EPH - International Journal of Medical and Health Science
ISSN (Online): 2456-6063
Volume 02 Issue 03 September 2016

DOI: https://doi.org/10.53555/eijmhs.v2i3.114

A SCREENING PROGRAM FOR PATIENTS IN RELATION TO CHRONIC KIDNEY DISEASE AND DIABETES IN ROMANIA - MANAGEMENT AND INNOVATION ASPECTS

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Abstract:-

The aim of our study is to present the results of a screening program for 401 patients in relation to chronic kidney disease and diabetes, shading new light on managing these pathologies and bringing into discussion the use of innovative analytical tools. The whole group of patients has been divided in two sub-groups: one presenting diabetes (204 subjects) and the other one with no diabetes (197 subjects). All subjects have been investigated via the following categories of parameters: (i) General health parameters: high blood pressure, overweight and obesity, kidney disorders, dyslipidemia, lower limb peripheral arteriopathies, cardiac disorders, endocrinologic disorders, hepatic steatosis, pancreatic disorders and (ii) Biological parameters: glycaemia, glycated haemoglobin - HbA1c, cholesterol-total, cholesterol- HDL, cholesterol-LDL, triglycerides, urea, creatinine, uric acid, glomerular filtration rate, total lipids, albumin, C Cystatin. In addition to these, if the case, psychological assistance has been be provided. All collected data for the two sub-groups of patients have been presented and critically analyzed. Furthermore, several correlations between various sets of variables have been proposed, setting up favorable initial conditions for developing an integrated model for managing these pathologies.

INTRODUCTION:

The chronic diseases represent a real and acute provocation for health systems all over the world (Nolte et. al., 2014) and the impact on higher group ages is increasing in most cases (Yach et. al., 2004). But, on another hand, there is strong evidence that younger people develop chronic conditions that will lead to an increased premature mortality (Barnet et. al., 2012 and Van Cleave et. al., 2010). A recent study of the institute of Health Metrics and Evaluation from 2015 mentions that, among chronic diseases, diabetes presents a high dynamic on impacting the health status of population and, hence, it represents a one of the most severe factors to be considered when building health policies and strategies or when putting these in practice (Busse et. al., 2010). The present study takes into consideration these aspects and realizes a deep analysis of diabetes impact and characteristics over a significant group of subjects in connection with other pathologies, focusing on chronic kidney disease. In 2013 (The 50th Congress of the European Association for the Study of Diabetes, Vienna - 2014) over 32 million European citizens presented diabetes, with associated costs ranging between 100 - 150 billion euros. On another hand, if considering these two pathologies associated, namely diabetes and chronic kidney disease, the impact on the patient may be devastating. Evidence from the FinnDiane (Finnish Diabetic Nephropathy Study, 2012) shows that the mortality in such cases increases even by 400% by comparison with healthy patients. If analyzing the national context, in Romania, according to the official statistics of the Ministry of Health, the incidence of diabetes is about 5% of population, but presenting a high dynamic of new cases. What constitutes a major worrying factor is the high incidence on children and low group age patients. In the same time, the time, kidney disease impact about 10% of the total population, about 8% being under medical supervision and treatment. All these problems lead to a high pressure on the financial allocation in order to mitigate the impact of these pathologies on population health - for example, according to the National Health Insurance Agency, in 2012 the funds allotted to these two pathologies represented 45.7% from the total funds within the National Health Programs. Going further and relating to the performance of the Health System in Romania it is possible to observe that the percentage of patients benefiting of hospital services is high, situation that leads to higher and many times unjustified costs. A report of the World Bank from 2012 shows the fact over 50% of emergency patients and about 75% of total hospitalized patients did not pass the filter of general or specialist practitioner. Consequently, the pressure on the health system artificially increases.

Considering all these ideas, the main objective of this study is to present the results of a screening programme for a group of patients presenting diabetes and for another one with no diabetes in connection to chronic kidneys disease presence. Further on, elements of managing in an efficient way the associated health care services are also presented. Hence, the basic hypothesis that constitutes the basis of this study is that a screening program with management valences could offer valuable experience in increasing both the quality of the associated health care services and the efficiency of spending the allotted resources as well.

Materials & Methods

In addition to the above mentioned aspects in what concerns the chronic kidney disease (CKD) in connection to diabetes, it could be mentioned that this problematic keeps its negative impact o the population from the geographical area where the current screening program has been developed (The National Screening Program 2007-2008, Predatorr Study 2013-2015). These assumptions led to the idea that such a study may bring its contributions in shading new light over the managing process of CKD in connection to diabetes for the population in the South-West Region of Romania. Actually, the incidence of diabetes among the whole population in the SW Region of Romania rises up to 12.1% (Predatorr Study, 2015).

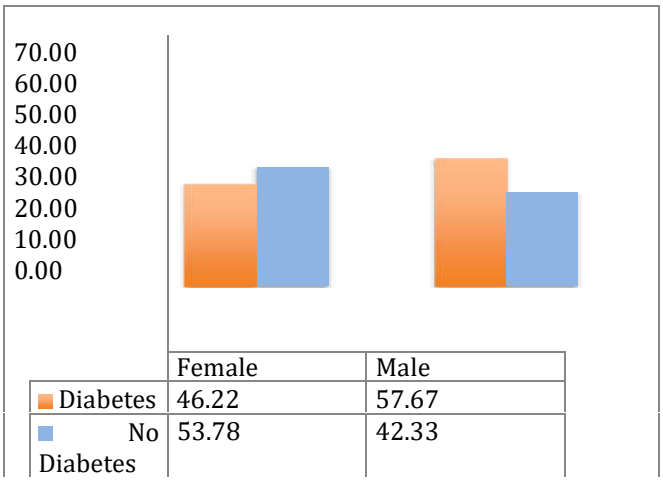

Fig. 1 Distribution of patients - gender, with and without diabetes (%)

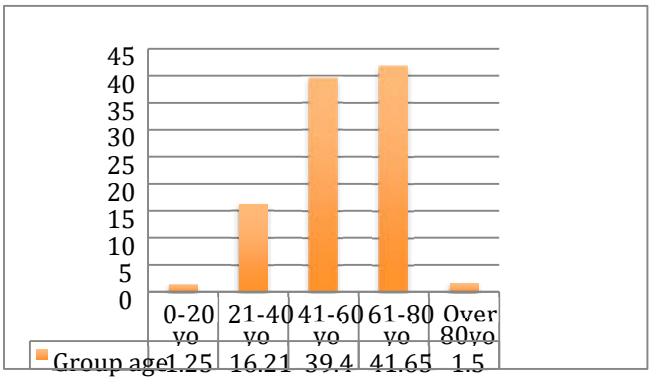

Fig. 2 Distribution of patients - group age (%)

When designing the study some examples of good practice have been used, namely Leonardo Program (implemented in Marche and Abruzzi Regions, Italy) and Diabaide and Cantonal Diabetes Program (implemented in Vaud Canton, Switzerland). Keeping in mind the available resources and the final objective of the study - to obtain a useful and accurate tool for managing the CKD in connection to diabetes and to minimize the costs of this process - the chosen target group has implied a number of 401 patients (204 with diabetes and 197 with no diabetes). Fig. 1 and Fig 2 present information on gender and group age of selected patients, respectively. It could be easily observed that the gender ration is more or less the same and that most of the subjects are aged 41-80 years old. All investigations took place over 6 months period - November 2016 until April 2017 in a privately managed Medical Center located in Craiova - South-Western region of Romania, benefiting of financial assistance in a dedicated research project - SMIS104769 which has as main goal developing companies in connection to innovative processes and products. The screening program has been designed keeping in mind three principles: simplicity, efficiency and effectiveness. In this respect it has been structured as follows: (a) Selecting the patients, (b) Introducing the objectives of the study (c) Assessing the patient's eligibility for being enrolled (d) Finalizing the enrollment procedure (e) Clinical examination (f) Psychological aspects (g) Para-clinic examination (h) Echography (i) other health/anamnestic variables (j) Identifying the CKD risk, medication, treatment, formulating specific recommendations etc.

Results

The current study focuses, analyses and presents, in a comparative manner, which is the situation in the group of patients presenting diabetes vs. the group of patient without diabetes, emphasizing characteristic aspects of CKD, keeping in mind the following two categories of variables:

a) General health parameters: high blood pressure, overweight and obesity, kidney disorders, dyslipidemia, lower limb peripheral arteriopathies, cardiac disorders, endocrinologic disorders, hepatic steatosis, pancreatic disorders.

b) Biological parameters: glycaemia, glycated haemoglobin - HbA1c, cholesterol-total, cholesterol- HDL, cholesterol-LDL, triglycerides, urea, creatinine, uric acid, glomerular filtration rate, total lipids, albumin, C Cystatin.

In addition to these, if the case, psychological assistance may be provided.

Fig. 3 presents relevant information for the objectives of the current study, sowing that the rate of patients presenting high blood pressure is significantly higher among those with diabetes by comparison to those with no diabetes (62.75% vs. 26.40%). On another hand, it could be mentioned that this rate is rather high among these patients with no diabetes, this results being in line with results with other studies (Barnett K. et al., 2012 and Nolte, E. and Knai, C., Eds., 2015). As it may have been expected, the incidence of overweight or obesity is much higher among those presenting diabetes (72.06%) by comparison to the group of subjects with no diabetes (34.01%). In what concerns the impact of kidney disorders, this is more than twice higher among those with diabetes (16.69% vs. 8.12%) - as presented in Fig. 5. Analyzing the situation presented in Fig. 6, despite the fact that those subjects presenting diabetes do have a higher rate of dyslipidemia than the others, the difference in not so evident, and a reasonable explanation being the fact that the population has bad alimentary habits 29.90% vs. 22.34%). In what concerns Fig. 7 the situation is obviously disquieting, the incidence of patients presenting diabetes and lower limb peripheral arteriopathies is about 10 times (!) higher by comparison to the other patients (10.29% vs. 1.02%).

Fig. 3 Patients with and without diabetes in connection to high blood pressure - HBP (%)

Fig. 4 Patients with and without diabetes in connection to overweight/obesity - OW/OB (%)

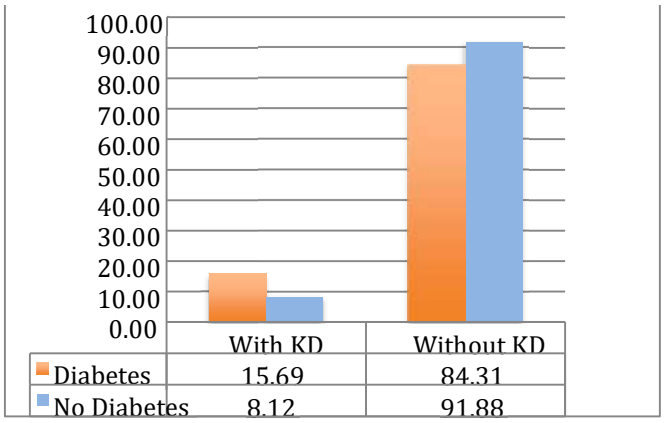

Fig. 5 Patients with and without diabetes in connection to kidney disorders - KD (%)

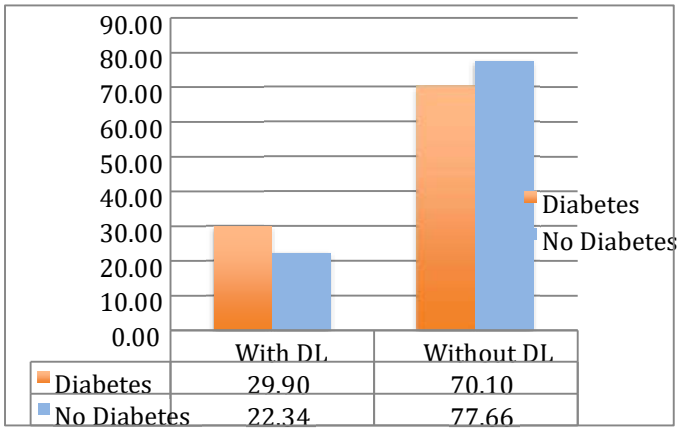

Fig. 6 Patients with and without diabetes in connection to dyslipidemia - DL (%)

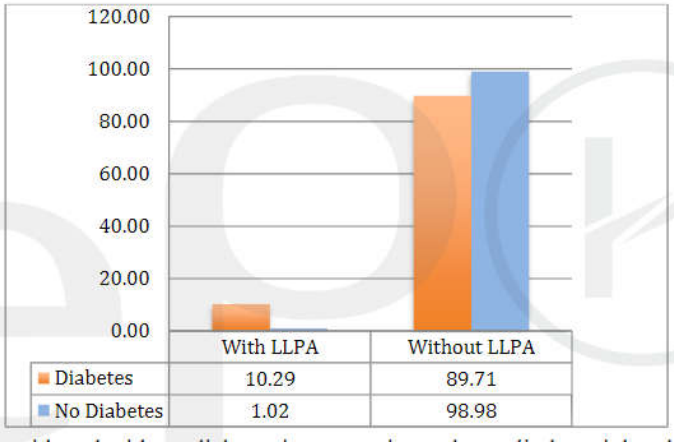

Fig. 7 Patients with and without diabetes in connection to lower limb peripheral arteriopathies - LLPA (%)

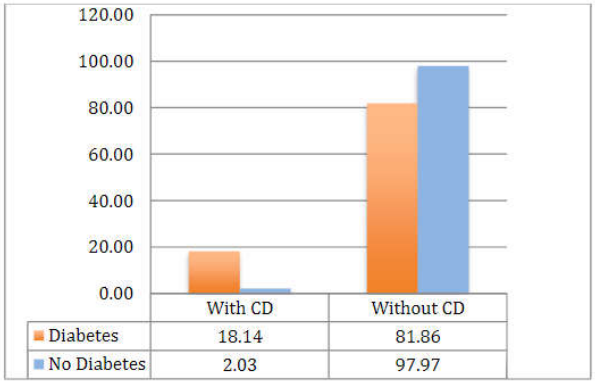

Fig. 8 Patients with and without diabetes in connection to cardiac disorders - CD (%)

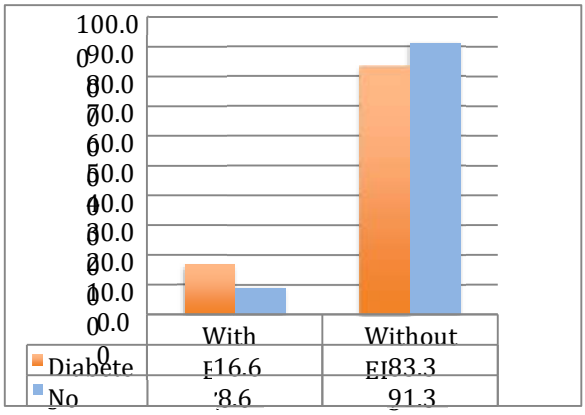

Fig. 9 Patients with and without diabetes in connection to endocrinologic disorders - ED (%)

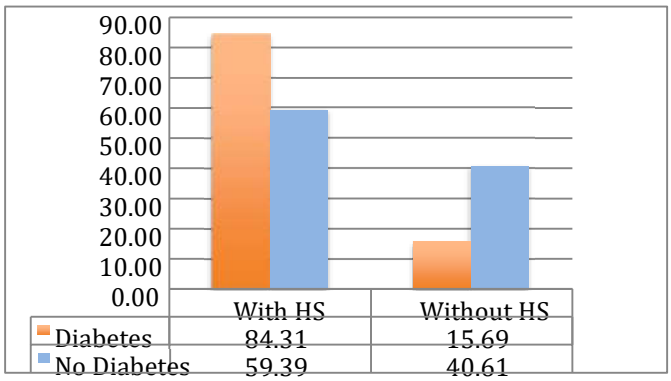

Fig. 10 Patients with and without diabetes in connection to hepatic steatosis - HS (%)

Fig. 11 Patients with and without diabetes in connection to pancreatic disorders - PD (%)

As it may have been expected, the ratio of patients with diabetes and presenting cardiac disorders is much higher than those with no diabetes (18.14% vs. 2.03%), as presented by Fig. 8. The same situation, even if the difference is not so high (16.67% vs. 8.63%), for subjects presenting endocrinologic disorders, is depicted by Fig. 9. Fig. 10 and Fig. 11 present, respectively, data about the incidence of hepatic steatosis and pancreatic disorders between the two groups of subjects. In both cases the group of patients with diabetes presents higher rates of these pathologies (84.31% vs. 59.31% and 22.55% vs. 17.77%, respectively).

Fig. 12 and Fig. 13 present two types of correlations for two of the considered variables, namely glycaemia and glycated haemoglobin - HbA1c. If Fig. 12 considers a cubic correlation, Fig. 13 considers a bi-quadratic one. This type of analysis has been considered in order to see if by using such correlations and subsequent analytical expressions on may reduce the number of collected data and keeping a high enough level of confidence into the obtained results. Such an approach, if the analytical expression characterizing the obtained correlation is accurate enough, could be considered an important tool of reducing costs and, on the other hand, if developed or enhanced, could fundament a new managing model for health care institutions/organizations.

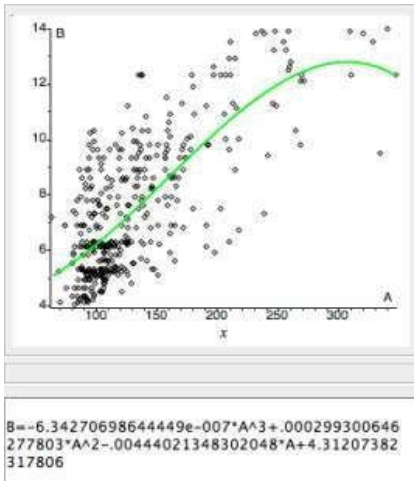

Fig. 12 Cubic correlation between glycated haemoglobin as function of glycaemia

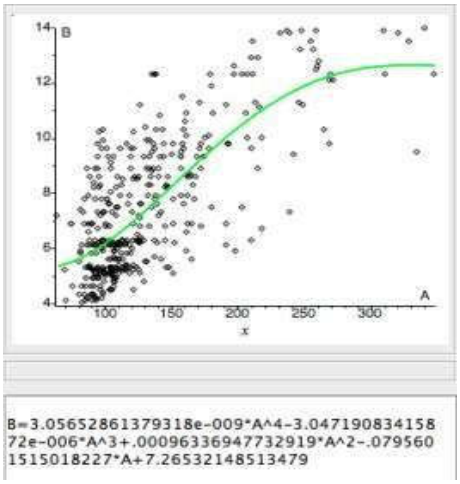

Fig. 13 Bi-quadratic correlation between glycated haemoglobin as function of glycaemia

Fig. 14, in the respect of the above-mentioned assumptions, presents a quadratic correlation between cholesterol - HDL as function of cholesterol - total. In Fig. 15 it is possible to observe a bi-quadratic correlation between triglycerides as function of cholesterol-LDL. Fig. 16 depicts a bi-quadratic correlation between uric acid as function of urea and Fig. 17 presents a cubic correlation between glomerular filtration rates as function of creatinine.

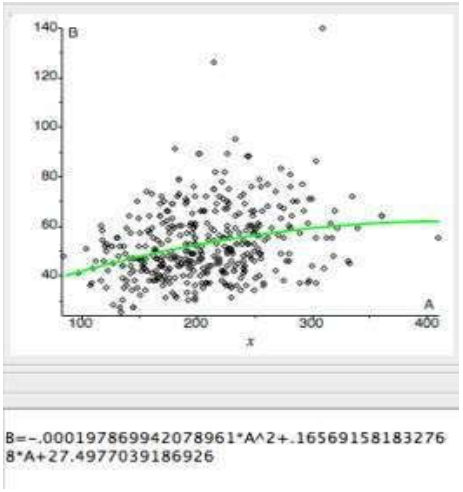

Fig. 14 Quadratic correlation between Cholesterol HDL as function of Cholesterol total

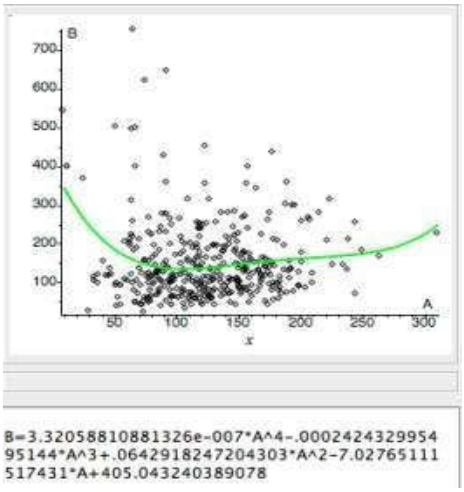

Fig. 15 Bi-quadratic correlations between triglycerides as function of cholesterol LDL

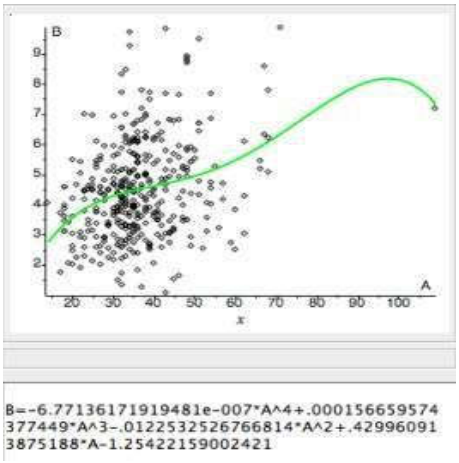

Fig. 16 Bi-quadratic correlation between Uric acid as function of urea

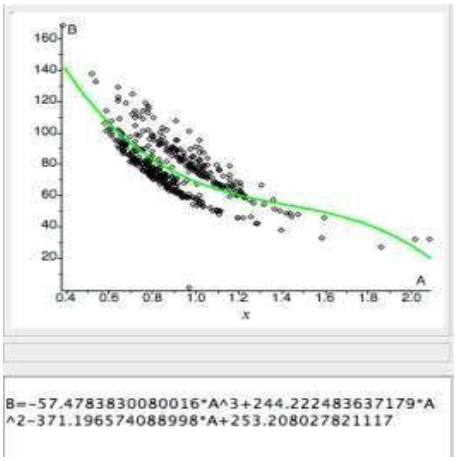

Fig. 17 Cubic correlations between glomerular filtration rate as function of creatinine

Conclusion

Chronic diseases represent, more and more, a burden for the health care services allover the world (Busse et. al., 2010). For this reason screening programs of such pathologies represent valuable instruments for collecting data, for identifying new evidence and to propose quality enhancements for managing the afferent health care processes (Hildebrandt et. al., 2010). In this respect the current study represents on one hand, a confirmation of previous studies and, on the other hand, a good start for proposing new lines of analysis. These new lines could be regarded from at least two perspectives: (i) Proposing an integrated health management model for patients with CKD in connection with diabetes offering services of psychological assistance if the case and (ii) Proposing analytical tools for minimizing the number of investigations in order to increase the efficiency of putting in practice the considered health management models. If taking about difficulties met during this screening program we could refer to those related to synchronizing various types of investigations for certain patients and when question of taking cross decisions when more medical opinions have been formulated. When discussing about limitations we could refer, primarily, to the fact that most of the subjects are from the same geographical area, hence decreasing the degree of comprehensiveness for the obtained results. With such difficulties identified, it is logically to propose new directions for enhancing the work, at least in what concerns: (i) Better synchronization for in-patient flow especially in what concerns cross diagnosis but having in mind other logistic aspects (e.g. dedicated software package, efficient communication channels with patients and medical staff etc.) and (ii) Developing further analytical tools in principle by increasing the number of considered variables, performing multi-dimensional interpolations and realizing qualitative analysis for minimizing the induced errors. The research team is very confident in developing the initial findings of this study and it is prepared, with resources and interdisciplinary competences, to continue this research path.

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