

# Clinical-epidemiological profile, risk factors and quality of life of patients with meibomian gland dysfunction

Perfil clínico-epidemiológico, fatores de risco e qualidade de vida de pacientes com disfunção das glândulas de meibomius

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## ABSTRACT

**Objective:** To investigate clinical-epidemiological profile, risk factors, and quality of life of patients with meibomian gland dysfunction.

**Methods:** A total of 108 patients were prospectively studied. Symptoms of dry eye, eyelid disorders and secretory function were analyzed. Laboratorial exams included fasting glucose, glycated hemoglobin, cholesterol, and triglycerides. Quality of life was analyzed using the Ocular Surface Disease Index®.

**Results:** Mean age was  $53.6 \pm 17.9$  years, 69.4% were females, 82.7% with gynecological history, 46.3% with cardiovascular history, and 80.6% had family history of cardiovascular disease. Symptoms were mild (28.7%) or moderate (38%), most of the patients showed slightly thickened eyelid margin (44.4%) and all functional glands (50.9%). Regarding clinical severity of patients, 34.3% were mild, 34.3% were moderate, and 31.4% were severe. In 11.3% and 19.6% of the patients, high fasting glucose and glycated hemoglobin levels, respectively, were found. There was association among severity and gynecological ( $p=0.001$ ), cardiovascular ( $p=0.006$ ) history, and quality of life ( $p<0.001$ ).

**Conclusion:** Meibomian gland dysfunction was predominant in female and in the fifth decade of life. Most patients had all functional Meibomian glands and signs of evaporative dry eye. Glucose and lipid profile levels may be altered in these patients. Most patients had worse life quality. There was association among clinical severity and gynecological, cardiovascular history, and quality of life.

## RESUMO

**Objetivo:** Investigar perfil clínico-epidemiológico, fatores de risco e qualidade de vida de pacientes com disfunção das glândulas de meibomius.

**Métodos:** Foram estudados prospectivamente 108 pacientes. Sintomas de olho seco, alterações palpebrais e função secretora foram analisados. Exames laboratoriais incluíram glicemia, hemoglobina glicada, colesterol e triglicérides. A qualidade de vida foi estudada por meio do *Ocular Surface Disease Index*®.

**Resultados:** A média de idade foi  $53,6 \pm 17,9$  anos, a maioria era do sexo feminino (69,4%), com antecedentes ginecológicos (82,7%), cardiovasculares (46,3%) e histórico de doença cardiovascular (80,6%). Os sintomas eram leves (28,7%) ou moderados (38%); a maioria dos pacientes tinha margem palpebral espessada grau leve (44,4%) e todas as glândulas funcionantes (50,9%). A gravidade clínica foi leve (34,3%), moderada (34,3%) e grave (31,4%). Em 11,3 e 19,6% dos pacientes, níveis de glicemia e hemoglobina glicada, respectivamente, estavam elevados. Houve associação entre gravidade clínica e antecedentes ginecológicos ( $p = 0,001$ ), cardiovasculares ( $p = 0,006$ ) e qualidade de vida ( $p < 0,001$ ).

**Conclusões:** A disfunção das glândulas de meibomius prevalece no sexo feminino e na quinta década de vida. A maioria dos pacientes apresentou todas as glândulas de meibomius funcionantes. Níveis de glicemia e perfil lipídico podem se mostrar alterados nesses pacientes. A maioria deles apresentou pior qualidade de vida. Houve associação entre gravidade clínica e antecedentes ginecológicos, cardiovasculares e qualidade de vida.

## INTRODUCTION

Meibomian gland dysfunction (MGD) is a chronic diffuse condition characterized by terminal duct obstruction and/or qualitative and quantitative alterations in glandular secretion, which can result in an altered tear film and symptoms of eye irritation, clinically apparent inflammation, and disease of the ocular surface.<sup>(1)</sup>

The prevalence of MGD ranges from 3.5 to 70%.<sup>(2-14)</sup> Higher rates are found in Asian populations (46.2 to 69.3%), in which the condition is more common in men.<sup>(3-5)</sup> In Caucasians, the prevalence ranges from 3.5 to 19.9% and is more common in women.<sup>(3)</sup> Moreover, the frequency of MGD increases with age. In Brazil, the prevalence ranges from 37.0 to 50.0%, occurring more in individuals 50 years of age or older and women.<sup>(15,16)</sup>

Chronicity of MGD can cause irreversible changes in eyelid structures, affecting vision and quality of life and requiring a multidisciplinary approach. Besides disfiguring the eyelid, these changes aggravate the infectious process and contribute to a worse clinical condition. This study can contribute to a better understanding of association between MGD and risk factors and expand the therapeutic arsenal with multidisciplinary focus.

Therefore, the aim of the present study was to investigate clinical-epidemiological profile, risk factors, and quality of life of patients with MGD.

## METHODS

A prospective cross-sectional study was conducted involving male and female patients of different races with MGD treated consecutively at *Hospital de Olhos Redentora*, São José do Rio Preto (SP), Brazil, between June and December 2022. Patients younger than 18 years or older than 85 years of age, pregnant women, and individuals allergic to fluorescein were excluded. The Human Research Ethics Committee at the Faculdade de Medicina de São José do Rio Preto approved the study.

Data were collected on demographic (sex, age, and educational level) and clinical characteristics (cardiovascular, dermatological, rheumatological or gynecological problems and a family history of cardiovascular disease). Symptoms of dry eye were investigated using the Ocular Surface Disease Index© (OSDI), with emphasis on photophobia, pruritus, and eye discomfort. Ophthalmological exam was conducted following the recommendation of the Dry Eye Workshop II ([https://www.tfosdewsreport.org/report-tfos\\_dews\\_ii\\_report/36\\_36/en/](https://www.tfosdewsreport.org/report-tfos_dews_ii_report/36_36/en/)).

Biomicroscopic exam involved eyelid morphology, including thickness of the eyelid margin, vascularization,

eyelash abnormalities, position of the mucocutaneous junction and orifices of the meibomian glands. Meibomian gland secretory function was assessed in terms of the expression and quality of secretion.

Ocular surface tests were performed, such as the quantification and interval of blinking, height of the lower tear meniscus, tear breakup time (TBUT), integrity of the ocular surface, and Schirmer's test. Laboratory exams included fasting blood glucose, glycated hemoglobin, total cholesterol (TC), low-density lipoprotein cholesterol (LDL-c), high-density lipoprotein cholesterol (HDL-c) and triglycerides (TG).

Quality of life was investigated using the OSDI. Besides symptoms, this questionnaire addresses functional limitations and environmental triggers.

Statistical analysis involved the chi-square test, Fisher's exact test and the likelihood-ratio test. Student's t-test was used to investigate associations between qualitative variables (two groups) and quantitative variables with Gaussian distribution. Mann-Whitney test was used to investigate associations between qualitative variables (two groups) and quantitative variables with non-Gaussian distribution. Analysis of variance (ANOVA) was used to investigate the association clinical severity (mild, moderate or severe) and quality of life (numerical OSDI score). A p-value  $\leq 0.05$  was considered indicative of statistical significance and the Bonferroni correction was used for multiple comparisons.

## RESULTS

Age ranged from 18 to 85 years (mean  $53.6 \pm 17.9$  years). Women (69.4%) and individuals with complete higher education (70.4%) accounted for the majority of the sample. A total of 82.7%, 16.7%, 13.9%, and 46.3% had gynecological, dermatological, rheumatological and cardiovascular problems, respectively, and 80.6% had family history of cardiovascular disease.

Most symptoms were mild (28.7%) to moderate (38%). Pruritus and/or discomfort were more frequent (63.9%). Morphological findings were mildly thickened (44.4%) or normal (35.2%) eyelid, moderate increase in vascularization (36.2%), crusted and oily eyelashes (61.1%), orifices with mild obstruction (30.6%), moderate obstruction (29.6%) or normal (30.6%) and posterior mucocutaneous junction (74.1%).

Regarding secretory function of the meibomian glands, 50.9% of the patients had all glands functioning and 52.8% had normal secretion quality with clear fluid. Dry eye test revealed that mean meniscus height was 0.3

± 0.1 mm. Fluorescein exam revealed absence of keratitis in more than half of the patients (53.7%); 48.1% patients had 15/15 on Schirmer's test and TBUT was 10/10 in 27.8%. Meibomian gland dysfunction severity was mild in 34.3%, moderate in 34.3%, and severe in 31.4%.

Biochemical profile of the patients (Table 1) showed that mean values did not deviate from reference values, with 183.4 ± 49.1 mg/dL, 105.4 ± 42.0 mg/dL, 53.0 ± 14.5 mg/dL and 126.2 ± 69.6 mg/dL for TC, LDL-c, HDL-c, and TG, respectively. Mean fasting blood glucose was 101.9 ± 23.8 mg/dL and glycated hemoglobin was 5.9 ± 0.9%. A total of 11.3% and 19.6% patients had high fasting blood glucose and glycated hemoglobin, respectively. With regards to the lipid profile, 34.7%, 33.3%, 27.8% and 28.9% had high TC, HDL-c, LDL-c and TG, respectively (Table 2).

**Table 1.** Biochemical profile of patients with meibomian gland dysfunction

Variable	n	Mean	SD	Median	Minimum	Maximum
Fasting glucose (mg/dL)	53	101.9	23.8	96.0	76.0	200.0
Glycated hemoglobin (%)	46	5.9	0.9	5.6	4.6	9.0
TC (mg/dL)	49	183.4	49.1	180.0	103.0	300.0
LDL-c (mg/dL)	38	105.4	42.0	100.0	16.0	205.0
HDL-c (mg/dL)	45	53.0	14.5	51.0	30.5	108.0
TG (mg/dL)	36	126.2	69.6	108.0	40.0	307.8

SD: standard deviation; TC: total cholesterol; LDL-c: low-density lipoprotein cholesterol; HDL-c: high-density lipoprotein cholesterol; TG: triglycerides.

**Table 2.** Distribution of patients with meibomian gland dysfunction according to biochemical findings

Variable	n (%)
Fasting glucose (mg/dL)	
< 126	47 (88.7)
≥ 126	6 (11.3)
Glycated hemoglobin (%)	
≤ 6.5	37 (80.4)
> 6.5	9 (19.6)
TC (mg/dL)	
< 190	32 (65.3)
≥ 190	17 (34.7)
HDL-c (mg/dL)	
≤ 45	15 (33.3)
> 45	30 (66.7)
TG (mg/dL)	
< 150	26 (72.2)
≥ 150	10 (27.8)
LDL-c (mg/dL)	
< 115	27 (71.1)
≥ 115	11 (28.9)

Results expressed as n (%).

TC: total cholesterol; HDL-c: high-density lipoprotein cholesterol; TG: triglycerides; LDL-c: low-density lipoprotein cholesterol.

Regarding quality of life, the mean OSDI score was 32.6 ± 21.0, considered severe in 50.5% of the patients and moderate in 16.2%. A significant association was found between sex and quality of life ( $p = 0.049$ ), with mean OSDI score higher among women (35.2) compared to men (26.4).

An association was found between sex and HDL-c (numerical and categorical). Median HDL-c (54.5 mg/dL) was higher in women compared to men (45 mg/dL) ( $p < 0.001$ ). The percentage of patients with HDL-c > 45 was also higher among women compared to men ( $p = 0.044$ ).

Table 3 shows association between gynecological problems and clinical severity ( $p = 0.001$ ). The percentage of patients with mild MGD (Grade 1) was higher among those without gynecological problems (63.0%) and the percentage of patients with severe MGD (Grade 3) was higher among those with gynecological problems (41.7%).

**Table 3.** Associations between clinical severity and history of gynecological, dermatological, rheumatological, and cardiovascular problems and family history of cardiovascular disease in patients with meibomian gland dysfunction

Severity	History of gynecological problems (n = 75)		p-value
	No	Yes	
1	17 (63.0)	10 (20.8)	0.001*
2	6 (22.2)	18 (37.5)	
3	4 (14.8)	20 (41.7)	
History of dermatological problems (n = 108)			
1	29 (32.2)	8 (44.4)	0.603*
2	32 (35.6)	5 (27.8)	
3	29 (32.2)	5 (27.8)	
History of rheumatological problems (n = 108)			
1	33 (35.5)	4 (26.7)	0.394*
2	33 (35.5)	4 (26.7)	
3	27 (29.0)	7 (46.7)	
History of cardiovascular problems (n = 108)			
1	27 (46.6)	10 (20.0)	0.006*
2	19 (32.8)	18 (36.0)	
3	12 (20.7)	22 (44.0)	
Family history of cardiovascular disease (n = 108)			
1	7 (33.3)	30 (34.5)	0.910*
2	8 (38.1)	29 (33.3)	
3	6 (28.6)	28 (32.2)	

Results expressed as n (%).

1 = mild; 2 = moderate; 3 = severe.

\* chi-square test; † Fisher's exact test; ‡ likelihood-ratio test; § Student's t-test; ¶ Mann-Whitney test.

As association was found between cardiovascular problems and clinical severity ( $p = 0.006$ ). The percentage of patients with mild MGD (Grade 1) was higher among those without cardiovascular problems (46.6%) and the percentage of patients with severe MGD (Grade 3) was higher among those with cardiovascular problems (44%).

A significant association was found between quality of life (OSDI score) and clinical severity ( $p < 0.001$ ). Patients with moderate (Grade 2) and severe (Grade 3) clinical severity had higher mean OSDI scores compared to those with mild severity (Grade 1). In the multiple comparisons with Bonferroni correction, differences were found between Grade 1 versus 2 ( $p = 0.001$ ) and Grade 1 versus 3 ( $p < 0.001$ ).

As association was found between quality of life (categorical OSDI score) and clinical severity ( $p < 0.001$ ) (Table 4). The percentage of patients with mild severity (Grade 1) was higher among those with a normal OSDI compared to those with a moderate or severe OSDI score. Moreover, the percentage of patients with mild clinical severity (Grade 1) was higher among those with a mild OSDI score compared to those with a severe OSDI score. In the multiple comparisons with the Bonferroni corrections, significant differences were found between normal versus moderate ( $p = 0.006$ ), normal versus severe ( $p < 0.001$ ) and mild versus severe ( $p = 0.012$ ) OSDI scores.

**Table 4.** Association between clinical severity and quality of life (categorical OSDI score) in patients with meibomian gland dysfunction

Clinical severity	Normal	Mild	Moderate	Severe	p-value
1	14 (87.5)	10 (52.6)	5 (29.4)	7 (13.2)	
2	2 (12.5)	4 (21.1)	9 (52.9)	20 (37.7)	< 0.001*
3	0	5 (26.3)	3 (17.6)	26 (49.1)	
Total	16 (100.0)	19 (100.0)	17 (100.0)	53 (100.0)	
Multiple comparisons with Bonferroni correction					
Normal versus mild					0.108
Normal versus moderate					0.006
Normal versus severe					< 0.001
Mild versus moderate					0.786
Mild versus severe					0.012
Moderate versus severe					0.336

Results expressed as n (%).  
1 = mild; 2 = moderate; 3 = severe.  
\* Analysis of variance.

In the analysis of age and clinical-epidemiological variables of patients with MGD (Table 5), age group was associated with gynecological ( $p < 0.001$ ), dermatological ( $p = 0.006$ ), and cardiovascular ( $p < 0.001$ ) problems. Women 60 to 85 years of age had a higher frequency of gynecological problems (90%) compared to those 18-29 (30.0%) and 30 to 59 years of age (51.4%). Patients 18 to 29 years of age had a greater frequency of dermatological problems (46.2%) compared to those 30-59 (16.0%) and 60 to 85 years of age (8.9%). No patients 18 to 29 years of age had cardiovascular problems, differing significantly from those 30-59 (38.0%) and 60 to 85 years of age (68.9%). Patients 60 to 85 years of age had a higher frequency of cardiovascular problems (68.9%) compared to those 30 to 59 years of age (38.0%).

In the analysis of morphological abnormalities in patients with MGD, associations were found between age group and intensity of the symptoms ( $p < 0.001$ ), meniscus height ( $p = 0.003$ ), fluorescein staining ( $p = 0.009$ ), eyelid margin ( $p < 0.001$ ), secretion expression ( $p <$

**Table 5.** Associations between age group (years) and clinical-epidemiological variables in patients with meibomian gland dysfunction

Variable	Age			p-value
	18-29	30-59	60-85	
Sex (n = 108)				
Female	10 (76.9)	35 (70.0)	30 (66.7)	0.774*
Male	3 (23.1)	15 (30.0)	15 (33.3)	
Schooling (n = 108)				
Complete primary school	0	1 (2.0)	5 (11.1)	
Incomplete primary school	0	1 (2.0)	5 (11.1)	
Complete high school	1 (7.7)	3 (6.0)	2 (4.4)	0.098†*
Incomplete high school	0	1 (2.0)	3 (6.7)	
Complete higher education	10 (76.9)	41 (82.0)	25 (55.6)	
Incomplete higher education	2 (15.4)	3 (6.0)	5 (11.1)	
History of gynecological problems (n = 75)				
No	7 (70.0)	17 (48.6)	3 (10.0)	< 0.001*
Yes	3 (30.0)	18 (51.4)	27 (90.0)	
History of dermatological problems (n = 108)				
No	7 (53.8)	42 (84.0)	41 (91.1)	0.006*
Yes	6 (46.2)	8 (16.0)	4 (8.9)	
History of rheumatological problems (n = 108)				
No	13 (100.0)	41 (82.0)	39 (86.7)	0.245†
Yes	0	9 (18.0)	6 (13.3)	
History of cardiovascular problems (n = 108)				
No	13 (100.0)	31 (62.0)	14 (31.1)	< 0.001*
Yes	0	19 (38.0)	31 (68.9)	
Family history of cardiovascular disease (n = 108)				
No	3 (23.1)	12 (24.0)	6 (13.3)	0.398*
Yes	10 (76.9)	38 (76.0)	39 (86.7)	

Results expressed as n (%).  
\* Chi-squared test; † Fisher's exact test; ‡ likelihood-ratio test; § Student's t-test; ¶ Mann-Whitney test; || Kruskal-Wallis test; # analysis of variance.

0.001), secretion quality ( $p = 0.038$ ), OSDI ( $p = 0.037$ ) and categorical OSDI ( $p = 0.019$ ).

Considering the association between age group and clinical severity in patients with MGD (Table 6), the frequency of mild MDG (8.9%) was lower and the frequency of severe MDG was higher (48.9%) among those 60 to 85 years of age compared to those 18-29 (53.8% and 7.7%, respectively) and 30 to 59 years of age (52.0 and 22.0%, respectively).

**Table 6.** Association between age group (years) and clinical severity in patients with meibomian gland dysfunction

Clinical severity	Age			p-value
	18-29	30-59	60-85	
1	7 (53.8)	26 (52.0)	4 (8.9)	< 0.001*
2	5 (38.5)	13 (26.0)	19 (42.2)	
3	1 (7.7)	11 (22.0)	22 (48.9)	
Total	13 (100.0)	50 (100.0)	45 (100.0)	

Results expressed as n (%).  
1 = mild; 2 = moderate; 3 = severe.  
\* Likelihood-ratio test.

Considering biochemical findings, associations were found between age group and fasting blood glucose ( $p = 0.047$ ), glycated hemoglobin ( $p = 0.005$ ) and TC ( $p = 0.002$ ). Median fasting blood sugar was lower among patients 18 to 29 years of age (86 mg/dL) compared to those

60 to 85 years of age (100 mg/dL). Glycated hemoglobin was lower in patients 18 to 29 years of age (4.9%) compared to those 60-85 years of age (5.8%). Mean TC was lower in patients 18 to 29 years of age (117.0 mg/dL) compared to those 30 to 59 years of age (202.3 mg/dL). Total cholesterol < 190 mg/dL was more frequent in patients 18 to 29 (100%) and 60 to 85 years of age (77.3%). Among patients 30 to 59 years of age, 47.8% had TC < 190 mg/dL and 52.2% had TC ≥ 190 mg/dL.

In the analysis of quality of life, the mean OSDI was higher among patients 60 to 85 years of age (37.9) compared to those 30 to 59 years of age (26.9). A higher frequency of OSDI considered normal (27.1%) and lower frequency of OSDI considered severe (37.5%) were found in patients 30 to 59 years of age compared to those 18 to 29 (0.0% and 61.5%, respectively) and 60 to 85 years of age (6.8% and 61.4%, respectively).

## DISCUSSION

The greater occurrence of MGD in women is in agreement with data described in the literature and may be explained by hormonal and genetic differences that may influence susceptibility to the disease. Mean age of the patients with MDG (53.6 years) is also in agreement with data reported in the literature,<sup>(5,17)</sup> although some authors reported a mean higher than 65 years of age. This difference may be attributed to genetic factors, lifestyle, and exposure to climatic conditions and visual tasks. However, there is no consensus on age upon the emergence of MGD, as different studies may have employed different methods.

A large portion of patients had moderate symptoms, the most frequent of which were pruritus and/or eye discomfort, which is in agreement with data described in the literature.<sup>(14,18)</sup>

In the biomicroscopic analysis, most patients had slightly thickened eyelid margin, a moderate increase in vascularization, crusty and oily eyelashes, normal orifices or with mild obstruction and a posterior mucocutaneous junction, which is in agreement with the literature.<sup>(14,18)</sup>

Most patients had all meibomian glands functioning, with normal secretion quality (clear fluid secretion).

Dry eye tests revealed a slight reduction in eye protection capacity. Mean meniscus height was  $0.3 \pm 0.1$  mm, indicating normal tear film production. Moreover, fluorescein exam revealed an absence of keratitis in more than half of the patients and 48.1% had normal Schirmer's tests, indicating adequate tear film production. However, 72.2% of the patients had an abnormal TBUT, indicating greater tear evaporation. Morphological and functional

assessment and results of the dry eye test are important to the diagnosis, follow-up, and individualized treatment of these patients.

Laboratory analyses indicated high fasting blood glucose and glycated hemoglobin in 11.3% and 19.6% of the patients as well as high TC, HDL, LDL, and TG levels in approximately one-third of the patients. The occurrence of diabetes and dyslipidemia in individuals with MGD has been reported in the literature. Analyzing 335 diabetic patients, Tulsyan et al.<sup>(6)</sup> found that 211 had moderate to severe MGD. Dao et al.<sup>(9)</sup> verified a significant increase in TC and a reduction in HDL in patients with MGD. Guliani et al.<sup>(11)</sup> found an increase in the prevalence of high TC, LDL, and TG levels and low HDL levels.

These findings underscore the importance of monitoring blood glucose and lipid profile, as diabetes and dyslipidemia are risk factors for the development of cardiovascular diseases, which are the main causes of morbidity and mortality throughout the world<sup>(19)</sup> and can both affect the health of patients with MGD. Thus, health care providers should be attentive to these findings and adopt adequate prevention and therapeutic measures.

With regards to quality of life, most patients had OSDI score considered severe, which is in agreement with results reported by Badian et al.,<sup>(17)</sup> who found a high proportion of severe cases (51.7%). Moreover, a significant association was found between sex and quality of life, as the mean OSDI score was higher among women, as previously described by Guliani et al.,<sup>(11)</sup> indicating poorer quality of life in women compared to men with MGD. A significant association was also found between sex and HDL-c levels, with both HDL-c levels and the frequency of HDL ≥ 45 mg/dL higher among women, suggesting lower cardiovascular risk in female patients with MGD, which is in agreement with the literature.<sup>(11,20)</sup> These findings demonstrate the importance of sex in the assessment of quality of life and HDL-c levels in these patients.

An association was found between the clinical severity of MGD and gynecological and cardiovascular problems as well as quality of life (measured by the OSDI scores), as the percentage of severe MDG was higher among patients with gynecological and cardiovascular problems and OSDI score considered severe. These findings are relevant to the assessment and treatment of patients with this condition.

The association between severe MGD and gynecological problems has been described in the literature.<sup>(5,6,13,21)</sup> Investigating 619 patients with MGD, Viso et al.<sup>(22)</sup> found an association between cardiovascular disease and

asymptomatic MGD. The association between clinical severity of disease and quality of life suggests that more severe forms of the disease lead to poorer quality of life, which is consistent with findings of some researchers.<sup>(17,20,23)</sup>

In this series, an association was found between quality of life assessed using the categorical OSDI score and both clinical severity and age in patients with MGD, as older patients had greater disease severity and, consequently, poorer quality of life. These findings are in agreement with data reported in the literature.<sup>(17,20,23)</sup>

The association between age and gynecological problems is in agreement with data described by authors of previous investigations.<sup>(5,11,13)</sup> Studying 92 young women with polycystic ovarian syndrome, Baser et al.<sup>(22)</sup> found that 72.82% had MGD. Analyzing 210 women, Tulsyan et al.<sup>(6)</sup> found a significant risk of severe MGD in those who were in menopause.

A significant association was found between age and dermatological problems, which is in agreement with data described by Shimazaki et al.<sup>(24)</sup> in a sample of women with Stevens-Johnson syndrome and MGD, with dermatological problems more frequent in younger participants. Vieira et al. and Barbosa et al.<sup>(25,26)</sup> associated rosacea with MGD, which is more common in patients older than 30 years of age. Acet et al. also demonstrated the association between acne vulgaris, tear film instability, and DGM in 73 patients.<sup>(27)</sup>

Age was also associated with cardiovascular problems in patients with MGD, which is in agreement with findings described in the literature.<sup>(5,6,11,13)</sup> Older patients with MGD and cardiovascular problems require greater care and may need referral to other specialties, such as cardiology.

Present results demonstrate the association between disease severity and quality of life, underscoring the need for therapeutic approaches aimed at improving the quality of life of these patients. The results also demonstrate the importance of considering the age of patients with MGD in the clinical assessment, considering possible comorbidities and preceding conditions related to age group.

Regarding clinical and morphological findings, the intensity of symptoms was associated with the age of the patients, suggesting that symptoms may become more intense with age. In this investigation, patients 60 to 85 years of age had a higher frequency of moderate to severe symptoms, which is in agreement with authors of previous studies.<sup>(5,16)</sup>

Analyzing the associations between age and high fasting blood glucose, glycated hemoglobin and TC, which have also been reported in the literature,<sup>(6,9,11,13)</sup> age is a non-modifiable risk factor for a number of adverse health conditions that can affect patients with MGD

concomitantly. Therefore, multidisciplinary clinical follow-up of these patients is necessary.

The significant association between age and scores on the OSDI questionnaire indicate that dry eye severity varies with age, which is compatible with findings described in the literature.<sup>(14,17,28,29)</sup>

In the quality-of-life analysis, mean OSDI score was higher among patients 60 to 85 years of age, which is in agreement with some studies.<sup>(5,14)</sup> Special attention is required for older people with higher scores, indicating poorer quality of life related to ocular health.

The findings related to clinical and morphological aspects and quality of life associated with age in patients with MGD can contribute to improvements in ophthalmological practice through an adequate therapeutic approach for each age group, especially older patients, considering age-related metabolic changes. Further clinical studies are needed to confirm these results.

As MGD may signal other systemic illnesses, clinicians should be attentive to possible comorbidities and use a multidisciplinary approach involving different specialties to ensure comprehensive treatment. The early identification of MGD can enable intervening more rapidly and avoiding more severe complications.

This study has limitations that should be considered, such as the fact that the prospective clinical study was conducted at a single center. Moreover, the high OSDI scores were determined with the aid of questionnaire, which adds a degree of subjectivity in the interpretation of the results.

## CONCLUSION

In conclusion, this study indicated systemic impairment in patients with negative impact on quality of life and worse prognosis. The knowledge on the clinical-epidemiological profile, risk factors, and quality of life of patients with Meibomian gland dysfunction requires further scientific studies with larger sample size than that of the present investigation. The clinical importance of these results underscores the need for a multidisciplinary approach to patients with Meibomian gland dysfunction. Longitudinal studies focused on Meibomian gland dysfunction as a possible sign of other adverse health conditions are needed.

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