

Research Article

Impact of Therapeutic Nutritional Education on the Anthropometric and Metabolic Parameters of Diabetic Subjects Monitored at the Smires Medical Center in Abidjan

Jean-Brice Gbakayoro^{1,*} , St éphane Claver Vani é¹, Audrey Herbert Y épi é¹,
Y éni éYolande Ouattara², Jacko Rhedoor Abodo³, Kouakou Brou¹

¹Laboratory of Nutrition and Food Safety, Training and Research Unit of Food Sciences and Technology, Nangui Abrogoua University, Abidjan, Ivory Coast

²National Program for the Fight against Metabolic Diseases and Prevention of No Communicable Diseases, Abidjan, Ivory Coast

³Department of Endocrinology, Diabetes and Nutrition, Abidjan, Ivory Coast

Abstract

Dietary prescriptions or “therapeutic nutritional education” must be an integral part of the holistic care of diabetic patients. However, for various reasons, some patients go without it. The objective of this work was to determine the proportion of patients followed in a health center in Abidjan (Smires) who benefited from therapeutic nutritional education and to evaluate the effect of good compliance with this nutritional education on their parameters. morpho-anthropometric and metabolic. A cross-sectional study with a descriptive aim was carried out to do this, for 6 months including patients meeting the inclusion criteria and followed at the SMIRES center. In total, 30 patients were interviewed, among whom there were 50% obese people, the average age was 52.5 years, the average fasting blood sugar was 1.89 g/L and the average duration of discovery of diabetes was relatively low, 4.96 years. At least 80% of patients had benefited from therapeutic nutritional education, including 66.69% from a Nutritionist/Dietician at this center. At least 70.02% of patients reported rigorously following these dietary prescriptions. Generally, we noted a good evolution of the morpho-anthropometric and metabolic parameters of the patients. Indeed, a good part of the patients who had high values in terms of these parameters, particularly saw their waist circumferences (56.67%), BMI (50.01%), blood sugar (50%), glycated hemoglobin (40.01%) decrease. This study confirms the important role played by nutritional education in the therapy that diabetic patients should benefit from.

Keywords

Therapeutic Nutritional Education, Diabetes, Morpho-anthropometric and Metabolic Parameters, Abidjan

*Corresponding author: gbakayoro.jb2018@hotmail.com (Jean-Brice Gbakayoro)

Received: 23 November 2024; **Accepted:** 30 December 2024; **Published:** 21 January 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

1. Introduction

According to the World Health Organization (WHO), non-communicable diseases (NCDs) represent the leading causes of morbidity and mortality worldwide [1]. NCDs include cardiovascular diseases, diabetes mellitus, cancers, chronic respiratory diseases, etc. [2]. Diabetes in particular has become a true global epidemic for several years. Each year, more and more people develop this disease which can lead to life-altering complications. In 2015, in addition to 415 million adults with diabetes, 318 million had glucose intolerance, putting them at high risk of developing the disease in the future [3]. Available data show that nearly 80% of people with diabetes live in low- or middle-income countries, particularly in countries in Asia and sub-Saharan Africa [4]. In Ivory Coast in particular, the PREVADIA study (Prevalence of diabetes in Ivory Coast) carried out in 2017 showed that 6.2% of people aged 20 to 79 suffered from diabetes. Several strategies are used to slow down this galloping expansion of diabetes and improve its management. These are on the one hand raising awareness among populations and on the other hand, therapeutic nutritional education [5, 6]. These measures take into account recommendations for a good diet and regular physical activity. The present study was carried out in a medical center in Abidjan (SMIRES), and aimed to show the impact of well-conducted and well-monitored therapeutic nutritional education on the evolution of morpho-anthropometric and metabolic parameters of patients with diabetes. Specifically, we described the socio-economic parameters and dietary habits of our study population, evaluated the monitoring of dietary prescriptions and determined the evolution of the morpho-anthropometric and metabolic parameters of the patients in the study.

2. Materials and Methods

2.1. Study Framework

The study took place within the consultation unit of the SMIRES medical center located in Cocody-ANGRE, Abidjan.

2.2. Type and Period of Study

This is a cross-sectional study with descriptive and analytical aims which took place over 5 months, from July 1 to December 30, 2020.

2.3. Study Population

The study population consisted of type 2 diabetic patients who came for consultation for the first time in the department. The inclusion criteria used were to be a type 2 diabetic patient, followed at the SMIRES center, to be at least 18 years old, to have had a biological assessment at entry and to

have given oral consent. Excluded from the study were pregnant or breastfeeding women, diabetic patients suffering from nutritional pathologies (functional colopathy, gastroesophageal reflux), serious illnesses (cancer, tuberculosis, etc.) and having a pathological situation that could profoundly modify the diet. food (end-stage renal failure, heart failure, liver failure, etc.).

2.4. Conduct of the Study

We solicited patients seen in consultation in 2020. After explaining to them the interest of the study, we obtained their consent for the majority. For patients who agreed to participate in the study, we collected data using a questionnaire administered face-to-face.

2.5. Statistical Analysis

Data were entered into Microsoft Office Excel 2007, then processed and analyzed using GraphPad Prism 7 software.

3. Results

3.1. Patient Characteristics Surveys

3.1.1. Anthropometric and Socio-economic Characteristics of Patients

The BMI (body mass index) of the patients surveyed was divided into people with a normal BMI (20.58%), overweight people (30%) and obese people (49.42%) with a majority of people among the obese who presented moderate obesity (36.66%). The average age was 52.5 years. Among the patients, there were 16.12% with an age between 30 and 39 years old, 32.25% between 40 and 49 years old, 32.25% between 50 and 59 years old, 19.38% greater than or equal to 60 years old. (Table 1). These patients surveyed belonged to all ethnic groups in Côte d'Ivoire (Akan: 48.38%, Gur: 16.16%, Krou: 12.90%, Mandé du Nord: 16.12%, Mandé du Sud: 06.44%). The majority resided in Abidjan (90%), were civil servants or workers (67.74%), had an average socio-economic level (74.19%) and a higher level of education (70.98%) (Table 2).

Table 1. General characteristics of patients surveyed.

				Proportion (%)
BMI	Normal			20.58
	Overweight			30
	Obesity	Moderate		36.66

	Proportion (%)
Morbid	09.76
Age groups	
[30 à 40 years old]	16.12
[40 à 50 years old]	32.25
≥ 60 years old	51.63
Average	52.5 years ± 12.47
Sex	
Male	53.33
Female	46.66
None	03.22
Level of study	
Primary	06.45
Secondary	19.35
Superior	70.98

Table 2. Socio-economic and demographic characteristics of patients surveyed.

	Proportion (%)
ethnic groups	
Akan	48.38
Gur	16.16
Krou	12.90
Northern Mande	16.12
South Mande	06.44
Place of residence	
Abidjan	90
outside Abidjan	10
Housewife/Trader	12.90
Occupation	
Civil servant/Worker	67.74
Retirees	12.90
Others	03.22
Socio-economic level	
Pupil	25.81
Average	74.19

3.1.2. Characteristics of Diabetes in the Patients Surveyed

The average duration of discovery of diabetes was 4.93 years (Table 3). The average fasting blood sugar of the patients surveyed was 1.89 g/L with extremes of 0.56 g/L and 3.16 g/L. The patients had an average glycated hemoglobin (HbA1c) of 8.88%. Patients whose reason for consultation in the SMIRES center was to monitor their diabetes represented 38.7% of the study population. Patients on dietary prescription alone (diet) represented 3.22%, those on insulin 12.9% and those on Oral Anti Diabetics (OAD) 83.88%. Among the patients on OAD, there were 22.58% on Metformin, 3.22% on

Glimepiride, 19.36% on DPP4 inhibitors, 9.67% on Gliclazide and 38.72% on other OAD. The majority of patients regularly practiced physical activity (83.87%), had a personal history of obesity (53.21%), had a family history of diabetes (70.96%) and did not present complications of diabetes (61.30%). The complications of diabetes which were found in those who presented it (38.70%) were micro-angiopathies (19.35%), macro-angiopathies (41.93%), infections (09.67%) and acute-metabolic complications (29.05%).

Table 3. Characteristics of diabetes.

	Proportion (%)
Duration of discovery of diabetes	
< 5 years old	67.74
[5 à 10 years old]	09.67
≥ 10 years old	22.59
Reason for consultation	
Chance discovery	19.31
Cardinal signs of diabetes	29.03
Diabetes monitoring	38.70
Complications	12.96
Diet alone	03.22
OAD/Metformine	22.58
OAD /Glimépiride	03.22
Traitment	
OAD /I-DPP4	19.36
OAD /Gliclazide	09.67
OAD /Others	38.72
Insulin	12.90
Regular practice physical activity	
Yes	83.87
No	16.13
Personal history	
Diabetes	98.37
Blood pressure	45.16
Obesity	53.21
Familial history	
Yes	70.96
No	29.04
Complications	
Yes	38.70
No	61.30
Type of complications	
Microangiopathies	19.35
Macroangiopathies	41.93
Infections	09.67
Acute metabolic	29.05

3.2. Therapeutic Nutritional Education of Surveyed Patients

Out of 30 people surveyed, there were 24 patients (80%) having benefited from therapeutic nutritional education and six 06 patients (20%) not having benefited from it, i.e. more people made aware of the new eating habits to adopt since the disease (Table 4). Out of 24 people who benefited from therapeutic nutritional education, there were 7 (23.3%) who had benefited from group therapeutic nutritional education and 17 (76.6%) from personalized therapeutic nutritional education. We especially note that the majority of patients (16 people) who benefited from therapeutic nutritional education had received it from the center's Dietitian/Nutritionist, i.e. 66.69%.

Table 4. Nutritional education.

Proportion (%)		
Carrying out nutritional education		80
Type of nutrition education	Personnalized	77
	Group	23
	The media	04
	Knowledge	04
Source of nutrition education	Health personnel	04
	Nutritionist/dietician	67
	Diabétologist	08
	General practitioner	13
Effective monitoring of nutritional education		70

3.3. Evolution of Morpho-anthropometric and Metabolic Parameters of Surveyed Patients

(i). *Evolution of waist circumference, BMI and blood pressure*

Figure 1 shows the evolution of waist circumference, BMI and blood pressure after monitoring drug and dietary prescriptions by the patients surveyed.

Dietary prescriptions contributed to the reduction in BMI (50.01%) and waist circumference (56.67%) of at least half of the patients. A certain number of patients had a waist circumference (10%), BMI (20%) and blood pressure (86.66%) that remained normal before, during and after nutritional education due to personalized medication prescriptions. However, a small number of patients experienced an increase in waist circumference (13.33%) and BMI (23.33%) or even an increase in these morpho-anthropometric parameters.

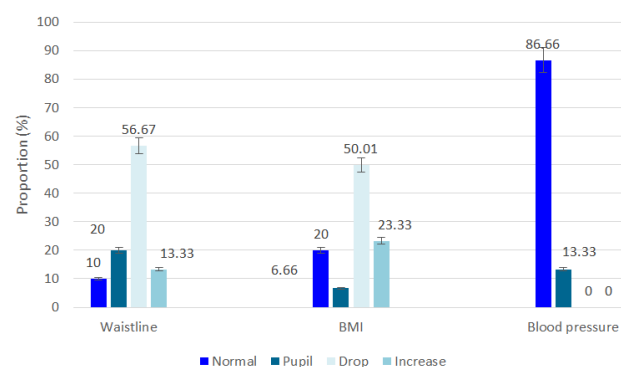


Figure 1. Changes in waist circumference, BMI and blood pressure of the patients surveyed.

(ii). *Evolution of blood sugar and glycated hemoglobin*

Figure 2 shows the evolution of blood sugar and glycated hemoglobin after monitoring drug and dietary prescriptions by the patients surveyed. A total of twelve (12) patients (40%) had normal blood sugar levels before, during and after nutritional education due to personalized medication prescriptions. Three (3) patients (10%) had consistently high blood sugar levels since their treatment. Dietary prescriptions contributed to a drop in blood sugar levels in 15 patients (50%). No increase in blood sugar levels was noted in the patients in our study population since the start of their treatment. Ten (10) patients (33.33%) had glycated hemoglobin that remained normal before, during and after nutritional education. There were eight (8) patients (26.66%) who had a consistently high HbA1C during their treatment. Dietary prescriptions contributed to a drop in blood sugar levels in 12 patients (40.01%). There was no increase in HbA1C of patients in our study population since the start of their treatment.

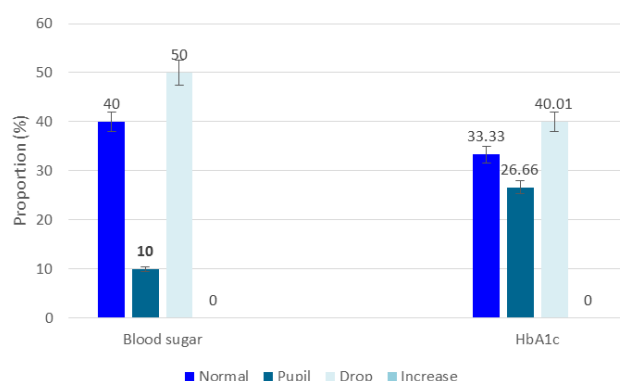


Figure 2. Evolution of blood sugar and glycated hemoglobin of the patients surveyed.

4. Discussion

With the aim of evaluating the effect of good compliance

with nutritional education on the morpho-anthropometric and metabolic parameters of patients, the socio-economic characteristics of patients, eating habits and the evolution of morpho-anthropometric parameters and metabolic disorders of the patients were studied. In terms of socio-economic characteristics of the study population, the results showed that the patients surveyed belonged to all ethnic groups in Côte d'Ivoire with many more patients belonging to the Akan ethnic group. This shows that type 2 diabetes affects all populations, without distinction. Indeed, according to the WHO, diabetes is a cosmopolitan condition [7]. Also, a sociodemographic reason could explain this predominance of the Akan ethnic group. Indeed, this study was carried out in Abidjan, a city located in the south of Côte d'Ivoire which is an area of origin of many Akan peoples, housing a large concentration of people from this ethnic group. This observation is confirmed by the results of various surveys carried out during the General Population and Housing Census [8]. Type 2 diabetes affects both sexes but with a slight male predominance (53.3% men and 46.7% women). These data are corroborated by those of LOUIS in France who also found a male predominance in their study [9]. This could be explained by the fact that the medical center where the investigation took place was private. However, men often have higher purchasing power than women, so they could take care of themselves more easily by attending private medical centers. The majority of patients were workers (66.7%), had an average social level (73.3%) and a higher education level (70%). These good levels (social and intellectual) could be advantageous for patients. Indeed, this not only allows them to better understand the therapeutic education messages addressed to them in general, but also the dietary advice in particular. In addition, their purchasing power allows them to meet the numerous expenses associated with the daily management of the disease [10]. All patients were aged over 30 years. This could be explained by the fact that type 2 diabetes most often occurs in adulthood. Our results are consistent with those of many other authors [11, 9]. In terms of diabetes characteristics, the results showed that the majority of patients had diabetes that had been present for less than five years (66.7%) and were treated with OADs (93.3%). Similar results have also been obtained by different authors in many other countries [12, 9, 13]. More than half of the patients had not yet presented complications related to diabetes. This could be explained on the one hand by the fact that the average duration of discovery of diabetes was relatively short (4.93 years). On the other hand, the good socio-economic (73.3%) and intellectual (70%) level of patients predisposed them to better cope with the demands of the disease. In terms of eating habits, the results showed that the majority of patients ate three meals/day (93.3%) and did not eat snacks (66.7%). This is in accordance with the recommendations made to type 2 diabetes patients on OAD and diets [14]. Regarding nutritional education, a good portion (80%) had received it, much more in a personalized way (70.8%) and through a

Nutritionist (66.7%). This is due to the fact that the SMIRES Center has a resident Nutritionist/Dietician. Regarding the monitoring of dietary prescriptions, the majority of patients measured foods before consumption (68.9%), avoided the consumption of foods with a high glycemic index (67.3%), favored the consumption of foods rich in fiber. (90%), followed dietary advice even outside the home (84.7%). All these prescriptions are part of the nutritional recommendations aimed at achieving a balanced diet, the cornerstone of treatment in diabetic patients. Following these dietary prescriptions by the majority of patients could be of great benefit to them. This could have a favorable effect in avoiding glycemic disorders [15].

In terms of the evolution of morpho-anthropometric and metabolic parameters, the results showed that in more than half of the patients, a regression in both waist circumference (56.7%) and BMI (50%) after at least three months of following dietary prescriptions. This loss of weight and waist circumference could be explained by the correct following of dietary prescriptions by the majority (70%) of these patients [11]. The risks linked to the occurrence of diabetes and its complications from obesity depend not only on the importance of adipose tissue but also on its distribution, in the abdominal and perivisceral position [16]. The good evolution of these morpho-anthropometric parameters in the patients in the study predicts a good evolution of their metabolic parameters. The majority of patients (86.7%) had normal blood pressure before, during and after nutritional education. Proper follow-up of dietary prescriptions would also have contributed to maintaining normal blood pressure throughout their treatment. In addition to good follow-up of dietary prescriptions, the majority of patients (83.3%) added regular physical activity. This is in accordance with the recommendations made to diabetic patients to achieve a better balance of metabolic parameters [17].

A drop in both blood sugar (50%) and glycated hemoglobin (40%) after at least three months of monitoring drug and dietary prescriptions was observed.

This could also be explained by the good follow-up of dietary prescriptions. Indeed, the significant reduction in BMI, waist circumference and the regular practice of physical activity by a large proportion of patients would explain a good evolution of their metabolic parameters.

5. Conclusion

Diabetes mellitus is a chronic disease whose management is multidisciplinary. Diet plays a key role in the therapeutic management of this condition. What makes it "The cornerstone of treatment". The present study allowed us to note a good evolution of morpho-anthropometric and metabolic parameters in general, when the hygienic-dietary measures are well observed.

Abbreviations

WHO	World Health Organization
NCD	Non-Communicable Diseases
PREVADIA	Prevalence of Diabetes in Ivory Coast
OAD	Oral Anti Diabetics
BMI	Body Mass Index
HbA1C	Glycated Hemoglobin

Acknowledgments

I would like to thank the manager of the smires medical center and all his staff for facilitating this study in their health center. I would also like to thank all the patients who voluntarily made themselves available for this study.

Author Contributions

Jean-Brice Gbakayoro: Conceptualization, Methodology
Stéphane Claver Vanié Data retention, Methodology
Audrey Herbert Yépié Formal analysis, Investigation
Yvén Yolande Ouattara: Investigation and Writing
Jacko Rhedoor Abodo: Validation, Resources, Supervision
Kouakou Brou: Project Supervision and Administration

Funding

No external funding was provided for this work.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] WHO (World Health Organization). Report on the global situation of noncommunicable diseases, Executive Summary, 2011, Page 1-12.
- [2] Pognon Sylvie Arlette Bancolé Houinato Dismant Stéphane, Oscar Djigbenoude and Judith Segnon Agueh. Common risk factors for oral diseases and no-communicable diseases in Cotonou (Benin), Med Buccale Chir Buccale, 2013, volume 19 issue 3, pages 155-159.
<https://doi.org/10.1051/mbcb/2013069>
- [3] International Diabetes Federation (IDF), IDF Diabetes Atlas 6th edition, 2013, p11.
- [4] Popkin B., The shift in stages of the nutritional transition in the developing world differs from past experiences! Public Health Nutrition, 2002, 5: 205-214.
<https://doi.org/10.1079/PHN2001295>
- [5] Khaled M. B., Méhadi N., Boumediene A. Ktob, A., Halfaoui S., Boukhatmi F. Role of nutritional education in the care of type 2 diabetics during Ramadan, Diabetes & Metabolism, 2013, 39(1), Page 1-70.
- [6] Helary C., Regat-Bikoi M.-C. Culture shock between advanced practice nurses for the implementation of a diabetes 2 therapeutic education program in Cameroon, Diabetes & Metabolism, 2015, 41(1), Page 1-27.
- [7] WHO (World Health Organization), World Diabetes Report, 2016, 88 p.
- [8] RGPH (General Population and Housing Census), Main preliminary results. Permanent Technical Secretariat of the RGPH Technical Committee, 2014, 23 p.
- [9] Louis C. J., Impact of a brief intervention on changing eating behavior in type 2 diabetic patients, Doctoral Thesis, Mixed Faculty of Medicine and Pharmacy of Rouen, Rouen, 2014, 95 p.
- [10] Morel A., Lecoq G., Jourdain-Menninger D., Evaluation of diabetes care, General Inspectorate of Social Affairs RM2012-033P France, 2012, 64p.
- [11] Douzan A. E. J., Knowledge and dietary practices of diabetic patients followed at the Antidiabetic Center of Abidjan (CADA), Doctoral thesis Faculty of Medicine, Abidjan-Cocody University, Abidjan, 2015, 175 p.
- [12] Ziza Ngaila N. P., Evaluation of the knowledge of type 2 diabetic patients on diabetes in the endocrinology-diabetology department of Chu de Yopougon, Abidjan, Diploma of specialized studies (D.E.S) in endocrinology, metabolism Medical Abidjan and nutrition, Félix Houphouët Boigny University, UFR Des Sciences, Abidjan, 2019, 97 p.
- [13] IDF (International Diabetes Federation), The Diabetes Atlas, 8th edition, 2017, 150 p.
- [14] Gbakayoro J. B., Dietary prescriptions for diabetics, Abidjan, AODCI, 2020, 4 p.
- [15] Gbakayoro J. B., Study of eating behaviors and their implications in the appearance of diabetes mellitus in the Baoulé Malinké and Agni populations, Unique doctoral thesis in nutrition and food security, Nangui Abrogoua University, Abidjan, June 15, 2016, 187 pp.
- [16] SNDLF (French Language Society of Nutrition and Dietetics), French Association for Studies and Research on Obesity, and French Language Association for the Study of Diabetes and Metabolic Diseases: Recommendations for diagnosis, prevention and treatment of obesity. *Cah Nutr Diet* 1998; 33 (Suppl 1) 1-48.
- [17] Barnard R. J., Jung T., Inkeles S. B. "Diet and exercise in the treatment of NIDDM", in The need for early emphasis, Diabetes Care; 1994, pp. 69-72.