

Association between diabetes and cataracts in the Peruvian population: analysis of a national survey

Associação entre diabetes e cataratas na população peruana: análise de uma pesquisa nacional

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ABSTRACT

Objective: To determine the association between type 2 diabetes mellitus and cataracts in Peruvian adults over 50 years of age.

Methods: Cross-sectional analytical observational study corresponding to the secondary analysis of the 2019 *Encuesta Demográfica y de Salud Familiar* database. Type 2 diabetes mellitus was considered an independent variable and cataract as a dependent variable. A descriptive analysis was performed using absolute frequencies and weighted proportions, as well as a multivariate analysis using generalized linear models of the Poisson family with logarithmic link function to estimate prevalence ratios on the association between diabetes and cataracts.

Results: Data from a total of 8,775 Peruvian adults over 50 years of age were analyzed, of whom 1,322 self-reported a diagnosis of cataract. Of the total respondents, 9.2% reported having been diagnosed with diabetes mellitus and 16.7% with cataracts. The crude model ($p < 0.001$) and the adjusted models 1 ($p = 0.007$) and 2 ($p = 0.029$) found an association between having diabetes mellitus and having cataracts.

Conclusion: Two out of ten adults aged 50 years old and older in Peru had cataracts. There was an association between having diabetes and the presence of cataracts in the Peruvian population.

RESUMO

Objetivo: Determinar a associação entre o *diabetes mellitus* tipo 2 e catarata em adultos peruanos com mais de 50 anos de idade.

Métodos: Estudo analítico observacional transversal correspondente à análise secundária da base de dados do *Encuesta Demográfica y de Salud Familiar* de 2019. O *diabetes mellitus* tipo 2 foi considerado variável independente e a catarata, variável dependente. Foi realizada uma análise descritiva utilizando frequências absolutas e proporções ponderadas, bem como uma análise multivariada, usando modelos lineares generalizados da família Poisson com função de ligação logarítmica para estimar razões de prevalência sobre a associação entre o diabetes e a catarata.

Resultados: Foram analisados dados de 8.775 adultos peruanos com mais de 50 anos de idade, dos quais 1.322 autorrelataram diagnóstico de catarata. Do total de inquiridos, 9,2% relataram ter sido diagnosticados com *diabetes mellitus* e 16,7%, com cataratas. O modelo bruto ($p < 0,001$), o modelo ajustado 1 ($p = 0,007$) e o modelo ajustado 2 ($p = 0,029$) encontraram associação entre ter *diabetes mellitus* e ter catarata.

Conclusão: Dois em cada dez adultos com 50 anos de idade ou mais no Peru tinham catarata. Houve associação entre ter diabetes e a presença de catarata na população peruana.

INTRODUCTION

Eye diseases and visual impairment are a global health problem. It is estimated that 2.2 billion people are visually impaired or blind (one billion of these are due to preventable causes).⁽¹⁾ Cataracts are the leading cause of blindness (65.2 million cases of people with moderate or severe blindness or visual impairment),⁽¹⁾ the second leading cause of visual impairment,⁽²⁾ and one of the largest contributors to disability-adjusted life years (DALYs) globally, with an estimation of more than 6 million DALYs in 2019.⁽³⁾ In addition, it is the leading cause of treatable blindness in the world, which is treated surgically.⁽⁴⁾ Therefore, several non-governmental institutions created a strategic plan to eliminate blindness by preventable causes through ophthalmological care, human resource development, provision of technology and suitable infrastructure facilities.⁽⁵⁾

In the Americas, three million people suffer from blindness, of which about 60% is caused by refractive errors and cataracts.⁽⁶⁾ In Peru, the prevalence of blindness is estimated at 2%, with cataracts as the main cause.⁽⁷⁾ Cataracts affect 16.7% of the population aged 50 years and older,^(6,8,9) due to lack of knowledge and/or fear of the complications of surgery, the high cost of the operation, and the limited supply of ophthalmology specialists in rural areas.⁽¹⁰⁾ To address this situation, the *Instituto Nacional de Oftalmología* (INO) developed primary care strategies through the decentralization of medical care in areas with difficult access and fewer human resources.⁽¹¹⁾

Cataract is a multifactorial disease. Risk factors associated with cataract include age, smoking, exposure to ultraviolet light (sunlight), excessive alcohol consumption, prolonged use of corticosteroids (topical, systemic, intravitreal, inhaled), previous ocular surgeries, ocular trauma, high myopia, and ocular inflammatory conditions.⁽¹²⁾ Diabetes mellitus (DM) is also described as one of the factors involved in its development,⁽¹³⁾ especially type 2 DM, which has become one of the most prevalent chronic noncommunicable diseases in the world, generating more than one million deaths and 751 DALYs per 100,000 inhabitants in 2017.⁽¹³⁾ In Latin America, nearly 30 million people have type 2 DM, more than 85% suffer from cataracts due to diabetes, and more than half require ophthalmologic surgery for cataracts.⁽¹⁴⁻¹⁶⁾

The literature has described an association between type 2 DM and cataracts, in which the pathophysiological mechanism is based on the formation of hydropic fibers in diabetic individuals that degenerate a crystalline lens, due to the action of aldose reductase, which catalyzes the reduction of glucose into sorbitol.⁽¹⁷⁾ This association has

been reported in several studies, which conclude that diabetic people have a 4- to 25-fold greater risk of developing cataracts than people without diabetes.^(18,19) In addition, there are conditioning factors such as age, female sex, use of corticosteroids, poor metabolic control, insulin treatment, and prolonged diabetes evolution that could be involved in the development of cataracts in diabetic patients.^(17,20)

Several studies conducted in contexts other than Peru have evaluated the association between having type 2 DM and having cataracts; however, there is little scientific evidence available on this association in the Peruvian population, especially in the population aged 50 years and older, a population group in which these conditions may occur, coexist, and become more prevalent with increasing age. Therefore, the objective of the present study was to determine the association between having DM and having cataracts in Peruvian adults over 50 years of age.

METHODS

Study design and population

A cross-sectional analytical observational study of the data collected by the *Encuesta Demográfica y de Salud Familiar* (ENDES) 2019 was conducted. The ENDES is a population-based survey conducted continuously by the *Instituto Nacional de Estadística e Informática* (INEI), which aims to provide updated and reliable information on demographic dynamics and the main health indicators in women of childbearing age, children under five and people aged 15 years and older. This survey also has information on the status of chronic noncommunicable diseases, as well as access to diagnostic and treatment services, and the associated factors.⁽²¹⁾ The survey consists of three questionnaires that collect information on the households and their members, individual women's health (applied to all women of childbearing age from 15 to 49 years), and health (applied to all persons over 15 years).⁽²¹⁾

The 2019 ENDES used a two-stage, probabilistic, balanced, stratified and independent sampling, with the unit of analysis being the usual residents of the dwellings selected through complex sampling.⁽²²⁾ The survey has a national geographic coverage, by urban and rural areas, in each of the 24 departments of the country and the constitutional province of Callao and in the natural regions (coast, highlands and jungle).⁽²²⁾ Peru is divided into three natural regions with specific characteristics. The coast, bordering the Pacific Ocean, is made up of Lima (the

capital of Peru) and is one of the regions with the highest population density and access to health services in the country. The highlands are made up of the highest altitude areas of the country with the lowest wealth index. Finally, the jungle is one of the regions with the greatest biodiversity, the largest geographic territory, and the greatest barriers to accessing health services.

For the present study, the 2019 ENDES health questionnaire collected information from a total of 36 760 households. This survey inquired about the self-reporting of the presence of cataracts only for respondents aged 50 years and older, resulting in a total of 8775 persons aged 50 years and older selected for the analysis.

Variables

Dependent variable

Cataract diagnosis was defined through self-reporting whether an individual had previously been diagnosed with cataract by an eye doctor (Have you ever been diagnosed with cataract by an eye doctor?). This variable was dichotomized into “Yes”, when the respondent gave a positive answer to the survey question, and “No” when a negative answer was given.

Independent variable

The diagnosis of DM was defined from self-reporting whether an individual had previously been diagnosed with DM or high blood sugar by a physician (Have you ever been diagnosed with diabetes or “high blood sugar” by a physician?). This variable was dichotomized into “Yes”, when the respondent gave a positive answer to the question, and “No”, when the respondent gave a negative answer.

Covariates

The covariates included in the study have been previously described in the medical literature as associated with the variables of interest.^(19,23-26) Covariates of importance included: sex (male/ female), age (50-59/ 60-69/ 70 or older), educational level (No level/ primary/ secondary/ higher), health insurance (yes/ no), hypertension (yes/ no), body mass index (BMI) (normal/ overweight/ obese), cigarette consumption in the last 12 months (yes/ no), area of residence (urban/ rural), wealth quintile (richest/ richest/ middle/ middle/ poorest/ poorest), altitude of residence in meters above sea level (0 to 499/ 500 to 1499/1500 to 2,999/ 3,000 and above), and natural region (Coast/Highlands/Jungle).

The diagnosis of hypertension was considered when an individual had a mean systolic blood pressure

≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg, based on blood pressure measurement (two readings) with a digital sphygmomanometer, or a self-reported diagnosis of hypertension by a physician, while the BMI was calculated using the Quetelet index as weight (kg) divided by height squared (m^2), and the WHO categories for overweight and obesity were considered.

Statistical analysis

The analysis was performed with the R 4.0 (R Core Team, R Foundation for Statistical Computing, Vienna, Austria) and RStudio 1.4.1106 (RStudio Team, RStudio PBC, Massachusetts, USA), considering a value of $p < 0.05$ as statistically significant. The ENDES databases are freely accessible and were loaded using the *haven*, *tidyverse* and *survey* packages, and merged according to a previous study.⁽²⁷⁾ The *svydesign* function was used to account for the complex sampling and weighting of the ENDES, where the term “certainty” was specified as a method to account for single primary sampling units.

First, the study variables were described using absolute frequencies and weighted proportions for categorical variables. Then, the chi-square test was used to evaluate the association between the independent variable and covariates with cataract diagnosis (dependent variable). Finally, crude prevalence ratios (PR) and adjusted PR (aPR) between diabetes and cataract diagnosis were reported using generalized linear models of the Poisson family with logarithmic link function and their respective 95% confidence intervals (CI). It should be noted that two adjusted models were performed to obtain global associations. The first model was fitted using individual characteristics (age, educational level, health insurance, BMI, hypertension and cigarette consumption in the last 12 months), while housing characteristics (area of residence, wealth quintile, altitude of residence and natural region) were added to the second model.

Ethical considerations

The present study was approved by the Ethics Committee of the *Universidad Científica del Sur* (020-2021-PRE15). It should be noted that the ENDES databases are freely accessible and can be obtained from the INEI website (<http://inei.inei.gob.pe/microdatos/>).

RESULTS

Data from 8,775 Peruvian adults over 50 years of age were analyzed, most of whom were women (52.3%), in the age group of 50 to 59 years (43.9%) and with no or

only primary education (45.2%), had health insurance (78.6%), were overweight (42.1%) and self-reported not having been diagnosed with hypertension (70.5%) and over consuming cigarettes in the last 12 months (88.3%). In relation to wealth quintiles, the majority of households were in quintiles 4 (20.7%) and 5 (24%). In terms of geographic domain, most respondents resided on the Coast (63.3%) and lived in an urban area (78.6%) (Table 1).

Table 1. Characteristics of the adult population registered in the 2019 *Encuesta Demográfica y de Salud Familiar*

Characteristic	Population included in the study	
	Absolute frequency (n=8,775)	Weighted proportion* % (95% CI)
Sex		
Male	4,045	47.71 (46.02-49.40)
Female	4,730	52.29 (50.60-53.98)
Age, years		
50-59	3,593	43.91 (42.32-45.50)
60-69	2,700	29.62 (28.18-31.06)
70 or older	2,482	26.47 (25.00-27.95)
Educational level		
No level/primary	5,249	45.22 (43.56-46.88)
Secondary	2,102	30.05 (28.38-31.72)
Higher	1,424	24.73 (23.13-26.33)
Health insurance		
Yes	7,190	78.62 (77.71-79.54)
No	1,585	21.38 (20.46-22.29)
Hypertension		
Yes	2,333	29.54 (27.98-31.09)
No	6,442	70.46 (68.91-72.02)
Body mass index		
Normal	3,235	29.63 (28.12-31.14)
Overweight	3,428	42.14 (40.47-43.81)
Obese	2,112	28.23 (26.60-29.85)
Cigarette consumption in the last 12 months		
Yes	1,046	11.69 (10.49-12.90)
No	7,729	88.31 (87.10-89.51)
Area of residence		
Urban	4,886	78.62 (77.71-79.54)
Rural	3,889	21.38 (20.46-22.29)
Wealth quintile		
Poorest	3,578	20.46 (19.45-21.48)
Poorer	1,731	16.97 (15.75-18.20)
Middle	1,275	17.90 (16.58-19.22)
Richer	1,126	20.67 (19.11-22.23)
Richest	1,065	24.00 (22.43-25.56)
Natural region		
Coast	3,212	63.26 (61.88-64.64)
Highlands	3,850	26.22 (24.90-27.53)
Jungle	1,713	10.53 (9.77-11.27)
Altitude of residence, in meters		
0 to 499	3,797	65.42 (63.85-66.97)
500 to 1,499	9,20	7.08 (6.05-8.27)
1,500 to 2,999	1,351	11.59 (10.55-12.71)
3,000 and above	2,707	15.91 (14.87-17.01)

CI: confidence interval

* The weighting factor and complex sampling of the 2019 *Encuesta Demográfica y de Salud Familiar* were included.

Of the total respondents, only 647 (9.22%) reported having been diagnosed with DM by a physician. Of these patients with diabetes, a higher proportion was made up

of women (10.6%) (vs. men [7.8%]), individuals in the 60-69 age group (12.3%), with a secondary education (12.0%), reporting having hypertension (12.6%) and with a BMI in the obese range (12.2%). Regarding place of residence, the majority reported being from an urban area (10.8%) and from the coast (11.6%). Similarly, most respondents belonged to wealth quintiles 4 (11.9%) and 5 (11.5%) (Table 2).

Table 2. Characteristics of the adult population according to the presence of diabetes, 2019 *Encuesta Demográfica y de Salud Familiar*

Characteristic	Without diabetes (n=8128)* % (95%CI)	With diabetes (n=647)* % (95%CI)	p-value†
Sex			
Male	92.24 (90.60-93.62)	7.76 (6.38-9.40)	0.008
Female	89.44 (87.94-90.77)	10.56 (9.23-12.06)	
Age (in years)			
50-59	93.45 (92.04-94.63)	6.55 (5.37-7.96)	<0.001
60-69	87.67 (85.37-89.65)	12.32 (10.35-14.63)	
70 or older	89.81 (87.29-91.88)	10.19 (8.12-12.71)	
Educational level			
No level/primary	93.00 (91.81-94.04)	7.00 (5.96-8.19)	<0.001
Secondary	88.05 (85.41-90.27)	11.95 (9.73-14.59)	
Higher	90.01 (91.81-94.04)	9.99 (7.97-12.47)	
Health insurance			
Yes	90.28 (89.01-91.41)	9.72 (8.59-10.99)	0.054
No	92.69 (90.43-94.46)	7.31 (5.54-9.57)	
Hypertension			
Yes	87.44 (85.01-89.52)	12.56 (10.48-14.99)	<0.001
No	92.17 (91.02-93.19)	7.83 (6.81-8.98)	
Body mass index			
Normal	94.18 (92.51-95.49)	5.82 (4.51-7.49)	<0.001
Overweight	90.40 (88.61-91.93)	9.60 (8.07-11.39)	
Obese	87.76 (85.48-89.73)	12.24 (10.27-14.52)	
Cigarette consumption in the last 12 months			
Yes	92.19 (88.59-94.72)	7.81 (5.28-11.41)	0.359
No	90.59 (89.40-91.65)	9.41 (8.35-10.60)	
Area of residence			
Urban	89.21 (87.81-90.48)	10.79 (9.52-12.19)	<0.001
Rural	96.51 (95.70-97.18)	3.49 (2.82-4.30)	
Wealth quintile			
Poorest	97.44 (96.74-98.00)	2.56 (2.00-3.26)	<0.001
Poorer	89.98 (86.97-92.35)	10.02 (7.65-13.03)	
Middle	89.93 (87.38-92.01)	10.07 (7.99-12.62)	
Richer	88.14 (85.35-90.47)	11.86 (9.53-14.65)	
Richest	88.55 (85.52-91.02)	11.45 (8.98-14.48)	
Natural region			
Coast	88.38 (86.65-89.90)	11.62 (10.10-13.35)	<0.001
Highlands	95.89 (94.99-96.63)	4.11 (3.37-5.01)	
Jungle	92.46 (90.60-93.98)	7.54 (6.02-7.40)	
Altitude of residence (in meters)			
0 to 499	88.44 (86.79-89.91)	11.56 (10.09-13.21)	<0.001
500 to 1,499	93.19 (90.23-95.30)	6.81 (4.70-9.77)	
1,500 to 2,999	93.85 (92.10-95.23)	6.15 (4.77-7.90)	
3,000 and above	97.06 (96.09-97.80)	2.94 (2.20-3.91)	

CI: confidence interval

*The weighting factor and complex sampling of the 2019 *Encuesta Demográfica y de Salud Familiar* were included; † estimated using the Chi-squared test.

Regarding the presence of cataracts, among the 1,322 (16.68%) people who self-reported the diagnosis of

cataracts, most were in the age group of 70 years or older (34%), had primary or no education (19.1%) and had health insurance (18.2%), and had not consumed cigarettes in the last 12 months (17.2%). In terms of wealth quintiles, the majority of respondents who reported

Table 3. Characteristics of the adult population according to the presence of cataracts, 2019 *Encuesta Demográfica y de Salud Familiar*

Characteristic	Without cataracts (n=7,453)* % (95% CI)	With cataracts (n=1,322)* % (95% CI)	p-value†
Sex			
Male	84.58 (82.55-86.42)	15.42 (13.58-17.45)	0.065
Female	82.17 (80.23-83.95)	17.83 (16.05-19.77)	
Age (in years)			
50-59	92.02 (90.58-93.26)	7.98 (6.74-9.42)	< 0.001
60-69	85.92 (83.50-88.03)	14.08 (11.97-16.50)	
70 or older	65.98 (62.50-69.29)	34.02 (30.71-37.50)	
Educational level			
No level/primary	80.86 (78.88-82.70)	19.14 (17.30-21.12)	0.005
Secondary	84.74 (82.04-87.10)	15.26 (12.90-17.96)	
Higher	86.09 (83.06-88.65)	13.91 (11.35-16.94)	
Health insurance			
Yes	81.83 (80.14-83.41)	18.17 (16.59-19.86)	<0.001
No	89.08 (86.51-91.21)	10.92 (8.79-13.49)	
Hypertension			
Yes	79.62 (76.79-82.20)	20.38 (17.80-23.21)	<0.001
No	84.87 (83.21-86.39)	15.13 (13.61-16.79)	
Body mass index			
Normal	82.61 (80.02-84.92)	17.39 (15.08-19.98)	0.484
Overweight	82.96 (80.69-85.02)	17.04 (14.98-19.31)	
Obese	84.60 (81.97-86.91)	15.40 (13.09-18.03)	
Cigarette consumption in the last 12 months			
Yes	87.45 (83.34-90.66)	12.55 (9.34-16.66)	0.034
No	82.77 (81.23-84.21)	17.23 (15.79-18.77)	
Area of residence			
Urban	81.83 (80.03-83.50)	18.17 (16.50-19.97)	<0.001
Rural	88.82 (87.41-90.08)	11.18 (9.92-12.59)	
Wealth quintile			
Poorest	89.58 (88.05-90.94)	10.42 (9.06-11.95)	<0.001
Poorer	84.10 (81.18-86.65)	15.90 (13.35-18.82)	
Middle	82.00 (78.78-84.82)	18.00 (15.18-21.22)	
Richer	80.12 (75.87-83.78)	19.88 (16.22-24.13)	
Richest	81.17 (77.41-84.43)	18.83 (15.57-22.59)	
Natural region			
Coast	81.61 (79.45-83.59)	18.39 (16.41-20.55)	<0.001
Highlands	86.59 (84.89-88.12)	13.41 (11.88-15.11)	
Jungle	85.56 (83.23-87.52)	14.54 (12.48-16.87)	
Altitude of residence, meters			
0 to 499	82.37 (80.31-84.26)	17.63 (15.74-19.69)	0.005
500 to 1,499	81.36 (77.32-84.82)	18.64 (15.18-22.68)	
1,500 to 2,999	84.31 (81.31-86.91)	15.69 (13.09-18.69)	
3000 and above	87.36 (86.31-89.17)	12.64 (10.83-14.69)	

CI: confidence interval

*The weighting factor and complex sampling of the 2019 *Encuesta Demográfica y de Salud Familiar* were included; † estimated using the Chi-squared test.

having cataracts were in quintiles 4 (19.9%) and 5 (18.8%). Also, the majority of respondents who reported having cataracts resided in an urban area (18.1%) and in the Coast region (18.4%). Of those who reported having cataracts, 20.4% had high blood pressure (Table 3).

In the crude analysis, an association was found between having DM and having cataracts (PR: 1.47, 95%CI: 1.17-1.85; $p < 0.001$). In adjusted model 1, after adjustment for the variables of age, educational level, health insurance, hypertension, and cigarette consumption in the last 12 months, an association was found between having diabetes and having cataracts (aPR: 1.39, 95%CI: 1.12-1.72; $p = 0.003$). In adjusted model 2, an association was found between the presence of diabetes and having cataracts after adjustment for the variables used in model 1 as well as the place of residence, wealth quintile, altitude of residence and natural region, (aPR: 1.28, 95%CI: 1.03-1.60; $p = 0.025$) (Table 4).

DISCUSSION

The aim of this article was to evaluate the association between having diabetes and having cataracts. It was found that, for every ten adults aged 50 years and older in Peru, two had cataracts. With respect to diabetes as a factor associated with the presence of cataracts, an association was found between these two diseases. Thus, having diabetes increased the probability of having cataracts in the Peruvian population aged 50 years and older.

The results show that 17% of adults aged 50 years and older in Peru have cataracts, and 9.22% of these adults reported having diabetes. It has been described that this disease is the main cause of bilateral blindness in this population group (affecting 2% of people), and more than half of these cases (58%) were due to cataract.⁽⁷⁾ Among the sociodemographic characteristics studied, it was found that the highest proportion of people suffering from cataract were in the age group of 70 years and older (34%), which is consistent with previous studies in Peru and around the world, indicating that the older the person is, the greater the possibility of developing cataract.^(7,28)

Regarding the sociodemographic characteristics of the population with cataracts, it was found that a greater

Table 4. Association between cataracts and diabetes mellitus, 2019 *Encuesta Demográfica y de Salud Familiar*

Characteristic	Presence of cataracts		Crude model		Adjusted model 1*		Adjusted model 2**	
	No (n=7,453)	Yes (n=1,322)	PR (95%CI)	p-value	aPR (95%CI)	p-value	aPR (95%CI)	p-value
Diabetes mellitus								
No	84.02 (82.53-85.40)	15.98 (14.60-17.47)	Ref.		Ref.		Ref.	
Yes	76.47 (71.16-81.07)	23.53 (18.93-28.84)	1.47 (1.17-1.85)	<0.001	1.39 (1.12-1.72)	0.003	1.28 (1.03-1.60)	0.025

PR: prevalence ratios; CI: confidence intervals; aPR: adjusted prevalence ratios; Ref.: reference category.

* Adjusted for covariate age, educational level, health insurance, hypertension, and cigarette consumption in the last 12 months; ** adjusted for covariates age, educational level, health insurance, hypertension, cigarette consumption in the last 12 months, area of residence, wealth quintile, altitude of residence, and natural region.

proportion resided in the coastal region, as well as in urban areas. The higher proportion of people with cataracts in these regions could be explained by the fact that, in Peru, there is a low number of physicians for the size of its population, and these physicians are concentrated in large cities. Specifically in relation to ophthalmology professionals, in the whole country there were only 298 in the year 2018,⁽²⁹⁾ a low number considering the size of the Peruvian population (32 million for the same year). These specialists are concentrated in large cities, despite the fact that the prevalence of vision defects and blindness is higher in rural and remote localities.⁽¹⁰⁾ In addition to limited access to medical care in Peru, the main reasons for people with cataracts for not accessing surgery include fear of not being able to pay the cost of the operation, fear of surgery or not knowing about the existence of cataract treatment.⁽⁷⁾

Regarding the association of diabetes with the presence of cataracts in the Peruvian population aged 50 years and older, a higher proportion of diabetics in this age group were found to have cataracts compared to people without this chronic condition. This finding is in accordance with the literature, in which a higher prevalence of cataracts has been described in patients with diabetes, reporting prevalences of cataracts of between 20% to 35% in patients with DM.^(17,30) Likewise, it is described that age increases the probability of presenting cataracts, as well as the progression of this ophthalmologic problem. In relation to the above, it is also noted that both the incidence and progression of the types of cataracts in diabetic patients are higher in older people,⁽¹⁹⁾ and the prevalence of cataracts is twice as high in diabetic patients over 65 years of age.⁽¹⁹⁾ This could explain the higher proportion of cataracts found in older patients in the present study.

There are limitations to consider when interpreting the results of the study. First, the cross-sectional design of the study does not allow establishing causal relationships because the variables of interest were collected at the same time. Also, there is the possible introduction of recall bias inherent to any survey. In addition, it is not uncommon in ophthalmology for patients to confuse the term “carnosity” (pterygium) with cataract, two totally different diseases, and therefore, some respondents may have mistakenly reported having cataract. Additionally, there are factors associated with the presence of cataracts not captured by the ENDES, such as excessive exposure to ultraviolet light, ocular trauma, previous ocular surgeries, prolonged corticosteroid use, ocular inflammatory diseases, which were not included in the analyses, and

alcohol consumption does not have complete data in the survey for this study. Despite these limitations, the ENDES is a representative national survey, widely used for the study of the health of the Peruvian population. Therefore, we consider that the analysis of the ENDES allows us to establish an initial view for the study of the relationship between diabetes and the presence of cataract in the Peruvian population.

CONCLUSION

In conclusion, it was found that two out of 10 adults aged 50 years and older in Peru had cataracts. Likewise, an association was found between having diabetes and the presence of cataracts in the Peruvian population, with people with diabetes having a greater probability of having cataracts than those without diabetes. Thus, the development of specific strategies for cataract detection and treatment, including campaigns for cataract screening in diabetic patients or for its treatment, would be of interest in the Peruvian diabetic population, which has been increasing in recent years. Likewise, general practitioners, internists, and endocrinologists can promote the importance of ophthalmologic evaluation to rule out not only diabetic retinopathy but also cataracts, and ophthalmology specialists can advocate the importance of educating diabetic patients in relation to eye health.

AUTHORS' CONTRIBUTIONS

RVF designed the study, performed the analysis, and verified the analytical methods. AFM and GLV drafted the first version of the manuscript with contributions from all authors. All authors discussed the results, contributed to the final manuscript and take responsibility for the content of the manuscript.

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