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End stage renal disease associated with diabetes in the Canary Islands: a public health problem with significant human suffering and high economic costs

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THE INCIDENCE OF END STAGE RENAL DISEASE ASSOCIATED WITH DIABETES (ESRD-DM) IN THE CANARY ISLANDS IS THREE TIMES THE NATIONAL AVERAGE

The high incidence and prevalence of patients with end stage renal disease (ESRD) in the Canary Islands (CI) has been well-documented for more than a decade.^{1,3} While successive annual registries of the Spanish Nephrology Society (S.E.N.) show a national average incidence of 125-130 patients per million population (ppm) per year, the Canary Islands report an incidence around 180-185 ppm.^{3,4}

A detailed analysis of primary kidney disease among the Autonomous Communities (AC) shows that this difference is due to the high proportion of diabetic patients that begin dialysis in the CI. The rest of the kidney diseases, although with variations between AC, do not have a relevant impact on the total incidence rate.¹ The national average incidence of ESRD-DM is found in the range of 20-30 ppm, while in the Canary Islands these values were three times higher, 65 ppm.^{3,4} From these observations, we quickly coined the phrase “in the Canary Islands there is a lot of diabetes” as the most probable explanation for the high rate of ESRD-DM.

THE PREVALENCE OF SELF-REPORTED DIABETES IN THE CANARY ISLANDS DOES NOT EXPLAIN THIS PHENOMENON

However, this supposition is not clear. The challenge is to answer the following question: Is the high incidence of ESRD-DM due to a high prevalence of diabetes in the general population? Preliminary studies suggest this possibility;^{5,6} however, two more recent population studies describe a relatively high prevalence with respect to other regions in Spain, but not so disproportionate as to explain the high rate of chronic kidney complications.^{7,8} In any case, there are no comparative homogeneous studies on the prevalence of diabetes in the general Spanish population. It is not possible to compare the studies that have been published because of the methodology that they used, moreover, they only focus on the prevalence in certain areas.

In a recent study, we analysed the prevalence of diabetes in the adult Spanish population, based on surveys by the Ministry of Health and Consumer Affairs conducted in 2003 and 2006.⁹ The main limitation of this source is that it only includes known diabetes, or “self-reported”, based on individual surveys. However, it is the only source of data that provides homogeneous information. The analysis of this data showed that the prevalence of self-reported diabetes in the surveys of 2003 and 2006 was within the range of 4-8% in Spain, and very close to 7% in the CI, in both surveys.¹⁰ That is, the prevalence of diabetes in the CI does not explain the alarming incidence of ESRD-DM.

A DIABETIC PATIENT IN THE CANARY ISLANDS HAS 3.9-FOLD HIGHER RISK OF NEEDING DIALYSIS THAN A DIABETIC PATIENT IN THE REST OF SPAIN

The ESRD-DM incidence data published in patient registries or scientific journals is usually expressed in per

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million population. This hampers our evaluation of the influence of the prevalence of diabetes in the general population on the epidemiology of ESRD-DM. With the aim of clarifying this concept, we analysed the incidence of ESRD-DM in relation to the rate of patients at risk, that is, to diabetic individuals in the general population.¹⁰ Using the Poisson regression model, along with the surveys from 2003 and 2006 to give strength to the model, and controlling by age groups, we see that a diabetic patient in the CI has 3.9 times (95% CI, 3.1-4.9) the risk of dialysis with respect to the rest of the AC in Spain. The difference between other AC was small. Of particular interest is that in the age group older than 75 years the differences are most striking, with ESRD-DM incidence being seven times higher in the CI than the Spanish average. A difference of this magnitude between regions of the same country has no precedent and needs a thorough analysis of the factors leading to these circumstances.

DIABETES IN THE CANARY ISLANDS STARTS EARLY AND IS ASSOCIATED WITH GREATER MORBIDITY AND MORTALITY

The analysis by age groups provided us with additional relevant information. One in four diabetics (25%) in the CI were less than 45 years old while in the rest of Spain this percentage is in the range of 8-12%. That is, globally there is not a higher prevalence of diabetes, but the diabetes mellitus starts earlier. At the other end of the age spectrum, we found more epidemiologic information of interest: in the group older than 75, the proportion of diabetic individuals was significantly less in the CI. In other words, compared with the rest of Spain, in the CI diabetes mellitus starts early, the time of exposure to the disease increases, and as a consequence, the risk of chronic complications such as nephropathy and the number of fatal outcomes increases. This is most evident in the older age groups and is consistent with data from the Ministry of Health, which show that the CI are among the regions with highest mortality associated with diabetes.¹¹ The combined analysis of data helps us understand the high rate of ESRD-DM when we use the population at risk as the denominator, i.e., diabetics in the general population.

Although we have taken another step forward, the reasons for the early development of diabetes in the CI and the high morbidity and long-term mortality remain unclear.

POSSIBLE BIASES AND LIMITATIONS OF THIS ANALYSIS

1. Statistical use of known or self-reported diabetes instead of the real prevalence of diabetes. It was the only

consistent source of data for comparative analysis. It could be questioned that the prevalence of “hidden” diabetes is not uniform between AC. There are data supporting that the ratio of known and unknown diabetes is approximately 50%, and does not significantly change between regions.¹²

2. Renal patient registries do not use standard criteria to assign primary renal disease. It is another potential source of bias, although it is unlikely to explain such a difference.
3. Is it possible that patients survive longer and therefore develop ESRD more frequently? This hypothesis is not sustainable, because as we noted previously, the mortality associated with diabetes and cardiovascular complications is higher in the CI.
4. Uneven distribution of health resources. Since the Spanish health system provides universal coverage throughout the country, this factor cannot be decisive in the proportion of patients starting dialysis between regions.
5. Different criteria for acceptance of home dialysis patients. This should be taken into account, but it is difficult to be sure about this considering the information available. Spanish registration data of renal patients show some differences in the average age of the incidents. However, the average age of onset is similar in the CI and several AC in which the incidence of ESRD-DM is clearly lower. This should affect all causes of ESRD, and is highly unlikely to explain the magnitude of the differences displayed between the CI and the rest of Spain.

COULD THERE BE A GENETIC BASIS?

Without doubt, this is a factor to be taken into account, although we lack information. The population of the CI is mainly of European origin, with a native minority mainly of North African origin.¹³ Currently there are initiatives to investigate genes that may confer sensibility to early development of diabetes and nephropathy, although it will be a difficult task given the size and heterogeneity of the genes involved.

SOCIOCULTURAL DEPRIVATION AND DISPARITY: AN UNFAVOURABLE SCENARIO FOR PUBLIC HEALTH

Countless studies show that sociocultural deprivation and disparity are independent predictors of morbidity and mortality in all health scenarios.¹⁴⁻¹⁶ In countries with great population heterogeneity we find this relation to be most

evident. To be more explicit, the expressions “deprivation” and “sociocultural disparity” can be considered synonyms of “poverty” and “social inequality”. As a consequence, the poor use less health resources, have lower compliance with treatment, and inadequate diet and health habits. We must add that, in more depressed areas, access to health resources is frequently more limited. In this context, population-based epidemiologic studies have shown that low sociocultural and health levels are associated with obesity,¹⁷ cardiovascular complications,¹¹ the development of diabetes and ESRD.¹⁸ All of these adverse health conditions are more common in the CI than in the rest of Spain.^{19,20} Therefore, it is likely that sociocultural deprivation and disparity are major factors in the early onset of diabetes and the disproportionate incidence of ESRD-DM in the CI.

THE ECONOMIC IMPACT OF HAEMODIALYSIS: THE SAVINGS ARE IN PREVENTION

The analysis of the global cost of treatment can help find areas for improvement in terms of health and economy (see article by Lorenzo, et al. “Economic Evaluation of Haemodialysis. Analysis of Cost Components Based on Patient-Specific Data” in this edition of the Journal). Ours is the first study in Spain that analyses the cost by expenditure component, based on individual patient data, and which introduces the Diagnosis-Related Group (DRG) as the source of the cost of hospitalisations. The average annual cost per patient was 40,070 euros, of which approximately half are attributed to the hemodialysis sessions, followed by drug costs; while costs for hospitalisation are third, accounting for 17% of the overall cost.

One interesting lesson was that once haemodialysis was initiated, the economic impact is quite similar between patients, except for extreme cases of hospitalisation. This is because approximately 78% of the cost is due to the haemodialysis sessions (51%) and common medications (27%), without major differences between patients. From this analysis it appears that the economic savings is in the prevention of ESRD. Once on dialysis, the saving margins are very narrow.

This consideration is of special significance in the CI, where the incidence of ESRD-DM is three times the national average,^{1,2} representing a differential incidence of 80 diabetic patients more per year. If we reduced the incidence rate to the national average, this would generate an annual cost savings of 3.2 million euros. Considering a survival of 85%, 70% and 65% in the first three years on haemodialysis (data from the Renal Patients Registry of the Canary Islands), the savings accumulated in a three-year period would be in the range of 15-25 million euros.

PROPOSAL FOR EARLY ACTION IN THE PUBLIC HEALTH FIELD

We are facing a devastating disease that, even though it has a universal dimension, is particularly serious in our region. Its increasing prevalence carries a significant human suffering and an enormous burden on the health budget. The different incidence rate among regions in a single country suggests that in the CI we are facing a combination of sociocultural factors associated with different access to health resources and, probably, also with a genetic basis.

To prevent or mitigate its impact is an urgent task and it requires a coordinated, patient and sustained effort from all health and social agents. The benefits of an effort of this type may be achieved in the long-term, but it is an absolute priority that is even more relevant if we consider that there is real room for improvement. It is well known that changes in lifestyle and the early use of renoprotective drugs can delay or even prevent the onset of chronic complications, such as diabetic nephropathy.²¹⁻²³ The most important thing is to act early. We are not facing a “renal” health problem, but rather a public health problem. To be considered as such, it must meet three basic requirements²⁴: 1) a chronic disease with high-impact on morbidity and mortality, quality of life and costs, 2) be unequally distributed, affecting socio-cultural groups with the greatest deprivation, and 3) available prevention strategies are not yet developed. Diabetes and more specifically diabetic nephropathy in the CI meet all these criteria.

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