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**\* Autor de correspondencia**

Email: María Catherine Orrico Fernández <[cattyorrico@gmail.com](mailto:cattyorrico@gmail.com)> Dirección: Ayacucho & Portoviejo, Quito, Pichincha, Ecuador. CP 170103. Teléfono [593] 2 991700. Ext 1655.

# Determinants of access to health services, out-of-pocket expenses and therapeutic adherence in patients with diabetes mellitus: A single-center observational study.

María Catherine Orrico Fernández<sup>1</sup>, Giovanni Wladimir Rojas Velasco<sup>1</sup>, José Esteban Costa Gil<sup>1</sup> Ph.D.

1. Department of Graduate Studies, Faculty of Medical Sciences, Favaloro University, Buenos Aires, Argentina.

## Abstract

**Introduction:** Type 2 diabetes mellitus (T2DM) represents a global epidemic that disproportionately affects low- and middle-income countries, where structural determinants and economic barriers severely restrict access to effective medical care. In Ecuador, this pathology is the fourth leading cause of mortality, and there is limited coverage of services. The objective of the present investigation was to determine the factors of access to health services, the impact of out-of-pocket expenditure and the levels of therapeutic adherence among diabetic patients treated in the metropolitan district of Quito during 2024.

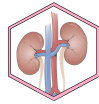
**Materials and methods:** An observational, prospective and cross-sectional study was carried out at the “Fray Bartolomé de Las Casas” health center. The sample was a probability of adults diagnosed with diabetes. For data collection, a survey validated by experts was used (Aiken’s V 0.81), with acceptable internal consistency (Cronbach’s alpha 0.782). The instrument evaluated sociodemographic, economic (expenses for consultations, drugs and transportation) and operational access variables. The statistical processing included inferential analyses using the chi-square test and the calculation of the odds ratio (OR).

**Results:** Ninety-five patients were analyzed. The perceived worsening of health was significantly associated with social security affiliation (OR 2.77,  $P=0.0258$ ) and with the lack of availability of institutional medications (OR 2.86,  $P=0.0347$ ). The average monthly expenditure on drugs was 82.19 USD, indicating that expenses greater than 50 USD per month constitute a critical risk factor for loss of adherence (OR 2.81,  $P=0.0211$ ). A paradox of accessibility was evidenced: patients who reported clinical stability tended to navigate the system, compensating for public shortages with their own resources, whereas users of social security associated saturation and bureaucracy with a decline in their condition.

**Conclusion:** The stability of diabetic patients in this context depends less on biological factors and more on the individual’s financial capacity to mitigate the deficiencies of the public system. The inefficiency of social security and high out-of-pocket spending on medications are the main determinants of perceived deterioration and low adherence.

## Keywords:

Accessibility to Health Services, Medication Adherence, Diabetes Mellitus, Health Determinants.



## Introduction

Type 2 diabetes mellitus (T2DM) is closely linked to obesity, sedentarism, and population aging [1, 2]. The complications derived from this pathology include heart disease, nephropathies, retinopathies, neuropathies, increased susceptibility to infections, recurrent hospitalizations, significant decreases in the well-being of patients, and disability and premature mortality, which underscore the urgency of taking measures to optimize prevention, the diagnosis and patient access to effective therapy [3].

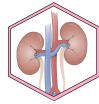
T2DM has reached epidemic proportions [4]. In 2021, according to the International Diabetes Federation (IDF), more than 537 million people were estimated to suffer from this pathology, a figure that could reach 700 million by 2045 if effective prevention and control strategies are not adopted [5]. The highest prevalence of T2DM is reported in low- and middle-income countries, where structural and economic determinants restrict access to medical care, which increases the likelihood of deleterious health consequences and even premature mortality. In different countries, health policies address T2DM through the promotion of healthy habits, the availability of essential drugs, and the strengthening of primary care. However, access to services remains a challenge in many areas, especially in rural communities and among socioeconomically vulnerable populations [6].

In the region of Latin America and the Caribbean (LATAM), T2DM is among the leading causes of poor therapeutic adherence and disability and death. Thus, it is estimated that more than 244,000 people die from this nosological entity in LATAM. The prevalence of T2DM has increased notably, from 18 to 62 million in the last 30 years [7]. It is likely that this figure is lower than that of people who need access to diabetes care, since approximately 40% of people do not know they have the disease and have not yet received a diagnosis. The prevalence of undiagnosed diabetes is higher in Guatemala (48.8%), Uruguay (48.7%), Puerto Rico (37.7–50%), Honduras (range of 31.9–53.7%), Mexico (range of 29.9–50%) and Nicaragua (43.3%) and lower in Colombia (Bogotá) (23.5%), the southernmost countries of South America (20.2%) and Costa Rica (10.3–28.4%). Therefore, the range observed suggests that the real prevalence of T2DM in LATAM could exceed previous estimates [8].

The factors that affect the increase in T2DM in this geographic area are population aging, accelerated urbanization, sedentarism and limited access to safe food. This is accentuated in rural or difficult-to-access areas.

Likewise, the out-of-pocket cost of these services constitutes a significant obstacle for patients with T2DM and their families, who must pay for consultations, drugs and supplies related to the normalization of blood glucose, whose cost depends on therapeutic adherence and the possibility of complications derived from the lack of these services [9,10].

In Ecuador, T2DM was the fourth leading cause of mortality in 2022 and 2023, with 5,100 and 4,460 cases, respectively, representing 5.1% of all etiologies [12], and approximately 7.1% of the population, approximately 727,000 people, suffer from T2DM. In Quito, the prevalence has



increased to 6.6% [11]. The Ecuadorian health system faces similar challenges in terms of care for people with diabetes; thus, the Ministry of Public Health (Ministerio de Salud Pública - MSP) has adopted a series of measures aimed at the quality of the provision of services and coverage of attention for several years. The low perceived risk of the importance of correct adherence to treatment has also been reported as a factor that asserts the burden of the disease in the country [12]. The objective of the present study was to establish the determinants of access to health services for diabetic patients treated in an MSP unit of the metropolitan district of Quito, as well as their impact on out-of-pocket expenditure and adherence to long-term treatments. during the year 2024.

## Materials and methods

### Study design

This is an observational, cross-sectional study. The source was prospective.

### Scenario

"The present study was carried out at the "Fray Bartolomé de Las Casas" health center in the city of Quito, Ecuador." The study period was from September 1, 2023, to July 31, 2024.

### Participants

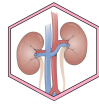
Patients older than 18 years with type 1 and type 2 diabetes mellitus who reside in the Metropolitan District of Quito and agreed to participate in the study through informed consent were included. Patients with gestational diabetes, people with cognitive impairment or psychiatric illness that prevented them from answering the survey, terminally ill patients or patients with decompensated chronic diseases that made their participation difficult were excluded.

### Variables

The sociodemographic variables included age, sex, marital status, educational level, occupation, area of residence and years of evolution. The economic variables included income level, monthly expenses related to medications, medical consultations, complementary exams and transportation. The variables of access to health services were type of health insurance, frequency of medical consultation, distance to the health unit, availability of medications in the health unit, waiting time for medical consultation, perceived impact of health care on the accessibility of health services and level of satisfaction with health care services. The variables of adherence to treatment were compliance with prescribed medication, difficulty in acquiring medications, attendance at follow-up consultations and level of adherence to prescribed treatment.

### Data sources/measurements

The source was direct. With respect to demographic determinants, age was measured in years. Marital status had the following nominal options: single, married, civil union, separated and



widowed. The educational level had the following nominal options: no education, primary, secondary and university. Occupation presented the following categorical options: employed, unemployed, informal and retired. The areas of residence were classified as urban or rural. Personal economic determinants (out-of-pocket expenses): The level of income was measured as follows: less than 1 BUS, 1-2 BUS, 3-4 BUS and more than 4 BUS. In the year 2025, the BUS is 470 USD per month (17), so that less than 1 BUS earns less than 470 USD per month, 1-2 BUS earns between 470 and 940 USD per month, 3-4 BUS earns between 940 and 1880 USD per month, and more than 4 BUS earns more than 1880 USD per month.

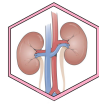
The type of health insurance was categorized as public, private or none. The frequency of medical consultations in the past year was categorized as monthly, bimonthly, semiannual or annual. The distance to the nearest health unit was categorized as follows: less than 30 minutes, 30 to 60 minutes or more than 60 minutes. The availability of medications in the health unit was categorized into always, sometimes and never. The wait time for medical consultation was categorized as follows: less than one week, between one and four weeks or more than one month. Compliance with the prescribed medication was categorized as always, sometimes and never. Attendance at follow-up consultations was categorized as yes or no. The level of adherence to the prescribed treatment was self-evaluated.

To guarantee the validity and reliability of the survey, a content validation was carried out through the judgment of three experts with more than 5 years of experience in the health sector, with a teaching status and who specialized in internal medicine. These were contacted by email and were asked, through informed consent, about their willingness to participate in the validation of the data collection instrument. Similarly, they were sent the survey and a content validation sheet, which allowed the specialists to issue an assessment, on a Likert scale, of each section of the construct according to its clarity, relevance, coherence and relevance. From this, the Aiken V coefficient was determined to be 0.81, which allowed us to affirm that there was good consensus among the members of the group of judges [13].

Subsequently, a pilot test was conducted with 15 volunteers prior to the final application of the instrument to evaluate the internal consistency of the survey. Thus, the participants considered the survey accessible and that it was well accepted; in addition, the average completion time was 3.5 minutes. A Cronbach's alpha coefficient of 0.782 was obtained, which is considered acceptable for the designed instrument and reinforces its reliability for use [14].

Authorization was requested from the administrators of the health units of the MSP (Ministry of Health) in the DMQ (Metropolitan District of Quito) prior to the application of the study, and an attempt was made not to interrupt the work routine when the surveys were administered; patients with a personal history of diabetes who were admitted to the center where the researcher was found from 9:00 am to 1:00 pm until the participants were completed for representativeness at the three health institutions.

Upon arrival at the stay, they were assessed whether they met the selection criteria of the study and were invited (if included) to be part of the research, with the subsequent reading of the



informed consent and explanation of the ethical principles, anonymization of the data and confidentiality of the information, in addition to the absence of risks, beyond the minutes for completion. Those who agreed were asked to sign the informed consent form and proceeded to complete the survey. Volunteers were provided with an adequate environment that guaranteed privacy.

### **Bias**

The surveys were applied in a standardized way by the principal investigator, using a preestablished guide approved in the research protocol. The information was independently reviewed by two researchers and recorded in duplicate. Only records with total agreement were included.

### **Study size**

The sample was probabilistic. With a census of the total estimated population of 2,679,722, 66.3% of the population consists of people older than 18 years, constituting a population of 1,776,655, with a rate of type 2 diabetes mellitus of 6.6%. There were 117,259 diabetic patients. With a confidence level of 95%, an expected standard deviation of 6.6%, and a confidence limit of 5%, the sample size was 95 cases. Epi Info Version 7.2 (CDC, Atlanta, United States, March 2025) was used for the sample calculations.

### **Quantitative variables**

The results of the ordinal variables are presented as frequencies and percentages. The results of the scale variables are presented as averages. Scale variables were not converted into quantitative variables. For the first analysis, the categorical options were regrouped into 2 categories according to the perceived impact of accessibility to services: Group 1: Worsening; Group 2: stability or improvement. For the second analysis of adherence to pharmacological treatment. The regrouping categories were as follows: Group 1: low adherence; Group 2: medium and high adherence.

### **Statistical analysis**

Inferential statistics are used. The percentages are compared using the chi-square test. The results of the association analysis are presented as odds ratios and 95% confidence intervals. Statistical analysis was performed with SPSS V 31.0 (IBM Corp.) (2024/2025). IBM SPSS Statistics, version 31.

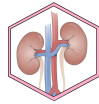
## **Results**

### **Participants**

A total of 95 cases were included in the study, which reached 100% of the sample size.

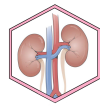
### **Characteristics of the study population**

The average age was  $41.6 \pm 13.2$  years. A relatively homogeneous distribution was observed among the different age groups, with a slight concentration in the ranges of 31 to 40 years (28.4%) and



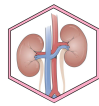
over 50 years (27.4%). However, the significant presence of young patients (23.2% with  $\leq 30$  years) suggests an early diagnosis of the disease. They were 49.5% men and 50.5% women. The largest proportion of patients were single (33.7%), followed by those who were in a consensual union (21.1%) and those who were divorced (26.3%). The rest of the categories presented minor incidences. A total of 56.8% of patients resided in urban areas, and 43.2% resided in rural areas. The average duration of disease evolution was  $13.95 \pm 8.74$  years, and almost half of the patients (46.3%) had been diagnosed during the past 10 years, while 30.5% had lived with the disease for more than 20 years. A total of 24.2% had incomes less than 1 SBU, 26.3% had incomes from 1 to 2 SBU, 30.5% had incomes from 2 to 4 SBU, and 18.9% had incomes greater than 4 SBU.

The average expenditure on medications was  $82.19 \pm 47.15$  USD per month, with a minimum of 0 USD/month to 149 USD/month. A total of 27.4% of the respondents spent more than 120 USD per month on drugs, and 18.9% reported spending less than 40 USD/month. The average expenditure on medical exams is  $47.01 \pm 30.31$  USD per month; 29.5% of patients spend less than 25 USD per month, 28.4% spend between 26 and 50 USD/month, and 15.8% spend between 51 and 75 USD/month, and 26.3% of patients spend more than 75 USD/month. In addition to the previous expenses, the cost of transportation to attend medical consultations is added, another factor that impacts patients, with an average expense of  $23.72 \pm 13.89$  USD per month. More than one-third (34.7%) spend more than 30 USD per month on travel.



**Table 1.** Perceived impact of accessibility to services.

Variables	Worsening N=35		Stability/Improvement n=60		X <sup>2</sup>
<b>Age</b>					
≤ 40 years vs. > 41 years	20	57.1%	29	48.3%	0.4072
<b>Marital status</b>					
Single/Divorced/Widowed vs. Married	26	74.3%	34	56.7%	0.08593
<b>Educational level</b>					
No formal education/primary vs. secondary	20	57.1%	36	60.0%	0.964
<b>Occupation</b>					
Unemployed/Retired vs. Employed	16	45.7%	24	40.0%	0.3041
<b>Years with diabetes</b>					
<15 years vs. >15 years.	20	57.1%	33	55.0%	0.9639
<b>Medical consultation expenses (USD/month)</b>					
<50 USD/month vs. >50 USD/ month	18	51.4%	28	46.7%	0.6542
<b>Expenditures on medications (USD/month)</b>					
<80 USD/ month vs. >80 USD/ month	19	54.3%	31	51.7%	0.836
<b>Medical exam expenses (USD/month)</b>					
<50 USD/ month vs. > 50 USD/ month	19	54.3%	36	60.0%	0.8052
<b>Transportation expenses for medical consultations (USD/month)</b>					
< 30 USD/ month vs. >30 USD/ month	23	65.7%	39	65.0%	0.9438
<b>Type of health insurance</b>					
Without health insurance/Private insurance vs. Social security	19	54.3%	46	76.7%	<b>0.02359</b>
<b>Frequency of medical consultations per year</b>					
< 3 consultations/year vs. >4 consultations/year	8	22.9%	17	28.3%	0.5588
<b>Distance to health center (km)</b>					
<15 km vs. >15 km	17	48.6%	31	51.7%	0.771
<b>Availability of medications</b>					
Never available vs. available	7	20.0%	25	41.7%	<b>0.03113</b>
<b>Waiting time for consultation (days)</b>					
≤10 days vs. >10 days	17	48.6%	18	30.0%	0.07028



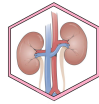
**Table 2.** Adherence to pharmacological treatment.

	Low adherence n=34		Medium/high adherence n=61		X <sup>2</sup> (p value)
	No.	%	No.	%	
<b>Age</b>					
<40 years vs. > 40 years	20	58.8%	29	47.5%	0.2915
<b>Marital status</b>					
Single/Divorced/Widowed vs. married	17	50.0%	43	70.5%	0.165
<b>Occupation</b>					
Unemployed/Retired vs. employee	14	41.2%	26	42.6%	0.8911
<b>Monthly income</b>					
<2 SBU vs. >3 SBU	16	47.1%	32	52.5%	0.6138
<b>Medical consultation expenses (USD/month)</b>					
≤50 USD/month vs. >50 USD/ month	11	32.4%	35	57.4%	<b>0.0193</b>
>50 USD/ month	23	67.6%	26	42.6%	
<b>Expenditures on medications (USD/month)</b>					
≤80 USD/ month vs. >80 USD/ month	19	55.9%	31	50.8%	0.6357
<b>Medical exam expenses (USD/month)</b>					
≤25 USD/ month vs. >25 USD/ month	5	14.7%	23	37.7%	0.257
<b>Transportation expenses for medical consultations (USD/month)</b>					
≤20 USD/ month vs. >20 USD/ month	14	41.2%	24	39.3%	0.683
<b>Type of health insurance</b>					
Without health insurance/private insurance vs. Social security	20	58.8%	45	73.8%	0.133
<b>Frequency of medical consultations per year</b>					
≤ 3 consultations/year vs. >4 consultations/year	8	23.5%	17	27.9%	0.5588
<b>Distance to health center (km)</b>					
≤5 km vs. >5 km	12	35.3%	11	18.0%	0.05972
<b>Availability of medications</b>					
Never available vs. availability	13	38.2%	19	31.1%	0.3741
<b>Waiting time for consultation (days)</b>					
≤10 days vs. >11 days	17	50.0%	18	29.5%	0.07028

**Main results**

[Table 1](#) presents the perceived impact of service accessibility. The variables that had an impact on the worsening of patients were the presence of a social security affiliation (odds ratio 2.7669; 95% CI 1.1311 to 6.7685) ( $P=0.0258$ ) and the lack of availability of medications (odds ratio 2.8571; 95% CI 1.0784 to 7.5701) ( $P=0.0347$ ). The other variables did not have a statistically significant effect.

[Table 2](#) presents the factors that influence adherence to pharmacological treatment. Medication expenses of more than 50 USD/month were a risk factor for loss of adherence (odds ratio



2.8147; 95% CI 1.1679 to 6.7835;  $P=0.0211$ ). The other factors did not have a statistically significant effect.

## Discussion

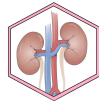
In the data shown in [Table 1](#), age was not a statistically significant factor in differentiation ( $P = 0.4072$ ), indicating that perceptions of deterioration or stability are influenced by factors beyond biological aging. Regarding educational level and occupation, the sample demonstrates a high level of consistency, preventing these variables from acting as predictors of health perception in this analysis ( $P = 0.964$  and  $P = 0.3041$ , respectively). Diabetes is characterized by its duration. In the table, the number of years since diagnosis was nearly identical between the two groups ( $P = 0.9639$ ), with 57.1% of patients having less than 15 years of disease progression in the worsening group and 55.0% in the stable group. This lack of statistical significance has major implications: it suggests that the perception of 'improving' does not rely on how long the disease has lasted. A patient diagnosed 20 years ago might perceive stability if the health system manages complications, while a patient with only 5 years might perceive rapid deterioration if they face major access barriers. These findings challenge the idea that negative perceptions are unavoidable before the disease fully develops and highlight the importance of systemic care management.

In Latin America, out-of-pocket spending is one of the most sensitive indicators of weak health systems. On average, these costs make up 34% of the total health expenditure in the region, significantly higher than the 21% seen in OECD countries.

The study categorizes expenses into four groups: consultations, medications, exams, and transportation. Surprisingly, none of these factors showed a statistically significant link to perceptions of worsening or stability ( $p > 0.6$  in most cases). "This homogeneity in spending suggests the existence of a 'financial floor' for the management of diabetes." That is, regardless of whether patients perceive their health as improving or declining, the financial burden remains similar. The fact that 48.3% of stable patients spend more than 80 USD per month on medications, compared to only 45.7% of those whose condition worsens, might indicate that consistent financial investment is, in fact, necessary for achieving perceived stability.

Transportation expenses have the highest P value (0.9438), with 35% of patients in both groups spending over \$30 per month to attend their appointments. This indicates that geographical and logistical barriers are a persistent structural issue affecting the entire population equally. "In saturated health systems, the patient must assume this cost as a condition for access, which reinforces the notion that accessibility is not limited to the availability of the service, but to the financial ability to 'reach' it."

The variable with the greatest statistical significance in this analysis is the type of health insurance ( $P = 0.02359$ ). The results clearly show a difference in patient experience based on institutional affiliation. In the group that perceived their condition as worsening, 45.7% relied on social security. Conversely, in the group that reported stability or improvement, this percentage significantly dropped to 23.3%. Meanwhile, 76.7% of patients without insurance or with private

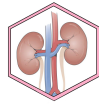


insurance were in the stable group. This relationship suggests that patients under social security systems (such as the IESS) experience care they associate with health deterioration. This could be due to multiple factors documented locally: 1. Saturation and workload of complications: Public systems often serve populations with higher risk factors and pre-existing complications, creating a workload that limits personalized healthcare. 2. Fragmentation and bureaucracy: The complexity of referral and counterreferral processes within social security can act as a barrier, delaying timely treatment and reinforcing feelings of deterioration. 3. Perceived quality difference: There is a documented tendency for patients to associate higher 'quality' or 'care' with direct (private) costs, affecting their subjective reports of improvement even if clinical outcomes are similar. Notably, the "Without insurance or with private insurance" group makes up most of the stable group. The odds ratio was 2.7669 (95% CI 1.1311 to 6.7685) ( $p=0.0258$ ). This raises questions about the role of private healthcare in compensating for public system shortcomings. Patients who should be receiving care outside the social security system seem to have a greater sense of control over their illness, likely due to shorter wait times for consultations and a perception of easier access to specialists [15 -16].

The drug availability variable was significantly different ( $P = 0.03113$ ). "However, the direction of the relationship is counterintuitive: 41.7% of patients who report stability or improvement state that medications "are never available in the public system," compared to only 20.0% of the worsening group." This apparent contradiction can be explained by the patient's "navigation capacity." Patients who perceive stability, despite the lack of medications in their health center, could be those with greater resilience or with resources to obtain them by other means (such as direct purchases, assistance programs, or social networks). Their perception of stability does not depend on institutional provisions but on their capacity for agency to overcome this lack. "On the other hand, the group that perceives worsening reports better institutional availability (80% reports availability "sometimes or always")." This suggests that, for these patients, providing medications alone is not enough to reverse the feeling of deterioration, possibly because they face more serious complications or because accompanying clinical care is inadequate.

The frequency of medical consultations is another indicator of the level of care. In both groups, more than 70% of patients attended more than four consultations per year ( $P = 0.5588$ ). This high frequency suggests a health system that manages to "keep" the patient within the care circuit but fails to differentiate the quality of that care to prevent perceived worsening.

The distance to the health center was also not a discriminating factor ( $P = 0.771$ ). 51.4% of those who worsened lived more than 15 km away, almost identical to 48.3% of those who were stable. This finding reinforces the idea that, in managing diabetes, once the patient has overcome the initial transportation barrier (which we've already seen is costly for both), the geographic location becomes less relevant compared to the quality of clinical interaction and social support.



### Implications for the Sustainability of Health Systems

Diabetes not only impacts individuals' quality of life but also creates a significant economic burden on institutions. It is projected that by 2028, complications from diabetes and cardiovascular events will drive billions of dollars in increased expenses for institutions like the IESS [17-18].

The report on stability under difficult access conditions (such as drug shortages) highlights the paradox of overuse and underuse. "Many health systems provide large volumes of "low value" services (quick consultations, repetitive exams without follow-up) while failing to offer "high value" services (biological drugs, intensive nutritional education, and continuous monitoring) [17].

Patients in the worsening group may be caught in a cycle of overusing emergency services or low-value consultations, while the stable group might be underutilizing the official system but compensating with high-value resources. This inefficiency not only harms patient health but also drains the human and financial resources of the system [18].

The perception of health in diabetes is not an accurate reflection of biological reality but a story constructed around accessibility. To the degree that health systems succeed in reducing the direct economic burden and increasing confidence in social security, patients' trajectories can shift from perceived deterioration to actual, lasting stability. The future of diabetes care in the region depends on governments' ability to close the gap between theoretical coverage and real accessibility, removing the paradoxes that currently force patients to be resilient despite the system, rather than because of it [19-20].

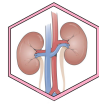
## Conclusion

The results show that patients' perception of health and adherence to treatment for diabetes are influenced more by the efficiency of the insurance system and the availability of supplies than by biological or demographic factors. Social security affiliation and drug shortages are identified as the main factors contributing to perceived worsening, while out-of-pocket drug costs exceeding \$50 per month are identified as significant risk factors that triple the likelihood of low medication adherence. Addressing these barriers requires an intervention that resolves the operational paradoxes within the system and reduces the patient's financial burden, ensuring that disease stability depends on a robust support infrastructure rather than solely on the patient's navigation skills and economic resilience.

### Abbreviations

T2DM: diabetes mellitus type 2.

OECD: The OECD (Organization for Economic Cooperation and Development) has 38 countries with advanced and emerging economies, such as Germany, the United States, Japan, Canada, Chile, Colombia, and Mexico, that work together to design better policies that promote economic growth, social welfare and sustainable development; these countries are a forum to share experiences and best practices in key areas such as the economy, education and the environment.

**Supplementary information**

The supplementary materials have not been provided.

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**Authors' contributions**

**María Catherine Orrico Fernández:** Conceptualization, data curation, research, visualization, original writing draft.

**Giovanni Wladimir Rojas Velasco:** Conceptualization, data curation, research, visualization and writing of the original draft.

**José Esteban Costa Gil:** Conceptualization, data curation, formal analysis, project management, software, validation, visualization, writing - review and editing.

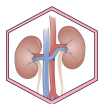
All the authors read and approved the final version of the manuscript.

**Financing**

The study was self-financed by the authors.

**Availability of data or materials**

Not applicable.



# Statements

## Approval of the ethics committee and consent to participate

The study was approved by the Bioethics Committee of the Faculty of Medical Sciences of Favaloro University in Buenos Aires, Argentina.

## Consent for publication

Does not apply when specific images, radiographs or photographs of patients are not published.

## Conflicts of interest

The authors declare that they have no conflicts of interest.

## Use of generative AI

The authors declare having used generative AI responsibly in the "Discussion" section, without replacing the critical thinking, experience and judgment of the authors." AI was used under supervision and control to develop the discussion section. The use of the AI tool maintains the privacy and confidentiality of the data and contributions, including published and unpublished manuscripts, as well as any personally identifiable information. The policies of the journal that allow the use of generative AI only in the introduction and discussion sections have been complied with.

Only limited rights are granted to AI to provide a service.

The accuracy, integrity and impartiality of all the results generated by AI were carefully reviewed and verified to ensure that the manuscript reflects an authentic and original contribution.

## Author information

**María Catherine Orrico Fernández:** medical doctor from the Central University of Ecuador (Quito, 2012). Specialist in family and community medicine from the Pontifical Catholic University of Ecuador (Quito, 2020). Master's Degree in Diabetes Mellitus from Favaloro University, Buenos Aires, Argentina.

Email: [cattyorrico@gmail.com](mailto:cattyorrico@gmail.com)

<https://orcid.org/0009-0001-7974-7400>

**Giovanni Wladimir Rojas Velasco,** medical doctor from the Central University of Ecuador (Quito, 2007). Specialist in family medicine from the Pontifical Catholic University of Ecuador (Quito, 2011). Doctor of Science in Public Health, University of São Paulo, (2021).

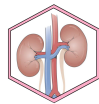
Email: [gwrojas@uce.edu.ec](mailto:gwrojas@uce.edu.ec)

<https://orcid.org/0000-0002-9117-9223>

**José Esteban Costa Gil,** Medical specialist in Endocrinology and Nutrition. Doctor of Medicine, teacher and researcher. Former President of the Argentine Federation of Endocrinology Societies, of the Argentine Diabetes Society and future president of the Latin American Diabetes Association.

Email: [jecostagil@hotmail.com](mailto:jecostagil@hotmail.com)

<https://orcid.org/0000-0002-2825-6417>



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**DOI:** Digital Object Identifier. **PMID:** PubMed Identifier.

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