Ciencia y Tecnología para la Salud Visual y Ocular

Volume 17 | Number 1 Article 1

2019

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Citación recomendada

Navarro Luna P, Vázquez Mendoza A, Alonso Trujillo J, González Aragón Pineda ÁÉ y Ramos Montes ÓA. Prevalencia de ojo seco en pacientes que acuden a la Clínica de Optometría de la FESI, UNAM. Cienc Tecnol Salud Vis Ocul. 2019;(1): 11-18. doi: https://doi.org/10.19052/sv.vol17.iss1.1

Artículos originales

https://doi.org/10.19052/sv.vol17.iss1.1

Prevalence of Dry Eye in Patients at the FESI Optometry Clinic, UNAM*

Prevalencia de ojo seco en pacientes que acuden a la Clínica de Optometría de la FESI, UNAM

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Received: 09-03-2018 / Accepted: 01-21-2019

ABSTRACT

Objetive: To report the prevalence of dry eye and to determine the differences between young and adult patients attending the Optometry Clinic of the Iztacala School of Higher Education at Universidad Nacional Autónoma de México (UNAM). *Material and methods:* In 1957, patients between the ages of 15 and 65 assessed at the "Centro de Diagnóstico de Alteraciones de Superficie Ocular" of the Iztacala School of Higher Education of UNAM between August 2016 and August 2017. The patients answered the digital version of the Ocular Surface Disease Index (OSDI) diagnostic questionnaire and the mucin arborization pattern was evaluated using the Tear Ferning Test (TFT). *Results:* The mean prevalence of the diagnosis with a significant difference of positive $P<0.05$ for Ferning (59.1%) and OSDI (63.8%). Using the Ferning technique in young patients (15 to 29 years), it was possible to assess a prevalence of dry eye of 51.9%; whereas in adults (30 to 65 years) it was 66.9%. Using the OSDI questionnaire, the prevalence was 60.1% in young people and 67.8% in adults; in addition, for each year of increase in age, the probability of having a dry eye increased by 1% with OSDI and 2% with Ferning. *Conclusions:* With this study, it was established, for the first time, that the young people who go to the optometry clinic of FES-Iztacala, a sector that had not been previously considered, also suffer from this disease.

Keywords: Dry eye, prevalence, Ferning test, ocular surface.

* La presente investigación no depende de ningún proyecto institucional o subvención económica. En ella tampoco existe conflicto de intereses con los autores.
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Cómo citar este artículo: Navarro Luna P, Vázquez Mendoza A, Trujillo AJ, González Aragón Pineda A, Ramos Montes OA. Prevalence of Drey Eye in Patients at the FESI Optometry Clinic, UNAM. Cienc Tecnol Salud Vis Ocul. 2019;17(1): 11-18. https://doi.org/10.19052/sv.vol17.iss1.1

RESUMEN

Objetivo: estimar la prevalencia de ojo seco y determinar si existen diferencias entre pacientes jóvenes y adultos que acuden a la Clínica de Optometría de la Facultad de Estudios Superiores Iztacala, UNAM. *Materiales y métodos*: se seleccionaron 1957 pacientes de 15 a 65 años de edad evaluados en el Centro de Diagnóstico de Alteraciones de la Superficie Ocular de la Facultad de Estudios Superiores Iztacala de la Universidad Nacional Autónoma de México, de agosto del 2016 a agosto del 2017. Los pacientes resolvieron el cuestionario de diagnóstico en su versión digital OSDI y se les evaluó el patrón de arborización de mucinas mediante Test Lagrimal de Ferning (TFT). *Resultados*: la prevalencia del diagnóstico tiene una diferencia significativa de P<0.05 positivo para Ferning (59.1 %) y para OSDI (63,8 %). Mediante la técnica de Ferning en pacientes jóvenes (15 a 29 años), se pudo valorar una prevalencia de ojo seco del 51,9 %, mientras que en adultos (30 a 65 años) fue de 66,9 %. Utilizando el cuestionario OSDI en jóvenes, la prevalencia es del 60 % y en adultos del 67,8 %; se encontró, además, que por cada año de incremento en la edad, la probabilidad de padecer ojo seco aumenta en 1 % mediante OSDI y en 2 % con Ferning. *Conclusiones*: con este estudio se estableció por primera vez que los jóvenes que asisten a consulta de la clínica de optometría de la FES-Iztacala —un sector que no se había considerado— también padecen esta enfermedad.

Palabras clave: ojo seco, prevalencia, test de Ferning, superficie ocular.

INTRODUCTION

Dry Eye (DE) is a disease caused by the combination of patient activities, environmental conditions, and alterations of one or more elements of the ocular surface. Its definition has changed over time and finally reached the current definition by the Tear Film and Ocular Surface Society's (TFOS) International Dry Eye Workshop II (DEWS II) in 2017:

> The dry eye is a multifactorial disease of the ocular surface characterized by the loss of homeostasis of the tear film and accompanied by ocular symptoms, in which the instability and hyperosmolarity of the tear film, inflammation and damage of the ocular surface, and neurosensory abnormalities play an etiological role. (1)

Currently, the diagnosis of this disease depends on both the performance of diagnostic tests and the implementation of diagnostic questionnaires (2), in addition to the tendency to associate the disease with the aging process, demeriting the risk factors. Different questionnaires and diagnostic tests are used in different studies (14-20), but the ocular surface disease index (OSDI) is the best validated questionnaire, designed to provide a rapid assessment of the symptoms of ocular irritation consistent with dry eye disease and their impact on vision-related functioning. However, it is necessary to supplement this information with the results of the diagnostic tests, such as the techniques that evaluate the quality of the ocular surface, namely the Tear Breakup Time (T-But), the Schirmer I Test (21-22), and the Tear Ferning Test (TFT) (23-26); the TFT depends on the composition of the tear sample, and it is a simple test for tear film quality at a gross biochemical level. The test results can be observed under a light or digital microscope and depending on the tear film composition.

The results show us that the standardized average age to suffer from dry eye is at 50 years or older (5), with a greater risk for women at 70% (6), related to hormonal processes such as menopause (7-10) or syndromes (11) such as Sjögren (12-13). For this reason, the relationship between these conditions should be reported in the prevalence of dry eye in our patient population between the ages of 15 and 65.

METHODOLOGY

This study is Cross sectional descriptive. As for the population, the study was carried out at the "Centro de Diagnóstico de Alteraciones de la Superficie Ocular" of the Optometry Clinic of the

Iztacala School of Higher Education of Universidad Nacional Autónoma de México and included a total of 1957 patients evaluated with different diagnostic techniques. The study was conducted between August 2016 and August 2017. Patients in the age range of 15 to 65 years were chosen to participate, and they had to be healthy and not be subject to any ophthalmic topical treatment. In the diagnostic process, all the patients answered the OSDI questionnaire after being submitted to the TFT and, subsequently, the results were divided between the ages of 15 to 29 and 30 to 65, according to the provisions of the United Nations (UN) (35). They signed an informed consent based on the Declaration of Helsinki, and the study was approved by the Optometry Ethic Committee of FES Iztacala; the patients answered the OSDI questionnaire (*2.0 Yor 2013*, in its digital version in Spanish), validated for the evaluation of dry eye symptoms; this questionnaire consists of 12 questions divided into 3 sections. Normal results were considered equal to and less than 13 points, while results with a higher value were diagnosed as dry eye. The TFT was performed with a 0.5-10µl micropipette (Eppendorf), calibrated at 4µl, taking a tear sample from the ocular surface (without pressure on the eyelids) and placing it on a glass slide, left to dry for three minutes under controlled temperature and humidity conditions. The results were compared with standardized patterns according to the Rolando (27-29) scale in which patients were considered as unaltered in scale 2 and 1, while patients in scale 3 and 4 were diagnosed with dry eye.

These two diagnostic techniques were chosen because the questionnaire is a subjective technique, the results showing the degree of symptomatology of the patient, to which we add the results of an objective technique, both of which are then compared with a standardized scale (30-31). The diagnoses depend on universally standardized conditions (32-34). For the statistical analysis, the Statistical Package for the Social Sciences (SPSS) program was used. The descriptive analysis was carried out by submitting the representative sample to the Pearson's chi-squared test in order to determine if there were differences between age groups and sex. A multivariate analysis was performed with logistic regression, and two models were adjusted for prevalence with Ferning and OSDI, using binary logistic regression, including age in qualitative form (years of age) and sex. The results were statistically significant, being considered with a confidence interval of 95% and determining a value of $p < 0.05$.

RESULTS

A sample of 1957 patients was taken (1260 = 64.4% women) with an average age of 34.3 years ± 15.14 (Table 1), who were assessed at the Centro de Diagnóstico de Alteraciones de la Superficie Ocular.

TABLE 1. **Percentage of the total population divided by gender and evaluated at the "Centro de Diagnóstico de Alteraciones de la Superficie Ocular"**

AGE	WOMEN (%)	MEN (%)	TOTAL (%)	P*
15 – 29 years	587 (46.59)	430 (61.69)	1017 (51.97)	<0.001
30 – 65 years	673 (53.41)	267 (38.31)	940 (48.03)	
Total	1260 (100.00)	697 (100.00)	1957 (100.00)	

Source: Own work

Their evaluation determined that there is a prevalence of dry eye of 59.1% using the objective test (TFT) and of 63.8% with the subjective test (OSDI), with a confidence interval of 95%. Thus, the results were statistically different (p= <0.05) (Table 2). The TFT results showed that young patients have a prevalence of dry eye of 51.9%, similar to adult patients, with 66.9%. However, OSDI results show a prevalence in young people of 60.0% compared to adults (67.8%); both were statistically different (p=<0.001), which shows a higher percentage when it comes to OSDI. The results were higher in both tests for adults (Table 3).

After adjusting the logistic model for TFT, it was found that for each year of increase in age the probability of suffering dry eye was increased by 2% (OR = 1.02, CI 95%, 1.02 - 1.03, p <0.001), while for OSDI the increase is 1% (OR = 1.01, CI 95%, 1.00 - 1.01, p <0.001).

Table 2. **Diagnosis of patients evaluated through the Tear Ferning Test and the OSDI questionnaire divided by gender**

	Patients	Women (%)	Men (%)	Total (%)	p*
Ferning	Healthy	508 (40.32)	292 (41.89)	800 (40.88)	0.497
	Dry eye	752 (59.68)	405 (58.11)	1157 (59.12)	
	Total	1260 (100.00)	697 (100.00)	1957 (100.00)	
OSDI	Healthy	446 (35.40)	262 (37.59)	708 (36.18)	0.334
	Dry eye	814 (64.60)	435 (62.41)	1249 (63.82)	
	Total	1260 (100.00)	697 (100.00)	1957 (100.00)	

Source: Own work

Table 3. **Diagnosis of patients evaluated through the TFT and the OSDI questionnaire divided by age**

	Patients	Young (%)	Adult (%)	Total (%)	p*
Ferning	Healthy	489 (48.09)	311 (33.09)	800 (40.88)	<0.001
	Dry eye	528 (51.91)	629 (66.91)	1157 (59.12)	
	Total	1017 (100.00)	940 (100.00)	1957 (100.00)	
OSDI	Healthy	406 (39.93)	302 (32.13)	708 (36.18)	<0.001
	Dry eye	611 (60.07)	638 (67.87)	1249 (63.82)	
	Total	1017 (100.00)	940 (100.00)	1957 (100.00)	

Source: Own work

DISCUSSION

The presence of dry eye increases with age (from the age of 40) and is related to the decrease in tear production, which triggers the gradual increase in symptoms (6). It is suggested that the patient's symptoms may or not affect the diagnosis of dry eye and its classification, combined with the results of the clinical tests (31). Therefore, implementing different objective techniques, such as the TFT, Tear Break Up Time (T-But), Schirmer I (ST I), Schirmer II (ST II), Phenol Thread Network, Green Lisamine, Demodex identification, together with subjective techniques, such as diagnostic questionnaires (OSDI or Mc Monnies), is fundamental to make a good diagnosis of ocular surface alterations. As such, the reason for choosing the OSDI questionnaire and the TFT is that the results of the stability tests of the tear film are highly variable and, therefore, decreasing the stimuli on the ocular surface allows greater reliability in the results (50).

Subjective tests can always have some type of error (40), due to the fact that there are variables inherent to patients (41), which cannot be controlled either (42), and it should also be considered that objective tests are capable of generating a tear reflex (43). This alters the results of the tests (44), which could mean that the fewer invasive techniques are performed, the more reliable the result will be. The correlation between symptoms and the clinical signs of dry eye indicate that they may or may not be related, which does not mean that one technique is more useful than another, but that both techniques (objective and subjective) should be used to be able to generate a reliable diagnosis.

In Mexico, a study was carried out by the Ministry of Health through the Mexican Institute of Social Security (IMSS) in November 2011 (3). In the study, a sector of the population ranging between 15 and 35 years of age was evaluated, determining that different reading activities in electronic devices (e.g., computer, cell phone, tablets, etc.)

are a risk factor for dry eye because they limit the number of blinks per minute, generating different symptoms, such as burning, tearing, redness and itching, which contributes to the development of the dry eye disease. In addition, different studies around the world indicate that the symptomatology is greater as age increases (4), depending on the patient's line of work. A few studies on the prevalence of this disease have been carried out in different areas of the country, such as in Monterrey, Nuevo Leon, in 2016, where a study was conducted at a university using only the OSDI diagnostic questionnaire, with which they established a prevalence of the disease of 70.4% in a young population (21 to 23 years of age). In that same year, during a study conducted in a hospital in downtown Mexico City, the OSDI questionnaire and the Dry Eye Questionnaire-5 determined a prevalence of dry eye of 43% and 30%, respectively. The work was carried out in a population of 338 patients from 16 to 85 years of age, and the analysis of the data shows that, based on age range, the prevalence of dry eye is greater than 25% in patients between 15 and 35 years and greater than 35% after 46 years of age.

The use of objective and subjective techniques for diagnosing alterations of the ocular surface (36-37) has been studied; considering that, the greater the number of techniques used in the same patient, the more complex the relationship of the results are (38), due to their variability, and therefore the techniques whose results are more reliable should be chosen. The Ferning Test was used because it is an easy technique to perform, and the results depend on the observation of the chemical effect where hyperosmolarity is essential to determine the degree of dry eye. Therefore, its results are reliable and, combined with the results provided by the OSDI questionnaire, a complete analysis of the information can be performed, where we can determine the patient's tear quality as a whole according to their symptoms (39). When observing the results of young people by gender, we can see that women with objective and subjective tests have a lower prevalence of dry eye (50.4%–58.7%) compared to adult patients (67.7%–69.6%), which supports the theory that the different hormonal processes that take place during aging generate different alterations in the elements of the ocular surface, culminating with dry eye disease (7-10). Young women compared to men in the same age range have a lower prevalence of the disease using both techniques.

With the results of the prevalence of dry eye in both sectors of the population (young and adult), the visual health professional will be able to deduce, during their clinical practice, that patients who appear in their office may suffer from this disease, and therefore they should be able to perform different evaluation techniques (45). Specific tests should be used to reduce the variability of the results, due to the low repetitiveness of the invasive tests (46). It is also important to consider that saturating the ocular surface with different techniques can generate an alteration in the results, as a consequence of the production of basal and reflex tearing (47). Therefore, using one or two techniques of ocular surface evaluation for diagnosis may be sufficient for an accurate diagnosis of dry eye, as our results show.

In countries such as France, Germany, Italy, Spain, Sweden, and the United Kingdom, it has been reported that dry eye syndrome produces an average net cost in treatment for the patient between $ 273,000 and $ 1,100,000 every year. In that sense, and considering that dry eye occurs in patients over 40 years of age, we could say that the maintenance time of this disease is about four decades. Considering this, as well as the results obtained in this study, in Mexico, a 19-year-old patient with a dry eye diagnosis should follow a treatment of at least 60 years. Therefore, they must generate preventive measures, such as reporting the consequences of the use of electronic devices for prolonged periods, because they reduce the number of blinks per minute (51), avoiding a well-hydrated corneal surface, which are habits that are mostly observed in young people (52); they must also create control measures in order

to prevent the disease and improve the health conditions of the Mexican population.

CONCLUSIONS

Dry eye is a disease whose prevalence has historically been associated with one sector of the population. However, with this study, we establish that young people, a vulnerable sector of the population that was recently taken into consideration, may also suffer from this disease.

The results show similar values for both techniques (Table 3), which represents a relationship between the symptomatology of the patient and the characteristics of the tear observed, supported by the bibliography, which indicates that an alteration in the ocular surface will cause the symptomatology to increase. It is worth mentioning that women have more symptoms than men when they are adults, something that should be evaluated in depth in another study.

The analysis of the results for both techniques shows a prevalence of the disease for the general population of 59.1% using the objective test (TFT) and of 63.8% with the subjective test (OSDI). The results in terms of quality vary depending on age and sex; women will have a greater number of alterations in the results compared to adult men. These results are reversed when it comes to young people, something that would be supported by previously published studies, which have shown that changes in sex hormones affect the conjunctival epithelium, triggering the dry eye syndrome (48-49).

As a complement to the analysis, it is observed that the symptomatology also changes depending on the age and sex; in fact, adult patients show greater symptoms as compared to young ones, which is evident in the case of women. However, this circumstance changes when we talk about symptomatology in young people, since it is at this point that men show more symptoms.

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