

Is there Association between Dyslipidemia and Diabetes type 2 in the Population of Castilla-La Mancha?

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Summary

Background and objective: The dyslipidemia is one of the main factors of risk of cardiovascular illness in patients with diabetes mellitus type 2 (DM2). The aim of this study is to evaluate the prevalence and factors of risk associated to the dyslipidemia in the population with DM2 of the Community of Castile-La Mancha.

Material and Methods: It is a longitudinal study made in centres of Attention Primary of the Service of Health of Castilla-La Mancha (n = 70). It selected a representative sample of the population with DM2 of 18 to 85 years by means of a procedure multiethnic. They obtained of the clinical history and by means of interview the data of the factors of risk to study. It analysed the association with the dyslipidemia by means of linear regression.

Results: 52,1% were men, the half age was of 69,8 years, the evolution of the diabetes of 9,99 years, 84,3% had HTA, 76,6% overweight/ obesity and the HbA1c half was of 6,96%. The prevalence of dyslipidemia was of 85.3% and in the analysis bivariate associated with antecedent of peripheral vascular illness, diabetes controlled, treatment antihypertensive, filtered glomerular, HbA1c > 7%, grasto corporal estimated in overweight and obesity, antecedent of cardiovascular illness, age and HbA1c. In the univariate analysis the independent factors were the feminine sex and the antecedent of cardiovascular illness.

Conclusions: The Prevalence of dyslipidemia in our study was of 85, 3%. The factors of risk associated of independent form were the feminine sex and the personal antecedent of cardiovascular illness.

Key words: *Dyslipidemia; Diabetes mellitus Type 2; Prevalence; Factors of risk*

Introduction

The diabetes mellitus type 2 (DM2) is an illness that has purchased a character pandemic because of the increase of the hope of life, that supposes an increase of the aging of the population, to the increase of the obesity and to the change in the lifestyles to some habits no heart-healthy (sedentarism and bad feeding) (1).

The prevalence of DM2, according to the study di@bet.es, summons in 13, 79% of the Spanish population elder of age. According to data of the Global organization of the Health (2016), in Spain the DM finds between the causes of death more frequent. The proportional mortality that attributes to this illness is of 3% of the total of deaths for all the groups' age groups.

The DM comports notable costs socioeconomic. Crespo Et al. They signalled that, in 2013, the annual cost of the DM was of 5. 890 million euros: 8, 2% of the sanitary cost total (2).

In the patients with diabetes, the complications microvascular are the main cause of morbidity and mortality to level world. Near of 3/4 parts die by cardiac illness or cerebrovascular. Likewise, the frequency of deaths by cardiovascular reasons in adults diabetics in comparison with the no diabetics is of 2 to 4 greater times (3). The importance of the chylomicrons for the reduction of the cardiovascular risk in the DM2 has been showed in different studies and meta-analysis (4). The association between dyslipidemia and cardiovascular illness (ECV) remained showed in the "United Kingdom Prospective Diabetes Study (UKPDS 23)", where observed that an increase of 38,5 mg/dl in the concentration of chylomicrons associates to an increase of 157% to present coronary arterial illness and that an increase of 4 mg/dl of the cHDL associates to a descent of 15% of events cardiovascular (3); like this then, the factor of risk of greater weight to develop coronary illness were the chylomicrons, followed of the levels of cHDL. It is necessary to diagnose and treat early the dyslipidemia of effective form for like this reduce the risk of cardiovascular events futures (1).

In Spain, diverse studies epidemiological have analysed the prevalence of the alterations lipid, that oscillate between 56,2% in the one of Dominguez and 92,6% in the study OBEDIA8; however, it is scarce the information on the prevalence and the factors associated to the dyslipidemia in patients with DM2 in Castile-La Mancha (5).

The present study has like aims: 1) estimate the prevalence of the dyslipidemia; 2) investigate the factors of risk associated to the dyslipidemia and 3) investigate the factors of risk associated of independent form to the dyslipidemia.

Material and Methods

Longitudinal study of population base on a sample of 70 patients with DM2, between November of the 2019 and February of the 2020. It made a procedure multiethnic by means of the employment of a sample of the conglomerates of some centres of health. Of the 60 centres of health registered in the Service of Castile-La Mancha of Health, selected 30. The greater part of this is in the province of Albacete (where selected 20), in Cuenca selected 4, in Ciudad Real 3 and in Toledo other 3. Later there was a second selection of a subsample of the contingents of patients of the doctors

of each centre of health chosen one. If any of the centres of health rejected to participate in the study, was replaced by another inside the same stratum.

Of each included patient in the study collected information of the following variables: age, sex, year of diagnostic of DM2, habitat, level of education, familiar economic level, labour situation, habit smoking, weight, size, perimeter abdominal waist, corporal fat estimated, index of corporal mass (IMC), arterial pressure systolic, arterial pressure diastolic, abdominal obesity, antecedents of ECV, arterial hypertension (HTA), treatment antihypertensive, dyslipidemia, treatment lipid lowering, renal insufficiency and retinopathy.

Besides, they collected the analytical parameters of quotient albumin/ creatinine, filtered glomerular (FG), glycosylated hemoglobin (HbA1c), plasma glucose, total cholesterol (CT), cLDL, cHDL, triglycerides (TG) and creatinine. For the register of the presarterial ion made 2 measurements of arterial pressure systolic and diastolic in 2 successive visits and with monitor of arterial pressure validated. For the analysis used the average of the 2 measurements.

For the analysis of data used the Program statistician SPSS V23.0.0.0. The qualitative variables expressed like absolute value and percentage, with the estimate of the interval of confidence to 90% (IC 90%). The quantitative variables expressed like half \pm typical deviation and IC 90%. For the relation of the quantitative and qualitative variables between himself employed an analysis bivariate with t of Student. It made the analysis multivariate of binary.

linear regression no conditional with the dyslipidemia like dependent variable, having in cuenta the variables that in the analysis bivariate associated with the presence of the dyslipidemia or were clinically notable, that were the following: age, sex, HTA, personal antecedent of peripheral vascular illness, diabetes controlled, antidiabetic treatment, HbA1c \geq 7%, quotient albumin/creatinine, FG, personal antecedent of ECV, years of evolution of DM, blood glucose basal, creatinine and retinopathy. All the statistical analyses were of 1 tail and considered statistically significant a value of $< p$ 0.05.

Results

Of the 70 patients, 68.9% were 65 years old or more, with average of age of 69.84 years and average of years of evolution of the diabetes of 9.99 years. 68.2% of the participants were of urban habitat,

50% had primary studies, 74% were retirees and 75% had annual income <18.000 D. There was a light predominance of men (52.1%) and the women were of greater age (70 years). The smoking active and the obesity according to the IMC was significantly greater in men; the abdominal obesity was significantly greater in women. The prevalence of dyslipidemia was of 85,3%; the one of HTA, of 84,3%; renal insufficiency, of 22.9%; sedentarism, of 48,2%; oligo albuminuria and proteinuria, 31,3%; overweight and obesity according to IMC, of 76,6%; obesity according to the corporal fat estimated by means of CUN-BAE, of 93%; abdominal obesity, of 67,6% and the retinopathy was of 29.3%.

The prevalence of dyslipidemia was similar in women and men (87.7% in women in front of 83.1% in men; $p = 0,085$). Of the subjects dyslipidemic, 79.5% were dyslipidemic for receiving treatment lipid lowering and 20.5%, dyslipidemic that did not receive treatment lipid lowering and that presented values of cLDL > 160 mg/dl, cHDL < 40 mg/dl in men or <50 mg/dl in women, or TG \geq 150 mg/dl. The 75.3% received treatment lipid lowering; 71.1%, statins; 5.4%, ezetimibe; 3.3%, fibrates; 0,8%, resins of ionic exchange and 0,5%, esters ethyl of sour fatty omega 3. 69.6% received treatment in monotherapy and 5.7% in biterapia. In the subjects dyslipidemic for receiving treatment lipid lowering, 96.5% received estatinas or herbs; 4.3%, fibratos and 2%, statins and fibrates.

In the subjects with diagnostic of dyslipidemia and without treatment lipid lowering, the 14.3% had the cLDL > 160 mg/dl; 79%, cHDL < 40 mg/dl in men or <50 mg/dl in women and 51.3% had TG > 150 mg/dl. The average of blood glucose plasma basal was of 137.85 ± 46.59 mg/dl, of CT 178.17 ± 38.18 mg/dl, of cHDL $47.09 \pm 12,10$ mg/dl, of cLDL $108,10 \pm 36,44$ mg/dl, of TG $136,6 \pm 66,3$ mg/dl and of creatinine $0.96 \pm 0,55$ mg/dl. 68.7% of the patients had normoalbuminuria; 23.8%, oligo albuminuria and 7.5%, self-evident proteinuria. 77.1% of the patients had a tax of filtered glomerular (MDRD) TFGe > 60 ml/min/1.73 m² and 22.9%, renal insufficiency (TFGe < 60 ml/min/1.73 m²). Of the patients with renal insufficiency, 19.1% had TFGe of 30-59 ml/min/1.73 m²; 2.9%, of 15-29 ml/min/1.73 m² and 0.9%, <15 ml/min/1.73 m². The average of plasma leukemia basal, TG and creatinine was significantly greater in men and, the average of CT, cHDL and cLDL was significantly greater in the women. To his time, the oligo albuminuria and proteinuria was significantly more prevailing in the men. They obtained the parameters lipid complete of 70 patients that had registered one or more parameters.

Of them, 26.6% did not reach the aims of CT (<200 mg/dl) neither 54.9% the ones of cLDL (<100 mg/dl). They documented TG high (\geq 150 mg/dl) in 33.7% and cHDL low (<40 mg/dl in men and <50 mg/dl in women) in 46%. With regard to the alterations combined, cLDL out of aims and cHDL low detected in 23,7%; cLDL out of aims, cHDL low or TG elevated in 14% and cLDL and CT fuerto of aims, cHDL low or TG elevated in 6,6%. In the analysis bivariado, the variables associated to the presence of dyslipidemia are: antecedent of peripheral vascular illness, diabetes controlled, pharmacological treatment for HTA, HbA1c \geq 7%, FG, and corporal fat estimated in overweight and obesity, personal antecedent of ECV, age and HbA1c (Table 1). The antecedent of peripheral vascular illness is included in the variable antecedent of ECV.

We have not found significant differences in the presence of dyslipidemia with the following variables: sex, familiar economic level, level of education, labour situation, habitat, habit tabáquico, HTA, HTA controlled, pharmacological treatment DM, quotient albumin/creatinine, IMC, obesity abdominal, retinopathy diabetic, years of evolution, blood glucose basal neither creatinine. In spite of have not found significant differences, we objectify that the subjects with dyslipidemia had greater time of evolution of his DM, greater levels of blood glucose basal and giving creatinine and greater values of IMC. To his time, the feminine sex, the black race, the familiar economic level «annual incomes < 18.000 D», the low level of education (without studies and primary studies), the labour situation «retired» and the urban habitat were more prevalent in the subjects dyslipidemic. Likewise, the habit smoking (smoker and former smoker), the HTA, the oligo albuminuria, the proteinuria and the retinopathy diabetic were more prevalent in dyslipidemic patients that in no dyslipidemic. He also objectified that the prevalence of the dyslipidemia was elder to measure that increased the oligo albuminuria and the degree of retinopathy diabetic, as well as, when the TFGe diminished.

In the analysis multivariable, identify that the variables that associate of independent form with the dyslipidemia are: the feminine sex and the personal antecedent of ECV (Table 2).

Variables	No dyslipidemia +/- OF	Dyslipidemia Current +/- OF	p	OR Raw	IC 95%
Age (years)	67,54 +/- 14,75	70,63 +/- 11,48	0,018	1,02	(1,00-1,04)
Years of evolution DM (years)	9,17 +/- 3,98	10,13 +/- 4,70	0,054	1,05	(0,99-1,10)
HbA1c (%)	6,70 +/- 1,40	7,01 +/- 1,34	0,030	1,23	(1,02-1,49)
Blood glucose Basal (mg/dl)	132 +/- 50	139 +/- 46	0,178	1,00	(0,99-1,01)
CT (mg/dl)	186 +/- 30	177 +/- 39	0,024	0,99	(0,98-0,99)
LDL (mg/dl)	111 +/- 25	108 +/- 41	0,464	0,99	(0,99-1,00)
HDL (mg/dl)	56 +/- 12	46 +/- 14	0,000	0,95	(0,94-0,97)
TG (mg/dl)	90,21 +/- 30,75	145,83 +/- 72,64	0,000	1,02	(1,01-1,03)
Creatinine (mg/dl)	0,87 +/- 0,44	0,98 +/- 0,57	0,068	1,78	(0,96-3,32)

*Dyslipidemia: In treatment lipid lowering or those that do not follow treatment lipid lowering and present figures of cLDL >

Table 1: Quantitative variables associated to the presence of dyslipidemia Clinical diagnostic of dyslipidemia *

160 mg/dl; cHDL < 40 mg/dl in men and <50 mg/dl in women or TG > 150 mg/dl. cHDL: Cholesterol joined to lipoproteins of high Density; cLDL: cholesterol joined to lipoproteins of low density; CT: total cholesterol; DM: diabetes mellitus; HbA1c: haemoglobin Glycosylated; IC: interval of confidence; OR: odds ratio; TG: triglycerides.

Variables	B	EE	p	OR	IC 95%
Sex (M vs. H)	1,028	0,273	0,000	2,79	1,64-4,78
Personal antecedents of ECV	1,253	0,329	0,000	3,50	1,84-6,66
HbA1c greater or the same to 7%	0,531	0,283	0,060	1,70	0,98-2,96
Age	0,015	0,010	0,137	1,02	0,99-1,04
Constante	0,381	1,009	0,706	1,46	

Table 2: Model multivariate. Variables associated of independent form with the dyslipidemia.

The model contains the following variables: sex (woman vs. man), personal antecedents of ECV (ictus, ischemic heart disease and arteriopathy peripheral), HbA1c>7% and age (continuous, by every year of more).

B: Coefficient of regression; ECV: cardiovascular illness; EE: standard error of B; H: men; HbA1c: glycosylated hemoglobin; IC: interval of confidence; M: women; OR: odds ratio.

Discussion

The results indicate that the prevalence of dyslipidemia in patients with DM2 of Castile-La Mancha is elevated and that less than 15% of the patients show the values lipid normal or recommended by the main guides of clinical practice. Said findings of prevalence are consistent with the found in other works so much in Spain as in the international field. When we compare these results with different publications, observe that it exists a big variability. In the majority of the studies the prevalence of dyslipidemia finds above 50%, with a rank that oscillates between 56.2% in the one of Dominguez and 92.6% in the study OBEDIA. On the other hand, the variability found in the prevalence of dyslipidemia can be due to the heterogeneity in the form to diagnose it and to that is in relation with the different criteria diagnostics. In this context, the greater prevalence observed in the study OBEDIA could be in relation with the point of court of the cLDL considered in the definition of dyslipidemia, that is lower that the used in the present study. These discrepancies are something usual in the medical bibliography, since the methodologies used to the hour to carry out the studies (is possible that other studies use distinct criteria diagnostics, methods of laboratory or different points of cut to determine the diverse factors lipidemia and his cardiovascular risk), as well as the population diversity, affect to the results ends of the studies.

Also it is important emphasize that the studies from population samples can have the inconvenient that, in spite of his randomness in the selection of the subjects, the sample do not represent the population of reference or that this find very delimited in the space and the time and, therefore, was not comparable with other studies. This prevalence so high could be related with the profile of the patients studied (high taxes of obesity, kidney disease age, bad metabolic control of the diabetes, etc.), since in the sample studied 69% were greater of 65 years. These analytical values do not depend of the register made by the professionals and are a faithful reflection of the reality. Although in multiple studies epidemiological longitudinal has analysed the prevalency of dyslipidemia in populations diabetics with distinct levels of cardiovascular risk, east is the first study in Spain that analyses the characteristics, prevalence and factors associated to the dyslipidemia of a representative sample of patients with DM2 of Castile-La Mancha. Besides, the previous studies to the moment to value the prevalence of dyslipidemia centre usually in the isolated alteration of the CT or cLDL according to the recommendations of the NCEP ATP III, without a complete analysis of the profile lipid and without taking into account to patients in treatment lipid lowering.

In the subjects with diagnostic of dyslipidemia and without treatment lipid lowering we objectify that the low values of cHDL is the alteration lipid more frequent (79%). Of the same way, observe a considerable increase of the levels of TG (51.3%) beside a discreet increase of the values of cLDL (14,3%). These results are concordant with the quantitative alterations described in the dyslipidemia in the patient with DM «dyslipidemia aterogenic». The dyslipidemia aterogénica is a characteristic element of the vascular residual risk of origin lipid no associated to changes in the neither them of cLDL and is a dyslipidemia very prevailing in the people with DM2, in the patients with high risk or very high risk, with visceral obesity or metabolic syndrome.

In the sample studied observes that a high proportion of patients no they reach the aims of cLDL. Also we objectify that an important proportion of cases has TG high and cHDL low, which saves concordance with the described in the bibliography, where finds elevation of the TG and decrease of the cHDL in approximate mind the half of the patients with DM2. These data signal an important residual risk (levels of cLDL, cHDL and TG suboptimal) that probably have to be controlled with more intensity of what does in the daily clinical practice and that perhaps was in relation with the inertia and therapeutic fulfillment; in patients with DM2, the percentage of

breach therapeutic is very high, and is of the 32, 36 and 38% for the lipid lowerings, antidiabetic and antihypertensive. If we examine the fulfillment of objectives according to the recommendations of the guides of clinical practice, we objectify that the 2/3 parts of the subjects have suitable levels of TG (67,2%) and less than the half do not reach the optimum levels of cLDL (45,1%) and cHDL (46%).

If we compare these results with the obtained in a transversal study made in the 17 autonomous communities of Spain, observe that the subjects studied attain more frequently the aims lipid recommended. In patients with DM2 and dyslipidemia the approach global therapeutic has to consider, in addition to cLDL, the control of the levels of cHDL and of TG like secondary therapeutic aims, what can involve a change in our therapeutic attitude to achieve such aims? The main contribution of this work is the knowledge of the high prevalence of dyslipidemia (85.3%) in patients with DM2 of the Community of Castile-La Mancha and that the factors associated of independent form to the dyslipidemia were the feminine sex and the antecedent of ECV. This knowledge is the first stair to implant the necessary means that make possible to improve the group of the profile lipid, and, therefore, would have to be useful to establish strategies of continuous improvement that involve to all the agents involved (medical personnel, personnel of infirmary and sanitary authorities) in the implementation of the clinical guides and in improving the adherence of the patients. Our results indicate that frequently it exists more than an alteration of the values plasma of lipids. Like this, 23.7% showed conjoint alterations of cLDL and cHDL; 14.7%, of cLDL, cHDL and TG and, 6,6%, of the 4 parameters. On the other hand, the CT, cHDL and cLDL were significantly greater in women and the TG were significantly Minimal in men; these findings are similar to the described in a study made in Catalonia. In the Or.K. Prospective Diabetes Study 27, observed that the CT, cHDL and the cLDL were significantly greater in women, what saves relation with the found in our study.

By means of the analysis multivariable, identify that the feminine sex and the personal antecedent of ECV associate of independent way with the dyslipidemia, above the age and of the HbA1c.

The prevalence of dyslipidemia sand associated with the feminine sex, what was consistent with other studies (4). Regarding the association between sex and dyslipidemia, in the current investigation the feminine sex was the most affected by dyslipidemia, although 52.1% of the participants were of masculine sex. The association of both categorical variables by means of the analysis multivariate

allowed to estimate that belong to the feminine sex in this group of patients increased in almost 3 times the relative risk to present dyslipidemia. The profile lipid altered is a characteristic of the DM and confers greater risk to present ECV, especially EAC. The relative risk of coronary cardiac illness fatal associated with the DM is 50% higher in the women than in the men.

The caused the greater risk of coronary cardiopathy in women with DM still does not know completely. However, the changes induced by the DM2 in some factors of cardiovascular risk, like the cLDL, cHDL, TG and the PA, have found more pronounced in the women than in the men, and this can explain the greater increase in the risk of arteriosclerosis in women diabetics. Besides, the differences between the sexes in the profile lipid could exert a paper in the most negative impact that has gave diabetes on the cardiovascular risk in the women in comparison with the men. Likewise, it has posited that the increase of the prevalence of the dyslipidemia in the women of age advanced can be related with the changes hormonal in the pre- and postmenopausal.

The prevalence of dyslipidemia associated with the personal antecedent of ECV. (6) In the current investigation, the antecedent of ECV was significantly more prevailing in the masculine sex (39,5%) and almost 4 of each 10 of patients with dyslipidemia had the antecedent of ECV (35,8%). The association of both categorical variables by means of the analysis multivariate allowed to estimate that have the personal antecedent of ECV in this group of patients increased in 3.5 times the risk to present dyslipidemia. (7) In this sense, is important to emphasize that the hypercholesterolemia is a factor of risk very prevailing in patients with ECV and confers special risk to suffer it, especially ischemic cardiopathy.

Likewise, the high levels of CT and cLDL are between the most important factors of risk of ECV, the cHDL low and the TG high are independent factors of risk of ECV and the treatment with statins has a beneficial effect in the incidence of the ECV atherosclerotic (8). I studied presents diverse limitations and fortresses. Between the main limitations find the inherent to the type of study (longitudinal) and of analysis of the information; in this sense has to recognise the presence of the bias of survival, the impossibility to generalise the results to populations with different characteristics to the described; to his time, is necessary to make studies prospective that can confirm these results and analyse with greater precision the variables associated to prevalence of dyslipidemia. Of the present study fits to stand out the sampling in which it is based,

that is a representative sample of Castile-La Mancha, as well as the fact that it have been objectified by several observers, what does it more damtativo in the harvest of data. Lto comparison of our results with the studies published to national and international level allows us see the consistency of the data. Besides, other variables could be predictors valid of dyslipidemia. Our study did not take into account the possible modifications of the therapy lipid lowering and the therapeutic fulfillment of the patients. Finally, the longitudinal design is very used, since his cost is relativaminferior body to the other designs epidemiological, like the transversal studies, and provide notable information and of fast form for the management of the services of health.

Because of the importance of the object of analysis that occupies us, believe necessary emphasize the importance to follow investigating in this line.

Conclusions

This investigation shows that in the patients with DM2 of Castile-La Mancha there is a high prevalence of dyslipidemia. The factors of risk associated of form Independent were the feminine sex and the personal antecedent of ECV. In sight of these results, exists the need of a handle integral and intensive of the dyslipidemia, for which has to try improve the metabolic control of the diabetes, decrease the obesity and promote changes in the lifestyles (cessation of the habit smoking, physical exercise and decrease of the consumption of saturated fats and of alcohol), with the end to diminish the ECV and to improve the quality of individual and collective life of and sta population.

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