

IMPACT ON TREATMENT ADHERENCE USING PHARMACOTHERAPY CONSULTATION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS AND HYPERTENSION IN RURAL AND URBAN POPULATION OF HIDALGO, MEXICO

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ABSTRACT

Objective: To evaluate the impact of a pharmacotherapy consultation identifying problems related to medication and areas of opportunity to improve treatment adherence in patients with type 2 diabetes mellitus and hypertension in health centers in “Jesús de Rosal” in Pachuca and Epazoyucan, Hidalgo. **Material and methods:** This was an experimental comparative study of rural and urban population performed from January to December 2017 in the health centers of Pachuca and Epazoyucan, Hidalgo. **Results:** A total of 60 (30 urban and 30 rural) patients were included; 67% were women with a mean age of 64 years; 36% had a disease evolution between 11 and 20 years. Only 45% had a secondary education. The level of knowledge of disease before the intervention in both populations was sufficient in 17%; after intervention, it increased to 90%. This was in contrast with the control group which had sufficient knowledge in 13% at the

beginning and in 14% at the end. In therapeutic adherence, initially 54% had adequate adherence, which increased to 78% at the end. The control group started at 33% and decreased to 30%. Mean HbA1c before the intervention in both populations was 7.40% and at the end 7%. The control group was 6.45% at the beginning and at the end it increased to 8.54%. Rural population had a more significant reduction in HbA1c ($p=0.0377$).

Conclusions: The main problems related with medication where need (60%), followed by quantitative security (36.3%) and to a lesser extent qualitative security (23.3%).

KEYWORDS: Therapeutic adherence; pharmacotherapy consultation; type 2 diabetes mellitus; hypertension.

INTRODUCTION

The prevention and control of chronic diseases is an increasingly urgent need. According to the World Health Organization (WHO), chronic diseases are the main cause of mortality and represent more than 60% of the total deaths in the world. Just in the last year, these illnesses caused 35 million deaths worldwide, which represents twice the number of deaths caused together by infectious, maternal, prenatal, and malnutrition diseases. Among the chronic diseases, diabetes mellitus (DM) is one of the main causes of morbidity and mortality. The diabetes epidemic is recognized by the WHO is a world threat.

It is calculated that in the world there are 180 million people with DM and it is very likely that this number will increase by 2030. In 2005, a total of 1.1 million deaths caused by diabetes were recorded; of these, 80% occurred in low- or middle-income countries.^[1]

In Latin America, there are 26 million people with diabetes, which is equivalent to 7% of the total world population of patients with this disease. By 2030 an increase in the disease of up to 39.9 million cases is predicted, a number that will surpass other regions such as North America and Southern Asia.^[2] Furthermore, it is calculated that 80% of patients will have poor control of the disease with subsequent middle- and long-term damage.^[3]

DM occupied first place as the cause of death by year in 2007 in Mexico. Death rates showed an increasing trend in both sexes with more than 60 thousand deaths and 400,000 new cases yearly.^[4] In the state of Hidalgo, a mathematical projection was made that shows that DM will increase fourfold by 2030.^[2]

Another important problem with this group of chronic diseases is hypertension (HT), which is considered one of the great challenges of modern medicine because of his high prevalence. It is probably the most important public health problem in high- and low-income countries. It can be said that one out of four people in our setting has high blood pressure.^[5]

The relevance of hypertension does not reside in its characteristics as a disease but in the increased risk of suffering fatal diseases; therefore controlling this disease means reducing morbidity and mortality.

In recent years, the incidence and prevalence of hypertension has caused concern among health professionals. The search for methods that contribute to its reduction and the study of factors that impact its development have gained vital importance. Poorly controlled HT reduces the patient's and their family's quality of life and can lead to death; however, the individual's behavior can play an important role in its evolution, even prolonging life in those who adequately adhere to the treatment and life regimens that this disease demands.^[6]

Errors in following medical prescriptions lead to disease progression in hypertensive patients, making it impossible to estimate the effects and value of a specific treatment. This makes a good diagnosis impossible, causing an unnecessary increase in the cost of healthcare.^[7]

The direct cost of complications attributed to deficient control of diabetes and HT are 3 to 4 times greater than in patients with good control. In addition, deficient treatment adherence (TA) multiplies difficulties in improving health in a population and causes waste and underutilization of treatment resources that are already limited.

Therefore, health systems have undertaken the task to update prevention and control policies and strategies in a sectorial scheme that allows the combination of efforts and organization of services in different levels of government to achieve a more organized response.^[8]

One of the most important factors for disease control is treatment adherence. By combining the definitions of authors such as Haynes and Rand, and emphasizing the need to consider patient compliance regarding recommendations and good communication between patients and professionals as an essential requirement for efficient therapeutic practice, the WHO defines therapeutic adherence as "the extent to which a person's behaviour, taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider".^[9]

In high-income countries, TA in patients with chronic diseases is approximately 50%, and in low-income countries it is even lower considering that the factors that have the greatest influence on adherence are related to the patient, taking into consideration the setting and

subsystem within the system as well as the characteristics of the disease, the required treatment and the health services that are available.^[10]

A study carried out in Cuba in hypertensive patients concluded that “only 50% of the patients totally adhere (patients totally understand the risk of their pathology) and that the rest partially adhere or do not adhere (patients without supervision)”^[11] this finding has also been observed in studies that have used the Morisky-Green questionnaire to evaluate TA.^[12]

Another study validating the MBG (Martín-Bayarre-Grau) questionnaire to assess TA in HT found that the degree of TA depended on three factors: Active compliance, treatment autonomy, and the complexity of adhesion. The application of surveys and questionnaires offers medical personnel a methodological tool to evaluate the patient's behavior beyond the empirical management of data obtained by simple observation of the patient's daily or habitual behavior which is frequently biased by the natural subjectivity of the professional or his/her lack of knowledge.^[9]

In México, Duran-Varela et al. found a low percentage of adherence of 54.2% and the factors associated with the lack of adherence were a low education level and a lack of knowledge of the disease.^[13]

Studies that have been performed reflect that the main factors of non-adherence are directly related to the strategies used to explain the importance and impact of the pathology to the patient in addition to the low level of knowledge about their disease.

Other causes of poor control are the patient's physiological changes, such as greater alteration of renal and liver function, which favor alterations in the pharmacokinetics and pharmacodynamics of the drugs and which predispose the patient to more adverse effects in comparison to patients without diabetes, who may not present them or do so with less frequently or less intensity. Likewise, polypharmacy, which is usual in these patients, favors the appearance of adverse drug reactions (ADR) and drug interactions (DI), making it necessary to evaluate the drug therapy and dose, since otherwise, both optimal control of the pathology as well as the quality of life of the patient may be affected.^[14]

Drugs have very significantly contributed to disease control. Their objective is to cure the disease, slow or prevent its evolution, or palliate its symptoms. However, these drugs fail when they cause adverse effects, toxicity or do not achieve the desired therapeutic effect;

thus, these failures translate into health or economic loss that cause an increase in morbidity, mortality and health and social cost. As part of the results found in a study performed in elderly adults, it was seen that polypharmacy reduces treatment adherence because of frequent adverse reactions and the multiple economical increases it produces.^[15]

In recent years, it has been seen that chronic patient adherence to multiple treatments is a cornerstone in the control of disease, knowing that in close to 50% of cases, patients are incapable of complying with a hygiene–health regimen and correctly taking drug treatment for more than a year.^[16]

To effectively manage this type of chronic process, the patient must have adequate knowledge of the disease, in addition to a follow-up of drug treatment with the aim of providing him/her with a clear therapeutic plan, which includes understanding the dose, route of administration, and the identification of possible interactions and adverse effects that contribute to treatment abandonment.

Therefore, there is a need to determine the treatment adherence of patients with diabetes and hypertension, whether pharmacological or not, and to measure the impact of a pharmacotherapeutic consultation (PTC) intervention.

The PCT provides support to the attending physician since the aim is to reinforce patient education. PCT is defined as a pharmaceutical professional practice that aims to assess and monitor drug therapy based on the specific needs of the patient, improving or achieving health results.^[17] Its objective is to increase the patient's knowledge of his/her drug therapy (routes of administration, drug interactions, the importance of compliance and possible adverse reactions) and treatment follow-up. Likewise, to emit pertinent recommendations aimed at optimizing drug therapy.

Chronic diseases are vivid and individuals who suffer them convert them into illnesses as defined by Fitzpatrick (1990:38): "Nowadays, chronic diseases are the biggest health problem facing medicine, the longer periods in which an individual lives with their disease, also mean more time in which they can reinterpret the significance of their symptoms and their treatment."^[16]

The patient's perception of disease is a basic element of treatment to teach them how to take care for themselves and it is influenced by the individual's personality and beliefs about

health. An individual will accept a change in lifestyle or a restriction imposed by treatment if he/she is capable of perceiving the risks that not changing their lifestyle or accepting the restriction imply.

Because of the aforementioned scientific information based on pharmotherapeutic follow up that has demonstrated the favorable impact of PCT on treatment adherence, this project was carried out to prove the usefulness of PCT in our population.

MATERIAL AND METHODS

This was an experimental, comparative study in rural and urban population performed from January to December 2017 in the Health Centers of the cities of Epazoyucan and Pachuca, Hidalgo. The sample consisted of 60 patients with DM2 and HT who were receiving more than three drugs; 30 formed the study group, 30 the control group and both were randomly chosen. The patients were informed of the study and were asked to voluntarily participate by signing a written informed consent. The protocol was approved by the Ethics and Research Committees of the Hidalgo Health Services.

A data collection sheet was designed for the variables age, sex, occupation, education, time of disease evolution of DM2 and HT. Glycosylated hemoglobin (HbA1c) and blood pressure (BP) values were recorded. Updated instruments were also applied to determine the level of knowledge of each pathology and the degree of treatment adherence: DKQ-24 for DM2, the Batalla test for HT and the Morisky–Green Test, both at the start and at the end of the study.

Blood samples were obtained by trained personnel and BP levels by nursing personnel from the research team using a standardized technique. Three HbA1c and BP measures were made during each consultation.

Both groups continued with standard medical care in their healthcare units; however, a PCT strategy was applied to the study group and negative drug results (NDR) as well as drug duplicity, inappropriate doses and intervals, drug interactions and lack of efficacy were determined. This information was provided to this attending physician with the aim of the physician considering this recommendation to make pertinent adjustments. Meanwhile, the control group followed the medical care guidelines of the health clinic. Follow-up was carried out with a monthly session for 6 months, providing the previously mentioned activities.

Data collection was carried out by previously trained clinical research personnel using authorized standard operating procedures. A database was generated in Microsoft Excel 2013 for data capture and the information was exported and the statistical analysis performed with the free access software Epi Info version 7. Descriptive statistics were used for quantitative variables (measures of central tendency and dispersion), and for qualitative variables ratios and proportions were calculated. To compare differences before and after the intervention, the chi-square test was used for quantitative data and Student's t-test for numerical data; a $p < 0.05$ was considered statistically significant.

RESULTS

A total of 30 patients from Epazoyucan and 30 patients from Pachuca were included in the study; of these 15 in each health center formed the study group and 15 from each center the control group with a percentage loss of 3.33% (2 patients from the study group in Pachuca), therefore, a total study sample of 58 patients was evaluated.

Gender distribution was 67% women and 33% men with a ratio of 1:2. Mean age was 64 ± 10 years with a minimum of 43 and a maximum of 85.

The distribution by age group was the following: 18% less than 5 years; 14% between 6 and 10 years; 36 between 11 and 20 years and 32% had 20 years or more of disease evolution. The distribution in the control group was 30% less than 5 years; 10% 6 to 10 years; 30% 11 to 20 years and 10% more than 20 years.

Regarding occupation 55% of the total sample was housewives with 57% belonging to the rural area and only 43% to the urban area. Of the total population, 45% were employed. With regard to education, 40% were illiterate, 45% completed secondary education, 14% preparatory school, and only 1% had postgraduate studies.

In relation to knowledge of DM2 (DKQ-24), before the intervention, the study group of both populations had insufficient knowledge in 83%. In the Batalla test (HT) 57% had insufficient knowledge and 46% did not have treatment adherence. Meanwhile, in the control group, 87% had insufficient knowledge of diabetes, 44% had insufficient knowledge about hypertension and 67% did not have treatment adherence.

Evaluation of these indicators after the intervention showed that knowledge of DM2 was sufficient to 90%, 95% had sufficient knowledge of HT, and adherence was achieved in 78%

of patients. The control group had sufficient knowledge of DM2 in 14%, 56% in HT, while adherence was only 30%.

In the analysis of each of the populations, the urban population obtained the following percentages with respect to the degree of adherence evaluated by the Morisky Green test: Before the intervention patients had 54% adherence and after the intervention this increased to 60% with a $p = 0.3926$, while the rural population started with 53% adherence and after the intervention adherence increased to 72% with a $p = 0.00347$ (Tables 1 and 2).

Table 1: Level of knowledge in rural population.

Level of knowledge	Before the intervention	After the intervention
DKQ-24 (Diabetes)	Sufficient 13%	Sufficient 93%
	Insufficient 87%	Insufficient 7%
Batalla test (HT)	Sufficient 53%	Sufficient 93%
	Insufficient 47%	Insufficient 7%
3) Morinsky–Green Test (adherence)	Adherence 53%	Adherence 73%
	Non–adherence 47%	Non–adherence 27%

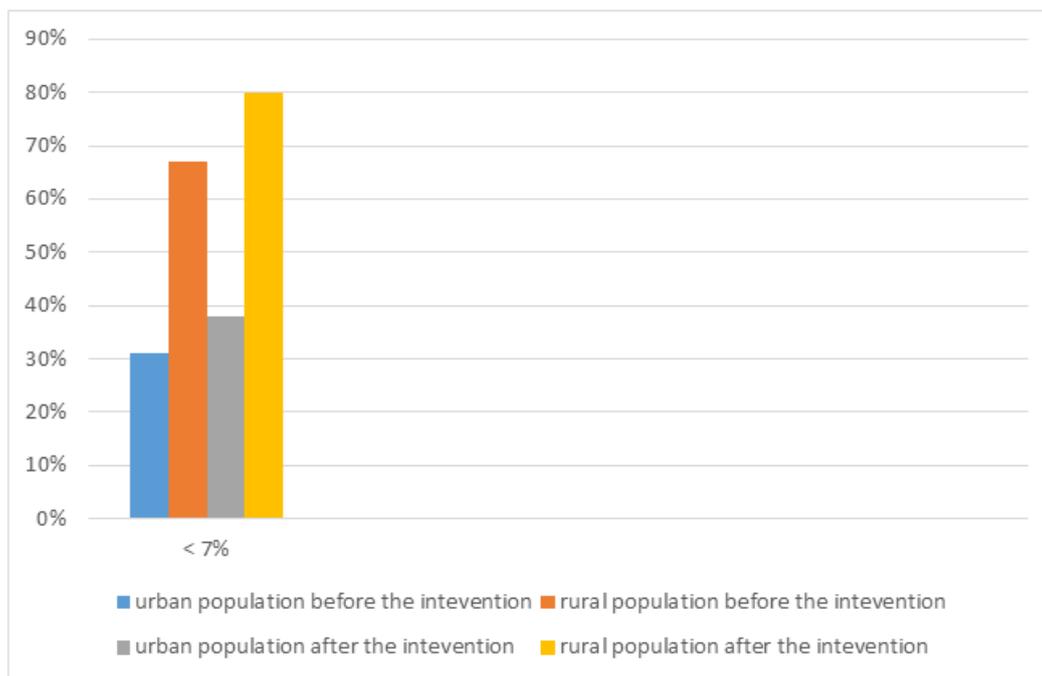
Table 2: Level of knowledge and urban population.

Level of knowledge	Before the intervention	After the intervention
DKQ-24 (Diabetes)	Sufficient 20%	Sufficient 87%
	Insufficient 80%	Insufficient 13%
Batalla test (HT)	Sufficient 60%	Sufficient 87%
	Insufficient 40%	Insufficient 13%
3) Morinsky–Green Test (adherence)	Adherence 54%	Adherence 60%
	Non–adherence 46%	Non–adherence 40%

Regarding HbA1c values before the intervention in both populations, rural and urban, the mean of the study group was 7.48% (50% had less than 7% and 50% had more than 7%). The control group had a mean of 6.45% (68% less than 7% and 32% more than 7%) at the start and 8.54% at the end.

After the intervention, the values for the study group using a mean HbA1c of 7%, 61% of the patients maintained their HbA1c values below 7.0% and 39% above 7.0%.

It was found that in the urban population, in the HbA1c values before the intervention, 31% of the patients had a level below 7% and at the end of the intervention only 30% maintained a value below 7% with a $p=0.2989$. In relation to rural population 67% had a HbA1c below 7% and after the intervention 80% were able to maintain their HbA1c values below 7% with a $p=0.0377$, making the intervention in the rural population statistically significant (Graph 1).



Graph 1: Comparison of glycosylated hemoglobin levels.

In relation to BP readings before the intervention, in both populations, the mean systolic pressure in the study group was 132 mmHg and in the control group 132.7 mmHg. Initially, the mean diastolic pressure was 77.5 mmHg in the study group and 78.16 mmHg in the control group.

After the intervention, the mean systolic pressure in the study group was 122 mmHg and in the control group 136 mmHg; diastolic pressure in the study group was 73 mmHg and in the control group 80 mmHg.

With regard to DRP, 60% were due to need; in other words, when the patient uses the drug but does not need it, followed by quantitative safety, 36.3%, in which the patient uses a drug but has adverse reactions; 23.3% were related to quantitative safety, in which the patient uses a dose, interval or duration greater than needed.

The following drug and general interventions were carried out.

A recommendation of dose adjustment in hypoglycemic agents, such as glibenclamide and insulin (due to a combination of both hypoglycemic agents and hypoglycemia in patients).

A recommendation of drug changes due to frequent adverse events.

Adjustment of drug administration schedules (to avoid possible drug – drug and drug – food interactions).

Patient education (focused on correct application and conservation of insulin and administration scheduling between each drug and food).

Disease (DM and HT) and health education.

Nutritional orientation and information on the importance of exercise.

DISCUSSION

Chronic diseases, such as diabetes and hypertension, are currently the main cause of mortality with a percentage of 60% worldwide. In Mexico, DM is among the first causes of death per year with more than 60,000, and 400,000 new cases, while in the state of Hidalgo, it is predicted that by the year 2030 DM will increase fourfold.^[2,4]

Among the improvement strategies during the tenure of Julio Frenk as Secretary of health in 2005, the document “Towards a More Integral Drug Policy for Mexico” was presented, in which 3 main objectives were stated: 1) have safe and effective drugs, 2) make them available to the population, and 3) have a consolidated national drug industry in expansion. To reach these objectives, a total of 72 strategies were proposed, including pharmaceutical care as one of the main actions to guarantee rational drug use, which leads to the implementation of pharmacotherapy follow-up in the hospital setting, the implementation of pharmacotherapy consultation in ambulatory clinics with the aim of providing information and promoting patient education as an intervention to improve both pharmacological and non-pharmacological treatment adherence in chronic patients, impacting on better glycemic and BP control.

Our results, in terms of therapeutic adherence, coincide with Alonso MA et al.^[18] who pointed out a lack of adherence of 50% in chronic patients; and in the intervention group, we agree with other studies where therapeutic follow-up was performed and a better adherence and effectiveness of treatment was observed when there was a pharmacotherapeutic follow-up such as the case of Libertad Martin, where 50% of the patients achieved total adherence by having a follow-up derived from this intervention.^[11] However, we also observed that in our urban population adherence was not total, despite the fact that the patients had a higher social-cultural level than the rural population; therefore, our results differ from a study

carried out in Mexico by Duran-Varela *et al.* in the Mexican Social Security Institute, which indicates that a low level of adherence is due to a low educational level and a lack of information about the disease.^[13]

Among the frequent factors found that limit adherence is the presence of adverse drug reactions such as those mentioned by Salinas Cruz,^[19] who emphasizes this aspect as well as the importance of the relationship with the treatment team.

In our study, greater adherence was observed in the rural population, in contrast with the urban population, even though the same techniques and focus on education were applied with each of the participating patients. The urban community group was not able to carry out all of the recommendations and this was reflected in the HbA1c results.

We think of these differences have to do with less opportunity and access to processed foods in the rural population and less use of transportation (they walk more) and their food preparation times, among other identified factors.

Among the causes of nonadherence in urban population were those related to the system; these include the lack of drugs, the high cost of drugs (insulin) and the difficulty in processing medical prescriptions.

Likewise, as mentioned in the study by Amezcua and Rodríguez,^[18] the economic factor was also important since those patients who did not have government support did not always have the economic resources to acquire drugs, a situation that was mentioned during consultations when patients were asked for the reasons why they sometimes discontinued their medication.

However, our intervention improved treatment adherence, and it was shown that participation of pharmacy personnel helps increase TA, as pointed out by Mengmeng L.^[10]

CONCLUSIONS

Patient education provided by healthcare personnel, plays an important role in care and evolution. Pharmacotherapeutic consultation has demonstrated a favorable impact on treatment adherence in patients with diabetes and hypertension, favoring empowerment of their pathology by using constant learning and strengthening of nutritional and pharmacological areas in a personalized manner.

Among the main problems of lack of treatment adherence, Negative Drug Risks were identified, mainly untreated health problems, which were mostly solved with dose adjustments and interval changes; this proved to be an effective strategy for better glycemic and BP control, leading to a better quality of life for patients.

Interdisciplinary cooperation between the physician and the pharmacy specialist enriches treatment and the quality of care of patients. Pharmacotherapeutic consultation is a feasible and viable strategy that allows rational drug use, is well accepted by patients, and helps improve treatment adherence.

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