

MACROANGIOPATHY IN DIABETIC PATIENTS. ROLE OF THE NURSE IN THE PREVENTION OF CARDIOVASCULAR COMPLICATIONS

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ABSTRACT

The subject of this paper concerns fundamental aspects of complications, management and education of the diabetic patient, especially the patient with macroangiopathic complications .

The increase in the prevalence of diabetes mellitus is now exponential and its impact on cardiovascular diseases is increasingly evident.

In fact, the patient with diabetes has a significantly increased risk of developing major cardiovascular events.

This is due to the particular aggressiveness of atherosclerotic disease at the level of the vessels, favored by endothelial dysfunction linked to the hyperglycemic state.

Diabetes is a chronic disease with very widespread diffusion all over the world, destined to increase in the near future with the progressive aging of the population and the increasing occurrence of risk conditions that precede its onset.

We are in fact in the presence of a real pandemic confirmed by epidemiological data, which indicate that more than 300 million people in the world are affected by diabetes.

In Italy, the treatment for diabetes absorbs 6.65% of the overall health expenditure, with a cost per patient that is more than double the national average.

Given the significant burden diabetes places on public health, preventing and improving the care of people with diabetes should be a primary goal for most communities and health systems.

The consequences for individuals are due to the complications that the person with diabetes can develop, in terms of a reduction in both the expectation and the quality of life, with significant repercussions, including economic ones.

The organizational quality and efficiency of diabetic care are correlated with better disease control, with a better prognosis of complications, leading to a lower diabetes-related mortality rate.

Reducing morbidity and mortality and improving the quality of life of people with diabetes mellitus represent one of the current challenges for healthcare professionals, healthcare organizations and medical staff working in public healthcare facilities.

The selection and subsequent implementation of therapeutic education interventions, whose efficacy and congruence with needs have been demonstrated, are essential steps towards improving the conditions of people with diabetes.

Diabetes is a chronic disease and as such requires responsible management by those affected. Often people with diabetes forget to live with a silent disease which, in addition to acute complications, also manifests long-term complications which can become fatal.

A structured intervention is therefore necessary that increases the motivation and adherence of patients to the therapeutic plan, thus leading to a good metabolic control, to an acquisition of knowledge that allows them an adequate management of the disease and a consequent better quality of life.

The aim of this thesis is to research the results of lifestyle modification among the most important scientific evidence, taking into consideration aspects such as: metabolic control, acquired knowledge, self-management, self-efficacy, quality of life and satisfaction of the subjects.

The research was carried out by consulting international databases such as " Pubmed " and " google scholar " .

The articles report that education for lifestyle change increases knowledge of one's illness, self-management skills and thus 2 an improvement in the quality of life.

As a result, there will be a reduction in the incidence of diabetes and an improvement in numerous cardiovascular factors. Furthermore, the nurse plays a role of fundamental importance both at the educational level through specific structured interventions, and at the psychological level.

The Diabetes

Definition and classification The denomination of diabetes mellitus derives from the Greek, diabetes = "pass through" (the kidneys) and mellitus = honey (in the sense of sweet, referring to the urine) (Treccani & Istituto della Enciclopedia Italiana, 2013).

Diabetes mellitus is a chronic syndrome characterized by hyperglycemia secondary to a defect in insulin se-

cretion or activity or more often by both.

Chronic hyperglycemia is associated in the long term with damage, dysfunction and collapse of different anatomical areas such as ocular complications, macroangiopathy, nephropathy, neuropathy, erectile dysfunction.

Therefore, it requires continuous and multiple interventions on glycemic levels and cardiovascular risk

factors, aimed at the prevention of acute and chronic complications; an educational activity for the patient suffering from diabetes, aimed at acquiring the knowledge necessary for the self-management of the disease; the treatment of complications of the disease, if any.

In order for glucose to enter the cells and be used as “fuel”, the presence of insulin is necessary.

Insulin is secreted by the beta cells constituting the langherans islands , (which are part of the endocrine portion of the pancreas) which is essential for the metabolism of sugars.

All simple and complex sugars (starches), which are consumed with food, are transformed during digestion into glucose, which is the main source of energy for muscles and organs.

The concentration of glucose in the blood is measured by blood sugar.

In healthy subjects, who have a regular life and a correct diet, generally throughout the day the blood glucose values remain between 60 and 130 mg / dl.

When fasting, blood glucose values can vary from 70 to 110 mg / dl; between 110 and 125 mg / dl it is a condition of impaired fasting glycaemia (IFG), a condition that should encourage the patient to pay more attention to his lifestyle and in particular to his diet.

Blood glucose values equal to or greater than 126 mg / dL, according to American Diabetes Association , are considered probable symptoms of diabetes.

The spread of diabetes is taking on the characteristics of a real epidemic, it is estimated that there are at least 387 million diabetics in the world, and that 4.9 million die from complications of this disease.

The criteria for the classification of diabetes mellitus have undergone continuous modifications and redefinitions in recent decades, with the tendency to become increasingly rigorous and sensitive, but also increasingly simple.

The classification and diagnostic criteria of pre - diabetic states and overt diabetes mellitus were revised and reformulated in 1997 by a commission of experts sponsored by American Diabetes . Association (ADA) and subsequently updated over the years to date.

The current classification of American Diabetes Association (ADA), based on etiopathogenetic criteria, provides four classes:

- **Type I diabetes**
- **Type II diabetes**
- **Gestational diabetes**
- **Other specific pathologies of diabetes**

Type 1 diabetes mellitus (DM1)

Type 1 diabetes is a form of diabetes that occurs mainly in childhood and adolescence (although cases of onset in adulthood are not rare).

For this reason, until recently it was referred to as childhood diabetes.

Type 1 diabetes mellitus falls into the category of autoimmune diseases because it is caused by the production of autoantibodies (antibodies that destroy their own tissues and organs, not recognizing them as belonging to the body but as external organs) that attack the Beta cells that are inside the pancreas. deputies for the production of insulin.

As a consequence, the production of this hormone,

whose task is to regulate the use of glucose by the cells, is reduced to zero completely.

Therefore, there is a situation of excess glucose in the blood identified with the name of hyperglycemia.

The lack or scarcity of insulin, therefore, does not allow the body to use the sugars introduced through food which are thus eliminated in the urine.

In this situation the body is forced to produce energy in other ways, mainly through the metabolism of fats, which involves the production of so-called ketone bodies.

The accumulation of ketone bodies in the body, if not intervened in time, can lead to very dangerous consequences up to a coma.

Inadequate control can affect development, increase comorbidities , decrease life expectancy , and increase the risk of acute and chronic diabetes-related complications.

Responsibility for caring for children with diabetes has a psychosocial impact on both the child and his family.

The predisposition to develop diabetes is in part hereditary in fact the first degree relatives are at risk, while for the homozygous twins there is a certain inheritance but not total, because the susceptibility genes for diabetes are at a low degree of penetrance therefore there it must be something else to make it rise.

The regions of the human genome that induce predisposition to diabetes are 20 loci, in particular in the loci that encode human leukocyte antigens for HLA .

Subsequent studies have shown a role in the genetic predisposition for diabetes mellitus also for the insulin gene and other genes involved in the immune process.

Furthermore, viral infections are associated in the onset of diabetes in predisposed individuals.

There are 2 mechanisms through which an infection causes diabetes: the virus infecting beta cells induces a modification of the protein antigens represented by HLA class 1 and T lymphocytes or there is an immune response to viral infection which is a cross reaction towards specific antigens of the beta.

Another role is the feeding with cow's milk as its proteins have a diabetic effect such as beta casein and bovine serum albumin which can lead to cross reactions between milk and cell proteins.

Other proteins are those of wheat such as gluten.

Protective foods are vitamin D which has immune properties modulatory linked to the alteration of vitamin D with the nuclear receptor, chemicals can cause direct toxic damage to the beta causing them to be destroyed.

The characteristic symptoms of diabetes 1 are associated with the progressive worsening of the insulin deficiency.

Initially manifests itself with polyuria, increased urine excretion, as the progressive worsening of the insulin deficiency determines a low action of insulin by reducing the hepatic production of glucose and increasing its uptake at the peripheral level, thus being a hypoglycemic action.

With the presence of deficiency the blood sugar will increase and a certain amount is exceeded or the renal absorption threshold is exceeded, the glucose is no longer reabsorbed and comes out with the urine as it

recalls water due to the osmotic effect.

Polyuria is observed in a high sensation of thirst and a state of dehydration of the skin and mucous membranes.

There is an increase in appetite but with a decrease in weight because in the presence of a deficit we have excessive lipolysis and proteolysis, there will be production of ketone bodies that will lead to nausea, vomiting, abdominal pain and if you do not have a correct drug therapy you can get to a coma or to death.

Type 2 diabetes mellitus (DM2)

It is a disease with a multifactorial etiology characterized by a great heterogeneity of molecular defects characterized by the presence of insulin resistance and often also by a relative insulin deficiency; for this reason, this form does not provide, except in some cases, the insulin treatment.

- cell destruction does not occur in DM2 .

Type 2 diabetes mellitus typically appears after puberty and affects approximately 90 - 95% of diabetic patients.

Many patients with the aforementioned diabetic form are obese, and obesity itself is a cause of insulin resistance .

Patients who cannot be defined as obese according to the criteria based on the calculation of the BMI, will most likely have a higher percentage of visceral adipose tissue, since this too is associated with insulin resistance .

Furthermore, this diabetic form may remain undiagnosed for some years and this is because the hyperglycemia, developing gradually, may initially be asymptomatic.

We can therefore say that at the base of DM2 there is in any case a defective insulin secretion that fails to compensate for the insulin resistance present in the tissue.

However, this tissue insulin resistance may be improved through weight loss or drug treatment.

The risk of developing this form of diabetes is greater in the obese, in physically inactive people, in women with a history of gestational diabetes mellitus, in hypertensive or dyslipidemic patients , in some ethnic groups and increases with increasing age.

DM2 is often also due to a strong genetic predisposition.

However, these forms are complex and not yet fully defined.

On the other hand, a different pathogenesis has been reported, which explains that the primary cause of DM2 is of ischemic origin due to a temporary or permanent decrease in the blood supply in the anterior hypothalamic nuclei, which causes over-excitation of the descending parasympathetic pathways and the anterior hypothalamus axis , increase in the concentration of glucose in the blood and lipids, as well as the accumulation of adipose tissue, the latter being the main one involved in insulin resistance and hyperinsulinemia .

Ischemia causes a chronic progressive deficit of insulin secretion, which favors the necrosis of the B lymphocytes due to lack of irrigation. In this sense, islets have been shown to be highly dependent on blood supply, making them very vulnerable to *ischemic changes*.

Gestational diabetes mellitus (GDM):

Gestational diabetes refers to an increase in blood sugar (blood sugar levels) when fasting or after meals and which is first observed in pregnancy. The risk of developing it must be evaluated in the initial stages of gestation especially in the presence of predisposing clinical signs such as obesity, previous GDM, familiarity with DM

. It generally appears in the II - III trimester of pregnancy and represents an important risk factor for the pregnant woman and the fetus.

Due to a situation of insulin - physiological resistance that is established in pregnancy, by placental hormones, not balanced by pancreatic function.

GDM is manifesting itself more and more in parallel with the increase in juvenile obesity.

Other specific types of diabetes: These are forms of diabetes that do not fall into the previous classes and which are due to other causes.

They can be the consequence of genetic defects of β - cells (**MODY1, MODY 2, MODY3, MODY4, MODY5, MODY6, mitochondrial DNA**) or in insulin action (insulin resistance type A, leprechaunism , Rabson - Mendenhall syndrome , lipoatrophic diabetes), exocrine pancreatic diseases (pancreatitis, trauma, neoplasms, cystic fibrosis, hemochromatosis , pancreatopathy fibrocalculosa), of endocrinopathies (acromegaly, Cushing 's syndrome , glucagonoma , pheochromocytoma , hyperthyroidism, etc.) or forms induced by drugs, chemicals and drugs (vacor , nicotinic acid, pentamidine , glucocorticoids , thyroid hormones, alpha - interferon, thiazides , etc.), infections (cytomegalovirus , rubella congenita) rather than uncommon forms of immune- mediated diabetes (Stiff - man syndrome , anti - insulin receptor antibodies, etc.) or deriving from other genetic syndromes (Down syndrome, Prader syndrome - Willi, Klinefelter , Turner, Wolfram, etc.). In particular, MODY diabetes (Maturity Onset Diabetes of the Young), is characterized by a juvenile onset of type 2 diabetes mellitus in which rare genetic defects in the intracellular mechanisms of insulin action have been identified. Mature-onset diabetes of young people (MODY) is a heterogeneous group of monogenic causes of beta cell dysfunction and diabetes that arise in children and young adults. Making an accurate diagnosis of **MODY** is important in establishing proper management.

In recent years, no major new monogenic causes of diabetes have been identified outside the neonatal period.

Diagnosis

The diagnosis of Diabetes Mellitus and the decrease of beta cells (responsible for the production of insulin) in the pancreas begins about 12 years before the diagnosis of 13 disease .

The importance of making an early diagnosis is reflected above all in the possibility of treating macro and micro vascular complications as soon as possible. The onset of type 1 diabetes occurs most of the time in a sudden manner with a marked increase in thirst, the elimination of a greater quantity of urine, even during the night, a more or less marked weight loss, despite the ' increase in hunger and caloric intake, and a reduction in strength and physical efficiency:

symptoms that attract the attention of the patient or family members and that lead to a quick check, perhaps with a urinary stick, to verify the possible presence of glycosuria.

Type 2 Diabetes

instead, very frequently it is not diagnosed at its onset, due to the absolute lack of any symptoms. In fact, unlike type 1, the blood glucose values are not so high as to cause the classic symptoms mentioned above. It is therefore estimated that at least one third of all diabetic patients do not really know they are diabetic and that the diagnosis is made only after the onset of a complication such as, for example, a myocardial infarction or stroke.

Hence, the need for a more timely diagnosis that allows to implement all those therapeutic aids that today we know are able to prevent possible cardiovascular complications.

Two very simple tests are now available for the diagnosis of diabetes: the determination of fasting glycaemia and the execution of an oral glucose load. Under normal conditions, blood glucose measured on venous plasma after at least 8 hours of fasting should be below 100 mg / dl. A blood glucose equal to or greater than 125 mg / dl allows the diagnosis of diabetes to be made. Glycemic included between 100 and 125 mg / dl define a condition which, although abnormal, is not yet diabetes and which, therefore, is simply defined as “abnormal fasting glycaemia”.

The oral glucose load is performed by taking 75 g of glucose in the morning, on an empty stomach, and determining the glycaemia both before taking the load and after 2 hours.

Under normal conditions, blood glucose two hours after loading should be below 140 mg / dL. Values equal to or greater than 200 mg / dl lead to the undisputed diagnosis of diabetes, while intermediate values between 140 and 199 mg / dl indicate a pathological condition that is not yet diabetes and which is given the definition of “glucose intolerance”.

It is implied that, when first resorting to the measurement of fasting glucose, where the presence of an abnormal glycaemia, between 100 and 125 mg / dl is found, it is necessary to proceed with the execution of a load test.

Both “abnormal fasting glycaemia” and “glucose intolerance” deserve the nickname of pre - diabetes, because both predispose, if not corrected by adequate therapy, to the onset of diabetes and cardiovascular atherosclerotic complications. As for the risk factors that cause this condition they are;

- First degree diabetic family members
 - Women who have given birth to macrosomal fetuses (weight equal to or greater than 4 kg) or who have been diagnosed with gestational diabetes in the past
 - Arterial hypertension with values equal to or greater than 140/90 mmHg or in antihypertensive treatment
- Hdl cholesterol values below 35 mg / dl or triglycerides above 250 mg / dl

Detection in the past of high blood glucose values even if sporadic

- A history of cardiovascular disease
- Women with polycystic ovary syndrome

Since age is itself a risk factor, a screening test should still be performed in all individuals over the age of 45 even in the absence of the specific risk factors listed above.

glycated hemoglobin (HbA1c) completes the diagnostic assessment but is not a necessary requirement for diagnosis.

The HbA1c expresses the average value of the glycaemia of the last two months and can give us valuable information on the metabolic balance reached in that period.

Under normal conditions it does not exceed 6%. Its determination is not useful for diagnosis, but for monitoring the effectiveness of the therapy.

Diabetes screening

In consideration of the increase in new cases of diabetes, both in developing and industrialized areas, such as Italy, it is essential to monitor the onset of the disease through screening. The recommended screening programs in the general population are those aimed at people at high risk of diabetes carried out at the time of medical check-ups.

Screening is a process of assessing asymptomatic subjects aimed at identifying preclinical pathologies, indicators of disease or indicators of risk conditions.

According to the WHO (World Health Organization) it must be simple to perform, easy to interpret, acceptable by the person to whom it is proposed, of high diagnostic accuracy, repeatable over time and with a favorable cost - benefit ratio.

There is therefore a need to identify cases of unrecognized diabetes, which make up one third of the total number of cases of diabetes.

The most suitable strategy is represented by the identification of the categories at high risk of developing diabetes, including subjects with IFG (impaired fasting glycaemia, altered fasting blood glucose: values between 110 and 125 mg / dl), the main risk factor, and subjects with a high BMI (≥ 25 kg / m²): an increase in BMI of 1 kg / m² increases by 8, 4% risk of developing type 2 diabetes.

Epidemiology

According to the data of the Passi surveillance, in the pool of ASL participants, the prevalence of diabetics increases with age (it is less than 2% in people under the age of 50 and is close to 10% among those aged 50 - 69), it is more frequent among men and women (5.1% vs 3.8%), in the socio - economically more disadvantaged segments of the population in terms of education or economic conditions, among Italian citizens compared to foreigners, and in the southern regions compared to the Center and to Northern Italy. The prevalence of people with diabetes has not changed substantially since 2008. According to data from the Cardiovascular Epidemiological Observatory, collected since 1998 and published on the Progetto Cuore website, in Italy 10% of men and 7% of women are metabolic.

Among the elderly (aged between 65 and 74 years), 20% of men and 15% of women are diabetic while 12% of postmenopausal women (average age 62) are diabetic.

According to WHO Europe, 52 million people within the WHO European Region are living with diabetes. The prevalence of this disease is growing throughout

the region, reaching rates of 10-14% of the population in some states .

This increase is partly due to the general aging of the population but mainly to the spread of risky conditions such as overweight and obesity, poor nutrition, a sedentary lifestyle and economic inequalities.

According to the WHO, there are approximately 346 million people with diabetes worldwide and more than 80% of deaths related to this disease occur in low- and middle-income countries.

WHO also estimates that deaths from diabetes are set to double between 2005 and 2030 (in 2004, figures refer to 3.4 million people missing as a result of the consequences of high blood sugar).

The World Health Organization has predicted that by 2025 there will be more than 300 million people with diabetes worldwide. diabetic, 8% of men and 4% of women are in a borderline condition (glucose intolerance) and 23% of men and 21% of women have diabetic syndrome.

Cardiovascular Complications

Definition and complications of diabetic macroangiopathy

Macroangiopathy , as the name itself illustrates , is altering the blood vessels, the large-caliber arteries.

Cardiovascular disease is the leading cause of mortality in Western countries, and diabetes mellitus is a condition of increased risk for this type of disease.

As the frequency and severity of acute complications have decreased, these chronic vascular complications, which can affect various areas of the body, have become clinically more important.

. The symptoms presented by the patient are related to the sites of the body where blood circulation is compromised.

More frequently, vascular complications occur in the form of impaired heart circulation (angina and myocardial infarction), cerebral (infarction and cerebral haemorrhage) and of the lower limbs (peripheral arterial disease).

Before treating these pathological conditions separately, let's take a look at what is the root cause of vascular disease - atherosclerosis.

Atherosclerosis is a chronic inflammatory disease of large and medium-sized arteries that causes ischemic heart disease, stroke, and peripheral vascular disease collectively called cardiovascular disease.

This condition is characterized by a gradual accumulation in the intima of macrophages, smooth muscle cells, lipids and collagen; it is identified as chronic inflammation localized in the intimate vascular tunic and triggered by prolonged endothelial damage.

The inflammatory agent is LDL cholesterol. A classic atherosclerotic lesion is plaque or atheroma, that is a formation consisting of fats, proteins and fibrous tissue that takes 20 - 30 years to develop.

This plaque tends to form more easily where the flow is not laminar but swirling, such as near arterial bifurcations.

Atherosclerosis and its complications are a frequent cause of death, just think that the diseases triggered by atherosclerosis are still the number 1 killer in the world.

On a macroscopic level, atherosclerosis shows itself with 3 lesions: lipid stria, fibrous plaque and complicated plaque. The lipid striae are elongated lesions of

1 - 2 mm, yellowish in color and sharp edges, which stand out against the white color of the intima; only flat and have a smooth and continuous surface.

Histologically, the lipid striae contain lipids and macrophages.

They do not reduce the vessel lumen and do not compromise its structural integrity.

Lipid striae appear in the aorta in early childhood or be present even at birth. In the presence of cardiovascular risk factors they can progress into more advanced lesions.

Fibrous plaque (atheroma) is a circumscribed thickening, protruding into the vascular lumen, up to 1.5 cm long.

The fibrous covering capsule is formed by smooth muscle cells and dense connective tissue where underneath are macrophages, smooth muscle cells migrated from the media and a few T lymphocytes.

These muscle cells become capable of producing cell matrix proteins, including collagen.

Deeper, a necrotic nucleus is observed containing lipids (cholesterol), cell debris and cell - foamy.

The latter, originating from macrophages, are filled with lipids. In the periphery of the plates there are small newly formed vessels.

Fibrous plaques can have complications such as ulceration, bleeding, thrombosis, calcification and lead to aneurysm formation.

Plaque ulcerates when macrophages in the lesion release metalloproteases that weaken the fibrous capsule.

Intra -plaque hemorrhage , the result of the rupture of newly formed vessels, also causes plaque ulceration because the accumulation of blood causes an increase in volume.

The rupture of the capsule causes the release into the circulation of solid fragments (emboli) which can stop in the smallest vessels and cause ischemia. The contact between blood and the contents of the plaque evokes the haemostatic response with the formation of a thrombus which can rapidly occlude the vessel causing necrosis of the downstream tissue. Deposition of calcium salts in plaques is often observed in a process similar to ossification.

ATHEROSCLEROSIS

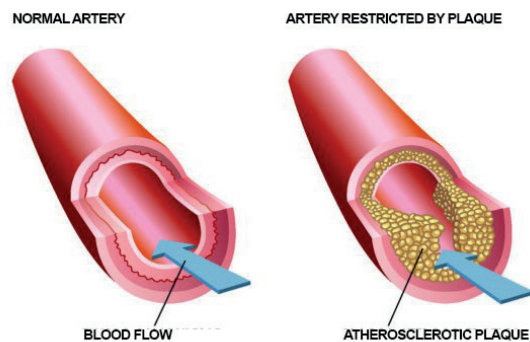


Fig. 1

Let us now take a closer look at the different manifestations caused by macroangiopathy in the most affected areas: the coronary arteries that supply the heart, the iliac and femoral arteries along the lower limbs, and the carotid vessels that carry blood to the brain;

- **Ischemic heart disease**
- **Peripheral arterial disease**
- **Cerebrovascular disease**

Ischemic heart disease

The term ischemic heart disease identifies a series of clinical pictures whose common denominator is represented by myocardial ischemia, defined as a condition of myocardial distress that occurs when the coronary blood flow becomes inadequate to meet the demands for oxygen and necessary nutrients to myocardial cells to perform their contractile function. It is a disease for which deposits of fatty material (mainly cholesterol) are formed on the inner wall of the vessels. The atherosclerotic plaque narrows the lumen of the vessel and determines a reduction in blood flow with a consequent reduction in the supply of blood, and therefore of oxygen and nourishment, to the areas supplied by that specific arterial branch. The correlation between diabetes and ischemic heart disease is well known since, as evidenced in 1993 by the famous MrFIT study, diabetes increases the risk of coronary and cerebrovascular disease by two to four times. The pathophysiological mechanisms that support the correlation between diabetes and heart disease, often superimposed on other usual risk factors such as smoking, age, hypertension and other unfavorable constitutional or family predispositions. On the other hand, some new aspects, of interesting relevance, which favor the development of cardiovascular pathologies in the course of diabetes should be mentioned:

- the reduction of nitric oxide synthesis (No), with consequent defect in action vasodilatory;
- the glucotoxicity and lipotoxicity associated with diabetes favor the release of proinflammatory cytokines, and therefore the maintenance of a

chronic inflammatory condition responsible for endothelial damage;

- the increase in reactive oxygen species, which are also responsible for endothelial damage;
- the increase in inflammatory proteins and thrombogenic factors.

In practical terms this translates into: - a 2 - 5 fold increase in developing a cardiac or cerebral ischemic event; - 60% probability of death from a cardiac or cerebral ischemic event. A study has shown that over 300,000 diabetic patients followed for six years has shown not only that the increase in cardiovascular morbidity and mortality is directly proportional to the increase hemoglobin glycosylated, but also that this increase is independent of the main associated risk factors (Zhao W et al.; Diabetes Care 37: 428 - 35). A relevant aspect in cardiovascular prevention in diabetic disease is hidden morbidity.

While 50% of patients with type 2 diabetes have chronic disease, about half of them have no symptoms or ECG signs. This implies that one in eight men and one in 16 women will suffer from myocardial infarction or will need revascularization surgery; and that one in 16 men (or women) will have a stroke within ten years. Ischemic heart disease is a condition to be prevented in patients with DM as it is the most frequent cause of death in the world, just think that in the United States alone it is responsible for more than a million deaths every year. About half of these "cardiovascular deaths" are directly related to coronary heart disease, while 20% are due to stroke. Ischemic heart disease is the leading cause of death in Italy, accounting for 28% of all deaths after cancer. Considering the potential years of life lost, that is, the years that each person would have lived if he had died at an age equal to that of his life expectancy, cardiovascular diseases take away over 300,000 years of life from people

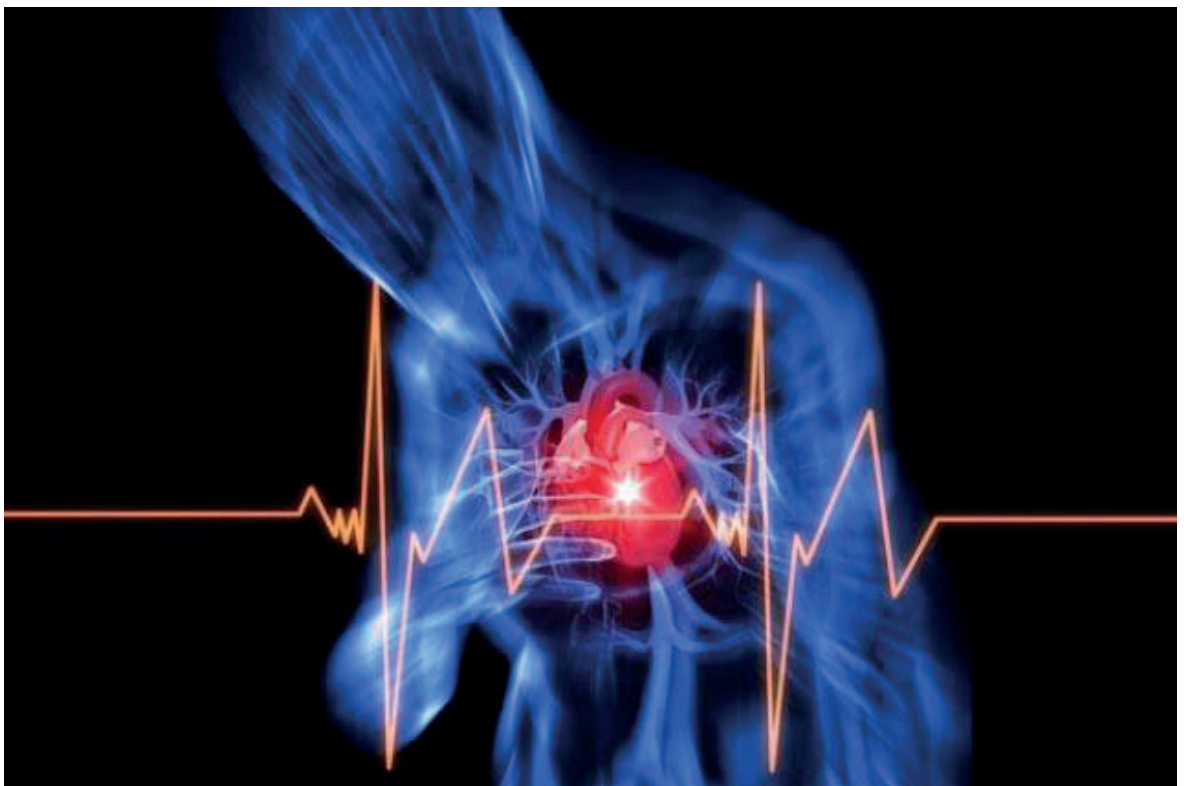


Fig. 2

under the age of 65 every year, 240,000 in men and 68,000 in women. Ischemic heart disease changes the quality of life and entails significant economic costs for society. In Italy the prevalence of citizens suffering from cardiovascular disability is equal to 4.4 per thousand (Istat data). 23.5% of the Italian pharmaceutical expenditure (equal to 1.34 of the gross domestic product) is destined to drugs for the cardiovascular system (Report on the health of the country, 2000). The data of the National Register of Coronary and Cerebrovascular Events show a substantially homogeneous picture throughout Italy, which dispels the cliché according to which one would get sick more heartily in the North than in the South of Italy. The incidence rates of heart attack, for example, are very similar in Naples and Friuli Venezia Giulia, for both men and women.

The health and social value of these data on cardiovascular diseases is accentuated by the consideration that they or, at least, the majority of them, 24 i.e. the arteriosclerotic forms, are largely preventable, at least 50% according to available estimates. Many of the risk factors of cardiovascular diseases are modifiable and, when there are more than one, they have an action that is not only additional but multiplicative or synergistic in determining the risk of disease. Ischemic heart disease can give rise to two types of events namely Angina pectoris and myocardial infarction. As for Angina Pectoris, it is characterized by chest pain, also called posterior sternal pain, caused by insufficient oxygenation of the heart muscle due to a transient decrease in blood flow through the coronary arteries. Anginal pain generally begins slowly, reaching its apex and then disappearing within 10 to 15 minutes; the pain can also spread to the organs close to the chest and this situation is called pain irradiation. In the most typical cases, the subject reports feeling a pain, more or less intense, in the center of the chest that spreads from behind the breastbone to the left arm (ulnar side) and, sometimes, to the throat (with a feeling of suffocation), to the jaw (with toothache), shoulder or pit of the stomach.

Shortness of breath is due to the inability of the heart to pump effectively and causes, in some patients, a feeling of tightness in the chest like a rope or like a vise tightening the chest (constricting pain), accompanied by a sense of chest tightness and sometimes anguish with a sense of imminent death. Pain can be triggered by physical activity, such as carrying a weight, climbing stairs, or climbing quickly (exertional angina), and resolves on interruption of the activity. Angina worsens when exertion is made after a meal; it is more intense if it is cold, so an effort that does not produce symptoms during the summer can instead induce anginal attacks in the winter. Even a strong emotion, an intense anger can trigger an anginal attack. Seizures can vary in frequency, from many in a day to sporadic, interspersed with symptom-free periods of weeks, months, or years; they may increase in frequency or disappear, for example if adequate coronary collateral circulation develops.

There are cases in which anginal pain can arise at rest, in full psycho-physical relaxation (spontaneous angina). There may be other accompanying symptoms including: shortness of breath, palpitations and cold

sweats. The first onset of angina in an individual is always, by definition, unstable (primary unstable angor), although in reality the term is scarcely used in clinical practice.

The clinical - prognostic classification of angina is mainly of two types: Østable angina pectoris, it is a clinical condition characterized by the onset of symptoms under exertion and always at the same levels of fatigue: this is the reason why it has been defined as stable exertional angina. ØUnstable angina pectoris is a clinical condition characterized by the onset of symptoms at rest and therefore unpredictable: this is why it has been defined as unstable angina. It is also renamed "pre - infarct syndrome", as the first episode may be prolonged enough to lead to myocardial infarction. Ultimately, angina pectoris is due to a sudden reduction in the blood supply to the heart, or part of it, for two possible reasons: 1) The coronary arteries have narrowing (stenosis), which does not allow the blood supply to increase in some circumstances (in particular efforts), during which the myocardial needs for nutrition and oxygenation are greater; 2)

In the coronary arteries there is a spasm, that is a transient narrowing dependent on a muscular contraction, for which the caliber of the coronary arteries is reduced and the quantity of blood that reaches the heart becomes insufficient even in conditions of rest. Myocardial infarction, on the other hand, is characterized by the obstruction of a coronary artery following the fissuring of the fibrous cap of an atheromatous plaque with the formation of an occluding thrombus and consequent necrosis of the myocardial tissue, unable to withstand hypoxic conditions even for a short time. It is divided into: 1) Myocardial infarction without ST segment elevation: it is the least dangerous infarction, due to an incomplete or temporary occlusion of the coronary vessel. In this case the level of myocardial necrosis indices is higher than normal, but the characteristic electrocardiographic picture of the infarction is missing. 2) Myocardial infarction with ST segment elevation: this is the most serious infarction, due to complete and stable occlusion of the coronary vessel. It is followed by the characteristic elevation of myocardial necrosis indices and by the characteristic electrocardiographic changes. Pain, where present, is typically localized in the region behind the breastbone, i.e. in the center of the chest. It typically tends to radiate to the left shoulder and upper limb, although irradiation to the cervical or left shoulder blade is possible. In the case of lower-type (or "diaphragmatic") myocardial infarction, pain occurs in the epigastrium and can be confused with pain in the abdomen or stomach and therefore of non-cardiac origin. It should be noted that these are the most typical sites of cardiac pain, but there are many others which, although not typical, must be taken into consideration by the cardiologist to whom they are described: irradiation to the jaw, elbows and wrists. The intensity of the pain is usually very strong, constricting, accompanied by a cold sweat and an imminent sense of death. Minor symptoms, but almost always present: a profound asthenia, a sense of nausea and vomiting. Unlike stable angina, which lasts a maximum of 10 - 15 minutes, the pain caused by myocardial infarction lasts more than 30 - 40 minutes and is not relieved either by rest or by taking drugs such as isosorbide dinitrate or trinitrine.

Peripheral arterial disease

Peripheral arteriopathy affecting the diabetic subject is an obstructive pathology on an atherosclerotic basis which however presents some peculiarities in terms of histopathological characteristics, anatomical distribution and clinical presentation. In fact, these patients are younger, have a higher BMI, are very often neuropathic and present a complex clinical picture in which there are a greater number of cardiovascular comorbidities than subjects without diabetes. In these subjects the AOCF manifests itself in a much more aggressive way both for the neuropathy but also for the greater tendency to infections; this leads to an increased rate of amputation between five and ten times greater than in non-diabetics (ADA 2003). The key feature of arterial disease in the diabetic is the rate at which the disease progresses, which is much faster than in the non-diabetic population. From an anatomical point of view, AD prefers medium and small caliber arteries (distal part of the superficial femoral, popliteal, arteries below - genicular), with a relative lower aorto - iliac commitment compared to the patient with non-diabetic AOCF. The motivation for this anatomical distribution is not entirely clear; it can be hypothesized that the high inflammatory component that accompanies endothelial dysfunction, present early in the diabetic, finds a more reactive ground in the arteries with a predominantly muscular component, and that the stimulation of these cells leads to a more rapid fibroblastic differentiation. The factors most implicated in the mortality of diabetic subjects with peripheral arterial disease are ischemic heart disease, present in 50% of these patients, and non-revascularization (Ouriel 2001) (Leibson 2004) (Norman 2006). Furthermore, age and dialysis treatment also reduce survival. In recent decades it has been seen that a deterioration of peripheral arterial disease leads to an increase in the number of deaths from cardiovascular diseases. The objective of screening in diabetic patients must be to promptly recognize the presence of peripheral vascular disease due to the high risk of morbidity and mortality related to cardiovascular disease. In fact, it is very common to find silent and unknown ischemic heart disease in subjects with diabetes and AD rather than in those without AD (Nesto 1990) (Wacker 2004) (Zellweger 2006). Peripheral arterial disease is considered one of the chronic diseases that most burden the health system and society in general. It has been estimated that more than 400,000 hospitalizations are performed annually in the US, including 160,000 surgeries and 69,000 minor or major amputations. AOP weighs heavily on social costs in terms of lost productivity and health expenditure and the problem is destined to widen taking into account the increased life expectancy and the continuous progress in diagnostic techniques and related instruments and intervention strategies. The economic implication of a pathology consists of two components: 1) Health expenditure which includes direct costs linked, for example, to the resources used for the diagnosis and treatment of the pathology. 2) Non-health costs which include so-called indirect costs, such as those related to the patient's loss of productivity due to abstaining from work or reduced productivity during work, other costs such as those of transport for assistance or adaptation of the domicile in the event of amputation and finally the intangible costs due to the reduced quality of life resulting from the disease.

Cerebral vasculopathy

Cerebral vascular disease is a treatable and preventable disease that can present in different forms of severity. It is caused by the lack of or lack of blood in an area of the brain, much like what happens to the heart during angina or myocardial infarction. Often this term is used to describe atherosclerosis of the carotid arteries that supply the brain with blood. Arteries are used to carry blood and therefore oxygen and nutrients) from the heart to the muscles and organs of our body. Vascular disease can cause a number of very serious complications including stroke. Stroke is caused by a sudden lack of blood circulation (ischemia) in the brain. The cause of most strokes is due to obstruction of the carotid arteries resulting in interrupted cerebral blood flow, or to occlusion of a brain vessel by a thrombus or embolus. The resulting lack of oxygen leads to a deficit of nervous functions. If blood circulation is not restored quickly, the affected brain tissue dies. Arteriosclerosis affecting the vessels that carry blood to the brain is particularly insidious because it does not cause any disturbance. Typically stroke symptoms are sudden and hence the name stroke (lightning). For this reason, subjects who have multiple risk factors for the formation of arteriosclerotic plaques in the carotids should undergo an evaluation of these vessels even if they have never had symptoms. When there is a sudden reduction in blood reaching the brain, one or more of the following disorders can occur: sudden weakness in one part of the body, often in one half of the body, numbness or tingling in one part of the body (face, arm, leg), sudden deviation of the oral cavity (crooked mouth), sudden loss of vision, difficulty speaking, dizziness with difficulty standing, violent unusual headache (those with habitual headaches need not worry excessively), difficulty in eating and swallowing or sudden speech disturbances. When the symptoms described above last for a few minutes or hours and then disappear completely without leaving traces, it is called TIA (transient ischemic attack). It is important to recognize a TIA because it represents a risk condition, an alarm bell, which can precede a real stroke. Cerebral vascular disease is particularly dangerous because it does not often give symptoms (asymptomatic or with signs that are not identified). It is very important to understand the signs of this devious disease right away. In fact, people immediately worry if they have a heart attack, because they feel a strong pain in the chest and this is an alarm bell recognized by all. The stroke is much more subtle, often no pain is felt, if an arm or a leg tingles or does not move well, we are inclined to underestimate the problem. Diabetic patients need to be better controlled and vascular risk factors in these patients need to be treated more aggressively. These measures are almost always associated with a medicine that serves to reduce the formation of thrombi inside the diseased arteries (antiplatelet agent) such as aspirin which is the most powerful and irreversible antiplatelet agent. In patients who do not respond to medical treatment and in whom diagnostic tests have shown the presence of an arteriosclerotic narrowing (stenosis) of the vessels in the neck, vascular surgery is possible (endarterectomy, thrombendarterectomy, ATE, carotid artery) to try to remove encrustations of the artery and restore normal blood flow. In addition to traditional carotid surgery, it is possible to try to re-

move obstacles to circulation with angioplasty (PTA, percutaneous transluminal angioplasty) in which a catheter inserted in the groin is brought up to the carotid artery, an inflatable balloon dilates the stenosis and the insertion of a metal retina (called a stent) ensures that the dilated region remains open. If a patient has a stroke, he must be immediately hospitalized and subjected to antiplatelet and anticoagulant therapy to ensure survival and reduce neurological complications as much as possible.

Cardiovascular risk in diabetes

The diabetes pandemic we are witnessing is likely to be followed in a few years by an explosion of cardiovascular disease, given the high frequency of these manifestations in diabetic patients. Several prospective observational studies and meta-analyses have shown that the risk of macrovascular complications in diabetes mellitus correlates with HbA1c values suggesting that normalization of glycemic levels can prevent the onset of cardiovascular events. Macrovascular complications of diabetes in their coronary, cerebral and peripheral localization of the lower limbs still represent the major cause of mortality and disability in diabetic patients, and are responsible for over 75% of hospital admissions in these patients. Type II diabetes mellitus is an independent risk factor for macrovascular disease. Studies show that type 2 diabetes mellitus increases the risk of CAD by 4 times. Cardiovascular alterations are responsible for 80% of the deaths of diabetic patients. Among these deaths: - 75% are caused by coronary atherosclerosis - 25% by cerebral or peripheral vasculopathy. In addition, 50% of people with type 2 diabetes at onset have pre-existing coronary atherosclerosis. Coronary heart disease is the leading cause of morbidity and mortality in diabetic patients. Many prospective studies have evaluated morbidity and mortality from cardiovascular disease in patients with type 2 diabetes. There is a strong agreement of results indicating at least a double increase in the risk of ischemic heart disease in diabetic subjects compared to non-diabetics. Similar data are obtained for other cardiovascular complications such as heart failure, peripheral vascular disease of the lower limbs and cerebral stroke. In Italy, two studies are available, that of Verona (Verona Diabetes Study) that of Casale Monferrato who report total and cause-specific mortality in two cohorts of patients with type 2 diabetes in a relatively recent period. In addition to a high incidence of events, diabetic patients have a worse prognosis. For example, it is documented that mortality in the first hours after the heart attack and in the following 12 months is higher in patients with diabetes, both men and women. This suggests that attention to the problem and/or the implementation of adequate measures for the early diagnosis and prevention of these diseases still need to be improved in the diabetic patient. Finally, it should be emphasized that a significant increase in cardiovascular risk is also observed in people with impaired glycemic regulation that are not diagnostic of diabetes, such as impaired glucose tolerance (IGT) or altered fasting glycemia (IFG). This latter observation suggests that, contrary to what is observed for microvascular complications, for macrovascular complications it is probably not possible to identify a threshold glycemic value for increased risk, or that

this threshold is much lower than the value used for the diagnosis of diabetes.

The new guidelines classify patients based on comorbidities and disease duration, dividing them into three groups:

1. CV risk 1) Moderate CV risk: young patients: (< 35 years for type 1 diabetes or > 50 years for type 2), who have had diabetes for less than 10 years, with no other risk factors.
2. CV risk 2) diabetics for 10 years or more, with at least one other risk factor, but no target organ damage.
3. Very high CV risk :
 - patients with stabilized diabetes and CV diseases
 - or with damage to target organs
 - or with three or more major risk factors
 - or have had type 1 diabetes for more than 20 years

Therefore, some specific risk parameters for diabetic patients are taken into account such as metabolic compensation, triglyceridemia and/or HDL cholesterol levels, micro and macroalbuminuria.

Risk Factors Based On Age

- age > 55 y. + 1 risk factor
- age between 45 and 54 a. + 2 risk factors
- age between 35 and 44 a. + 3 risk factors

Risk Factors To Consider

1. LDL cholesterol > 115 mg / dl or total cholesterol > 190 mg / dl
2. triglycerides > 150 mg / dl or HDL cholesterol < 40 mg / dl
3. Blood pressure > 130/85 mmHg
4. Tobacco smoke
5. Micro and macro albuminuria
6. Hyperglycemia (HbA1c > 7.5 %) or glycemic instability
7. Positive family history of cardiovascular diseases.

Prevention And Treatment

Primary prevention

The interventions that constitute primary prevention are based on lifestyle modification. This lifestyle change concerns a public health problem whose solution cannot be entrusted exclusively to the health system, but requires the involvement of many other institutional subjects and civil society (ministries, municipalities, provinces, professional and trade associations, Consumer associations, food manufacturers, advertisers, mass media, etc.) as recommended by the European Union (EU) and the World Health Organization (WHO). Primary prevention therefore has the main objective of modifying potentially modifiable factors such as excess weight in a sedentary lifestyle and incorrect nutrition.

Excess weight

Primary prevention of diabetes is identified with the prevention of excess weight. It is possible to keep the obesity epidemic under control and reverse its trend through comprehensive actions, which intervene on the social, economic and environmental determinants of lifestyles. Overweight and obesity, especially if lo-



Fig. 3

calized viscerally, represent the main risk factor for the development of type 2 diabetes. The pathogenetic link between excess body fat and diabetes is mainly represented by the situation of insulin resistance.

The randomized and controlled intervention studies mentioned above, conducted in subjects with impaired glucose tolerance and / or impaired fasting glycaemia from different countries (China, Norway, Finland and the United States), have clearly shown that weight loss, even if of moderate entity (7% of the initial weight), together with other interventions aimed at modifying the lifestyle, can induce a reduction of about 60% in the progression from impaired glucose tolerance to type 2 diabetes.

In the Finnish DPS study, it was also observed that there is a significant relationship between the extent of weight loss and improvement in insulin sensitivity. Therefore, on the basis of these evidences, the latest nutritional recommendations for the therapy and prevention of diabetes by the “Diabetes and Nutrition” Study Group of the European Association for the Study of Diabetes (EASD), translated into Italian and recently published in *Il Diabete*, the journal of the Italian Diabetes Society (SID), establish the following with regard to this specific aspect:

1. Avoiding overweight and regular physical activity are the most appropriate means to reduce the risk of developing type 2 diabetes;
2. in overweight subjects, weight loss and maintenance of the achieved weight represent the central point of lifestyle modifications aimed at reducing the risk of onset of type 2 diabetes.

Both of these recommendations are grade A (high), that is, based on consistent scientific evidence from randomized and controlled intervention studies, and, therefore, must definitely be put into practice.

Nutrition and eating behavior

A correct diet, understood not as a restriction but as a balanced, healthy and preventive nutrition, which

allows the individual a normal growth, a better control of both blood sugar and other metabolic - clinical parameters is essential for children and adolescents with diabetes, since The severity of the prognosis (eg obesity and late complications) is closely linked to a correct management, by the patients themselves and their families, of the lifestyle in general and of the diet in particular. Children and young people with diabetes have the same nutritional needs as other subjects of the same age; those receiving regular nutritional counseling have a diet closer to LARN (Recommended Nutrient Intake Levels) than controls and not several cardiovascular risk factors. The nutritional recommendations for a healthy lifestyle for the general population are also appropriate for young people with type 1 diabetes and therefore the family and the entire relational sphere can take advantage of lifelong nutritional education, which will favor normal social integration.

Nutritional educational objectives must be commensurate with the age of the patients through the use of different teaching methods. Recognition, prevention, treatment of hypoglycemic episodes and adaptation of the diet to physical - sporting activity are priority educational objectives.

Inadequate dietary prescriptions are co-responsible for the large increase in eating disorders

Therefore, in order to avoid negative repercussions, of an organic and psychological nature, induced by a restrictive or unbalanced diet, it is necessary to ensure: - auxological and nutritional status evaluation of young people with diabetes; - dietary interviews with patients and their families, with therapeutic education techniques, in order to increase and reinforce knowledge on the proper nutrition of the family, on the groundlessness of restrictive diets and on the opportunity of a healthy diet that includes the balanced intake of all nutritional principles, respecting, as far as possible, local traditions, the needs of the family and the lifestyle of the subject; - elaboration and proposal

of correct dietary models and personalized behavioral strategies for preventive nutrition; - research and improvement of motivation for change; - elaboration of information / educational interventions on selected groups of the population.

Physical activity and beneficial effects on cardiovascular risk in diabetes

Regular physical activity corrects some typical cardiovascular risk factors, such as hyperinsulinemia, hyperglycemia, hyperlipidemia, impaired blood clotting and hypertension.

A 2013 study examined the effects of physical activity on the increased cardiovascular risk that accompanies diabetic disease showing that even modest levels of physical activity can reduce, and even cancel, the additional negative impact of diabetic disease on the risk of death for cardiovascular diseases.

The Norwegian study HUNT recruited 53,587 patients (25,159 men and 28,428 women) between 1995 and 1997, asking them to report information about physical activity practiced in their free time by completing a questionnaire.

In the questionnaire, patients had to report how much time per week they spent on activities defined as light, moderate or demanding, based on definitions contained in the questionnaire, such as the presence of tachypnea.

At the end of the follow-up, the causes of death of the deceased patients and the events occurred to the surviving patients were examined. The results confirm the increased risk of cardiovascular mortality in diabetic patients compared to the general population. By selecting diabetic patients and comparing them with non-diabetic patients who had reported being inactive, the authors then examined the combined effects of physical activity and diabetes on the risk of death from cardiovascular disease.

Examining the results, it is observed that ever increasing levels of physical activity can progressively reduce the risk of death from cardiovascular disease in diabetics, bringing them to the same risk levels as in non-diabetic and inactive patients.

These results led the authors to the conclusion that even modest levels of physical activity can negate the influence that diabetic disease has on the risk of death from cardiovascular disease.

Clinical research over the past twenty years has shown that physical activity during pregnancy is safe and offers benefits to the maternal-fetal unit.

Historically this potential benefit has been ignored due to concern that physical activity could theoretically lead to an increase in insulin secretion, free fatty acids and ketones, along with a reduction in glucose levels.

As early as 1985, the American College of Obstetrician and Gynecologist (ACOG) began recommending moderate physical activity to pregnant women, although there was still little evidence of its benefits. Following these initial recommendations, studies carried out over the past 20 years have allowed us to consider physical activity as safe and recommendable, due to its potential benefits both before and after childbirth.

Increasing physical activity is now recommended to improve glycemic control and keep body weight under control, as over 39% of pregnant women with

GDM cannot maintain optimal glycemic levels with diet alone.

The ADA and ACOG urge women who have no medical or obstetric contraindications to start or continue a moderate exercise program as part of their GDM treatment.

These recommendations are also reinforced by the observation that more physically active women appear to have a lower incidence of GDM.

As mentioned above, over 39% of pregnant women with GDM fail to obtain and maintain optimal glucose levels, so physical activity plays a fundamental role.

Muscle contraction by itself promotes the entry of glucose into cells, so it can be defined as an excellent alternative to reduced insulin functioning.

Physical activity, therefore, can improve glucose tolerance by increasing insulin sensitivity thanks to the entry of glucose into the muscles and the synthesis of glycogen, so it is essential to accompany dietary and drug therapy with constant and moderate exercise.

Secondary prevention of diabetes

Secondary prevention is implemented when the disease is already in progress, even without having manifested itself with symptoms, therefore it consists in identifying with laboratory tests which subjects are already presenting alterations due to the pathology, and to apply a series of measures aimed at blocking or slowing down the evolution of the disease.

However, attention should be paid to the continuity of care connected to new care models, such as "disease management", "case management" and the "chronic care model", which, with a very general term, can be defined as "Integrated Management".

These approaches share the fact that they are systems that place an informed and educated patient at the center of the entire system to play an active and preventive role in the management of the pathology from which he is affected.

However, it is necessary to negotiate goals with the patient and it is necessary to think about an integrated care system.

Integrated management, in fact, through the construction of shared care pathways, currently stands as a prototype of an organizational model aimed at improving care and preventing complications.

Targets

- LDL cholesterol <100 mg / dl
- Triglycerides <150 mg / dl
- HDL cholesterol > 40 mg dl

Strategies

- non-drug therapy + optimization of glycemic compensation. - if the objectives are not achieved after 3 months, start specific drug therapy. - in patients with acute coronary syndrome it is advisable to start non-pharmacological and specific pharmacological therapy at the same time.

Pharmacological and non-pharmacological treatment

Pharmacological therapy includes a correct choice of drug and must take into account the individual characteristics of the patient such as age, level of comorbidity and the risk of hypoglycemia. In addition, it

must be constantly re-evaluated to ensure that blood glucose levels are reached and maintained (Handelsman et al., 2015).

Among the best known drugs, we find oral antidiabetics such as metformin, GLP-1-RA, tazones (TZD), alpha-glucosidase inhibitors, salfanuliree, colesevelam and bromocriptine (Faglia & Beck-Pecoz, 2006). Insulin represents the agent with the most hypoglycemic power, its use is vital in the treatment of type 1 diabetes and is often used as a reinforcement therapy for oral antidiabetic drugs in DM2, if the latter are no longer sufficient to guarantee levels of desired Hb1Ac.

The decision to integrate it into treatment depends on cardiovascular complications, age and general health and the risk of hypoglycemia (Handelsman et al., 2015).

There are different types of insulin (Philippe et al., 2009): 1. Ultra-fast insulin: the effect lasts 3-4 hours and has an almost immediate action (5-10 minutes) with a maximum peak at 1-2 hours 2. Rapid insulin: the action begins after 15-30 minutes and has an effect of 5-8 hours 3. Intermediate or slow insulins: the effect occurs 2-4 hours after administration and has a variable duration from 10-16 hours. 4. Ultra-slow insulin: first effects after 4-6 hours. 5. Ultra-slow analogue insulin: the action begins within two hours of administration and lasts for 21-24 hours, with the property of not having a maximum peak.

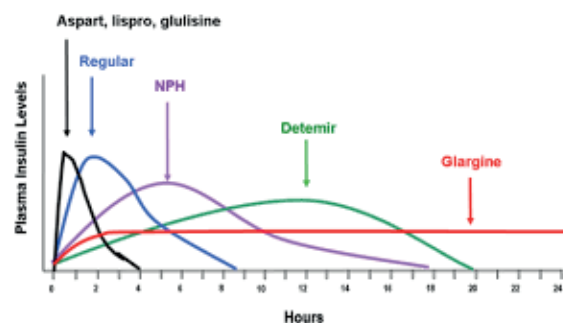


Fig. 4

The non-pharmacological treatment of diabetes consists mainly in lifestyle changes concerning primary prevention such as that of carrying out a balanced diet involving the intake of vegetables, low glycemic index carbohydrates, limiting saturated fats and taking proteins from poor foods. of saturated fats such as fish, beans and egg white with the aim of achieving and maintaining an ideal weight.

Other non-drug treatments consist of physical activity, cessation of cigarette smoking and group behavioral support so that the testimonies and experiences of other patients could help the person's lifestyle.

Nursing Role

The nurse as a key element of care

At the Centennial Conference of the International Council of Nurses, held in June 1999, Dr. Gro Harlem Brundtland, Director General of the World Health Organization, said: "Nurses, as primary health care workers, are in a position without equal in the fight for world health".

By now constituting as many as 80% of skilled health workers in most national health systems, nurses and midwives can be a powerful force in bringing about

the changes needed to meet the need for Health for All in the 21st century.

Indeed, their professional contribution spans the entire spectrum of health care. It is clear that nurses are the backbone of most health care teams. The nurse should lead the patient to sustain a critical reflection so that he himself is aware and convinced of what foods to consume and those to avoid in case of DM2.

Through these reflections, the practitioner will be able to perceive how the patient thinks and how he makes decisions, using them as tools to support the client.

During the therapeutic education process, the ability to assimilate a multitude of information is required, ranging from blood glucose monitoring, knowledge of the pathology, various treatments, including dietary recommendations.

Assistance from a nurse trained in therapeutic education is often necessary, if not mandatory (Grégoire & Philis, 2017).

Nurses constitute the largest group of professionals in the healthcare system who provide care for patients with DM2 throughout their lives and in different settings.

Nurses with a specialization in diabetes represent a category of nurses who are adequately trained and competent to support diabetic patients. Furthermore, they must continually update themselves - for example, on ADA standards and take into account the context in which they work (Hamric, 2014).

The current and therapeutic teaching guidelines provided by the ADA on DM2 follow ten standards that constitute "diabetes self-management education" (DSME) (Funnell & Freehill, 2018):

1. The diabetes self-management education (DSME) program is recognized as an integral part of managing the DM2 patient.
2. The DSME is provided by multiple health professionals and by patients themselves.
3. In the DSME, the determination of education needs is structured according to the diversity and individuality of patients in terms of needs and resources.
4. The DSME provider must plan, implement and evaluate therapeutic teaching according to these standards. Must have an academic level or equivalent professional experience in chronic disease management and therapeutic education.
5. The DSME provider must be constantly updated and fully aware of their limitations in the field of therapeutic teaching.
6. A systemic and scientifically based storyline should be used for each therapeutic teaching session, particularly for diabetes - describing the disease process of DM2 and treatment options. - Integrate a nutrition plan.
 - Integrate a physical activity plan
 - Medicines management
 - Self-monitoring of blood glucose
 - Prevent and treat acute complications
 - Prevent and treat chronic complications
 - Develop personal development strategies
 - Develop health promotion and lifestyle change strategies.
7. The DSME enters into a partnership between caregivers and clients, oral and written by mutual agreement.
8. The DSME is structured according to a plan and

organization discussed by the patient and the practitioner at the beginning of the teaching.

9. DSME results are measured by the patient and caregiver during and at the end of each educational program.
10. The effectiveness of the therapeutic program is measured at the end of the latter and opens the possibility of evaluating further paths of therapeutic education.

Administer and teach self-administration of insulin

The correct injection technique guarantees optimal insulin action and glycemic control.

A correct method of administration must take into account:

Injection site The insulin must be injected into the intact subcutaneous tissue, avoiding intramuscular injection, which does not guarantee correct absorption and functionality of the injected insulin, causing poorly manageable glycemic variability.

Hospital nursing staff must be trained in the correct injection technique with insulin pen and syringe and the latest evidence.

Furthermore, injection into the subcutaneous tissue is less painful than into the dermis or muscle.

Intradermal injection is often associated with accelerated insulin absorption and the risk of reflux or allergic reactions is high.

Intramuscular injection (IM) is often painful, can cause hematomas, carries the risk of too rapid insulin absorption, which results in high variability in blood glucose values and a potential increased risk of hypoglycemia.

The recommended sites for insulin injection are the abdomen, thighs and buttocks.

About a third of patients use the upper arm at least once a day, making it the most convenient site to go to for injecting insulin in public.

Until recently, it was believed that the fatty tissue layer in the arm was relatively thin, and healthcare professionals recommended injecting insulin into the arm with the pinch technique only - almost impossible to do with one hand.

Contrary to what has been recommended up to now, the best site to inject insulin is immediately below the greater trochanter.

The fastest absorption occurs in the abdominal area, a little less rapidly in the arms, more slowly in the legs and even more slowly in the buttocks.

It is generally recommended that fast-acting insulin be given to the abdominal area or thighs and slow-acting insulin to the buttocks where absorption is slower. The problem with the injection in the buttocks is that it is a difficult area to reach and the tendency is to always inject insulin in the same place.

Healthcare professionals should encourage patients to use the entire abdominal wall above and below the waist instead of always injecting insulin into a small area below the navel, which often appears to be the case.

This means that the patient repeatedly injects insulin into the same spot causing lipodystrophy to form.

In pediatric age, the use of the abdomen for the injection of rapid insulin or the rapid analogue is preferred, in order to avoid a too fast entry into the circulation with the risk of unexpected hypoglycemia if the insu-

lin is injected into subjected areas. movement (legs and arms).

Injection technique

It has been proven that for the achievement of good glycemic control in insulin - treated patients, not only the type and dose of insulin chosen are fundamental but also the correct technique of administering the drug, which together represent the patient's age and body mass. index (BMI), the most important variables that can affect the pharmacokinetics and pharmacodynamics of insulin. Although it is now known how essential a correct injection technique is, specific educational paths are rarely planned and even less frequently the choice of needle length is made on the basis of the patient's subcutaneous thickness.

The new recommendations published in 2014 take into consideration the 10 points considered of fundamental importance to obtain a correct injection technique:

1. role of health professionals;
2. psychological aspect relating to injections;
3. drug injection sites;
4. absorption of the drug;
5. preparation of the injection;
6. patient safety;
7. injection devices: pens, pen needles and syringes;
8. choice of needle length;
9. injection technique;
10. lipohypertrophy and other complications related to the injection. - Needle selection The needle of choice for the insulin pen is the universal needle related to iso standards (4 - 5 mm), which guarantees safety and ease of injection.

Hospitalized patients who are already autonomous in the management of their disease should be allowed to continue self-management even during hospitalization, agreeing on the modalities with the care team. If the patient is newly diagnosed or not autonomous, the insulin pen should be made available within the wards to allow the patient to learn or verify the technique by the hospital staff.

If the patient is newly diagnosed or not autonomous, the insulin pen should be made available within the wards to allow the patient to learn or verify the technique by the hospital staff.

It is not recommended to aspirate insulin with syringes from pen cartridges or pre - filled pens, both for the damage that is produced on the needle that is leaking the tip and the initial lubrication, and for the risk of contamination of the insulin itself: furthermore, it is useful to remember the higher cost of these compared to the bottle. The length of the needle is an individual decision made by the patient together with the healthcare professional and based on several factors: physical, pharmacological and psychological.

Choosing an appropriate needle in terms of length ensures a comfortable and safe injection. There are different needle lengths on the market.

Depending on the needle used, it is necessary to adapt the injection technique in order to avoid intramuscular injections.

In the 4 sites commonly used for insulin injection it is about 2 mm, while the subcutaneous varies in relation to sex, age, BMI. 4 and 5 mm needles can be inserted into the skin at 90 °; for needles of 6 mm or longer the injections should be made using the skin fold or at a

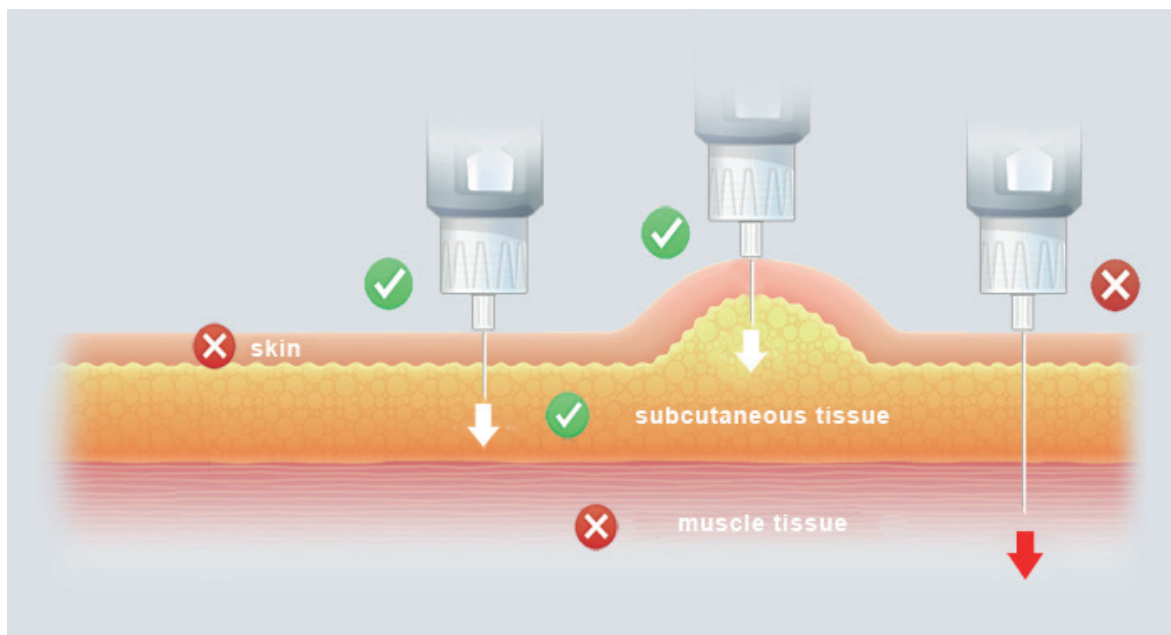


Fig. 5

45 ° angle (pinch technique).

In the limbs and lean abdomen, to avoid the risk of IM injections, a 45 ° angle or fold is recommended.

Once the insulin administration is finished and before the needle is removed, the patient should slowly count to at least 10 to avoid incomplete administration.

Nursing treatment when cardiovascular risk is added

“Put prevention in your daily practice “is one of the objectives to be pursued to obtain the reduction of mortality and morbidity for cardiovascular diseases.

The low incisiveness of secondary prevention interventions is documented by the data of the EUROASPIRE study conducted in 10 European countries on patients after a myocardial infarction, which highlighted the high percentage of persistence of risk factors months after the coronary event.

On the other hand, the data of the same study show that in Italy only 17% of patients after an acute myocardial infarction (AMI) are initiated into a structured program of secondary prevention, such as cardiological rehabilitation, whose results in terms of mortality, morbidity and improvement in the quality of life are now well established.

the lack of a multidisciplinary approach to a complex, multifactorial pathology, such as cardiovascular, where only a team work involving several health professionals and in particular the cardiologist, the professional nurse, the rehabilitation therapist, the dietician and the psychologist can achieve positive results. In fact, to optimize secondary prevention interventions it is necessary to organize an all-encompassing path, tailor-made for the individual patient, which starts in the immediately post - acute phase of the disease and which includes:

- careful prognostic stratification in order to identify patients at greatest risk;
- optimization of therapy to use the recommended drugs at the maximum tolerated doses;
- correction of risk factors to avoid or slow down the progression of the disease;
- direct

action on endothelial function, also using non-pharmacological strategies such as physical training;

- an intervention on the psychological profile of the patient, structured or not according to the severity.
- In the context of the various competences, a role of primary importance is that played by professionals in the nursing area.

Carinex study Survey analyzed which professional figures are most frequently involved in secondary prevention programs within rehabilitation cardiology structures.

In the course of their daily practice, nurses, rehabilitation therapists, cardiology technicians, can come into contact with a large number of people and become promoters of “health messages”.

The nurses who work in the hospital, then, assisting patients throughout the hospital stay, from admission to discharge, actively contribute to the prevention programs constituting a fundamental link in the continuity of care.

The nurse collaborates with the doctor to carry out instrumental investigations that allow to define the risk profile of each patient.

Risk stratification is one of the central moments of any prevention strategy. The scarcity of resources makes it essential to concentrate interventions where the cost - benefit ratio is greater.

In primary prevention it is sufficient to know the risk factors to define the profile of each subject.

Nursing Counseling as a “health educator”

Counseling, a tool for health education, can be defined as “a voluntary and conscious intervention of the health and social staff in the patient’s decision-making processes to achieve a shared goal of improving the state of health”.

The counseling, born as a modality of psychological help developed starting from the 30s, by Rollo May and Carl Rogers, defines a consultation (in practice one or more in-depth individual interviews) conducted by a professional who is attentive to the relation-

ship, and has a non-directive approach.

The influence of the non-directive approach has subsequently led many professionals who operate in the health and social fields and who can establish meaningful personal relationships with their users / patients to develop a less prescriptive professional practice, more attentive to listening and relating, and more respectful of the needs of the user / patient, even without practicing psychological counseling proper.

It is therefore necessary to distinguish between counseling as a therapeutic practice (psychological competence) and counseling skills, required of every operator engaged in health and social activities. According to the patient-centered approach, the best way to come to the aid of a person in difficulty is not to tell them what to do but to help them understand their current situation and manage the problem.

The aim therefore is to help the person to mobilize their personal resources in dealing with the problem that is brought within the counseling relationship.

The general goals of counseling are

- provide support in times of crisis;
- help the patient to find information about the disease, to assimilate it and to act accordingly;
- encourage the patient to make lifestyle changes if necessary;
- develop self-determination in the patient and the ability to make autonomous choices;
- help the patient to anticipate, prevent or prevent the establishment of highly critical situations.

Health education also means providing correct information on the therapies administered.

Drugs to be taken for cardiovascular disease are usually prescribed for long periods or, in some cases, for life, and their effectiveness depends on the degree of compliance of the patients.

Often the technical and nursing staff are the first to be consulted by patients about the therapies to be taken and any side effects complained of.

It is evident that inadequate information on the purposes of the therapy, on its modalities of assumption, on the side effects determined by it frequently leads to the suspension of the therapy, with conceivable consequences. The patient education process for therapies must include information on:

- the aims of the therapies undertaken;
- the expected duration of therapy;
- the need for periodic clinical and laboratory checks (for example haemostasis for patients on anticoagulant therapy);
- the possibility of pharmacological interference, suggesting that you contact your doctor if you

need to take other drugs (for example antibiotics, antipyretics or other);

- the danger of spontaneous dose variations;
- the need to take the drug at the prescribed times;
- the most frequent side effects induced by the drug, clarifying their meaning, the absolute harmlessness of some of them and the potential danger of others which require the need to contact the treating physician quickly;
- the increased risk of cardiovascular disease in women taking oral contraceptive therapies, especially when other risk factors, such as smoking and hypertension, are present.

Likewise, it is essential to inform the patient about the various diagnostic tests to which he will have to undergo, about the relative execution techniques, about the duration and the risk connected to them, about any preparatory measures, such as fasting, carrying out investigations. foreplay, etc.

Conclusions

The diabetic patient is certainly a patient at increased cardiovascular risk compared to the non-diabetic patient.

It is necessary to focus attention on an intervention that can direct the subject to an awareness of his own pathology and to a greater management of the same.

The strongest and most shared indication of the most recent guidelines - guidelines and consensus documents on the management of diabetic disease therefore provides for the ever-vigilant attention to the implementation of a correct lifestyle and the need for a personalization of therapy, with adaptation pharmacological and non-pharmacological prescriptions to the metabolic and clinical profile of the individual patient.

Based on the results listed above, education in lifestyle modification for the diabetic patient plays a fundamental role in the prevention of cardiovascular complications.

Consequently, the nursing teaching methodology should not be underestimated as the latter has the task of managing, supporting and motivating the patient in order to feel himself the main actor of his health path. In order to plan adequate clinical - educational interventions related to diabetes, three fundamental aspects should be developed in particular: - the attitude of health professionals in dealing with chronic diseases, such as diabetes; - the patient's involvement in continuous cooperation with the operator, in order to solve the motivational problem; - the development of suitable learning procedures that help the subject to self-manage with the necessary skills.

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