

Nutrition vital consequence for a reduction in the cost of Diabète care in Algeria

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Received: 21/01/2024; Accepted: 24/03/2024 Published:15/06/2024

Abstract:

Diabetes is a real public health problem; and through this study the aim is to identify the problematic of this pathology in the economic approach and its overall management. Affected subjects who number in the thousands and require expensive long-term care; this disease absorbs a very large part of the national health expenditure.

The charges also hard on social security balances and state budgets. Scary figure; more than 5 million Algerians have diabetes in Algeria. Ranking with top 10 countries in number of new cases of diabetes in children and adolescents (0-19 years), Algeria is in 6th place. In the Top 10 countries / territories in terms of new cases of type-1 diabetes (children and adolescents), our country is in 8th place. In order to reduce its mortality and control these costs; The state is developing diabetes education-based control strategies to teach people with diabetes the knowledge and skills that will enable them to self-manage their diabetes and related conditions. It is one of the cornerstones of management, along with diet, physical activity and drug treatment, and is critical for improving outcomes.

Therefore; our problem addresses the essential role of Healthy Eating and the benefits of weight reduction in diabetes balance and which will reduce its consequences and personal burden; Family social and above all economy.

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Keywords: Diabetes in Algeria; economic burden of diabetes; nutrition; and dietetics of diabetes

1. INTRODUCTION

Diabetes is a chronic disease caused by a disorder of carbohydrate metabolism with absolute or relative insulin deficiency; affects human societies whatever their stage of development.⁽¹⁾

Diabetes in Algeria has an economic cost, which tends to increase until it absorbs a significant portion of overall health expenditure. This is the alert given by experts, who have supported it with edifying figures. In 2014, the disease cost US \$ 471 billion, or about 20% of healthcare spending. Complications linked to diabetes (cardiovascular accidents, eye damage, amputations, etc.) multiply the financial burden of treatment by 24 for type 2 and twelve for type 1. A large part of the excess medical expenses in diabetics is attributable to complications of the disease.

By 2030, the disease will consume US \$ 595 billion. Beyond the economic aspects, diabetes, as much as cancer, is a fatal disease, if it is not apprehended by an effective and rigorous therapeutic approach, combined with a good hygiene of life (healthy and balanced diet, loss weight, physical exercise ...). In 2012, he killed 4.8 million people around the world. This is huge for a condition that has been treated for a century.

As prevention is better than cure, changing dietary habits in a diabetic can delay the progression of the disease and avoid these complications; therefore our problem is as follows:

How can nutrition be a vital consequence for reducing the cost of diabetes care in Algeria?

2. Reminder on diabetes:

There is not just diabetes, but lot of diabetes. Diabetes does indeed

(1). Perlemuter.L; COLLIN DE L'HORTET.G. diabetes and metabolic diseases; Masson; Paris ; 2 EME edition 1995. p 54

appear; more like a syndrome than a disease. In other words, it is a set of signs that can be due to different causes.⁽¹⁾

2.1 Etiology:

Diabetes is a term of Greek origin (diabaino) which means to get through. It is a condition in which the fluids absorbed seem to immediately pass through the body and be excreted in the urine.

To understand what is going on; it seems useful to give a brief description of the phenomena which take place in the kidney. Both kidneys in humans contain about 2 million building blocks called nephrons. Each nephron is made up of a collection of small blood vessels or capillaries called a glomerulus, which is extended by a long, threadlike tube. Daily; glomeruli filter from the blood; about 150 liters of water and a certain amount of molecular substances: glucose; essential salts; urea...some of these substances are non-volatile wastes from various chemical reactions that occur in the cells of the body. The filtered liquids will undergo a reabsorption action as they progress through the renal tubule. Thus 99% of water and almost all of the glucose and salts are reabsorbed. What remains will constitute the urine which is evacuated in the bladder or approximately 1.33 cm per minute for a diuresis of 1.5 L per day. The mechanisms of this exchange are under the direct control of a number of hormones that act in specific ways. The disturbance of these mechanisms at a particular level is at the origin of three major diseases very different from each other and which clinical and biology allow to individualize⁽²⁾.

2.2 Diabetes insipidus:

Characterizes a disease in which the subject excretes considerable amounts of excessively diluted urine composed of essential water; the other substances are normally reabsorbed in the renal tubule which gives the urine a tasteless flavor. This diabetes is due to the absence of

(1). Pecher.j-c; Jacobs; diabetic sugar ; house edition maloine; canada; 2nd edition; 1994; p95.

(2). Mostefa khiati, diabetes in children; university publication office - Algiers; edition 2167; p 27.

the antidiuretic hormone (A.D.H) responsible for the reabsorption of water after filtration. Under normal conditions; this hormone which is secreted in the brain; allows the volume of urine to be adjusted according to the diet. When it is absent or there is insensitivity of the renal tubule to its action. The filtered water only passes through the kidney and ends up in the bladder.⁽¹⁾

2-3 Renal diabetes:

In the blood; the concentration of sugar or blood sugar is normally one gram per liter. The 150 liters filtered per day therefore contain about 150 g of glucose which under normal conditions is completely reabsorbed in the renal tubule so that the urine emitted does not contain sugar at all. Renal diabetes results from an abnormality in the reabsorption of glucose from the renal tubule. This anomaly is variable; it is hardly ever total. This results in the presence of glucose in the urine (glycosuria) whereas; blood sugar is normal. This disease does not require treatment; it never progresses to diabetes mellitus.

2.4 Diabetes mellitus:

As we have just seen; glucose is completely reabsorbed after filtration. The amount reabsorbed daily is 150 g, but the maximum reabsorption capacity of the kidneys is almost double. This ability allows the body to adapt to excessive sugar intake (rich meals, etc.). However; when blood sugar exceeds 1.8 g / l; the ability to reabsorb excess glucose found in the urine. This diabetes is thus characterized by the association of an increase in blood sugar or hyperglycemia and glycosuria. there are several varieties. The dosage of insulin⁽²⁾; made it possible in 1960 to distinguish a default variety of insulin; of a variety where insulinemia is normal or even increased.

2.5 Type 1 diabetes: IDD or childhood diabetes

(1). Mostefa khiati; op quotes; p 29.

(2). Insulin: hormone which by several mechanisms ensures the maintenance of blood sugar at a constant level of 1g / L .

Insulin dependent diabetes or lean diabetes and currently called type I diabetes; mainly characterizes the young subject (juvenile diabetes). But it can occur at all ages of life. Hyperglycemia is linked to a lack of sufficient insulin secretion. It is quickly fatal without the daily administration of insulin. In the absence of insulin treatment; he progresses to coma and death.

2.6 Type 2 diabetes: NIDD or D. adult

Non-insulin-dependent diabetes: is the prerogative of adults. Due to improper use of insulin by the body. It accounts for 90% of diabetes cases worldwide and is mainly the result of being overweight and lacking in exercise. Currently, this type of diabetes also affects obese children. In this variety; at least four sub-varieties are individualized.

➤ **Diabetes in obese subjects;** fatty diabetes or bloated diabetes of maturity. also called type II diabetes. is the most common form. it usually appears after 40 years but can be seen earlier. It tends to be accompanied by obesity. It is favored by a sedentary lifestyle and a diet too rich in dietary glucose. **weight loss and a well-followed dietetic treatment considerably improve the patient.** These measures when applied in predisposed families; may delay the onset of the disease or only allow very mild forms to appear. **This type of diabetes is rare in poor countries and disappears in the event of famine.**

➤ **diabetes resulting from general cell disruption.** Constant hyperglycemia is here necessary to maintain cellular energetics. This variety can be seen after 50 years; especially in industrialized countries. High blood sugar is associated with high cholesterol. Basal insulinemia is normal; it increases moderately on the glucose load test.

➤ **Diabetes in elderly hypertensive subjects;** this is another variety where hyperglycemia compensates for the circulatory deficit associated with generalized vascular sclerosis. Hyperglycemia here must therefore be observed.

➤ **MODY (Maturity Onset Diabetes of the Young)** is a

specific type of diabetes since it takes on the character of these subvarieties but is only seen in children.⁽¹⁾

c) Transient diabetes.

➤ Gestational diabetes:

Hyperglycemia detected for the first time during pregnancy. Increased insulin resistance, including enhanced placental degradation of insulin, is the main mechanism behind gestational hyperglycemia.

➤ The disturbance of central origin:

Brain trauma; brain tumor; encephalitis; cerebral or meningeal hemorrhages; vascular collapse.... which causes irritation of the regulatory centers resulting in the release of factors which accelerate the release of glucose stored in the liver in the form of glycogen (hepatic neoglycogen) resulting in an increase in blood sugar. this state does not give way until the cause which engendered it has disappeared.

3. RISK FACTORS

3.1 Type 1 diabetes:

- People with a family history of IDD (hereditary). Food during the neonatal period and infancy (proteins from cow's milk). Exposure to various viruses.

3.2 Type 2 diabetes:

Obese and sedentary adults and children. Certain ethnic groups: Asians and Africans, make 02 times more NIDD than natives of the Americas and Australia. People with a family history of NIDD (hereditary). Women who have had gestational diabetes mellitus. Absent physical activity. Nutritional factors: Food intake rich in saturated fat and low in fiber. Severe or prolonged stress. Drugs and hormones. Among these drugs, we find corticosteroids, certain treatments of the

(1). Perlemuter.L; COLLIN DE L'HORTET.G; op quotes; p 102.

nervous system (especially so-called atypical neuroleptics), anti-virals.

certain anti-cancer drugs, diuretic drugs, hormonal contraceptives (especially at high doses of estrogen or progesterone).⁽¹⁾

4. Complication:

4.1 ACUTE METABOLIC COMPLICATIONS OF DIABETES:

The acute metabolic emergencies of diabetic ketoacidosis, non-ketonic hyperosmolar states of hypoglycemia and lactic acidosis may present with coma or altered level of consciousness in diabetics. Other conditions to consider include stroke, seizures, trauma, drug abuse, infections, and ethanol poisoning.

a) DIABETIC ACIDOCETOSIS:

Diabetic ketoacidosis (DAC) is an unbalanced diabetes (hyperglycemia, hyper ketonuria, and hyper ketonemia if dosed) requiring emergency treatment with insulin and intravenous fluid intake. The risk of death from DAC is too high in Algeria due to late diagnosis and presentation and insufficient treatment. DAC occurs at any age, although there is a well-known peak in puberty. The usual precipitating factors are infection, treatment errors, new cases of Diabetes; but the cause is not found in almost 40% of cases.

Initial treatment at primary level and its cost:

Set up a venous line and start the IV infusion of ordinary dirty serum (cost of the bottle = 150 AD) at least 1 liter in the first hour in the absence of contraindications. Give 10u of regular insulin IM. Arrange for immediate transfer to an emergency service. Inform the referral service.

b) Non-Ketotic hyperosmolar conditions of diabetic:

The non-ketotic hyperosmolar state is characterized by its

(1). Philippe Even and Bernard Debré; drugs: they can cause diabetes: the site: <https://www.topsante.com/medecine/medicaments/grandes-familles-de-medicaments/medicaments-ils-peuvent-provoquer-le-diabete-23493> consulted on: 30 / 10/2023 at 8 p.m

insidious development and very pronounced hyperglycemia (usually > 50 mmol / L), dehydration, and prerenal uremia. There is no significant hypercetonemia. In 2/3 of cases these are unrecognized cases of diabetes. Infections, diuretics, high sugar drinks can all be precipitating factors. It usually affects middle-aged or elderly people with a high risk of death.

The initial treatment is the same as for DAC.

c) HYPOGLYCEMIA:

Hypoglycemia is a medical emergency and must be treated quickly to avoid serious complications. Common causes of hypoglycemia are: More physical exercise than usual; Deferred meal, skipped or omitted a snack; Poor insulin injection technique; Administration of a large amount of insulin; Insufficient carbohydrate intake; Significant alcohol consumption; Error in sulfonylurea doses.

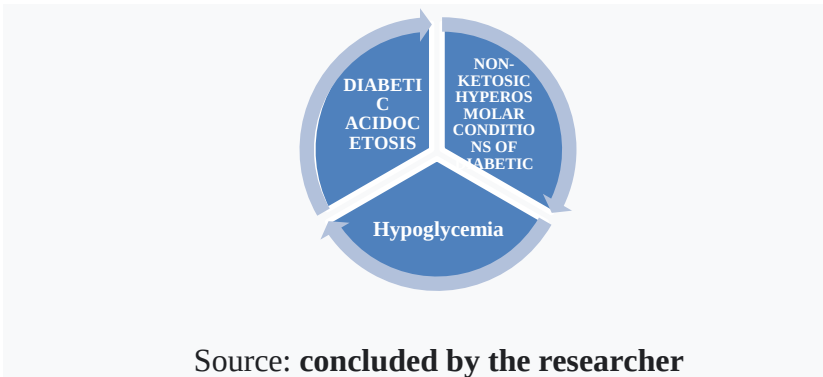
4.2 Acute taking care:

Oral glucose if the patient is conscious. If the patient is unconscious, give intravenously 50% glucose (40 - 50ml) or 100 - 150ml 20% glucose followed by infusion of 10% glucose if necessary. (price of the bottle = 150 DA), Glucagon can also be injected into unconscious patients. When he wake up, give a meal rich in slow-acting sugars. Extend the IV administration of glucose (5-10% for 24 hours) if necessary. In case of hypoglycaemia secondary to long-acting sulfonylureas, intermediate or long-acting insulin or alcohol. If the IV route is inaccessible, consider administration by rectal route or nasogastric tube of glucose or glucagon (1 mg IM) if available).

When you wake up, try to identify and properly treat the cause of the low blood sugar. Evaluate the types of insulin used, the injection techniques and sites (since lipohypertrophy can alter the rate of insulin absorption). Check and correct inappropriate eating habits, exercise and alcohol consumption. Review other medications and kidney function.⁽¹⁾

(1). Team of Diabetes Quebec health professionals; complication of diabetes;
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Fig.1. The acute metabolic complication of diabetes



4.3 Taking care of chronic microvascular complications (kidneys, eyes, heart, nerves)⁽¹⁾

Microvascular complications may be present at the time of diagnosis of diabetes due to the fact that this diagnosis is usually late. Optimal treatment of diabetes and high blood pressure can prevent these complications or slow their progression. The screening for complications and appropriate interventions reduce the risk of outcomes like blindness and amputations. The prevention and appropriate management of microvascular complications is a huge challenge for all African countries, since diagnostic methods for their early detection are not part of routine clinical practice or are simply absent.

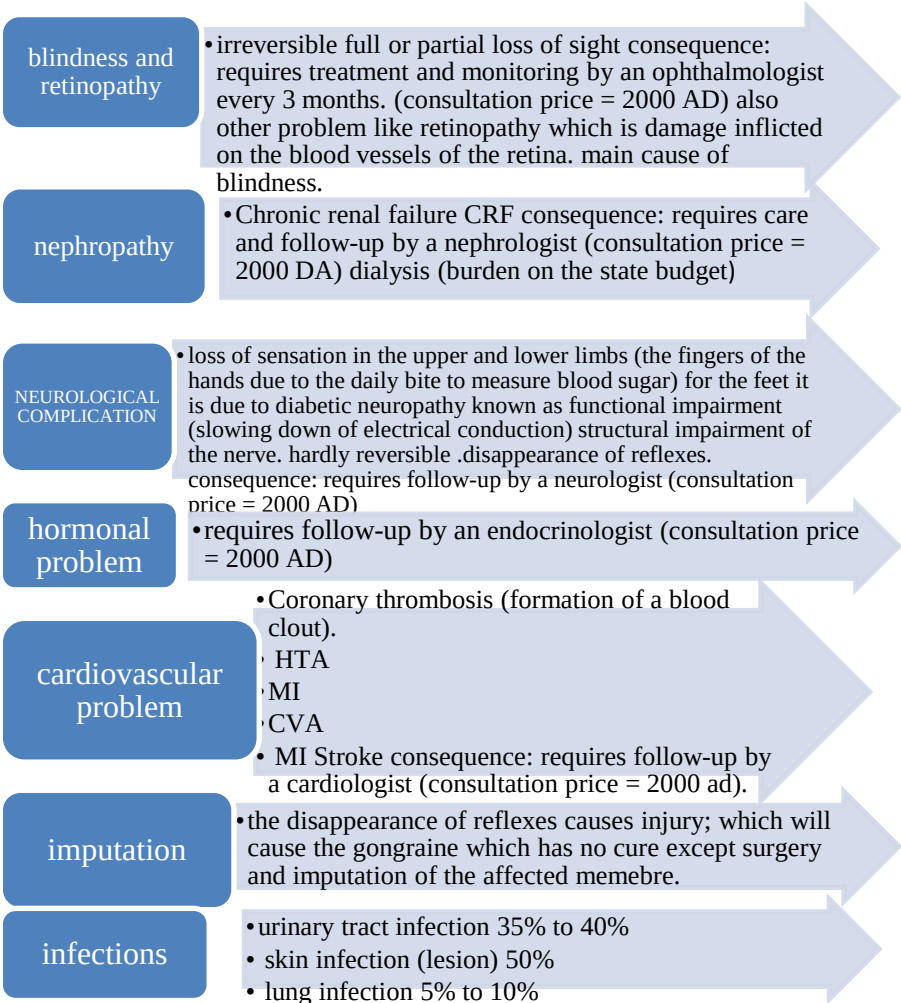
- Diabetes is progressively one of the major causes of CKD kidney failure. The majority of chronic renal failure patients in Algeria die from uremic complications and the unavailability of replacement therapy facilities. Persistent microalbuminuria is a marker for the development of nephropathy patent in diabetics, as well as being a marker of high cardiovascular risk.
- Patients who progress from microalbuminuria to macroalbuminuria (> 300mg / 24h) are at risk of progression to end-stage renal disease within a few years. Intervention at the micro

<https://www.diabete.qc.ca/fr/comprendre-le-diabete/tout-sur-le-diabete/complications/les-complications-liees-au-diabete/>; site consulted on: 08/11/2023. At 21h.

(1). Pr Jean-Jacques AltmAn, Dr Roxane Ducloux - Dr Laurence lévy-Dutel, the great book of diabetes, Eyrols, 2012; p 30.

albuminuria stage may slow the progression to end stage renal disease. In previous years, several interventions have been shown to be effective in reducing the risk and slowing the progression of kidney damage. Screening and surveillance Test for proteinuria once a year using urine strips. Measure the urinary excretion of micro albumin each year (if not proteinuric) by: Semi-quantitative methods (Micral II reagent strip, Clinitek 50 strip) or ratio of micro albumin: creatinine.

Fig.2. chronic microvascular complications (KIDNEYS, EYES, HEART, NERVES) and its cost.



Source: Mokrani Hacene; management of a patient in hospital for complications from diabetes; end of study dissertation NIPT SOUR

GHOZLAN; Bouira; Algeria 2005; p 55.

The consultation with each specialist doctor requires a set of additional examinations; we will quote them with their prices in order to try to set the cost of caring for a patient with diabetes at maybe: Without forgetting the analyzes which require the follow-up every 3 months the person touched by diabetes must make the following assessment:

Table 1.complementary examination set for diabetics

The additional examination:	Tarif :
The blood test: • bnf (blood numbering formula) • fasting blood sugar, • glycated hemoglobin (ghb1C), • microalbuminuria (search for albumin in the urine), the presence of which signals a risk of vascular damage from diabetes. • Total Cholesterol (HDL. LDL / Triglyceride) • PR • UREA –CREATININ • CUE	500 AD 100 AD 750 AD 600 AD 750 AD 200 AD 400 AD 850 AD
PRICE :	5500 AD
Complementary cardiac examination: ECG ULTR - DOPPLER TA 140/80	1500 AD 3000 AD or more it depends on the surface of the body.
Complementary ophthalmic examination:Fundus	2500 AD

CONSULTATION AT 05 SPECIALIST PHYSICIAN: ophthalmologist / nephrologist / endocrinologist / cardiologist / neurologist / surgeon	2000 AD consults her five times (10,000 da) / 03 months+ cost of drugs that we go to site after in the bill.
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Source: concluded by the researcher

In the following table we will mention the drugs most prescribed and used by diabetics IDD / NIDD; and their pharmaceutical price; many of which cost a lot of pulpit; which made this disease covered 100% by insurance (economic burden on the state budget):

Table 2.Invoice for the care of a diabetic in Algeria: (cost of drug treatment per unit):

Type I diabetes: IDD		Type II diabetes: DNID	
Medication :	Price :	Medication :	Price :
Insulin :		Oral hypoglycemic agents:	
Lantus soil		Diaglimide (0.5 mg)	356.00AD
Apidrasol		Diaglimide (1 mg)	370.00AD
Novorapid	7937.25 AD	Diaglimide (2 mg)	390.00AD
Novomix	4161.41 AD	Glimix (0.5 mg)	335.8 0 AD
Humalog 25	5663.84 AD	Glimix (1 mg)	337.80 AD
Humalog 50	5681.17 AD	Glimix (2 mg)	339.00 AD
Humalog 100	5640.92 AD	Glucophage 850 (30 cp)	147.60 AD
Glucagan	5603.56 AD	Glucophage850 (90 cp)	442.80 AD
Insulting	5639.20 AD	Glucophage 1000	173.00 AD
Mixtard (10 ml)	2338.34 AD	Novoformin 500 mg	109.20 AD
Actrapid (10 ml)	918.16 AD		
	955.48 AD		
	917.76 AD		

GLYCEMIA MEASURE STRIP (Dextro)		Novoformin	
		1000 mg	173.00 AD
		Amarel 1	
		Amarel 2	250 .00 AD
		Amarel 3	480.00 AD
		Amarel 4	720.00 AD
		Amarel 5	750.00 AD
			920.00 AD
			1500 AD

Source: concluded by the researcher

In the following table we will demonstrate a 03 month drug bill for a patient with IDD diabetes and which will cost almost 40,000 DA paid totally by the state since this disease is fully supported 100/100 .

Table 3.Example invoice for 03 months of a patient with DID diabetes:

Medication served	Qt	Price U	Rising	Insured amount	Pharmacy amount
Glucagen hypokit	01	2338.34 AD	2338.34 AD	0 AD	2338.34 AD
Reagent strip for glucose assay(blood)	11	1500.00 AD	16500 AD	0 AD	16500 AD
Novorapid flexpen	02	5652.37 AD	11.304.75 AD	0 AD	11.304.75 AD
Lantus solostar	01	7918.3 AD	7918.3 AD	0 AD	7918.3 AD
INVOICE AMOUNT		38 061.39 AD			
AMOUNT PAYABLE BY THE INSURED		00 AD			
MONTANAT TO		38 061.39 AD			

BE REFUNDED TO THE OFFICINE	
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Source: invoice from a pharmacy of a IDD patient

Without forgetting the analyzes which require the follow-up every 3 months the person touched by diabetes must make the following assessment:

5. Nutrition and diabetes:

Knowing how to adopt a diet that respects the balance between the different food groups (carbohydrates, proteins, lipids) remains the basic measure in order to avoid the complications of diabetes and its economic and social burden. This does not mean that we should deprive ourselves of everything, far from it. There are some basic rules to follow in order to achieve a balanced diet: Avoid bad sugars. (carbohydrate / starch). Choose foods containing complex carbohydrates (fresh fruits, vegetables and whole grain products). Control fast sugars (table sugar, molasses.) And complex sugars (carbohydrates). Avoid saturated fats, fried foods, animal fats, and some dairy products. On the contrary, it is necessary to promote a diet based on fruits, vegetables and polyunsaturated fats as found in oily fish, olive oil, borage or evening primrose oil, hemp and flax, rich in Omega 3 and 6. Include foods rich in protein; lean meats, fish, soy, legumes, lean cheese, etc ;

- Completely avoid the consumption of alcoholic beverages since they provide empty calories.

- Eat more fiber! People with diabetes should know that fiber is their best friend. In fact, fibers have the property of slowing the absorption of sugar in the intestine. Diabetics must consume fiber (therefore complex sugars). Fiber is found in good quantity in vegetables, fruits and whole grains (oats, barley, etc.)⁽¹⁾

(1). Unicef; guide for the fight against nutritional deficiencies; for the use of health personnel; ANEP; Algeria 1996; p 121.

6. Hygiene - dietetic measures (common to type 1 and type 2 diabetes):

6.1Dietary recommendations:

Diet must be adapted, it is an integral part of the treatment of diabetes, the diet must be as close as possible to a normal balanced diet. The general principles are: A normal energy intake, as follows in proteins, lipids, carbohydrates (15%, 30%, 55%); A distribution of the ration in 3 meals and 1 to 3 snacks, adapted to the prescription of insulin, and to the patient's lifestyle; A good knowledge of carbohydrate equivalents (see table) and allows the patient to easily juggle his ration and to diversify his menus.⁽¹⁾

Table 3.Carbohydrate equivalence table for bread

Bread	100 g of bread = 7 ordinary rusks of 10 g
Potato Cereal - banana	100 g of potato = a 3 tbsp of cooked rice = 3 tbsp. to s. cooked pasta = 5 tbsp. cooked pulses = 100 g of banana 20% carbohydrates

Table 4. Carbohydrate equivalence table for fruit

Carbohydrates:	10 %	15 %	20 %
Fruits:	Apricots	Pineapple	Almond
Fresh or frozen, weighed raw without waste.	Lemon	Peach	Cherry
To consume raw or pressed or cooked poached without sugar	Strawberry	Walnut – hazelnut	Fig
	Mandarin	Pear	Grape
	Orange	Apple	
	Watermelon	Brugnon	
	Ripe	plum	

(1). Diabetes: Nutrition guide for diabetics , <http://www.le-diabete.com/nutrition-index.html>; site consulted on 09/11/2023. At 13h

Table 5. Carbohydrate equivalence table for vegetables

Carbohydrates:	3 %	5 %	7 %
Green vegetables : Canned fresh or frozen, weighed raw, no waste, ready to cook. To consume: raw, in salad or cooked in garnish or soup.	Salad / endive	Aubergine	Beet
	Tomato	Avocat	Carrot
	Leek	Cabbage	Onion
	Pepper	Cauliflower	Bean
	Fennel	Pumpkin	Green bean
	Spinach	Melon	
	Cucumber	Olive	
		Turnip / radish	
		Squash	

Source: Diabetes: Nutrition Guide for Diabetics

Distribution of carbohydrates according to calorie level, the diets below are established on the assumption of a "late night" patient and therefore require the prescription of a snack around 10 p.m.⁽¹⁾

6.2 Physical exercise:

May have a beneficial effect on insulin sensitivity, hypertension and lipid control should be done at least 3 to 4 times a week to have an optimum effect, physical exercise reduces this risk by 42% .Advising 1 hour of walking / day may increase the risk of acute and delayed hypoglycemia.⁽²⁾

6.3 Suggest:

Self-monitoring to better understand the response to exercise and

(1). Printable diabetic food chart by root on January 18, 2018; ; <https://printablegraphics.in/printable-diabetic-food-chart/> ; consulted on: 10/11/2023

(1). Peter-J D'Adamo; FIGHT AGAINST DIABETES AND SUPPORT ITS TREATMENT: 4 BLOOD GROUPS, 4 DIETS; Borché, paris; 2005, p 125.

(2) . Peter-J D'Adamo; FIGHT AGAINST DIABETES AND SUPPORT ITS TREATMENT: 4 BLOOD GROUPS, 4 DIETS; Borché, paris; 2005, p 225.

the effects of insulin and dietary changes on this response. An anticipated reduction in the dose of insulin for regular exercise. An additional intake of carbohydrates if necessary. Warn against : The risk of delayed hypoglycemia, especially in the event of prolonged, intense or unusual exertion, and warn the subject of the possible need to reduce the dose of insulin at bedtime and the next day: The fact that physical exertion during an insulin deficiency will increase blood sugar and ketonemia. The fact that alcohol can increase the risk of low blood sugar after exercise. Avoidance of tobacco, and promote the information and awareness program in favor of smoking cessation assistance Publicize the existence of withdrawal assistance services.⁽¹⁾

❖ Patient follow-up:

Consultation every 3 months; in-depth clinical examination: Check weight, blood pressure, foot exams (+++), search for signs of neuropathy. Verification of the quality of metabolic control (glycated hemoglobin, self-monitoring of blood glucose at home). Compliance with treatment. Check-up at least once a year: - Proteinuria, Urinary albumin excretion (micro albuminuria); Kidney function (serum creatinine, creatinine clearance) and Lipidogram ; ECG; The fundus (the ophthalmologist will determine the frequency in case of retinopathy). In-depth clinical examination, with measurement of BMI and blood pressure , Search for macroangiopathy lesions and other tests are indicated depending on the course of the disease (see complications).

7. Conclusion:

Diabetes causes very high medical costs. For 2014, the excess spending calculated on a benefit-by-benefit basis reached \$ 471 billion, more than half of which was for complications. This is a very conservative value, which only reflects the more intensive use of the services.

(1) Peter-J D'Adamo; op quotes; p 130

A second approach, which estimates the attributable cost as a whole, places the cost of diabetes significantly higher, at 500 billion dollars. The difference is easily explained: not only does the second calculation include all medical benefits, but it also includes the additional resources required to treat patients with diabetes. The excess medical expenses caused by diabetes are therefore between 170 and 250 billion dollars.

The cost analysis provides useful information for setting public health priorities and shows the resources that could be freed up if the proportion of people affected and the onset of complications were avoided. As type 2 diabetes is closely linked to lifestyle, especially food hygiene; its consequences are largely preventable; complications can be delayed or even avoided by early diagnosis and good disease management. A decrease of one percentage point in the average prevalence in the canton of Vaud would allow an annual saving in health expenditure of between 50 and 60 billion \$. Direct medical costs make up the bulk of the costs of diabetes. There are also direct non-medical costs, such as transportation for dialysis patients.

Diabetes and its complications cause significant indirect costs, in the form of the loss of productive capacity when a diabetic is no longer able to work or has to reduce his level of occupation, or dies prematurely. Not measured here but penalizing, the loss of quality of life, with the progression of the disease and the appearance of complications. Another social cost is added, as there is social and economic inequality in the face of diabetes, with social inequalities causing inequalities in health. People with low income and low education have a significantly higher risk of developing the disease. As one of the roles of health promotion and prevention is to reduce health inequalities, the public health issue is heightened.