INFLUENCE OF HYGIENIC AND DIETARY MEASURES ON THE TREATMENT OF TYPE 2 DIABETES: SURVEY OF 155 PATIENTS IN THE CASABLANCA REGION

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ABSTRACT

Aim: our study aimed to evaluate the general characteristics, dietary habits and practices related to type 2 diabetes, as well as a quantitative assessment of the consumption of the different food groups and the effect on glycemic control. **Materials and methods:** This descriptive cross-sectional study of 155 type 2 diabetic patients was collected in two locations: a pharmacy (for 55 patients) and a medical office (for 100 patients). **Results:** Compliance was poor in 62% for diet, 29% for treatment, in 11% for medical follow-up. 36% of patients were physically active. 34% of patients have used herbal remedies to treat their diabetes. A significant unfavorable association was found between HbA1c and bread, meat, fruit, French fries, pasta and herbs, however, there is a significant favorable association between HbA1c and diet, physical activity and treatment. Conversely, there was a nonsignificant association between HbA1c and single plate use, soft drinks, white sugar, adherence to meal schedule, snacking, poultry, diabetes age, fruit juice, vegetables, dairy, fish, couscous, frequency of medical consultation.

KEYWORDS: *Type 2 diabetes; Therapeutic education of the patient; Hygienic and dietary measures.*

I. INTRODUCTION

Diabetes is currently a major public health problem; its management involves a triad of pharmacological treatment, physical activity and changes in dietary behaviors.

OBJECTIVES

- Evaluate the general characteristics of type 2 diabetic patients.
- Evaluate the dietary habits and diabetes-related practices of type 2 diabetic patients.
- Evaluate the frequency of diabetic patients adhering to their anti-diabetic treatment and diet.
- A quantitative evaluation of the consumption of different food groups.
- To determine the relationship between the consumption of certain foods, certain habits and the management of diabetes, as represented by the HbA1c level.

II. METHOD AND MATERIALS

➢ **Type of Study**

This is a descriptive cross-sectional study. The dietary survey was conducted using a questionnaire.

➢ **Location of study**

- A community pharmacy in the Casablanca region, Morocco, where 55 diabetic patients were recruited.
- A medical office of an endocrinologist, located in the city of Mohammedia, Morocco, where 100 diabetic patients were recruited.

➢ **Duration of study**

- From 03/03/2022 to 13/05/2022 at a community pharmacy.
- From 28/06/2022 to 07/07/2022 in a medical office.

III. RESULTS

A. General Information

1. Age Range

The age of our participants (155 patients) ranged from 34 to 89 years, with an average age of 61.66 years. The average age at the time of diagnosis was 51.63 years, with a minimum of 28 years and a maximum of 83 years.

2. Sex

Our sample consisted of 53 men (34%) and 102 women (66%), resulting in a sex ratio of 0.51.

3. Biological Indicators

HbA1c ranged from 5% to 14%, with an average of 8.13%. The average fasting blood glucose level was 1.74.

B. Information on the dietary regimen
(a) Significant Negative Association
1. Bread Consumption

The average bread consumption is 315g/day/patient, and 64% consume more than 200g/day.
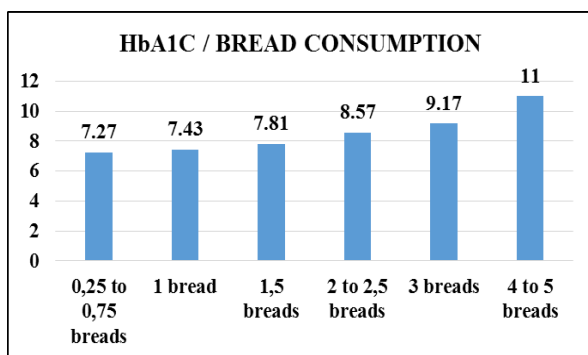

Figure 1: Comparison of HbA1c with the Amount of Bread Consumed per Day (N=146).

- ➢ The more the bread consumed, the higher the HbA1c level. For example, the HbA1c is 7.27% for a consumption of 0.25 to 0.75 bread/day, while it reaches 11% for those who consume 4 to 5 breads/day.
- ➢ According to the PEARSON correlation test, a significant correlation is found between the amount of bread consumed and the HbA1c level (p-value of 0.000).

2. Consumption of Red Meat

22% do not consume red meat, 31% consume it once a week, 21% consume it twice a week, 17% consume it 3 to 4 times a week, and 9% consume it 5 times or more.
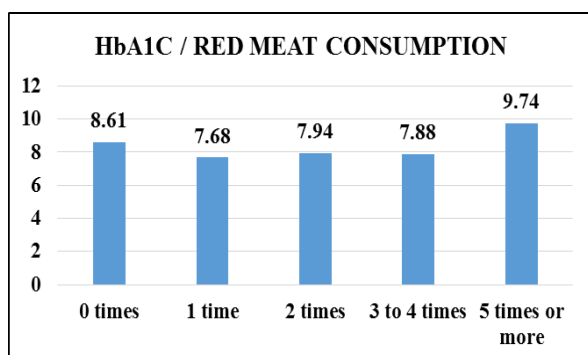

Figure 2: Comparison of the Average HbA1c with the Amount of Red Meat Consumed per Week (N=144).

- ➢ For patients who consume red meat once a week and up to 5 times or more, and based on the PEARSON correlation test, a significant correlation (p-value of 0.00038) is found between this consumption and the increase in HbA1c levels.

3. Fruit Consumption

21% of patients consume fruit every other day, 30% once a day, 31% twice a day, 15% three times a day, and 3% consume more than three fruits a day.
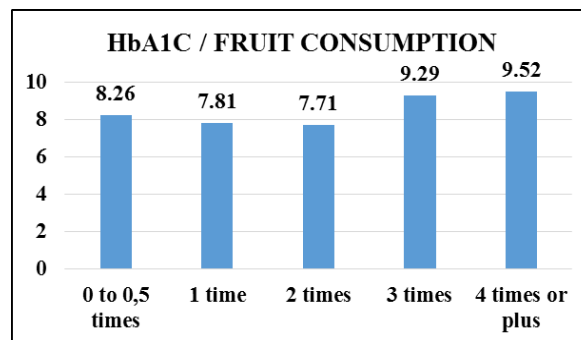

Figure 3: Comparison of HbA1c with the Amount of Fruit Consumed per Day (N=144).

- ➢ Looking at patients who consume one fruit or more (up to 4 fruits or more), a significant correlation is found between fruit consumption and the increase in HbA1c levels. This hypothesis is supported by the PEARSON correlation test (p-value 0.00179).

4. Consumption of Fries

82% of patients consume fries 0 to once every 15 days, 15% consume them once to twice a week, and 3% consume them daily.
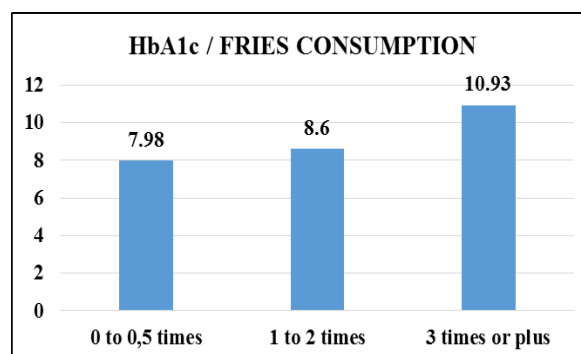

Figure 4: Comparison of the Average HbA1c with the Amount of Fries Consumed per Week (N=140).

- ➢ According to the PEARSON correlation test, there is a significant correlation (p-value of 0.0109) between the consumption of fries and the increase in HbA1c levels. Therefore, we can say that the more fries are consumed, the higher the HbA1c level will increase.

5. Consumption of Pasta
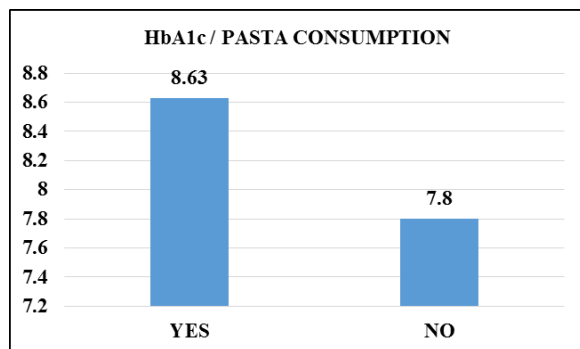
54% of our patients consume pasta.

Figure 5: Comparison of the Average HbA1c with Pasta Consumption (N=92).

➢ According to the STUDENT'S test, the p-value is 0.0332, indicating a significant difference between the average HbA1c of those who consume pasta and those who do not. Therefore, pasta consumption increases the HbA1c level.

6. Consumption of Medicinal Plants
34% of patients have used medicinal plants to treat their diabetes.
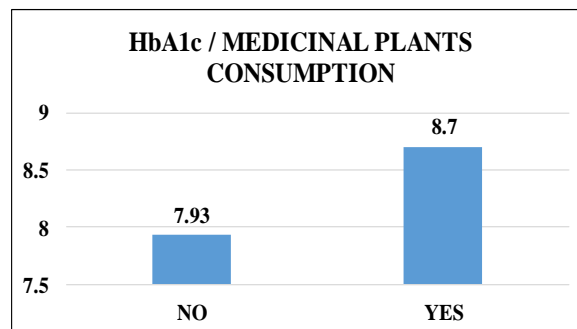

Figure 6: Comparison of the Average HbA1c with the Use or Non-Use of Medicinal Plants (N=149)

➢ There is a significant difference between the average HbA1c of those who consume medicinal plants and those who do not (STUDENT's test p-value of 0.0418). Thus, it can be concluded that patients who consume medicinal plants have a higher average HbA1c than those who do not.

(b) Significant Positive Association
1. Dietary regimen Compliance
38% of patients follow a dietary regimen, 31% follow a partial dietary regimen, and 31% do not follow any dietary regimen.
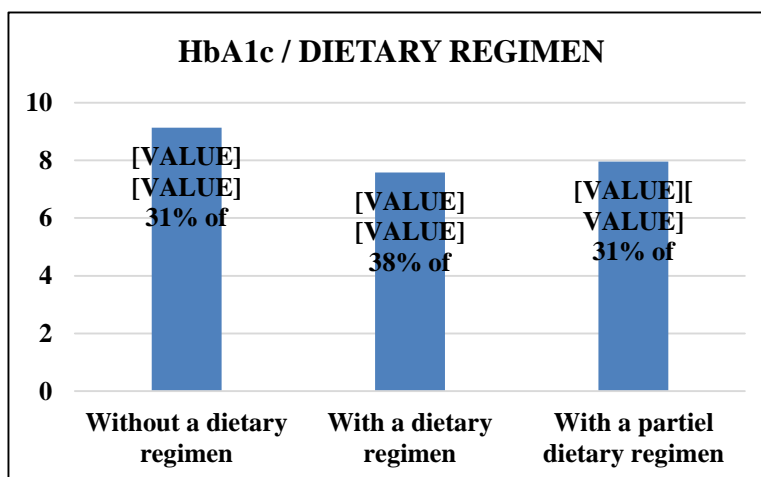

Figure 7: Comparison of the Average HbA1c with Compliance or Non-Compliance to the Dietary Regimen (N=147).

➢ According to the STUDENT's test, the p-value is 0.0002, indicating a significant difference between the average HbA1c of those who do not follow a dietary regimen and those who do. We can say that people who do not follow a dietary regimen have a higher HbA1c level (9.13) compared to those who follow a dietary regimen (7.95).

2. Physical Activity
Only 36% of patients engage in physical activity, and among these, 32% take precautions during exercise (such as carrying sugar with them).
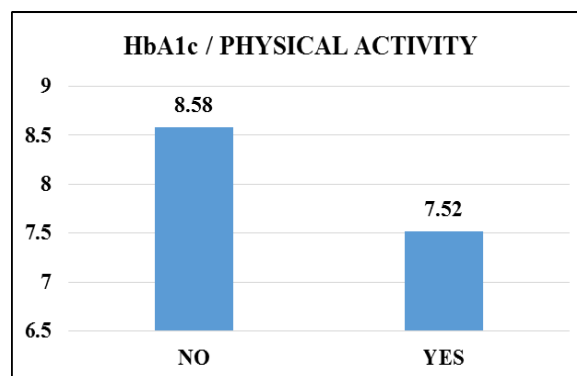

Figure 8: Comparison of the average HbA1c with or without physical activity (N = 143).

➢ According to the STUDENT's test, the p-value is 0.00106, indicating a significant difference. We can conclude that patients who do not engage in physical activity have a higher average HbA1c.

3. Adherence to Treatment

71% of patients adhere to their treatment, while 29% exhibit poor treatment compliance.

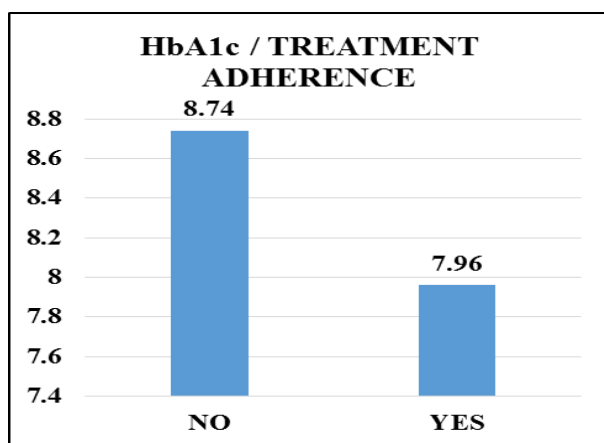41% of non-adherent patients are on insulin, and 31% of adherent patients are on insulin.

Figure 9: Comparison of the Average HbA1c with Treatment Adherence (N=134).

➢ There is a significant difference between the average HbA1c of patients who adhere to their treatment and those who do not (the p-value of the STUDENT's test is 0.0442). Therefore, we can say that patients who do not adhere to their treatment have a higher average HbA1c.

OTHER RESULTS: Non-Significant Associations

According to the statistical tests, no significant association was found between HbA1c and the use of an individual plate, carbonated drinks, white sugar, meal timing adherence, snacks, poultry, diabetes duration, fruit juices, vegetables, dairy products, fish, couscous, and the frequency of medical consultations.

IV. DISCUSSION

A. Bread Consumption

Bread has a high glycemic index (70-100), meaning it significantly increases blood sugar levels. Systematic reviews and meta-analyses based on randomized controlled trials have shown that low-glycemic-index diets improve blood sugar control in individuals with diabetes or at risk of diabetes.[1],[2] Additionally, a systematic review with meta-analysis indicates that a low glycemic or glycemic load diet leads to a small statistically significant but clinically relevant improvement in HbA1c and other cardiovascular risk factors.[3]

B. Red Meat Consumption

According to recommendations, red meat consumption should not exceed twice per week.[4] A recent meta-analysis, which included 6 high-quality studies, demonstrated that a vegetarian diet led to a significant but modest reduction (-0.4%) in HbA1c, with no significant reduction in fasting blood sugar levels.[5]

C. Fruit Consumption

The recommendation for fruit consumption is two fruits per day, preferably those with a low glycemic index.[4]

According to the present study, excessive consumption of fruit results in an increase in HbA1c levels. Sixty-one percent of our patients remain within the recommended range, while 21% do not consume fruit daily, which could be explained by limited purchasing power.

In strictly controlled experimental conditions, fruit and vegetable consumption has been associated with a reduction in blood pressure. However, the effect of fruits and vegetables on plasma lipids, diabetes, and obesity has not been fully explored. Clinical trials on vitamins have yielded disappointing results.[6]

D. Fried Foods Consumption

The Moroccan Ministry of Health recommends avoiding fried foods, favoring cooking methods such as tagine, baking, steaming, and al dente pasta (pasta that is not overcooked).[4]

E. Pasta Consumption

Despite the significant difference, pasta consumption is not excessive, as only 5% of patients consume pasta more than twice a week.

F. Consumption of Medicinal Plants

34% of our patients reported using medicinal plants to treat their diabetes. These patients have significantly poorer diabetes control, which may be explained by neglecting pharmacological treatment in favor of traditional treatments. A study in Morocco by **A. Errajraji, F. Ouhdouch, N. El-Anssari** (7) found that 52% reported using medicinal plants to treat their diabetes. This practice was significantly more frequent among women, individuals aged over 50, and patients with lower educational levels; it was also more frequent, although not significantly, with the duration of diabetes.

Another study in Tunisia by **I. Ksira, H. Sfar, S. Hamdi, N. Ben Amor, O. Fendi, M. Zarrouk, and F. Ben Mami**[8] found that 28.75% of patients reported using medicinal plants. A sense of well-being was reported in most cases, but improvement in glycemic levels was observed in only 26% of cases.

G. Dietary Compliance

Dietary compliance in our study was low (62% of participants showed poor compliance), which is reflected in poorer glycemic control. This was also observed in the study by **S. Ridouane, Z. Fouad, A. Diouri** in Morocco (9), which found that compliance was poor in 65.21% of patients regarding their diet.

H. Physical Activity

Physical activity levels were low in our study (only 36% of patients engaged in physical activity). According to the study by **S. Ridouane, Z. Fouad, A. Diouri** in Morocco[9], compliance was poor in 47.82% for physical activity. Additionally, the study by **L. Hallab, A. Chadli, D. Nsame, S. Elaziz, H. El Ghomari, A. Farouqi** in Morocco[10] found that 82.6% of participants had low physical activity levels.

I. Treatment Adherence

The adherence to the Treatment was not very high (29% of our patients were non-adherent), which is reflected in poorer glycemic control compared to those who adhered to their treatment. Insulin use is likely linked to non-adherence, as 41% of non-adherent patients were on insulin, compared to 31% of adherent patients. A study by **Dr. S. Chakdoufia, Dr. A. Laargane, Dr. S. Moussaoui, and Prof. G. Belmejdoube**[11] found that non-adherence characterizes more than half of the studied (52.8%). These results are consistent with other studies showing that non-adherence can affect 30% to 60% of patients regardless of the country or methodology used. Women are more involved in their treatment (67%), and patients with lower educational levels are less compliant (70%).

V. CONCLUSION

Hygienic and dietary measures play a crucial role in the management of type 2 diabetes. This study highlights the need for better dietary education and improved motivation for diabetic patients in following their dietary regimen.

The quantitative assessment of what diabetics consume remains challenging to implement in practice. Indeed, diabetic balance, represented by the HbA1c level, is simultaneously influenced by various food groups, therefore, prospective studies are necessary to precisely demonstrate the impact of each food group on the HbA1c level.

VI. BIBLIOGRAPHY

1. CHAKDOUFI, S., LAARGANE, A., MOUSSAOUI, S., et al. Observance thérapeutique chez les patients diabétiques de type 2. In : Annales d'Endocrinologie. Elsevier Masson, 2017; 411-412. (n.d.).
2. CHIAVAROLI, L., LEE, D., AHMED, A., et al. Quel est l'effet d'un régime alimentaire à faible indice glycémique sur le contrôle de la glycémie et sur les facteurs de risque cardiovasculaire chez les patients atteints de diabète sucré?. Minerva, 2022. (n.d.).
3. DAUCHET, Luc et DALLONGEVILLE, Jean. Fruits et légumes et maladies coronariennes. Sang Thrombose Vaisseaux, 2010; 22(10): 517-522. (n.d.).
4. ERRAJRAJI, A., OUHDOUCH, F., et EL-ANSSARI, N. Usage des plantes médicinales dans le traitement du diabète de type 2 au Maroc: Use of medicinal plants for type 2 diabetes treatment, in Morocco. Médecine des maladies Métaboliques, 2010; 4(3): 301-304. (n.d.).
5. HALLAB, L., CHADLI, A., NSAME, D., et al. Croyances et pratiques alimentaires chez les diabétiques de type 2 obèses marocains: Beliefs and food practices of obese type 2 diabetics in Morocco. Médecine des maladies métaboliques, 2012; 6(3): 244-248. (n.d.).
6. KSIRA, I., SFAR, H., HAMDI, S., et al. Utilisation des plantes hypoglycémiantes dans le traitement du diabète. In : Annales d'Endocrinologie. Elsevier Masson, 2014; 385-386. (n.d.).
7. ministère de la santé du maroc. (2016, avril). ÉDUCATION THÉRAPEUTIQUE DES DIABÈTIQUES DE TYPE, 2.
8. RIDOUANE, S., FOUAD, Z., et DIOURI, A. P141 Les facteurs de la non compliance aux règles hygiénodiététiques et au traitement médicamenteux chez les diabétiques de type 2. Diabetes & Metabolism, 2008; 34. H81. (n.d.).
9. Thomas D, Elliott EJ. Low glycaemic index, or low glycaemic load, diets for diabetes mellitus. (n.d.).
10. Wang Q, Xia W, Zhao Z, Zhang H. Effects comparison between low glycemic index diets and high glycemic index diets on HbA1c and fructosamine for patients with diabetes: a systematic review and meta-analysis. Prim Care Diabetes, 2015; 9: 362-9. (n.d.).
11. Yokoyama Y, Barnard ND, Levin SM, Watanabe M. Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis. Cardiovasc Diagn Ther., 2014; 4(5): 373-82. (n.d.).