	183	76.3
• household activities	86	35.8
• Jogging	23	9.6
• Cycling and Football	11	4.6
How often do you do physical activity?	not	%
• 3 to 5 times/week	90	37.5
• More than 5 times/week	39	16.3
• 2 to 3 times/week	35	14.6
• Once a week	31	12.9
How long does a session last?	not	%
• Between 15 and 30 mins	55	22.9
• More than 45 min	55	22.9
• No physical activity	45	18.8
• Less than 15 mins	7	2.9
• Between 30 and 45 mins	78	32.5

Table 6: Participants' adherence to physician recommendations for diet and exercise

Do you receive recommendations from your doctor?	not	%
• Yes	198	82.5
• No	42	17.5
Did you understand the recommendations made by the doctor for your diet?	not	%
• little understood	211	87.9
• Yes	29	12.1
Are you able to follow the recommendations made by the doctor for your diet?	not	%
• Most of the time	161	67.1
• No	79	32.9
If yes or most of the time, how do you follow the doctor's recommendations?	not	%
• I take into account the doctor's recommendations when buying food	46	19.2
• I take care of the purchase of my food	35	14.6
• I don't eat enough	28	11.7
• I measure meals	25	10.4
• I give the instructions to the person who takes care of the purchase of my food	23	9.6
• I prepare food according to the doctor's recommendations	18	7.5
If not or most of the time, what recommendations do you fail to follow?	not	%
• Measure meals with measuring bowl	88	36.7
• Do not eat to satiety	72	30.0
• Limit oil intake	66	27.5
• Limit intake of Maggi broth	43	17.9

• Limit salt intake	24	10.0
• Avoid snacking	22	9.2
Why can't you follow the doctor's dietary recommendations?	not	%
• Habits	112	46.7
• The financial means	108	45.0
• common dishes	98	40.8
• Hunger	64	26.7
• Taste	39	16.3

Table 7: Relationship between glycemic control and following the doctor's nutritional recommendations

Glycemic balance	Following the doctor's nutritional recommendations		Total
	Yes	No	
Normal	37	2	39
Abnormal	117	84	201
Total	154	86	240

$X^2=12.79$ dof=3 P=0.000

The relationship between following the doctor's nutritional recommendations and normal glycemic control is statistically significant (p=0.000).

Table 8: Relationship between BMI and adherence to doctor's nutritional recommendations

BMI	Following the doctor's nutritional recommendations		Total
	Yes	No	
thinness	3	1	4
normal	64	4	68
Overweight	68	28	96
Obesity	19	53	72
Total	154	86	240

$X^2=13.83$ ddl=3 P=0.003

The relationship between following physician recommendations and patients with normal BMI is statistically significant (P=0.003).

Table 9: Relationship between glycemic control and meals away from home

Glycemic balance	PMeals away from home		Total
	Yes	No	
Normal	19	20	4
Abnormal	127	74	68
	146	94	96

Discussion

Our study made it possible to analyze the capacities of management and the prevention of secondary complications related to diet and physical exercise in type 2 diabetics in Mali. We also described the recommendations made by health professionals, their levels of understanding and appropriation of type 2 diabetic patients. Secondly, we studied the care and management capacities focused on six (06) health facilities in Bamako. But also the risk factors, the level of knowledge and the management of diabetes in connection with diet and physical exercise in 240 diabetic patients followed regularly in hospital structures in Bamako.

All healthcare professionals provided general advice to patients with type 2 diabetes on diet and exercise. Healthy lifestyle adaptations for low-income countries highlight the importance of ensuring that dietary and exercise recommendations are tailored

to the cultural and economic realities of participants. This is particularly important for West Africa, where families eat meals together. Changing an individual's diet is complicated in West Africa, particularly in Mali, where women take turns cooking the common dish of food served to the family. Any change in the family diet must be approved by the head of the household and the other women preparing the meals. Referring physicians attempt to meet this need through education-based communication strategies to promote changes in diet or exercise. These tips basically revolved around less fat, salt and no sugar with at least 30 mins of physical exercise.

In our average values, of which that of the age of our sample was 57 years, which was relatively low compared to other studies, these results can be superimposed on the studies of Garanet and Delisle and Nazaire [19]. The female sex was predominant and

the level of education and socioeconomic status were low; other studies reach the same results [20]. More than half (70%) of our patients were either overweight (BMI between 25 and 30) or obese (BMI \geq 30). This result was identical to that of Djire with 71.5% with 90.7% having poor glycemic control [20,21]. This result explains all the difficulty of the care and daily management of diabetes in our context. The average age of diagnosis of diabetes of 5.3 years approximates other studies [3].

Management of diabetes in the structures was provided at least by an endocrinologist and/or a diabetologist in 100% of cases (18 specialists). The presence of specialists in these structures is explained by the creation of a diploma course (DES/DU) in Bamako since 2010 and the recruitment of specialists by the civil service of the state and communities in Bamako on the recommendations of the missions Diabetes health and DGHSP joint supervision. All structures have equipment for screening for diabetes and risk factors, namely a blood glucose meter, a blood pressure monitor, a scale and a tape measure. In addition, CSRefs and hospitals have at least one HbA1c reader and foot kit. In all structures, the therapeutic education equipment (televisions, DVD players, BAI, posters) is no longer functional. In this regard, it should be noted that these structures have been equipped thanks to the joint efforts of Diabetes Health in support of those of the Malian Ministry of Health.

The active file of diabetic patients was estimated at nearly 15,000 diabetic patients. This figure highlights an almost daily increase in the number of diabetic patients followed in Bamako. A hospital prevalence of 5.1% was reported in a recent article published in Mali Médical. Other old studies carried out by Malian medical specialists indicated that diabetes affects about 3% of the population, and that type 2 represents 90% of cases. The adoption of the STEPwise strategy ("STEPS: The WHO STEPwise Approach to Surveillance of Chronic Disease Risk Factors: The WHO STEPS Surveillance Manual" 2013), which is an approach to surveillance of chronic diseases through risk factors carried out in Mali in 2013 evokes a prevalence of overweight (16.6%) and obesity (8.8%) in Bamako (30). Mali is going through a health transition, as increased globalization and accompanying urbanization are causing a double burden of communicable and non-communicable diseases. These numbers are grossly underestimated given the increasing numbers of diabetes worldwide especially in Africa. In Mali, we have clearly demonstrated that the surveillance system of health structures concerning diabetes is non-existent and largely underestimated for the follow-up of diabetes cases. There is a disparity in the centralization of data since there are several modes of data feedback.

All diabetes management structures ensured minimum assessments. It is reported that although few means are available for health in Mali, a mobilization around diabetes has taken shape there, gradually, since 2003, other actors have been involved, but also the Malian State, which has created in 2002 a specific section for non-communicable diseases within the National Health Directorate. This MNTs section of the DNS has now become a division in the Directorate General for Health and Public Hygiene (DGSHP).

The challenges are still enormous, such as the often late management of diabetic patients, but also by other factors, such as the difficulty of patients to respect a balanced diet or the difficulty of access to treatment. It should be noted that the management in hospitals is generally for when patients have hypoglycemic attacks or major complications. This study also tried to identify some key elements of the diabetes management process in Bamako.

Regarding eating habits, 86.7% of our participants said they had undertaken significant behavioral changes to follow up on the recommendations made by doctors. The most mentioned changes were: less sugary meals, less fatty meals, more vegetables, measuring meals. This result was superior to other studies [3,23]. We found in the study that 60.8% of our participants ate meals away from home most often for work and hunger; result similar to other studies where 60.5% of people with diabetes ate outside the home; or social ceremonies (baptisms and weddings) [3,24]. According to an interesting study conducted in Mali in 2008, eating out of the home was probably related to men's work and their ability to make purchases [11].

Healthcare professionals (100%) said they made recommendations on the types of foods and beverages to avoid, the types of foods to favor, the types of foods to measure, and the cooking of foods. Despite these recommendations, we find that 51.2% of our participants failed to avoid the unadvised foods; only 31.56% who said they were able to stick to the foods recommended by the doctor. Nutritional management and therapeutic education remain insufficiently integrated into the management of diabetes in the West African region. The study showed that recommendations related to nutrition and physical exercise were often limited to advice given to patients during consultations. However, these are not homogeneous between health professionals. Regarding out-of-home meals, the majority of health professionals at 83.33% suggested that diabetics avoid them. Despite 60.8% of participants often took meals outside the home according to our study. As for physical activity, all the doctors gave general advice to type 2 diabetics. Walking is the most recommended physical exercise at a frequency of at least 3 times a week for a duration of 20 to 30 minutes. per session.

The study revealed high consumption of tea with sweet, fried and other non-recommended foods, and low consumption of recommended ones such as fruits and vegetables. Unfortunately, the cost of treatment generally only includes medical treatments, and does not include the costs of dietary changes or other activities that might reduce the risk of hypoglycemia. In Mali, according to a study carried out in 2016, the minimum theoretical cost of an acceptable treatment of diabetes without complications in the public sector would represent 29% of the gross domestic product per capita; subjects' reported total expenditures consumed an average of 24% of their income.

In the Malian context where a common meal was shared, changes in behavior and recommendations must necessarily include family members, in particular the head of household and co-wives in cases of polygamy. Several studies have invoked difficulties in taking into account the specificities of people with diabetes when purchasing food, ignorance of the importance of diet, physical exercise in the management of diabetes and the economic burden represented by the purchase of drug [3,11]. The reasons given were that the changes were very difficult to integrate into their daily lives, habits, social context, but above all the lack of financial resources and the fact that families eat common meals together, which is likely to complicate measurements and retention. during heavy meals. Other factors of non-application of the recommendations made by health professionals are understanding, the environment and recommendations not adapted to our context, which makes their implementation difficult and complex.

The study demonstrated the need to develop nutritional education tools that would take into account not only the patient's level of education, but also their culture and preferences, given that

nutrition is the cornerstone of treatment. burden of diabetes. It would therefore be relevant for health professionals to be trained in nutritional and therapeutic education. Health structures must have rooms dedicated to nutritional and therapeutic education. This strategy would thus enable people with type 2 diabetes to develop skills in terms of adaptation and self-management, such as those recommended by the French National Authority for Health (HAS). The limits of our study were that the number of people studied was limited given the available resources and the exploratory nature of the study, the availability of doctors. We strongly recommend in future research to carry out a large-scale control trial in Mali to provide further strong evidence that a behavior change intervention significantly improves glycemic control and self-management in the treatment of diabetes, particularly in patients with type diabetes.

Conclusion

This work has highlighted that in the face of the growing rise of risk factors and the complexity of diabetes management. We have highlighted the role played by the referring physicians in the offer, the structuring of care and the construction of knowledge in initial and continuing training. We recommend to improve the response to diabetes in Mali to align the response of the Malian health system to the challenges of the management of diabetes on the one hand. On the other hand, improve the feedback of data on non-communicable diseases for the implementation of better public policy.

References

1. Wesenbeeck CFA van (2020) Distinguishing urban and rural food security in West Africa. Available at: https://www.oecd-ilibrary.org/en/development/distinguish-urban-and-rural-food-security-in-west-africa_159010a5-en
2. WHO | World Diabetes Report [Internet]. [cited 2020 Nov 30]. Available at: <https://www.who.int/diabetes/global-report/en/>
3. Rasio E, Delisle H, Ekoé JM. Presented by: Dramane Mamadou Traore 124.
4. American Diabetes Association (2022) <https://cloud.3dissue.com/214523/214622/253881/2021ResearchReport/index.html>
5. Doubi S, El Ouahabi H, Dakkar O, Ajdi F (2014) Evaluation of a therapeutic education program for diabetic patients in a Moroccan University Hospital Center: preliminary results of a pilot survey. *Pan Afr Med J* 18: 258.
6. Traore M (2013) Nutritional and metabolic impacts of fasting during the month of Ramadan in Malians with type 2 diabetes. Available at: <https://corpus.ulaval.ca/jspui/handle/20.500.11794/24083>
7. Lager G, Sittarame F, Chambouleyron M, Moutet AL, Pinget SM, et al. (2016) A therapeutic education to attempt the remission of type 2 diabetes. *Educ Thérapeutique Patient - Ther Patient Educ* 8: 20103.
8. Paquot N (2020) DIET IN TYPE 2 DIABETIC PATIENTS. *Rev Médicale Liège* 60: 5.
9. Oppert JM (2004) Physical activity as a means of treating type 2 diabetes: the concrete and interventional aspect. *Ann Endocrinol* 65: 52-58.
10. Lecerf JM (2012) Nutritional management of type 2 diabetes: certainties and controversies. *Corresp en Metabolisms Horm Diabetes Nutr* 2012: 6.
11. Coulibaly A (2020) Nutritional survey and development of tools for the dietary management of type 2 diabetes in Mali. Available at: <https://corpus.ulaval.ca/jspui/handle/20.500.11794/19994>
12. Sy S, Samake M, Samake M, Sy D, Sy D, Coulibaly M, et al. (2020) Prevalence of Micro and Macroalbuminuria in Type 2 Diabetics at the Center Hospitalier Universitaire du Point-G in Bamako. *Health Sci Dis* 21: 3.
13. Garanet F, Baguiya A, Sawadogo N, Besancon S, Traoré AS, et al. (2018) Educational practices and diabetes: study among health professionals in Burkina Faso and Mali. *Public Health (Bucur)*. 30: 713-723.
14. Balcou-Debussche M () AN ETHNOSOCIOLOGICAL APPROACH TO THERAPEUTIC PATIENT EDUCATION IN TYPE 2 DIABETES 16.
15. Philippe J, Brändle M, Carrel J, Diem P, Keller U, et al. (2020) Recommendations on the treatment of type 2 diabetes. *Forum Med Switzerland – Swiss Med Forum* 9: 30.
16. Scheen A, Paquot N (2015) update of American and European recommendations for the treatment of type 2 diabetes. *Rev Médicale Liège* 70: 3.
17. Masson E (2022) Dietary beliefs and practices among type 2 diabetics in Bamako (Mali) [Internet]. EM-Consult. ailable at: <https://www.em-consulte.com/article/221466/croyances-et-pratiques-alimentaires-chez-des-diabe>
18. Development and Health (2022) Diabetes in Mali: dietary aspects. Available at: <https://devsante.org/articles/le-diabete-au-mali-aspects-dietetiques>
19. Mariko M (2012) Follow-up of outpatient diabetic patients in the Internal Medicine Department CHU Point G. Available at: <https://www.bibliosante.ml/handle/123456789/1515>
20. Djire M (2020) Therapeutic compliance in type 2 diabetic patients. USTTB. Available at: <https://www.bibliosante.ml/handle/123456789/3955>
21. Togola A (2018) Therapeutic education of the diabetic patient at the Bougouni reference health center Available at: <https://www.bibliosante.ml/handle/123456789/1978>
22. Mallé D (2019) Frequency of ketoacidosis in diabetics hospitalized in the Department of Medicine and Endocrinology of the Hospital of Mali. USTTB; Available at: <https://www.bibliosante.ml/handle/123456789/3629>
23. Coulibaly A (2009) Turgeon O'Brien H, Galibois I. Food beliefs and practices among type 2 diabetics in Bamako (Mali). *Cah Dietary Nutr* 44: 136-142.
24. Ake-Tano SOP, Ekou FK, Konan YE, Tetchi EO, Kpebo DO, Sable SP, et al. (2017) Dietary practices of type 2 diabetics followed at the Antidiabetic Center of Abidjan. *Public Health* 29: 423-30.

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