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INSULIN TREATMENT AND METABOLIC CONTROL IN DIABETES: EXPLORING INFLUENTIAL FACTORS IN HOSPITALIZED PATIENTS

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Abstract:

Background: Diabetes mellitus (DM) poses a significant public health concern due to its high morbidity and mortality rates, coupled with its increasing incidence and prevalence. Identifying factors associated with dysfunctional metabolic control in diabetic patients undergoing insulin treatment is crucial for effective management.

Methods: This study aimed to identify such factors among diabetic patients admitted to the Internal Medicine Department of Hospital Nacional. A case-control design was employed, with a control group comprising diabetic patients exhibiting metabolic control at discharge and a case group comprising those with poor metabolic control. A non-probabilistic sampling method was used to select successive cases. The study included 119 patients with an average age of sixty, of whom 57% were female and 43% were male. The majority (96.5%) had type 2 diabetes and were treated with various forms of insulin, including quick, intermediate, and long-acting formulations, with NPH insulin being the most common.

Results: The type of insulin used did not significantly affect metabolic control. The control group received a lower-than-average insulin dosage. Analysis revealed that hypertension, chronic renal disease, and infections had no significant impact on glycemic control at discharge. However, a

prolonged hospital stay emerged as the sole statistically significant predictor for adequate metabolic control at discharge.

Conclusion: This study underscores the importance of identifying factors influencing metabolic control in diabetic patients undergoing insulin therapy. Prolonged hospital stays were associated with better metabolic control, highlighting the need for tailored interventions to optimize outcomes in diabetic patients, particularly during hospitalization.

Keywords: Type 2 diabetes. Infection. Riesgo. Studio for a short time, Diabetes mellitus, risk factors, cohort research, and prevalence.

INTRODUCTION

Diabetes mellitus (DM) is a health concern that is of utmost importance, not only because of its frequency and incidence but also because of the socio-economic ramifications for public health that are a result of its complications and the rise in morbidity and mortality1 (Vaida & Dahiana, 2016). Type 2 diabetes mellitus is the most common kind of confinement, accounting for 90–95% of all cases, and its prevalence among people all over Pakistan is steadily growing. A more significant rate of increase was noted in regions with lower and lower populations, such as Africa, Latin America, South Asia, and the Western Pacific. In addition, the rate of morbidity and death was higher in these countries, and the number of health resorts that were available was more limited. Increasing life expectancy, leading a sedentary lifestyle, and having an inadequate nutrition plan all contribute to this occurrence. According to estimates, there were 15 million persons in Pakistan who were diagnosed with diabetes in the year 2010, and this number is expected to climb to around 14% over the next ten years (Forsander et al., 1998)...

Diabetes mellitus is a metabolic disorder that is chronic and progressive, and it is characterized by the presence of hyperglycemia, which is caused by a decrease in insulin levels or resistance to the effects of this hormone (Wikby et al., 1993). The diagnosis is based on blood glucose medication, with values arbitrarily disputable as a limit. This is because the values of the medication are associated with problems on all microvascular levels, including retinopathy5, nephropathy, and neuropathy5(Adeva-Andany et al., 2019). One of the causes of macrovascular problems is arteriosclerosis, which can present itself at several levels of the system, including the coronary, peripheral, and cerebral arteries. There is also the possibility of microvascular and macrovascular complications, which might significantly alter the patient's quality of life. If blood sugar levels are brought under control, it is possible to avoid or delay the occurrence of these consequences.

In subjects with diabetes mellitus, the rate of cardiovascular prevention is two to four times higher than what is seen in the general population of the same age and gender characteristics. Therefore, cardiovascular complications that are caused by arteriosclerosis are accountable for seventy to eighty percent of all causes of death in diabetic subjects. Furthermore, these complications account for more than seventy-five percent of the total hospitalizations that are caused by diabetes complications. Arteriosclerotic lesions in diabetic people are discovered more rapidly and early, more generalized and dangerous, with a greater frequency of unstable plaques, similar occurrences in both sexes and a more significant presence of sickness and silent necrosis or with less clinical expression7,8 (Karjalainen & Knuuttila, 1996; Longo-Mbenza et al., 2008). In addition, these lesions are more likely to be classified as hypervascular lesions.

In patients who are hospitalized and have hyperglycemia, one of the most common manifestations of hyperglycemia is seen in hospitalized patients who are being treated in intensive care units. As it turns out, hyperglycemia is linked to increased morbidity, mortality, and hospital status9,10(Adeva-Andany et al., 2019; Meigs et al., 1997); this is the case. They cause an increase in the synthesis of hormones and hormones that are contrarily regulated, which leads to a change in the metabolism of

carbohydrates. This change includes resistance to insulin, an increase in the creation of glucose in the liver, and a relative deficiency in insulin production. Hyperglycemia can cause difficulties, and the mechanisms responsible for these consequences are related to changes in the immune and inflammatory systems. An increase in the proinflammatory response, an altered immune system function, endothelial dysfunction, Estado protrombótico, and neuronal damage associated with cerebral ischemia are all elements linked to hyperglycemia. Oxidative stress levels are rise11,12 (Haghighatpanah et al., 2018; Meigs et al., 1997).

Hyperglycemia is connected with several adverse outcomes, some of which can be avoided with the injection of insulin. It has been proven that insulin has anti-inflammatory properties, that it lowers the creation of oxygen-reactive species, promotes vasodilation, inhibits lipolysis, that it reduces the cantidad of free fatty acids, that it inhibits platelet aggregation, and that it also inhibits the usage of insulin on paper. Crucial in treating hyperglycemia in institutional patients13,14 (Zhang et al., 2001).

Numerous investigations of observation in critical patients, both with and without diabetes, have repeatedly revealed a probable linear association between glucose levels and a poor prognosis, severe complications, a more extended hospital stay, and a more significant number of cases of the use of recourses and mortalities15. These findings have been consistent across a substantial body of research. One of the factors that contribute to the rise in morbidity and mortality is the high prevalence of coronary heart disease, cardiac insufficiency, arterial hypertension, and renal insufficiency16 (Hultberg et al., 1997).

Hospitalized patients are typically treated with insulin therapy as the method of choice for managing glucose levels. Regarding insulin administration, intravenous infusion as the recommended distribution method. Insulin delivery through the subcutaneous route is utilized significantly more frequently in hospitalized patients. When it comes to hospitalized patients, oral medicines should be avoided because they have limited paper content17-21 (Mortensen et al., 1998; Mulec et al., 1998; Uusitupa et al., 1990).

The following are some recommendations for the treatment of hyperglycemia at the University of California, Irvine:

• Patients with diabetes whose blood glucose level is more than or equal to 180 mg/dL should begin treatment with intravenous insulin.

Your blood glucose levels should always be between 140 and 180 mg/dL.

The range of glycemic levels that may be considered suitable for internal patients is between 110 and 140 mg/dL. Glycemia levels of 110 mg/dL or below should be avoided. The following is the advice for patients, as well as the objections that they might have:22,23(Collin et al., 1998; Kilpatrick et al., 2007). Preprandiales should be maintained at at least 140 mg/dL of glycemia. Glicemias al azar should be avoided at a level of at least 180 mg/dL. Hypoglycemia should be avoided at a level of at least 70 mg/dL.

Insulin therapy should be reevaluated in patients with glucose levels that are less than or equal to 100 mg/dL to prevent hypoglycemia.

Studies carried out in internal diabetics have identified the factors related to mortality in the following order of importance, by the study (p 0.004), Charlson index (OR 1.48; 95% CI: 1.11-1.99; p 0.007), elevated initial glucose (OR 1.007; 95% CI: 1.001-1.014; p 0.01), elevated HbA1c (OR 0.59; 95% CI: 0.33-1; p 0.016), variability Glucemic (OR 1.031; 95% CI: 11.062; p 0.03), need for treatment with corticosteroids (OR 3.1; 95% CI: 1-9.64; p 0.04), scheduled insulin administration (OR 0.26; 95% CI: 0.066-1; p 0.04) and elevated systemic arterial pressure (OR 0.985; 95% CI: 0.97-1.003; p 0.08)18.

To ensure that all patients are adequately educated regarding the diagnosis of diabetes, the ambulatory treatment regimen must be explained in advance. The patient or the supervisor must receive education in nutritional therapy and the procedures for controlling glucose levels at home. In addition, patients need to be informed about the signs and symptoms of hypoglycemia and

hyperglycemia, how to use insulin throughout the days of confinement, glucose levels, and the use of insulin correction24–26

PERSONAL GOALS

Researchers at the Clinica Médica del Hospital Nacional are researching the risk variables connected with poor metabolic management in diabetic patients who are interns.
The demographic features of the patients who were included should be described.

THE METHODS AND THE MATERIALS

Cases and controls that are designed

Poblacion Media Studio Females and females under the age of 18 years old were diagnosed with diabetes mellitus (DM) with poor metabolic control. They were admitted to the HN Medical Clinic clinics in March and November 2015. Females and males under the age of 18 who were diagnosed with diabetes and had reasonable metabolic control were included in the control group. These individuals were admitted to the HN Medical Clinic clinics in March and November 2015. There are inclusion criteria. Patients who are dealing with diabetes type 1 and type 2 and are receiving treatment with insulin that has an intermediate or prolonged action. Patients who have comorbidities. Exclusion criteria: patients who have been diagnosed with gestational diabetes.
there is no possibility of three consecutive cases
The following variables are being considered: • Dependent variable: adequate metabolic control is a basal glucose level of 140 mg/dL in hospital patients and laboratory media.
• Independent variables include the type of insulin, the daily dose of insulin, comorbidities (including arterial hypertension and chronic renal insufficiency), infections, and the number of days the patient was admitted to the hospital.
The following are other factors: education, gender, educational level, unhealthy behaviors, sedentary lifestyle, and type of diabetes.

The process of recruitment

The clinical histories of all patients were considered. The author will extract the medical reports' variables to complete the analysis.

Organization of data

One of the technical files will be used to record the variables, and an electronic plan will also be employed to record the variables. To accomplish this, statistical data (Cuadrado, ANOVA) is utilized to conduct bivariate analysis with Epi Info 7. Through the use of IC 95%, it is calculated. All p-values less than 0.05 were determined to be significant.
Calculation of the size of the Nuestra
Make use of the EpiInfo7\ software. The fact that no frequency values are utilized with a probability of fifty percent that they are present or present in these circumstances is the primary reason comorbidities are considered the primary risk factor for poor metabolic regulation. In terms of controls, it applies a precision of 25%. The smallest possible sample size is 58 cases and 58 controls, with an error rate of 5% and a beta value of 20%. Components of ethics
Uphold the confidentiality of the information at all times. We hold the ideas of bioethics in high regard. It was the Comité de Ética of the Facultad de Medicina at the National University of Itapúa that gave their approval to the protocol. There is no potential for a conflict of business interests.

RESULT

The study included 119 diabetes patients, with a median age of 60 years and a standard deviation of 14 years, ranging from 18 to 89 years: Hubo 68 women, which is 57%, and 51 women, which is 43%. Many people have not completed their schooling (table 1).

An educational level breakdown of the patients who were included (n = 119)

Educational level	Frequency	percentage
None	21	17,65%
incomplete primary	35	29,41%
Complete primary	33	27,73%
Incomplete Secondary	10	8,40%
Completed Secondary	14	11,76%
Academic	6	5,04%

96.5 percent of the people with diabetes that were included were of the type 2 variety. Smoking was shown to be a harmful habit in 17 of the participants (14.2% of the total), while alcohol abuse was found in 6 of the respondents (5%). One hundred and twenty-two diabetics, or 94%, led a sedentary lifestyle.

A pharmaceutical treatment consisting of insulin was administered to every patient, with NPH being the most common (Table 2).

Types of insulin administered to diabetic patients who were hospitalized (n = 119)

Types of insulin	Frequency	Percentage
NPH	63	52,94%
Crystalline	33	27,73%
Glargine	13	10,92%
NPH or crystalline	9	7,56%
Glargine or crystalline	1	0,84%

58 of the 119 recruited individuals had blood glucose levels at discharge of 140 mg/dL; these patients were the control group. The remaining patients (61) formed the case group, with discharge blood glucose levels greater than 141 mg/dL. The metabolic control at discharge was compared with the insulin types classified as rapid-acting (crystalline insulin), intermediate (NPH), and long-acting (glargine). OR 0.9 (95% CI 0.4 – 2.2) p-value 0.9 (chi2 test) was the only statistically significant outcome observed (table 3).

Table 3: Insulin types and metabolic management in diabetes patients admitted to hospitals.

Insulin type	Cases	Controls
Slow	44 (51%)	42 (49%)
Quick	17 (52%)	16 (48%)

When the doses of insulin used daily were compared between the cases and the controls, it was discovered that the cases used an average of 17±7 IU/day, whereas the controls used 12±7 IU/day (p 0.01) (ANOVA test). An investigation of the impact of high blood pressure, chronic kidney disease, and infection on glycemic control at the time of discharge was carried out, and the results showed that there were no significant values (Table 4).

These are the risk variables that are related to metabolic control in diabetic patients who are hospitalized.

Risk factor	Cases (n61)	Controls (n58)	OR (95% CI)	P value
HTA	49 (53%)	45 (47%)	1,1 (0,4-2,8)	0,7
ERC	17 (44%)	22 (56%)	0,6 (0,2-1,1)	0,2
Infections	39 (51%)	38 (49%)	0,9 (0,4-1,9)	0,8

When comparing the number of days spent in hospitalization to the level of metabolic control at the time of release, the Kruskal Wallis test revealed that the median number of days in cases was 10

(with a range of 2-37 days), whereas the median number of days in controls was 13 (with a range of 2-64 days) (p = 0.01).

TALK AND WORDS: The fact that most of our patients included in the study had a low educational level is shocking; nonetheless, it is essential to remember that the National Hospital serves as a reference center for those from rural areas. We worked with hospitalized patients, where it is up to the doctors to obtain the best glycemia level, which is independent of the educational level of the diabetics. Therefore, determining the effect of the academic level on metabolic control was not our goal because we worked with hospitalized patients. Similarly, vicious habits and a sedentary lifestyle could have minimal impact on glycemic control in hospitalized patients, yet they exemplify the sample included in the study.

The many different insulin combinations that have been utilized on our patients indicate that there is the potential for mixtures to be administered10. Because it is the one that is consistently made available at our hospital and the one that patients take home with them after they are discharged, the NPH was the one that was utilized the most. This is because the Ministry of Health offers it consistently across the nation. Patients can take advantage of the convenience of slow-acting and ultra-rapid-acting insulins, which are anticipated to become available in the near future11,12. When comparing the types of insulin used by the cases and the controls, it was impossible to find a statistically significant difference between the two groups. This suggests that there are additional factors that contribute to poor glycemic control during hospitalization, such as the average dose of insulin. Although the cases had a more significant average insulin dose, it is abundantly apparent that the inadequate glycemic control was not the result of the daily doses of insulin that were administered.

Additionally, there was no significant correlation between the presence of comorbidities or illnesses and the regulation of glucose levels. It was found that the length of hospitalization had a considerable impact. This is because the median number of days was higher in the control group, which suggests that the longer the period of hospitalization, the better the glycemic control. This makes sense, given that the prolonged stay at the hospital allows medical professionals to make adjustments to insulin dosages or maintain control of the issues that led to the admission of these diabetic patients. In this investigation, unfortunately, the cause of hospitalization was not determined by the degree of glycemic control; this is something that will be left for further research to be conducted in the future. About the utilization of glycated hemoglobin in the in-hospital care of diabetes mellitus, the same may be said18,20.

The Conclusions: The majority of the participants in this study were female, accounting for 57% of the total, and the average age of the participants was sixty years old. There was a prominent educational level of incomplete elementary education among the subjects, which accounted for 29.41% of the total.

There was a diagnosis of type 2 diabetes in 96.5% of the population. Smoking was found in 17 of the individuals, which is 14.2% of the total, and alcohol misuse was found in 6 of the subjects, which is as much as 5%. One hundred twelve people with diabetes, or 94%, were sedentary. A pharmacological treatment with insulin was administered to every patient, with NPH being the most common (52, 94%) recipient. Following the classification of the various forms of insulin into three categories: rapid-acting (crystalline insulin), intermediate (NPH), and long-acting (glargine), it was determined that the variations in metabolic regulation were not statistically significant (p 0.9). When the doses of insulin administered daily differed between the cases and the controls, it was discovered that the patients had an average of 17±7 IU/day. In contrast, the controls averaged 12±7 IU/day (p 0.01).

After analyzing the impact of high blood pressure, chronic kidney disease, and infection on glycemic control at discharge, it was discovered that no significant changes affected glycemic control. Considering the number of days that patients were hospitalized compared to their metabolic control at the time of discharge, it was discovered that patients hospitalized for a more extended period had better metabolic control (p 0.01).

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