

Access to Online Health Education Materials by Diabetic Patients in Türkiye and the Effect of These Materials on e-Health Literacy

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Abstract

The health literacy level of diabetic patients plays a significant role in the onset of disease and their treatment. This study examines the access to online health education of diabetic patients living in Türkiye and their ability to achieve this through e-health literacy. The study utilized an 8-item e-Health Literacy Scale and a 14-item Brochure Evaluation Form. The sample consisted of 137 diabetic patients aged 18-65. Data were collected via face-to-face surveys and Google Forms between June and August 2024. Data were analyzed using SPSS. Significant differences were observed in both access to online health information and e-health literacy levels based on participants' age and education level. Access to online health information increases with age, but e-health literacy decreases. While e-health literacy increases with education level, access decreases slightly. According to the multiple regression analysis, the variables of age, education level, and access to online health status significantly predict e-health literacy. These findings suggest that interventions aimed at improving e-health literacy can consider the evaluation of online information as well as the opportunities for accessing it.

Keywords: Diabetic Patients, E-health Literacy, Online Health Education Material

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1. Introduction

Diabetes mellitus is defined as a lifelong chronic metabolic disease that causes disorders in fat, carbohydrate, and protein metabolism, characterized by hyperglycemia due to inadequate or no production of the insulin hormone by the body as a result of the defect in the beta cells of the pancreas (Kavak & Aktürk, 2019: 741).

According to the atlas published by the International Diabetes Federation in 2023, one of the main causes of chronic kidney disease is diabetes. Diabetes could also cause damage to the kidneys. At the same time, the fact that people with type 1 diabetes worldwide are mostly under the age of 20 is becoming less valid day by day. It is now seen in individuals of all ages in all countries (International Diabetes Federation, 2023). It is estimated that the number of diabetic patients



worldwide will reach 480 million in 2030 (Ünüvar et al., 2007: 1948). According to the International Diabetes Federation (IDF) Diabetes Atlas, diabetes prevalence in Türkiye's adult population (ages of 20-79) is 7.4% as of 2010. According to the world population distribution, the prevalence of diabetes is calculated as 8.0% (Gücük & Boztaş, 2013: 13). Since diabetes is a chronic disease, the increasing incidence of diabetes significantly affect individuals and societal levels. The way individuals cope with diabetes could affects the health outcomes and the course of the disease.

With the development of technology and the spread of information becoming easier on the internet, individuals have started to search for their health information as well (Jia et al., 2021: 1740). Internet environment besides being the first environment looked for all other information, nowadays individuals also search for their health information on the internet when it comes to their health (Özen & Topbaş, 2023: 27). In this environment where false information as well as accurate information is spreading rapidly, it is significant for individuals to have access to accurate, safe, and current sources. Individuals need to be conscious of accessing accurate resources, as applying any misinformation they acquire may negatively affect their health outcomes.

Since distinguishing the accuracy of rapidly disseminating health information is also an important issue, individuals' access to accurate health education materials is significant for their health. E-health literacy levels that analyze how this health information, scanned via the internet, is perceived are also an element that could affect access to accurate information.

Individuals generally engage in online health-seeking behavior regarding their health status when they receive a diagnosis or symptom of a disease (Uslu & Şeremet, 2020: 836). E-health literacy, which is argued to emerge on the common ground of public health, medical informatics, and the business world, is supported by the thoughts of lightening the burden of medical systems, strengthening the users of health care services, and reducing the costs (Jackson et al., 2024; Tian & Chen, 2022). Distributing brochures about health problems to healthcare service users contributes towards awareness in managing their illness (Akbulut, 2015: 128). People with high health literacy can participate more effectively in health decisions. The availability of health information on the internet makes it essential for individuals to have high e-health literacy. Individuals need to have the qualifications to use accurate sources properly. In this case, comprehensibility of the sources presented to the users becomes more of an issue.

The reason for materials being easy or hard to perceive is related to the level of readability. The concept of readability is generally confused with legibility, which is related to layout features such as the shape and size of the text. In this sense, it is known that the level of readability is related to the capacity to comprehend the information in the text (Dubay, 2004; Kher et al., 2017).

There are many formulas used to determine the level of readability in texts (Orgun & Paylan Akkoç, 2020: 413). With aims such as increasing the participation of individuals in health information and health decisions and increasing adaptation to the treatment process, brochures about health problems or risks are used. Today, with the development of technology, these brochures are also shared online to inform patients. The readability of the materials used in this context and the quality and comprehensibility of the shared information are significant. Easy accessibility to the brochures would contribute to individuals deriving greater benefit from them. However, there is still a lack of studies in Türkiye that simultaneously examine the e-health literacy of diabetic patients and their access to online health education materials. This study aims to address this gap by.

In the literature concerning diabetic patients, there are studies examining the effect of educational levels on disease management, health literacy, the relationship between health literacy levels and self-care management, and health literacy in diabetic patients (Akyol Güner et al., 2020; Neşe et al., 2021; Parlak & Şahin, 2021; Ran et al., 2022; Butayeva et al., 2023; Dilekçi & Duru Aşiret, 2025). However, the access of diabetic patients to online health education materials and the effect of these materials on e-health literacy have not been previously investigated. Furthermore, studies examining the comprehensibility of online health materials used by patients are quite limited. Therefore, this study aims to contribute to the development of health policies and patient-centered digital health communication strategies by examining the interaction between access to online health education materials and e-health literacy levels among diabetic patients in Turkey.

2. Method

2.1. Purpose, Hypothesis and Model

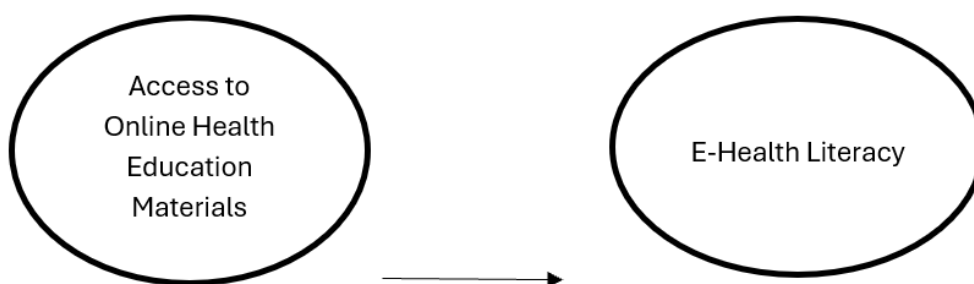
With diabetes being also one of the chronic illnesses increasing in prevalence in society, the importance of patient awareness is gradually growing. Informed patients have a positive effect on treatments. It is important for patients to become aware of their diseases and to obtain accurate information from reliable sources in order to manage their

health better. In this case, issues such as the adequacy, accuracy, and understandability of the information resources presented and accessible to patients come to the fore. When the literature is analyzed, it reveals that studies that examine the level of health literacy of diabetic patients exist; however, no studies that examine the level of e-health literacy of diabetic patients and their access to online health education materials were found. This study aims to determine diabetic patients' (type 1 and type 2) access to online health education materials in Türkiye and the effect of these materials on e-health literacy. This study contributes to the literature by jointly examining the relationship between diabetes patients' access to online health education materials and e-health literacy in Turkey. In the literature, the concepts of e-health literacy and access have been examined separately alongside different concepts, and it is generally observed that they are not used together, focusing only on health literacy or access behavior (Kim & Xie, 2017; Neter & Brainin, 2019). This research, however, demonstrates that accessibility can paradoxically reduce e-health literacy when information quality and evaluation skills are inadequate. In this respect, the study fills a gap in the literature and is significant in terms of its application to online health communication and patient education strategies.

Hypothesis and model of the research are presented below:

H₁: Access to online health education materials negatively affects e-health literacy.

Figure 1. Research Model



2.2. Research Type

This study revealed descriptive findings from the beautiful research model. A cross-sectional survey model was designed to capture the research data over a specific period of time, while a descriptive and correlational survey model was designed to identify the current situation.

2.3. Universe and Sample of the Research

Research data were collected using the Google Forms application and the face-to-face survey. Data collected face-to-face was transferred manually to the SPSS software. A convenience sampling method was used in the research. The brochure titled 'Diabetes and Nutrition' on the official website of the Health Ministry is used in the research. Participation in the research is based on voluntariness and comprises diabetic patients (Type 1 and Type 2) in Türkiye. Since the number of universes is uncertain, a G-Power test was conducted based on other studies in the literature (Elkoca & Erci, 2022; Erdağı & Yılmaz, 2014; Eser, 2019; Karakuş & Kasar, 2023; Küçük et al., 2023). With an effect size of 0.2, a type 1 error margin (α) of 0.05, and a power level of 0.95, reaching 122 people was deemed sufficient. In the research, 137 people were analyzed. Participation in the study is voluntary, and people who do not meet the criteria are not included in the study.

2.4. Data Collection Tools Used in the Research

Information about the scales used in the research is presented below.

E-Health Literacy Scale: Cameron D. from Canada of Toronto University in 2015, Norman and Harvey A. The analysis of Turkish validity and reliability of the e-Health Literacy scale, which was developed because of Skinner's studies, was conducted by (Tamer Gencer, 2017). Cronbach's Alpha value was determined to be 0.915. The scale form consists of 8 statements and one sub-dimension.

Reader Brochure Evaluation Form: A literature review was conducted, existing brochure evaluation forms in the literature were examined, and a form was created by the authors to be suitable for this study on online brochures (Bozkurt, 2019; European Commission, 2009; Hashempour, 2018). The form consists of 14 statements.

Diabetes and Nutrition Brochure: taken from the database of the Health Ministry. It is presented online along with a survey for the participants. A brochure link was added to the Online Form, and an evaluation of the original version was requested (Ministry of Health, 2024).

2.5. Analysis of Data

When evaluating the findings of the study, IBM SPSS Statistics 22 was used for statistical analysis. As part of the data collection process, participants provided data via Google Forms and face-to-face surveys, and the data collected face-to-face was manually transferred to SPSS. A normal distribution test was performed before data analysis. If skewness and kurtosis values were between +1.5 and -1.5, the data were considered normally distributed, and parametric tests were applied. Therefore, the t-test was used for bivariate comparisons, and analysis of variance (ANOVA) was used for group comparisons of more than two variables. Parametric tests were chosen because the data were normally distributed, these tests had high statistical power. Pearson correlation and multiple hierarchical regression analyses were conducted to determine the relationship between variables and to examine the effects of variables on others. Correlation analysis was used to determine the direction and magnitude of the relationship between variables, while regression analysis was used to measure the effect of one or more independent variables on the dependent variable. In evaluating the analysis results, the significance level was accepted as $p < 0.05$. In the reliability analysis conducted in the study, Cronbach's alpha for the e-health literacy scale was found to be 0.943. Furthermore, validity studies of the scales used were taken from the literature and applied within the scope of the study. According to the literature, scales with α values between $0.60 \leq \alpha \leq 0.80$ are considered highly reliable, while those between $0.80 \leq \alpha \leq 1.00$ are considered very reliable (Kalaycı, 2008).

3. Findings

Socio-demographic information of 137 diabetic patients is presented below.

Table 1. Demographic Findings of Participants (N=137)

Variables	(n)	(%)	Variables	(n)	(%)
Age			Educational Status		
Between the ages of 17-27	36	26.3	Primary Education and Secondary School	30	21.9
Between the ages of 28-40	37	27.0	High school	30	21.9
Between the ages of 41-52	32	23.4	Associate and bachelor's Degree	46	33.6
Between the ages of 53-86	32	23.4	Postgraduate	31	22.6
Gender			Level of Income		
Female	88	64.2	Minimum wage and below	52	38.0
Male	49	35.8	Twice the minimum wage	44	32.1
Marital Status			Three times the minimum wage	41	29.9
Married	52	38.0			
Unmarried	85	62.0			
Total	137	100	Total	137	100

According to Table 1, 27.0% of the participants (37 people) were between the ages of 28 and 40; 64.2% (88 people) were women; 62.0% (85 people) were unmarried; 33.6% (46 people) had an associate degree or bachelor's degree. It was determined that the income level of 38.0% (52 people) was minimum wage or below.

Table 2. t Test Results for Gender

	Gender	n	Mean	Ss.	t	p
Access to Online Health Brochures	F	88	1.26	.161	-1,653	.102
	M	49	1.31	.209		

E-Health Literacy	F	88	3.47	.889		
					.775	.762
	M	49	3.52	1.020		

As a result of the t test in Table 2, no significant difference was found in terms of gender for diabetic patients regarding access to online health education materials and e-health literacy scale averages ($p>0.05$).

Table 3. t Test Results for Marital Status

	Marital Status	n	Mean	Ss.	t	p
Access to Online Health Brochures	Married	52	1.28	1.289	-0.533	.595
	Unmarried	85	1.27	1.272		
E-Health Literacy	Married	52	3.39	1.038	1.726	.087
	Unmarried	85	3.65	.716		

As a result of the t test in Table 3, no significant difference was found among groups defined by the marital status of diabetic patients regarding access to online health education materials and e-health literacy scale averages ($p>0.05$).

Table 4. ANOVA Findings for Age

	Age	n	Mean	Ss.	F	p	Post-hoc (Tukey-HSD)
Access to Online Health Brochures	1. between the ages of 17-27	36	1.25	.175	3.375	0.001	4>1,3
	2. between the ages of 28-40	37	1.26	.173			
	3. between the ages of 41-52	32	1.24	.117			
	4. between the ages of 53-86	32	1.36	.225			
	Total	137	1.28	.181			
E-Health Literacy	1. between the ages of 17-27	36	3.75	.507	9.851	0.020	4<1,2
	2. between the ages of 28-40	37	3.80	.783			
	3. between the ages of 41-52	32	3.54	.799			
	4. between the ages of 53-86	32	2.79	1.22			
	Total	137	3.49	2.934			

According to ANOVA in Table 4, a significant difference was found regarding the ages of diabetic patients in terms of access to online health education materials and e-health literacy scale averages ($p<0.05$). A post hoc (Tukey-HSD) test was included in order to determine the reason for the difference. This indicates that access to online health education materials is higher in diabetic patients between the ages of 53-86 compared to diabetic patients between the ages of 17-27 and 41-52. However, it has been determined that e-health literacy level is lower between the ages of 53 and 86. It is interpreted that as people get older, the reason for their access to online health education materials might be their wish to access health information easily. At the same time, long wait times for an appointment may encourage people to access online health materials.

Table 5. ANOVA Findings for Income Status

	Income Status	n	Mean	Ss.	F	p
Access to Online Health Brochures	1. Minimum wage and below	52	1.27	.212	.582	.560
	2. Twice the minimum wage	44	1.26	.137		
	3. Three times the minimum wage	41	1.30	.182		
	Total	137	1.28	.181		
E-Health Literacy	1. Minimum wage and below	52	3.36	.886	1.610	.204
	2. Twice the minimum wage	44	3.46	.939		
	3. Three times the minimum wage	41	3.70	.974		
	Total	137	3.49	.934		

According to ANOVA in Table 5, no significant difference was found between the income status of diabetic patients and access to online education materials, and e-health literacy scale averages ($p>0.05$).

Table 6. ANOVA Findings for Educational Status

	Educational Status	n	Mean	Ss.	F	p	Post-hoc (Tukey-HSD)
Access to Online Health Brochures	1. Primary Edc. and second. School	30	1.37	.208	3.622	.015	1>2,3
	2. High School	30	1.25	.157			
	3. Associate and bachelor's Degree	46	1.25	.173			
	4. Postgraduate	31	1.26	.164			
	Total	137	1.28	.181			
E-Health Literacy	1. Primary Edc. and second. School	30	2.92	1.290	5.757	.001	1<2,3,4
	2. High School	30	3.52	.762			
	3. Associate and bachelor's Degree	46	3.63	.736			
	4. Postgraduate	31	3.80	.720			
	Total	137	3.49	.934			

According to ANOVA in Table 6, significant difference was found between the educational status of diabetic patients in terms of access to online education materials and e-health literacy scale averages ($p<0.05$). Post hoc (Tukey-HSD) test was included in order to determine the reason of the difference. Findings suggest that as e-health literacy increases with education, access to online health education increases. This suggests that individuals with higher education levels evaluate digital health more critically and selectively, while their overall access to and frequency of use of online materials decreases. In other words, as education levels increase, individuals are more likely to search for reliable online health resources and be more careful. Therefore, even as access declines, e-health literacy increases, enabling them to better retain and effectively utilize information in healthcare settings.

Table 7. Distributions Among Participant Characteristics, Access to Online Health Brochures, And E-Health Literacy (N: 137)

Variables	1	2	3	4	5	6	7
1. Gender ¹	1						
2. Marital Status ¹	0.14 ^b	1					
3. Age ²	0.21 ^a	0.61 ^{a**}	1				
4. Income Status ¹	0.16 ^b	0.25 ^{b*}	0.26 ^{a**}	1			
5. Educational Status ³	0.15 ^b	0.31 ^{b**}	-0.43 ^{a**}	0.21 ^{b*}	1		
6. Access to Online Health Brochures ¹	0.08 ^a	0.08 ^a	0.41 ^c	0.27 ^a	0.38 ^a	1	
7. E- Health Literacy	0.52 ^a	0.13 ^a	-0.36 ^{c**}	0.14 ^a	0.31 ^{a**}	0.44 ^{c**}	1

Correlation coefficients: * $p>0.05$, ** $p>0.001$

^aEta coefficient; ^bCramer V coefficient; ^cPearson correlation coefficient; ¹Two-category qualitative data; ²Continuous numerical data;

³Four-category qualitative data; ⁴Five-category qualitative data.

A moderate positive and statistically significant correlation was found between e-health literacy and access to online health brochures score ($r = 0.44$; $p < 0.001$). A low negative and statistically significant correlation was found between e-health literacy and age score ($r = -0.36$; $p < 0.001$). A low positive and statistically significant correlation was found between e-health literacy and education status score ($r = 0.31$; $p < 0.001$). No significant correlation was found between e-health literacy and gender, marital status, and income status scores ($p>0.05$).

The results of multiple regression analysis conducted to determine the effect of access to Online Health brochures and personal variables on e-health literacy are shown in Table 8.

Table 8. Multiple Regression Analysis Results

Variables*	E-Health Literacy				VIF	Durbin-Watson
	B	β	t	p		
Step 1	$F(2.134) = 13.33, p < 0.001, R = 0.40, R^2 = 0.16$					1.88
Age	-0.24	-0.28	-3.28	0.001	1.22	
Educational Status	0.16	0.19	2.17	0.031	1.22	
Step 2	$F(1.135) = 14.128, p < 0.001, R = 0.30, R^2 = 0.25, \Delta R^2 = 0.09$					
Access to Online Health Brochures	-1.58	-0.30	-3.759	0.001	1.00	

*Among the socio-demographic variables in Table 7, variables that have a significant relationship with the e-health literacy score were included in the regression analysis.

The Durbin-Watson coefficient and Variance Inflation Factor (VIF) coefficients were examined to assess the presence of multicollinearity and autocorrelation problems. The Durbin-Watson coefficient is expected to be between 1.5 and 2.5, and VIF values are expected to be less than 10 (Büyüköztürk, 2011). In the study, the Durbin-Watson coefficient was found to be 1.88, and VIF values were found to be between 1.00 and 1.22. Age and education level were added to step 1. Access to online health education materials was added to step 2 as the main predictor, Access to online health education materials was found to be a significant predictor of e-health literacy ($\beta = -0.30, p < 0.001$), indicating a negative relationship. As access increased, e-health literacy scores tended to decrease. Adding access to online health education materials to the model significantly increased the total variance in e-health literacy scores. Demographic characteristics explained 16% of the total variance in e-health literacy scores ($R^2 = 0.16; p < 0.001$). This proportion increased to 25% when access to online health education materials was added to the model ($R^2 = 0.25; \Delta R^2 = 0.09; p < 0.001$). The study also found that age and education were significant predictors of e-health literacy among demographic variables.

4. Discussion

According to the results of the study, no significant differences were found between diabetic patients in terms of gender, marital status, and income level, whereas significant differences emerged with respect to age and education. In contrast, a significant difference was found between their ages, educational status, and scale averages. Khan et al. (2024) found in their study that illiteracy and age have an impact on diabetes management (Khan et al., 2024). Aytar Yılmaz et al (2013) in their study found that psycho-social support has a positive effect on the treatment process of diabetic patients. In the study by Şengül & Güzel (2024), a significant difference was found between the health literacy scale average and the participants' ages. According to the findings, as age increases, health literacy scores tend to decrease. This indicates that age is an influential variable on health literacy. In this sense, the findings support the existing literature. However, Gedik (2016), in their study, found that the self-efficacy levels of women and married individuals were high within the sociodemographic profile of diabetic individuals living in rural areas. According to this study, the findings are different from the reported literature. It is thought that this difference arises from working in various places at various times (Gedik, 2016).

The correlation analysis conducted in the research revealed a moderate, positive, and significant relationship between access to online health education materials and e-health literacy. Akyol Güner et al., (2020) in their study stated that the health literacy of diabetic individuals is at an insufficient level (Akyol Güner et al., 2020). The results of the regression analysis indicate that access to online health education materials predicts e-health literacy level. Neşe et al., (2021) in their study, determined that the health literacy of type 2 diabetic patients is at a moderate level and their diabetic self-care levels are low (Neşe et al., 2021). Diviani et al. (2015) found in their study that low health literacy plays a role in the evaluation of online health information (Diviani et al., 2015). Wang and Luan (2022) in their study stated that the lack of digital health literacy of the elderly has become a problem that needs to be solved urgently (Wang & Luan, 2022).

5. Conclusion and Suggestions

Based on the information obtained, online health education materials were found to be not presented effectively and caused a decrease in the level of e-health literacy. It was stated that individuals with high e-health literacy may, surprisingly, do not prefer online health education materials. Although individuals with low e-health literacy attempt to access online materials, they may struggle to benefit from them effectively due to difficulties in evaluating the content. This can be interpreted as people starting to withdraw from online health-seeking behavior as e-health literacy increases. In this context, it is recommended that the content of online health education materials about diabetes be

designed to be more reliable, eye-catching, readable, and attractive to young individuals. The fact that elderly people prefer online health education materials, but the level of their e-health literacy is low, is one of the conspicuous findings. Strategies need to be developed to increase the literacy level, especially among elderly people. For example, courses may be held for e-health literacy. People with low e-health literacy levels have a limited ability to choose reliable information when searching for health information in an environment where information pollution is high. For this reason, people should be informed about where they can obtain accurate information, and individuals should be supported in increasing their e-health literacy as well as their health literacy.

The majority of the participants stated that access to health sources on the internet is significant. In this respect, it is suggested that access to health sources be made more secure. Training programs can be organized for users on how to use digital health sources. It was determined that participants prefer to receive information from experts and pay attention to the accuracy of the information when searching for health information. Promotion of reliable health sources by the government and health institutions will make it easier for patients to access accurate information. In addition, developing systems where users can give feedback on the health brochures they have read will ensure that the quality and reliability of the resources are constantly increasing. It is thought that the research is instructive in terms of health management practices and policymakers, as it clarifies aspects that are not mentioned in the literature.

This research is considered instructive for health management practices and policymakers by clarifying aspects not addressed in the literature. Furthermore, this study makes an original contribution by jointly examining e-health literacy and access to online health education materials among diabetes patients in Turkey. Another notable finding is that, while e-health literacy increases with increasing education level, access to online health education materials does not increase at the same rate. This discrepancy is thought to stem from factors such as limited trust in online resources, difficulties distinguishing reliable content, or generational differences in technology use. Discussing such contradictory findings provides a more comprehensive understanding of how digital health literacy interacts with health information-seeking behaviors and highlights the need to develop strategies that address both literacy and access issues simultaneously. Based on the research results, the following recommendations can be made to healthcare administrators and policymakers:

- Training programs and practical courses should be organized to increase e-health literacy.
- Simplified brochures, informative seminars, and short videos should be prepared to support health information access and evaluation skills.
- Promoting and promoting reliable online health resources will increase patient trust.
- Brochures and materials should be highly readable, visually appealing, and appealing to different target groups.
- The quality of content in online health brochures should be continuously improved by creating systems that allow users to provide feedback.

This study has several limitations. First, the sample size was limited and convenience sampling was used. This limits the generalizability of the findings. Furthermore, data were collected using self-report measures, and participants' subjective assessments may be biased. It is recommended that future longitudinal and experimental studies be conducted with larger, more representative samples to support these findings.

Ethical Declaration

It is declared that scientific and ethical principles were adhered to during the execution and writing of this study, and that all sources used have been appropriately cited. Ethics committee approval dated 29.05.2024 and decision number 2024/557 was obtained from Selçuk University Non-Interventional Clinical Research Ethics Committee for the research.

Declaration Regarding the Use of Artificial Intelligence

The authors commit to adhering to ethical principles, transparency, and responsibility in the use of artificial intelligence tools, ensuring their academic responsibility.

Declaration of Conflicting Interests

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