

ORIGINAL RESEARCH

Age, obesity, and physical inactivity drive erectile dysfunction severity in men with type 2 diabetes mellitus: a cross-sectional study

Cristian Santiago Torres^{1,2}, Verónica Alexandra Celi^{1,2,*},
Katherine Geovanna Esparza^{1,2}

¹Universidad Técnica del Norte-Facultad Ciencias de la Salud (UTN), 100105 Ibarra, Ecuador

²Red de investigación en Fisioterapia (RIF), 100105 Ibarra, Ecuador

***Correspondence**

vaceli@utn.edu.ec

(Verónica Alexandra Celi)

Abstract

Background: Erectile dysfunction (ED) is defined as the inability to maintain a penile erection sufficient for sexual intercourse. It is highly prevalent among men with type 2 diabetes mellitus (T2DM), and factors such as age and overweight are important predictors. This study aimed to determine ED severity and its association with risk factors in patients with T2DM. **Methods:** A descriptive, cross-sectional, correlational study was conducted in 130 men from Ibarra, Ecuador. Spearman's ρ and ordinal logistic regression were used to analyze the relationship between ED severity and risk factors. **Results:** The mean age was 62.67 years, with most participants being older adults. Overall, 52.3% were overweight, 21.5% were obese, and 26.2% had normal weight. In addition, 51.5% had lived with diabetes for 1–5 years. Mild-to-moderate ED was present in 86.9% of participants, whereas 13.1% reported severe ED. Regarding physical activity (PA), 53.9% reported moderate levels, 24.6% low or inactive levels, and 21.5% high levels. Spearman's analysis showed significant positive associations between ED severity and age ($\rho = 0.558$; $p < 0.001$), PA ($\rho = 0.289$; $p = 0.001$), and body mass index (BMI) ($\rho = 0.218$; $p = 0.013$). Compared with the high-PA group, participants with low PA had 79% lower odds of belonging to a less severe ED category (Odds Ratio (OR) = 0.21; 95% Confidence Interval (CI): 0.08–0.53; $p = 0.001$). Similarly, the moderate-PA group had 65% lower odds of belonging to a less severe category (OR = 0.35; 95% CI: 0.16–0.75; $p = 0.007$). **Conclusions:** Advanced age, lower PA, and excess body weight were associated with greater ED severity in men with T2DM.

Keywords

Erectile dysfunction; Type 2 diabetes mellitus; Physical activity; Body mass index

Edad, obesidad e inactividad física determinan la gravedad de la disfunción eréctil en hombres con diabetes mellitus tipo 2: un estudio transversal

Resumen

Antecedentes: La disfunción eréctil (DE) se define como la incapacidad de mantener una erección del pene suficiente para lograr la relación sexual. Es altamente prevalente entre los hombres con diabetes mellitus tipo 2, y factores como la edad y el sobrepeso constituyen predictores significativos. El objetivo de este estudio fue determinar la gravedad de la disfunción eréctil y su asociación con factores de riesgo en pacientes con diabetes mellitus tipo 2. **Métodos:** Se realizó un estudio descriptivo, transversal y correlacional en una población de 130 hombres de la ciudad de Ibarra, Ecuador. Se utilizó el coeficiente rho de Spearman y la regresión logística ordinal para analizar la relación entre la DE y los factores de riesgo. **Resultados:** La edad media fue de 62.67 años, predominantemente adultos mayores. Entre los participantes, el 52.3% tenía sobrepeso, el 21.5% obesidad y el resto tenía un peso normal. En general, el 51.5% había estado viviendo con diabetes durante 1 a 5 años. En cuanto a la gravedad de la disfunción eréctil (DE), el 86.9% presentó disfunción leve a moderada, mientras que el 13.1% reportó casos graves. Respecto a la actividad física (AF), el 53.9% reportó niveles moderados, el 24.6% niveles bajos/inactivos y el 21.5% niveles altos. El análisis de correlación de Spearman reveló asociaciones positivas significativas entre la gravedad de la DE y las variables analizadas. La edad mostró la correlación más fuerte ($\rho = 0.558$; $p < 0.001$), seguida de la AF ($\rho = 0.289$; $p = 0.001$) y el índice de masa corporal (IMC) ($\rho = 0.218$; $p = 0.013$). En comparación con el grupo de alta actividad física (AF), los individuos con baja AF mostraron una reducción del 79% en las probabilidades de pertenecer a una categoría menos grave (Odds Ratio (OR): 0.21; 95% de Intervalo de confianza (IC): 0.08–0.53; $p = 0.001$). De manera similar, el grupo de actividad moderada mostró una reducción del 65% en las probabilidades de estar en una categoría menos grave en comparación con el grupo de alta actividad (OR = 0.35; IC del 95%: 0.16–0.75; $p = 0.007$). **Conclusiones:** Estos hallazgos indican que la edad avanzada, la baja AF y el exceso de peso corporal están relacionados con una mayor gravedad de la disfunción eréctil en pacientes con diabetes mellitus tipo 2.

Palabras Clave

Disfunción eréctil; Diabetes tipo 2; Actividad física; Índice de masa corporal

1. Introduction

Erectile dysfunction (ED) is defined as the inability to achieve or maintain an erection sufficient for satisfactory sexual performance [1]. The World Health Organization (WHO) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure [2]. Regular PA contributes to the prevention and management of ED by enhancing cardiovascular function, supporting weight and diabetes control, regulating testosterone levels, and promoting overall well-being [3].

ED is highly prevalent among men with type 2 diabetes mellitus (T2DM), with age, alcohol consumption, excess weight, and poor glycemic control identified as key predictors [4]. Globally, the prevalence of ED among patients with diabetes is estimated at 65.8%, with age, duration of diabetes, peripheral vascular disease, and body mass index (BMI) recognized as major contributing factors [5].

In 2019, it was estimated that approximately 463 million people worldwide had diabetes, and this number is expected to rise to 578 million by 2030 and 700 million by 2045. Moreover, the disease is more prevalent among individuals living in urban areas (10.8%) than in rural settings (7.2%), and it occurs more frequently in high-income countries (10.4%) than in low-income countries (4.0%) [6]. Notably, poor dietary patterns are estimated to account for 70.3% of new T2DM cases worldwide, with the highest burdens reported in Central and Eastern Europe, Central Asia (85.6% and 81.8%, respectively), and Latin America and the Caribbean (81.8% and 83.4%, respectively) [7].

In a study conducted among patients attending the General Outpatient Clinic of the Federal Medical Centre, Umuahia, the factors associated with ED were age, tobacco use, alcohol intake, diabetes mellitus, hypertension, depression, and a high level of perceived stress [8]; in this way, ED is considered a marker of overall health, and addressing it through a comprehensive approach—including diet, PA, sleep, and stress management—can improve both erectile function and general health outcomes [9].

The benefits of regular exercise for erectile function have been reported by numerous studies. Engaging in PA among men aged 40 years and older was associated with a reduction of more than 20% in the likelihood of experiencing ED [10]. Beyond its physical manifestations, ED also carries significant psychological consequences, including diminished self-esteem, loss of confidence, feelings of emasculation, and increased risk of social isolation, depression, and reduced overall well-being [11].

ED is also associated with a lower quality of life. In a study conducted in Ukraine, it was found that the progression of ED was accompanied by a decrease in the integral quality of life index from –25.2% in mild cases to –33.3% in moderate cases and –41.6% in severe cases [12]. Patients with ED consistently score lower on both physical and mental quality-of-life scales, with the most pronounced impairments observed in the physical domain. Additionally, ED can lead to relationship difficulties, decreased intimacy, and reduced partner satisfaction, ultimately affecting the quality of life of both partners [13, 14].

ED acts as an independent risk factor and a prognostic

marker for cardiovascular disease, with common underlying mechanisms such as endothelial dysfunction, oxidative stress, systemic inflammation, and low plasma testosterone levels. For this reason, men with ED should be carefully evaluated for cardiovascular risk factors in order to prevent future major adverse cardiovascular events [15–17].

The relevance of this study lies in the fact that ED not only impairs quality of life and intimate relationships, but may also serve as an early marker of underlying conditions such as cardiovascular disease and diabetes. Therefore, the findings may provide a foundation for prevention programs that promote healthy lifestyles and, when ED is present, encourage timely diagnosis and treatment of its root causes, ultimately improving both overall health and erectile function.

This study aims to determine the statistical relationship between ED and risk factors and to analyze and predict ED based on risk factors such as age, BMI, and physical inactivity.

2. Materials and methods

2.1 Study design

A descriptive, cross-sectional study was conducted to determine the presence of ED and its association with PA levels, age, and BMI.

2.2 Setting

Study participants were recruited at the exit of the outpatient clinic of the Endocrinology Department at Instituto Ecuatoriano de Seguridad Social (IESS)-Ibarra Hospital during the period from April to August 2025.

2.3 Participants

The study included 130 men over the age of 18 years with a confirmed diagnosis of T2DM. A non-probabilistic consecutive sampling method was used, including all patients who attended the outpatient clinic during the study period, met the inclusion criteria, and agreed to participate by signing the informed consent form.

The recruitment process was carried out by three eighth-semester Physiotherapy students who had received three months of prior training to ensure proper administration of the data collection instruments. Before the official start, a pilot test was conducted to standardize the procedure, establishing an average completion time of 8 to 10 minutes for the two questionnaires. No blinding was applied, as this was an observational study based on self-reports.

2.4 Inclusion and exclusion criteria

2.4.1 Inclusion criteria

- Men diagnosed with T2DM.
- Patients aged over 18 years.
- Individuals willing to participate in the study by signing the informed consent form.

2.4.2 Exclusion criteria

- Individuals with cognitive impairment or limitations that interfere with the data collection process and the administration

of study instruments.

2.5 Feasibility and data collection

The study was feasible thanks to the voluntary participation of the men, who signed an informed consent form ensuring confidentiality and the exclusive use of their data for research purposes. Additionally, the availability of validated instruments supported the accuracy and reliability of the collected data. ED was assessed using the International Index of Erectile Function-5 (IIEF-5), the most widely used instrument worldwide for evaluating ED. The Spanish version of the IIEF-5 has demonstrated high reliability (Cronbach's $\alpha = 0.75$) and validity (0.784, >0.5), confirming its suitability for this population [18].

PA was assessed using the short form of the International Physical Activity Questionnaire (IPAQ-SF), one of the most widely used self-report instruments for measuring PA. The administration of this tool and its subsequent repetition allow for an acceptable estimation of both total sedentary behavior and moderate-to-vigorous intensity PA [19].

The participants' weight and height were measured directly using a stadiometer and a calibrated scale in order to calculate their BMI.

2.6 Data analysis

Data were processed using Jamovi software, which facilitates accessible and reproducible statistical analysis. To examine the relationship between ED and PA, Spearman's ρ correlation was applied. Ordinal logistic regression was additionally used to analyze and predict the probability of ED occurrence, odds ratios (OR) and 95% confidence intervals (CI) were reported, and a p -value less than 0.05 was considered for statistical significance.

3. Results

Table 1 shows that the study population consisted of 130 men diagnosed with T2DM. When characterizing the participants, the mean age was identified as 62.67 years, indicating that the sample primarily represents an older adult population. Regarding BMI, 52.3% of participants were overweight, 21.5% were obese, and 26.2% had a normal weight. In terms of disease duration, 51.5% had been diagnosed within the previous 1 to 5 years, suggesting that more than half of the population was in the relatively early stages of the condition. Meanwhile, 37.7% had lived with diabetes for 6 to 20 years, and a smaller proportion reported more than 20 years since diagnosis. With respect to ED, 86.9% of participants presented with mild to moderate impairment, while 13.1% reported severe dysfunction. In terms of PA, 53.9% reported a moderate level, 24.6% reported low or no activity, and 21.5% reported a high level of activity.

The results presented in Table 2 display the Spearman's correlation analysis, which revealed positive and statistically significant associations between the severity of ED and all examined factors. Age emerged as the main correlate ($\rho = 0.558$; $p < 0.01$), showing a moderate-to-strong association with the progression of clinical severity. Furthermore, accord-

TABLE 1. Characteristics of the study population by age, body mass index, duration of diabetes, erectile dysfunction, and physical activity.

Variables/Category		Statistic	
Age (yr)	Mean	Minimum	Maximum
	62.67	30	87
BMI	Frequency	Percentage	
Normal 18.5–24.9 kg/m ²	34	26.2%	
Overweight 25–29.9 kg/m ²	68	52.3%	
Obesity >30 kg/m ²	28	21.5%	
Total	130	100.0%	
Duration of T2DM	Frequency	Percentage	
1–5 yr	67	51.5%	
6–10 yr	22	16.9%	
11–20 yr	27	20.8%	
21–30 yr	14	10.8%	
Total	130	100.0%	
Erectil Dysfunction	Frequency	Percentage	
Mild	43	33.1%	
Mild to moderate	38	29.2%	
Moderate	32	24.6%	
Severe	17	13.1%	
Total	130	100.0%	
Physical Activity	Frequency	Percentage	
High	28	21.5%	
Moderate	70	53.9%	
Low/Inactive	32	24.6%	
Total	130	100.0%	

BMI: Body mass index; T2DM: Type 2 diabetes mellitus.

TABLE 2. Correlation of the study variables.

			Body Mass Index	Age	Physical Activity
Spearman's ρ	Erectile Dysfunction	Correlation Coefficient	0.218	0.558	0.289
		Sig. (bilateral)	0.013	<0.001	0.001

Sig.: statistical significance.

ing to our data coding, significant but smaller correlations were identified with low levels of PA ($\rho = 0.289$; $p = 0.001$) and BMI ($\rho = 0.218$; $p < 0.05$). The coefficients indicate that increasing age, physical inactivity, and excess body weight are directly associated with more severe stages of ED.

Table 3 presents the ordinal logistic regression model, which revealed a statistically significant, inverse, and dose-dependent association between PA level and the severity of ED. The results indicate that PA is a key protective factor. Compared with the high PA group (reference category), individuals with low PA showed a 79% reduction in the odds of belonging to a less severe category (OR = 0.21; 95% CI: 0.08–0.53; $p = 0.001$), which translates into a substantially higher probability of being classified in more severe categories. Similarly, the

moderate PA group showed a 65% reduction in the odds of being in a less severe category compared with the high PA group (OR = 0.35; 95% CI: 0.16–0.75; $p = 0.007$). Although the explanatory power of the model was modest (Nagelkerke's pseudo $R^2 = 0.095$), the findings confirm that PA is a significant and independent predictor, even when considering the multifactorial nature of ED. The significant thresholds of the model validate the ordinal structure of the response variable. Taken together, these results provide strong statistical evidence that higher levels of PA are associated with a lower likelihood of experiencing severe ED.

Table 4 shows a statistically highly significant association ($p = 0.013$) between BMI and ED. Individuals with a normal BMI had 69% lower odds of presenting a more severe degree of ED

TABLE 3. Ordinal logistic regression for predictors of erectile dysfunction severity.

Parameter	Estimate (β)	Standard error	Wald Statistics	df	Sig. (p-value)	Odds Ratio (OR)	95% CI for OR
Physical Activity Predictor							
Low Physical Activity	-1.585	0.489	10.508	1	0.001	0.21	0.08–0.53
Moderate Physical Activity	-1.057	0.394	7.192	1	0.007	0.35	0.16–0.75
High Physical Activity (Reference)	–	–	–	–	–	Ref.	–
Thresholds (Erectile Dysfunction)							
≤Mild vs. >Mild	-1.695	0.363	21.839	1	<0.001	–	–
≤Mild to moderate vs. >Mild to moderate	-0.353	0.333	1.129	1	0.288	–	–
≤Moderate vs. Severe	1.118	0.356	9.864	1	0.002	–	–
Goodness of fit (Pseudo R^2) Cox & Snell 0.088; Nagelkerke 0.095; McFadden 0.034.							

df: degrees of freedom; Sig.: significance level (p value); Ref.: reference category; CI: confidence interval.

TABLE 4. Parameter estimates of the ordinal logistic regression model for body mass index and erectile dysfunction.

Parameter	Estimate (β)	Standard Error	Wald	df	Sig. (p-value)	Odds Ratio (OR)	95% CI for OR
Body Mass Index Predictor							
Normal	-1.186	0.478	6.147	1	0.013	0.31	0.12–0.78
Overweight	0.042	0.404	0.011	1	0.917	1.04	0.47–2.30
Obesity	0.000	–	–	–	–	1	–
Erectile Dysfunction Thresholds							
ED (≤Mild vs. >Mild)	-1.05	0.363	8.381	1	0.004	–	–
ED (≤Mild to Moderate vs. >Mild to Moderate)	0.288	0.350	0.675	1	0.411	–	–
ED (≤Moderate vs. Severe)	1.717	0.395	18.93	1	<0.001	–	–
Goodness of fit (Pseudo R^2): Cox and Snell = 0.074; Nagelkerke = 0.080; McFadden = 0.029.							

ED: Erectile Dysfunction; OR: Odds Ratio; CI: Confidence Interval; Sig: Significance level (p value); df: Degrees of freedom.

compared with individuals in the obese category (OR = 0.31; 95% CI: 0.12, 0.78). Conversely, this indicates that individuals with obesity had 3.23 times higher odds (calculated as $1/0.31$) of experiencing a more severe degree of ED than those with normal weight. The CI does not include the null value of 1.0, confirming the robustness of this protective effect associated with normal body weight.

The odds of a higher degree of ED in the overweight group were statistically indistinguishable from those observed in the obese group (OR = 1.04; 95% CI: 0.47, 2.30). The wide CI crossing 1.0 indicates that no meaningful difference in risk can be concluded between these two BMI categories. The model's goodness of fit, assessed using the Pseudo R^2 statistics, was modest (Cox and Snell = 0.074; Nagelkerke = 0.080; McFadden = 0.029), indicating that BMI accounts for approximately 2.9% to 8.0% of the variance in the outcome. Despite this modest proportion, the statistical significance of the predictors demonstrates that BMI is a relevant explanatory factor in the pathophysiology of ED.

Table 5 presents the ordinal logistic regression analysis, which demonstrated that age is a robust and highly signifi-

cant predictor of ED, explaining 33.6% of the variance in the outcome (Nagelkerke R^2). The results indicate a positive and progressive association ($\beta = 0.100$; 95% CI: 0.069–0.131; $p < 0.001$), meaning that for each additional year of age, the log-odds of presenting a more severe degree of ED increase. This finding statistically confirms aging as a critical and cumulative determinant in the progression of the condition.

4. Discussion

A 2022 study by Nadine *et al.* [20] reported that more than 30 million people in the United States have been diagnosed with T2DM, most of whom are over 60 years of age. This finding is consistent with our results, where the mean age was 62.67 years [20]. In a study that included 13,589 adult patients with T2DM, 37.4% had a BMI of 25–29.9 and 37.4% had a BMI of ≥ 30 . This trend is consistent with our study, in which 73.8% of participants were overweight or obese [21]. Regarding the relationship between T2DM and ED, Abdalshikure *et al.* [4] (2025), in a study conducted in 204 men with T2DM, concluded that 43.1% of the participants had a disease duration

TABLE 5. Estimates of the parameters of the ordinal logistic regression model for age and erectile dysfunction.

Parameter	Estimate	Std. Error	Wald	df	Sig.	OR	95% CI
Predictor							
Age (yr)	0.100	0.016	39.382	1	<0.001	1.105	0.069–0.131
Erectile Dysfunction Thresholds							
ED ($\leq$ Mild vs. $>$ Mild)	5.282	0.978	29.171	1	<0.001	–	3.37–7.20
ED ($\leq$ Mild to Moderate vs. $>$ Mild to Moderate)	6.946	1.064	42.611	1	<0.001	–	4.86–9.03
ED ($\leq$ Moderate vs. Severe)	8.614	1.139	57.190	1	<0.001	–	6.38–10.85
Goodness of fit (Pseudo R^2): Cox and Snell = 0.312; Nagelkerke = 0.336; McFadden = 0.140.							

ED: Erectile Dysfunction; OR: Odds Ratio; CI: Confidence Interval; Sig.: Significance level (*p* value); Std. Error: Standard Error; df: Degrees of Freedom.

Note: The 95% CI for age refers to the β coefficient estimate.

of 5 to 10 years, followed by 38.7% with a duration of less than 5 years, which differs from our results. A cross-sectional study conducted in 236 diabetic men from western Uganda concluded that 36.4% of participants had mild to moderate ED, followed by 22.4% with moderate ED, which differs from our findings, in which the largest proportion of the study population had mild ED [4]. In a retrospective cross-sectional analysis of 20,789 men aged 40 to 91 years, conducted between 2008 and 2018, 17.1% reported ED. Within this subgroup, 49.3% reported little to no PA, 39.4% moderate activity, and only 11.4% high activity. Overall, men with ED were more physically inactive compared with those without the condition (25% vs. 19%). This general pattern contrasts with our sample, where the majority reported a moderate level of PA [10].

Francesco *et al.* [22] reported that the prevalence of ED in men without comorbidities increased from 10% to 79% between the ages of 40 and 80 years. The presence of comorbidities such as hypertension, obesity, and diabetes substantially increased this risk, ranging from 41% to 85%. These findings are consistent with ours, which showed a higher prevalence of ED among older men with T2DM [22].

In a 2024 study, Mingming and colleagues found that 61.1% of 2509 men assessed met the recommended levels of aerobic PA. They further observed that men engaging in 150–300 minutes per week of moderate PA had a 22% lower risk of ED, while those exceeding 300 minutes per week had a 39% lower risk. These results are consistent with ours, which showed that higher levels of PA were associated with less severe ED [23].

A study in three public hospitals in the Gurage zone, which included 204 men with diabetes, reported that 76.5% had ED, with overweight (BMI ≥ 25 kg/m²) and obesity (BMI ≥ 30 kg/m²) identified as independent predictors. These data are comparable to our findings, in which 73.8% of participants were overweight or obese and, moreover, BMI was positively and statistically significantly associated with ED severity [4].

Regarding the probability of developing ED associated with PA, our study demonstrated that higher levels of PA were associated with a lower likelihood of experiencing severe ED. This finding is consistent with the study reported by Katarzyna *et al.* [3] (2025), which indicates that regular PA, particularly aerobic exercise, helps prevent and treat ED by improving cardiovascular health, controlling obesity and diabetes, regulating

testosterone, and enhancing overall well-being. Similarly, the present study shows that reducing the level of PA from high to low increases the likelihood of experiencing severe ED fivefold. This finding aligns with the results of Telila *et al.* [24] (2023), who reported that individuals with insufficient PA are 4.15 times more likely to suffer from ED compared with those with adequate activity levels. These findings have direct implications for public health and clinical practice, strongly supporting the recommendation of PA not only as a preventive measure but also as a potential therapeutic intervention in the management of ED.

We also found that men with a normal BMI were less likely to present with severe ED in this sample. This finding is consistent with that of Vahit *et al.* [25] (2025), whose study suggests that obesity is associated with a greater susceptibility to developing ED, after reporting that 70% of participants with a BMI above 30 presented mild to moderate ED. Furthermore, our study demonstrated that individuals with obesity are 3.23 times more likely to present a higher grade of ED compared with those with a normal BMI. According to a recent study published in *Frontiers in Endocrinology* by Liu *et al.* [26] (2023), obese individuals have a significantly higher risk of developing moderate-to-severe ED (OR = 2.71; *p* = 0.002) compared with normal-weight subjects, suggesting a direct positive correlation between excess adiposity and severe impairment of ED. Finally, our research demonstrated that for every additional year of age, the probability of presenting a more severe grade of ED increases. Our findings are consistent with recent data reported by Pellegrino *et al.* [22] (2023) in *European Urology Focus*, who identified a strong non-linear correlation between aging and the probability of ED. Their study demonstrated that the risk of developing erectile impairment rises sharply from the fourth to the eighth decade of life, establishing advanced age as the most significant independent predictor for the severity and prevalence of the condition [22].

5. Conclusions

This study, conducted in 130 men with T2DM, shows that age, PA level, and BMI are clinically relevant determinants of ED severity in this high-risk population. Older age was strongly and progressively associated with more severe ED, underscoring aging as a critical factor that should be routinely

considered in the assessment and management of sexual health in men with diabetes. Higher levels of PA were consistently linked to milder degrees of dysfunction, supporting physical exercise as a key protective and potentially modifiable factor that should be promoted as part of comprehensive diabetes care. In addition, men with normal BMI had substantially lower odds of severe ED compared with those with obesity, highlighting weight control as an important target for prevention and intervention. Together, these findings indicate that lifestyle-related factors such as physical inactivity and excess weight are closely associated with ED severity in men with T2DM. While causal relationships cannot be established from this cross-sectional design, the results provide context-specific evidence that can inform the development of educational and preventive strategies targeting metabolic control and sexual health in this high-risk population.

6. Limitations

The main limitations of this study include the use of nonprobabilistic, single-center sampling in a cohort composed exclusively of men with T2DM living in the city of Ibarra, which restricts the generalizability of the findings to other regions or populations with different sociocultural backgrounds. In addition, the cross-sectional design precludes the establishment of causal relationships between PA levels, BMI, age, and ED severity. Another important limitation is the lack of key clinical variables (such as glycemic control, cardiovascular comorbidities, smoking status, use of specific medications, and hormonal profiles) all of which may act as residual confounders and could influence the severity of ED.

7. Recommendations

Based on the findings and the limitations identified, future research should include larger and more representative samples, incorporating multiple centers and diverse geographic and sociocultural contexts to enhance the external validity, representativeness, and comparability of the results. Moreover, longitudinal or cohort designs are recommended to better assess temporality and explore potential causal relationships between PA, metabolic control, BMI, and the progression of ED. It would also be advisable to incorporate objective clinical variables (such as glycated hemoglobin, lipid profile, blood pressure, cardiovascular comorbidities, pharmacological treatment, and testosterone levels) to develop more robust and clinically meaningful predictive models.

AVAILABILITY OF DATA AND MATERIALS

The data are contained within this article.

AUTHOR CONTRIBUTIONS

CST and VAC—formal analysis, project administration, software, writing-original draft. CST and KGE—data curation. VAC—validation. All authors contributed to conceptualization, investigation, methodology, resources, visualization, and writing-review & editing. All authors read and approved the

final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Research Council of the Universidad Técnica del Norte, through Resolution No. UTN-CI-2024-267-R, approved this research project of the Facultad de Ciencias de la Salud (FCS). This study complies with the ethical principles set forth in the Declaration of Helsinki and with the requirements for obtaining informed consent. This was an observational, descriptive, non-interventional study classified as involving minimal risk, in accordance with Agreement No. 00005 (Official Register, Fifth Supplement No. 118, 02 August 2022) issued by the Ministerio de Salud Pública del Ecuador. The research was limited to administering the International Index of Erectile Function (IIEF-5), the International Physical Activity Questionnaire Short Form (IPAQ-SF), and a general data form used to collect information on age, body mass index, and disease duration, without any interventions or invasive procedures. In this regard, and in line with Article 60 of the aforementioned Agreement, which states that studies based exclusively on open or public data do not require approval from a Human Research Ethics Committee (CEISH) for their conduct or publication, such approval was not required, as the study involved only the use of anonymized data and did not include any interventions or invasive procedures. Nevertheless, all participants provided informed consent, and the confidentiality and anonymity of the information collected were safeguarded at all times.

ACKNOWLEDGMENT

The authors wish to thank all the men who participated in this study and Universidad Técnica del Norte for its valuable support.

FUNDING

The research reported in this article was funded by Universidad Técnica del Norte (UTN) through resources allocated to the “Investiga UTN” project, under the research grant: InvestigaUTN-2024-1346.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- [1] Schellack N, Schellack G, Nyane NA. Management of erectile dysfunction. *SA Pharmaceutical Journal*. 2025; 92: 19–26.
- [2] World Health Organization. Physical activity. 2024. Available at: <https://www.who.int/es/news-room/fact-sheets/detail/physical-activity> (Accessed: 04 April 2026).
- [3] Michalak K, Jarych W, Zukierski K, Mazur M, Żak K, Jucha H, *et al.* The role of physical activity in preventing and treating erectile dysfunction: review. *Quality in Sport*. 2025; 40: 59805.
- [4] Abdlshekure SA, Mamo AG, Fikadu B, Seid A. Prevalence and determinants of erectile dysfunction among type 2 diabetes mellitus

- patients at selected government hospitals in Gurage zone: a cross-sectional study. *PLOS ONE*. 2025; 20: e0318908.
- [15] Kitaw TA, Abate BB, Tilahun BD, Yilak G, Rede MB, Getie A, *et al*. The global burden of erectile dysfunction and its associated risk factors in diabetic patients: an umbrella reviews. *BMC Public Health*. 2024; 24: 2816.
 - [16] Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, *et al*. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Research and Clinical Practice*. 2019; 157: 107843.
 - [17] O'Hearn M, Lara-Castor L, Cudhea F, Miller V, Reedy J, Shi P, *et al*. Incident type 2 diabetes attributable to suboptimal diet in 184 countries. *Nature Medicine*. 2023; 29: 982–995.
 - [18] Azudialu BC, Vivien A, Benjamin N, Ugonne OF, Uchenna N, Austin NRI. Association between lifestyle and biosocial conditions with erectile dysfunction among adult patients in a tertiary hospital in southern Nigeria. *Journal of Disease and Global Health*. 2024; 17: 1–8.
 - [19] Saffati G, Seyan Z, Rendon DO, Almuhaideb M, Hinojosa-Gonzalez DE, Kronstedt S, *et al*. Erectile dysfunction as a holistic indicator of well-being: a narrative review. *Sexual Medicine Reviews*. 2025; 13: 11–19.
 - [10] Pitta RM, Kaufmann O, Louzada ACS, Astolfi RH, de Lima Queiroga L, Ritti Dias RM, *et al*. The association between physical activity and erectile dysfunction: a cross-sectional study in 20,789 Brazilian men. *PLOS ONE*. 2022; 17: e0276963.
 - [11] Allen MS, Wood AM, Sheffield D. The psychology of erectile dysfunction. *Current Directions in Psychological Science*. 2023; 32: 487–493.
 - [12] Trishch VI, Detsyk OZ, Solomchak DB, Antoniv RR. Analysis of the men's sexual dysfunctions impact on different aspects of their quality of life. *Polski Merkuriusz Lekarski*. 2025; 53: 648–654.
 - [13] Ezemenahi SI, Alabi AN, Ogunfowokan O, Nwaneli CU, Aigbokhaode AQ, Esegbe P. Quality of life of hypertensive men with erectile dysfunction in a tertiary health centre in southern Nigeria. *African Journal of Primary Health Care & Family Medicine*. 2023; 15: e1–e7.
 - [14] Elterman DS, Bhattacharyya SK, Mafilios M, Woodward E, Nitschelm K, Burnett AL. The quality of life and economic burden of erectile dysfunction. *Research and Reports in Urology*. 2021; 13: 79–86.
 - [15] Terentes-Printzios D, Ioakeimidis N, Rokkas K, Vlachopoulos C. Interactions between erectile dysfunction, cardiovascular disease and cardiovascular drugs. *Nature Reviews Cardiology*. 2022; 19: 59–74.
 - [16] Yannis D, Frizza F, Vignozzi L, Corona G, Maggi M, Rastrelli G. Erectile dysfunction is a hallmark of cardiovascular disease: unavoidable matter of fact or opportunity to improve men's health? *Journal of Clinical Medicine*. 2021; 10: 2221.
 - [17] An J, Xiang B, Peng J, Li D. Understanding the erectile dysfunction-cardiovascular disease connection: clinical and pathophysiological insights. *Sexual Medicine Reviews*. 2025; 13: 406–422.
 - [18] Lizarraga-Limousin R, Medrano-Sánchez EM, Díaz-Mohedo E, Vergara-de-Carlos L. Spanish cross-cultural validation of the electronic version of the international index of erectile function-5 (IIEF-5). *International Journal of Environmental Research and Public Health*. 2022; 19: 3115.
 - [19] Flora S, Marques A, Hipólito N, Morais N, Silva CG, Januário F, *et al*. Test-retest reliability, agreement and construct validity of the international physical activity questionnaire short-form (IPAQ-sf) in people with COPD. *Respiratory Medicine*. 2023; 206: 107087.
 - [20] Bahour N, Cortez B, Pan H, Shah H, Doria A, Aguayo-Mazzucato C. Diabetes mellitus correlates with increased biological age as indicated by clinical biomarkers. *GeroScience*. 2022; 44: 415–427.
 - [21] Szwarcbard N, Xiang A, Gasevic D, Jones A, Earnest A, Andrikopoulos S, *et al*. The association of weight status with glycemic control, diabetes related complications and anti-hyperglycemic medication use in patients with type 2 diabetes mellitus: the results of the Australian national diabetes audit (ANDA) 2015–2022. *Diabetes Research and Clinical Practice*. 2025; 226: 112333.
 - [22] Pellegrino F, Sjöberg DD, Tin AL, Benfante NE, Briganti A, Montorsi F, *et al*. Relationship between age, comorbidity, and the prevalence of erectile dysfunction. *European Urology Focus*. 2023; 9: 162–167.
 - [23] Zhang M, Wang Z, Liu W, Wang M, Wu H, An R. Association between the recommended volume of leisure-time physical activity and erectile dysfunction: a cross-sectional analysis of the national health and nutrition examination survey, 2001–2004. *Heliyon*. 2024; 10: e32884.
 - [24] Mesfin T, Tekalegn Y, Adem A, Seyoum K, Geta G, Sahiledengle B, *et al*. Magnitude of erectile dysfunction and associated factors among adult diabetic men on follow-up at Goba and Robe hospitals, Bale Zone, South East Ethiopia: hospital-based cross-sectional study. *BMC Endocrine Disorders*. 2023; 23: 236.
 - [25] Cavdar VC, Izgi Y, Akbas F. Sexual dysfunction in male patients with obesity: is it still being overlooked? *Hormones*. 2025; 24: 671–678.
 - [26] Liu Y, Hu X, Xiong M, Li J, Jiang X, Wan Y, *et al*. Association of BMI with erectile dysfunction: a cross-sectional study of men from an andrology clinic. *Frontiers in Endocrinology*. 2023; 14: 1135024.

How to cite this article: Cristian Santiago Torres, Verónica Alexandra Celi, Katherine Geovanna Esparza. Age, obesity, and physical inactivity drive erectile dysfunction severity in men with type 2 diabetes mellitus: a cross-sectional study. *Revista Internacional de Andrología*. 2026; 24(3): 53-60. doi: 10.22514/j.androl.2026.030.