A Study on the Prevalence of Dry Eye Disease in Newly Diagnosed Autoimmune Disorders in a Tertiary Eye Care Hospital

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KEYWORDS
Dry eye, autoimmune disease, prevalence, Tear film breakup time (TBUT), Sjogren's syndrome.

ABSTRACT
INTRODUCTION: The aims of the study were to assess the prevalence and severity of dry eye in autoimmune disorders. The objectives included studying the prevalence of dry eye in patients with autoimmune disorders and assessing the severity of dry eye in each individual with an autoimmune disorder.
AIM: To assess the prevalence and severity of dry eye in patients newly diagnosed with Autoimmune disorders.
OBJECTIVES:
- To study the prevalence of dry eye in patients newly diagnosed with Autoimmune disorders.
- To assess the severity of dry eye in each patient with an Autoimmune disorder.

MATERIAL AND METHODS: The study design is a cross-sectional study. The study population included hospital-based population newly diagnosed with autoimmune disorders. The study was conducted in the state of Tamil Nadu, with the study setting being the Ophthalmology Outpatient Department at SBMCH. The study period was 11/2 years from Jan 2023 to June 2024. Ethical considerations include obtaining approval from the Medical Ethical Committee of Sree Balaji Medical College and Hospital before commencing the study. The resources and funding for the study was self-funded.
RESULTS: The mean age of the study participants were 32.34±9.05 years. Gender-wise, 43.8% were males, and 56.2% were females, indicating a female preponderance. Among the autoimmune disorders studied, Rheumatoid arthritis (32.9%), Psoriasis (27.4%),and Sjogren's syndrome (12.3%) were the most prevalent. Tear film meniscus height results revealed that 80.8% had TFMH <0.25% and 19.17% had TFMH 0.25-0.50mm.Tear film breakup time (TBUT) results revealed that 64.4% had TBUT more than 10 seconds, and 35.6% had 5 to 10 seconds. The Rose Bengal test showed positive results in 43.8% and was negative in 56.1% of patients. Schirmer's test 1 showed 35.6% had moderate dry eye followed by 32.8% had mild dry eye and 17.8% had severe dry eye. Schirmer's test 2 also showed 36.9% of patients had moderate dry eye,31.5% had mild dry eye and 20.5% had severe dry eye. Ocular surface disease index questionnaire (OSDI) indicated 38.4% had mild dry eye,30.1% had moderate dry eye,15.1% had severe dry eye and 16.4% had normal tear function.
CONCLUSION: The study provides a valuable understanding of the prevalence and characteristics of dry eye syndrome in a diverse population with various autoimmune conditions. The findings highlight important demographic patterns, ocular manifestations, and tear function parameters among individuals with autoimmune diseases.

1. Introduction

Dry eye as a complex disorder rooted in the intricacies of the tear film. It arises from a delicate balance between tear deficiency and excessive tear evaporation, resulting in damage to the interpalpebral ocular surface and the emergence of debilitating symptoms of ocular discomfort[1,2,3]. In clinical practice, the term "keratoconjunctivitis sicca" is often used interchangeably with dry eye. Also recognized as dry eye syndrome, dry eye disease, chronic dry eye disease, or keratitis sicca, it encompasses a spectrum of conditions marked by disruptions in the tear film. These disruptions may stem from reduced tear production, compromised tear quality, or excessive tear evaporation. The resulting ocular discomfort may manifest as irritation, a foreign body sensation, redness, or even more severe pathologies affecting the ocular surface[1,2,3].

Dry eye, far from being a simple ailment, represents a chronic and multifactorial condition. It can arise from deficiencies in one or more of the tear film's constituents or manifest as a component of systemic diseases, including but not limited to Sjogren's syndrome, lupus, and Stevens-Johnson syndrome. Environmental factors, such as contact lens use and exposure to harsh conditions like arid climates or windy environments, can exacerbate dry eye symptoms. Furthermore, dry eye's prevalence tends to rise with age, with estimates suggesting that nearly 75% of individuals over the age of 65 will encounter dry eye syndrome[4].

The etiology of dry eye often remains elusive due to its intricate web of causative factors, with autoimmune disorders emerging as the most prevalent among them. Effective management of autoimmune disorders holds the potential to control the progression of dry eye disease. Diagnosis, classification, and assessment of dry eye's severity necessitate a comprehensive evaluation that includes tests like the Schirmer test, tear break-up time assessment, ocular surface staining using sodium fluorescein, and the ocular surface disease index questionnaire. In this study, we embark on a journey to uncover the correlations between individuals with dry eye syndrome in those newly diagnosed with autoimmune disorders within a hospital-based population. Through such investigations, we aspire to shed further light on the intricate interplay of factors underlying this complex ocular condition and pave the way for more tailored and effective therapeutic approaches.

➢ AIMS:

• To assess the prevalence and severity of dry eye in patients newly diagnosed with Autoimmune disorders.

➢ OBJECTIVES:

• To study the prevalence of dry eye in patients newly diagnosed with Autoimmune disorders.

• To assess the severity of dry eye in each patient with an Autoimmune disorder.

2. Methodology:

➢ STUDY DESIGN: Cross sectional study

➢ STUDY POPULATION: Hospital based population newly diagnosed with Autoimmune disorders.

➢ STUDY AREA: Tamil Nadu

➢ STUDY SETTING: Ophthalmology department

➢ STUDY PERIOD: 1.5 years (January 2023 to June 2024)

➢ ETHICAL CONSIDERATION: institutional Medical Ethical Committee approval was obtained before starting the study.

➢ RESOURCES AND FUNDING: Self-funding

➢ SAMPLE SIZE AND SAMPLING METHOD:

Dobsons formula

$N=Z^2PQ/d^2$

Z=1.96;P=5;Q=95;d=5

N=1.96X1.96X5X95/25

N=73

➢ INCLUSION CRITERIA:

- Patients with newly diagnosed Autoimmune disorders presenting to the ophthalmology OPD
- Rheumatoid arthritis
- Systemic lupus erythematosus
- Sjogrens syndrome
- Ankylosing spondylitis
- Psoriasis
- Vitiligo
- Scleroderma

- Age Group: 18-50yrs

➢ EXCLUSION CRITERIA:

- Patients diagnosed with an autoimmune disorder already on treatment
- Meibomian gland dysfunction
- Eyelid disorders(Blepharitis,entropion,ectropion,Trichiasis)
- Medications(Atropine,Betablockers,isotretinoin,chlorpromazine, chlorpheniramine,methyldopa,morphine,promethazine)
- Meibomian gland tumours
- Post menopausal women

➢ STUDY TOOLS

- Patients fitting the inclusion criteria are taken as the study subjects.
- The purpose and details of the study protocol was explained to each subject and written informed consent was obtained.
- Detailed history regarding previous or present ocular complaints, current or past medications, family history was noted from study subjects.
- Ocular surface disease index(OSDI) questionnaire was given to each patient.
- All subjects were subjected to clinical evaluation using:

1. Slit lamp bio microscopy for anterior segment & ocular adnexa evaluation
2. Schirmer test-1
3. Schirmer test-2
4. Tear film meniscus height(TFMH)
5. Tear film breakup time(TBUT)
6. Best corrected visual acuity
7. OSDI questionnaire
8. Rose Bengal test

- Patient particulars: Name, Age, Sex
- Instruments used : Slit-lamp,Snellens chart, Schirmers strip, Flouresein strip,rose bengal stain.

3. Results:

Table 1: Distribution of age among the study participants (N=73)

SIno	Age	Frequency	Percentage
1	18-30	22	30.1%
2	31-40	19	26.0%
3	41-50	32	43.8%
Mean±SD		32.34±9.05	

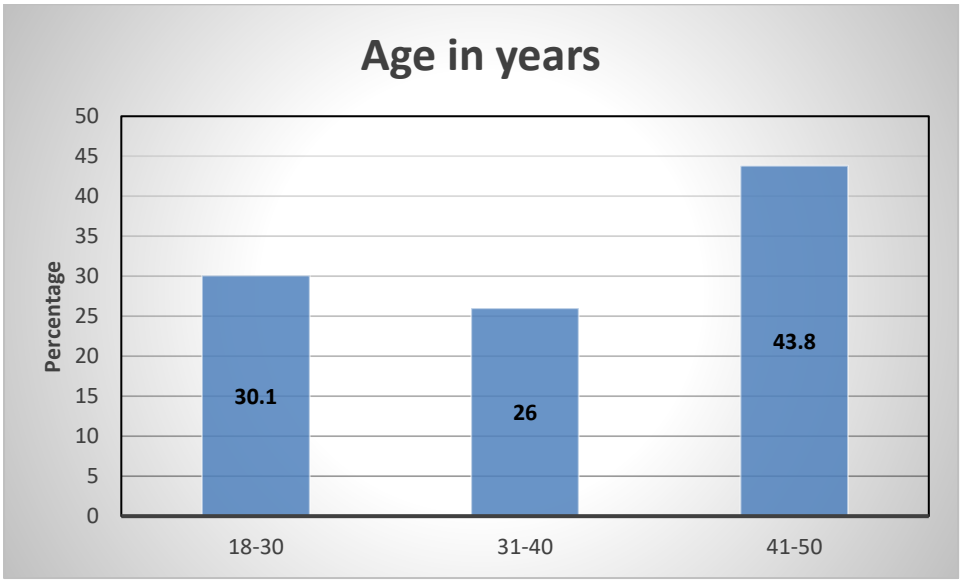

Figure 1: Distribution of age among the study participants (N=73)

The present study has shown that majority of the study participants with dry eye were in the age group of 41-50 years (43.8%) followed by 18-30 years (30.1%), 31-40 years (26%). Mean age of the study participants were 32.34±9.05 years.

Table 2: Distribution of gender among the study participants (N=73)

Slno	Gender	Frequency	Percentage
1	Male	32	43.8%
2	Female	41	56.2%

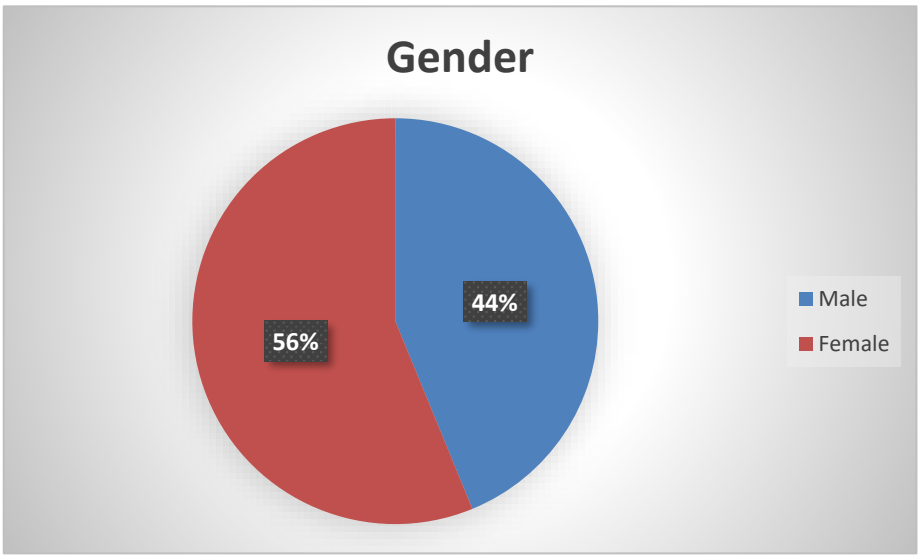

Figure 2: Distribution of gender among the study participants (N=73)

The present study has shown that majority of the study participants were females (56.2%) compared to males (43.8%).

Table 3: Distribution of diagnosis among the study participants (N=73)

Slno	Diagnosis	Frequency	Percentage
1	Ankylosing spondylitis	3	4.1%
2	Psoriasis	20	27.4%
3	Rheumatoid arthritis	24	32.9%
4	Scleroderma	2	2.7%
5	Sjogren's syndrome	9	12.3%
6	SLE	2	2.7%
7	Vitiligo	13	17.8%

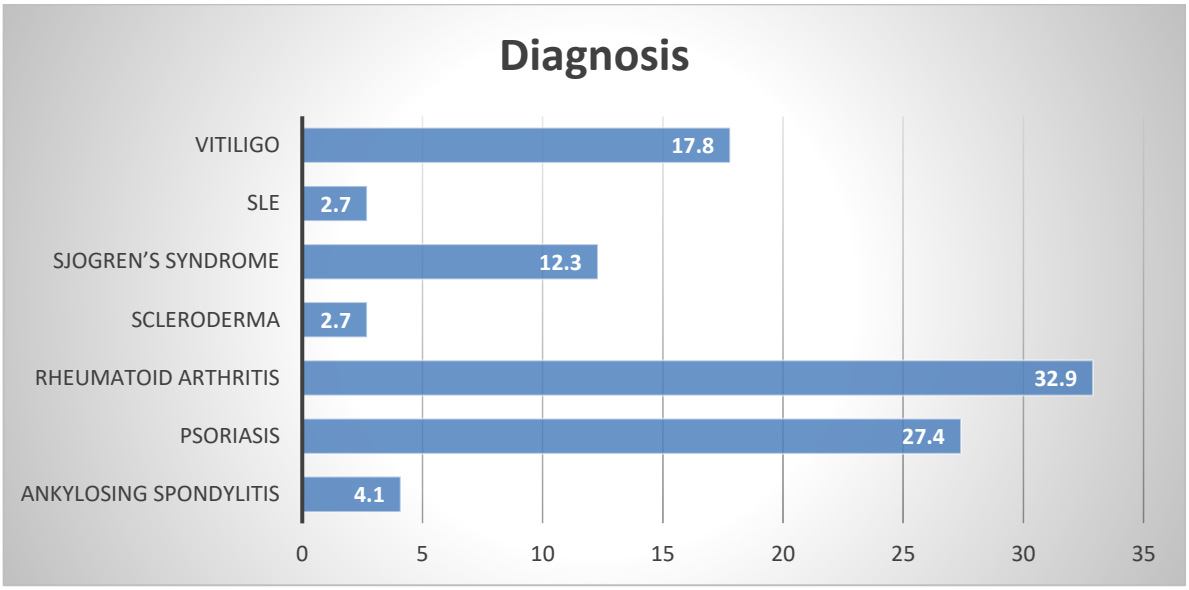

Figure 3: Distribution of diagnosis among the study participants (N=73)

The present study has shown that majority of the study participants who presented with dry eye were diagnosed with Rheumatoid arthritis (32.9%) followed by Psoriasis 27.4%, 17.8% Vitiligo, 12.3% Sjogren's syndrome, 4.1% with Ankylosing spondylitis and 2.7% Scleroderma and SLE respectively.

Table 4: Distribution of conjunctival congestion among the study participants (N=73)

Slno	Conjunctival congestion	Frequency	Percentage
1	Present	39	53.4%
2	Absent	34	46.6%

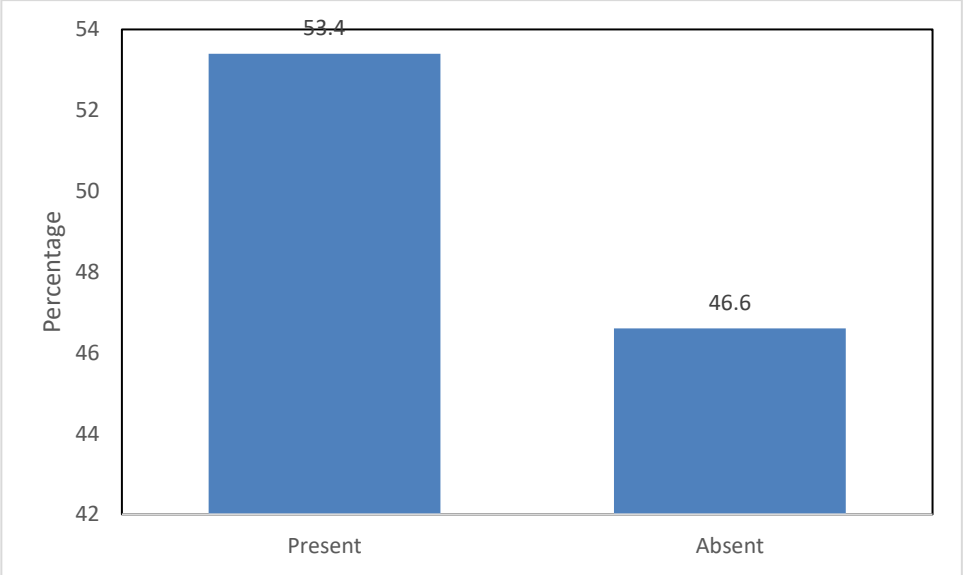

Figure 4: Distribution of conjunctival congestion among the study participants (N=73)

The present study has shown that participants diagnosed with dry eye had conjunctival congestion in 53.4% and was absent in 46.6%.

Table 5: Distribution of corneal dryness among the study participants (N=73)

Slno	Corneal dryness	Frequency	Percentage
1	Present	58	79.4%
2	Absent	15	20.5%

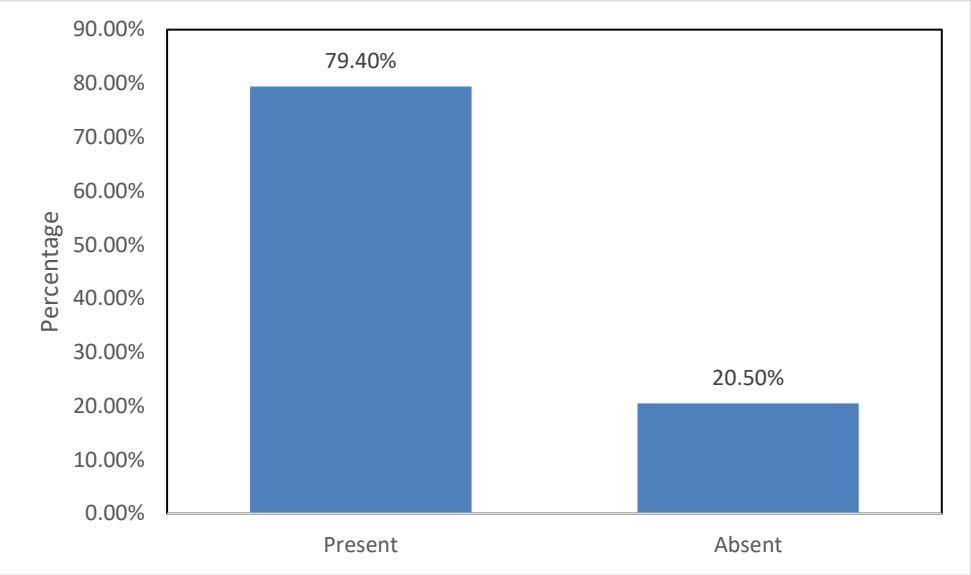

Figure 5: Distribution of corneal dryness among the study participants (N=73)

The present study has shown that the study participants with autoimmune disorder who presented with dry eye had corneal dryness in 79.4% and corneal dryness was absent in 20.5%.

Table 6: Distribution of refractive error among the study participants (N=73)

Slno	Best corrected visual acuity(BCVA)	Frequency (No of eyes)	Percentage
1	6/6 to 6/12	88	60.27%
2	6/12 to 6/60	48	32.87%
3	<6/60	10	6.84%

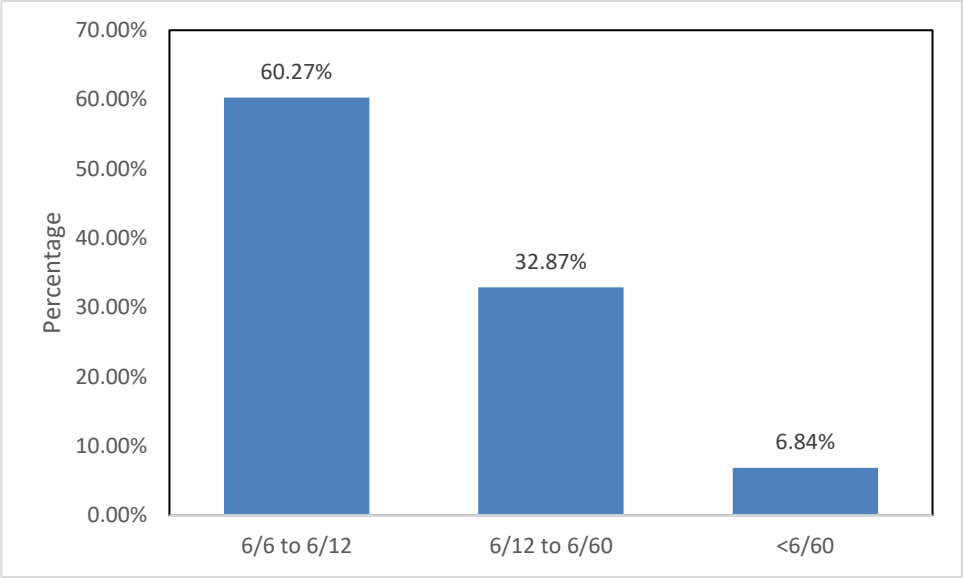

Figure 6: Distribution of refractive error on left eye among the study participants (N=73)

The present study showed that 88 eyes (60.27%) had best corrected visual acuity of 6/6 to 6/12. Around 48 eyes (32.87%) had BCVA of 6/12 to 6/60, 10 eyes (6.84%) had BCVA less than 6/60.

Table 7: Distribution of Schirmer's test-I among the study participants (N=73)

Slno	Schirmer's test -I	Frequency	Percentage
1	0-5 mm (severe dry eyes)	13	17.8%
2	5-10 mm (moderately dry eyes)	26	35.6%
3	10-15 mm (mildly dry eyes)	24	32.8%
4	>15 mm (normal tear function)	10	13.6%

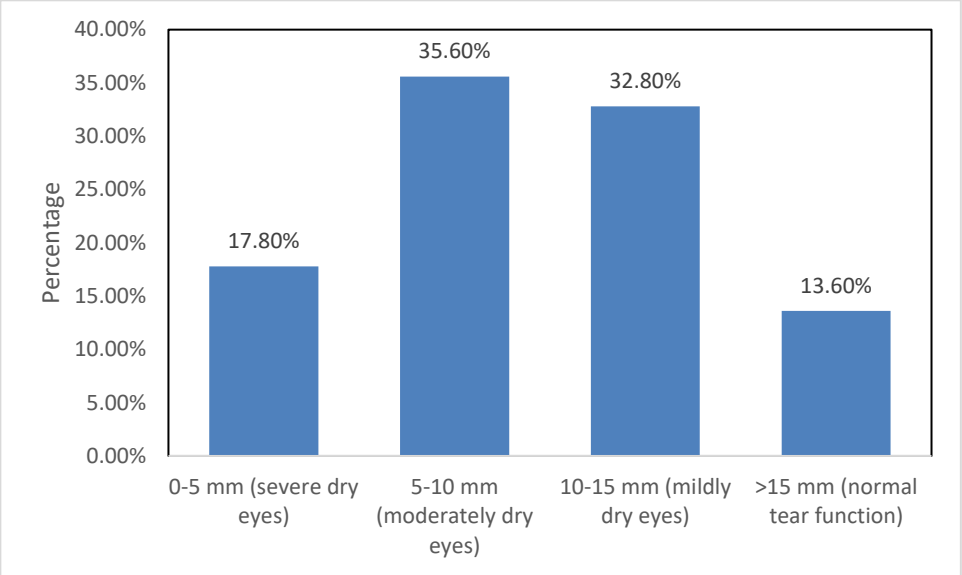

Figure 7: Distribution of Schirmer's test-I among the study participants (N=73)

The present study has shown that in Schirmer's test-I, normal tear function was present among 13.6% of the study participants. Mildly dry eyes were present among 32.8%. Moderately dry eyes were present among 35.6%. Severe dry eyes were present among 17.8%.

Table 8: Distribution of Schirmer's test-II among the study participants (N=73)

Slno	Schirmer's test -II	Frequency	Percentage
1	0-5 mm (severe dry eyes)	15	20.5%
2	5-10 mm (moderately dry eyes)	27	36.9%
3	10-15 mm (mildly dry eyes)	23	31.5%
4	>15 mm (normal tear function)	8	10.9%

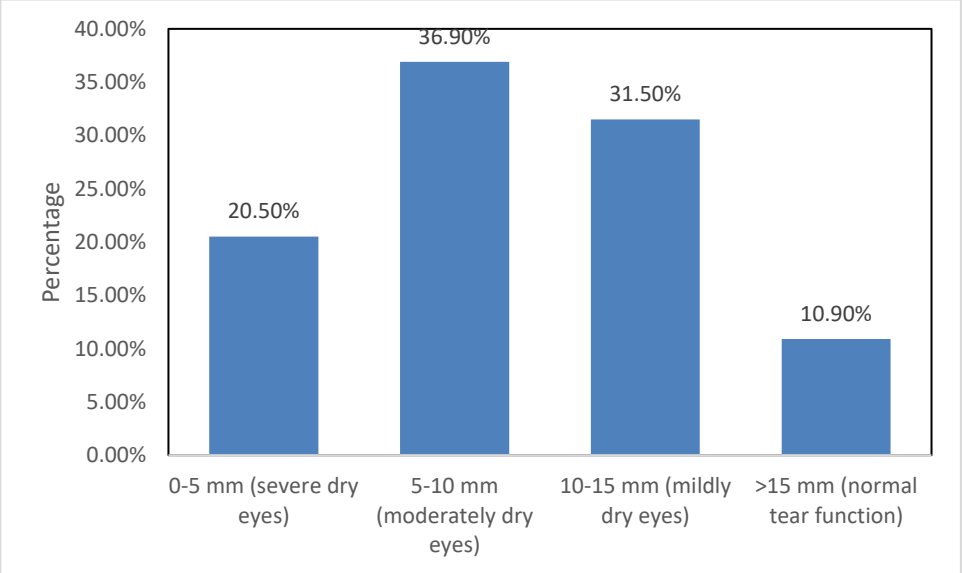

Figure 8: Distribution of Schirmer's test-II among the study participants (N=73)

The present study has shown that in Schirmer's test-II, normal tear function was present among 10.90% of the study participants. Mildly dry eyes were present among 31.5%. Moderately dry eyes were present among 36.9%. Severe dry eyes were present among 20.5%.

Table 9: Distribution of tear film meniscus height test among the study participants (N=73)

Slno	Tear film meniscus height	Frequency	Percentage
1	<0.25mm	59	80.8%
2	0.25-0.5mm	14	19.17%

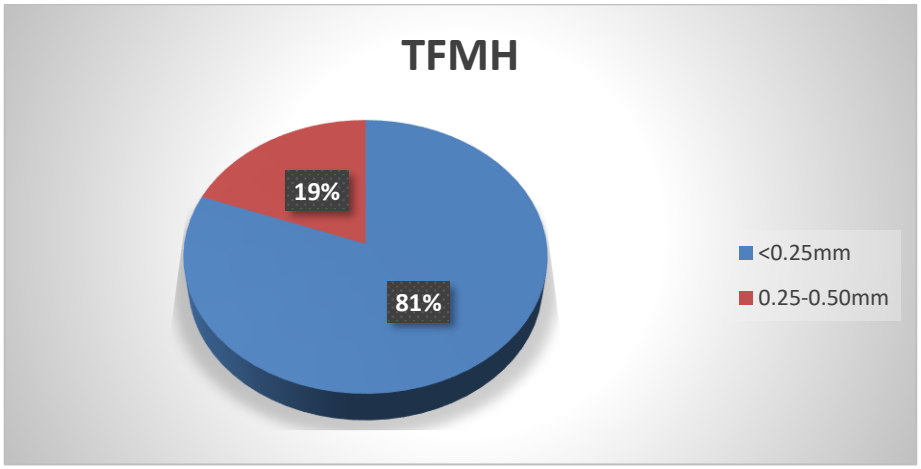

Figure 9: Distribution of tear film meniscus height among the study participants (N=73)

The present study has shown that around 80.8% had TFMH <0.25mm and about 19.17% had TFMH of 0.25-0.5mm.

Table 10: Distribution of tear film break up time test among the study participants (N=73)

Slno	Tear break up time test	Frequency	Percentage
1	>10 sec	47	64.4%
2	5 to 10 sec (Marginal)	26	35.6%

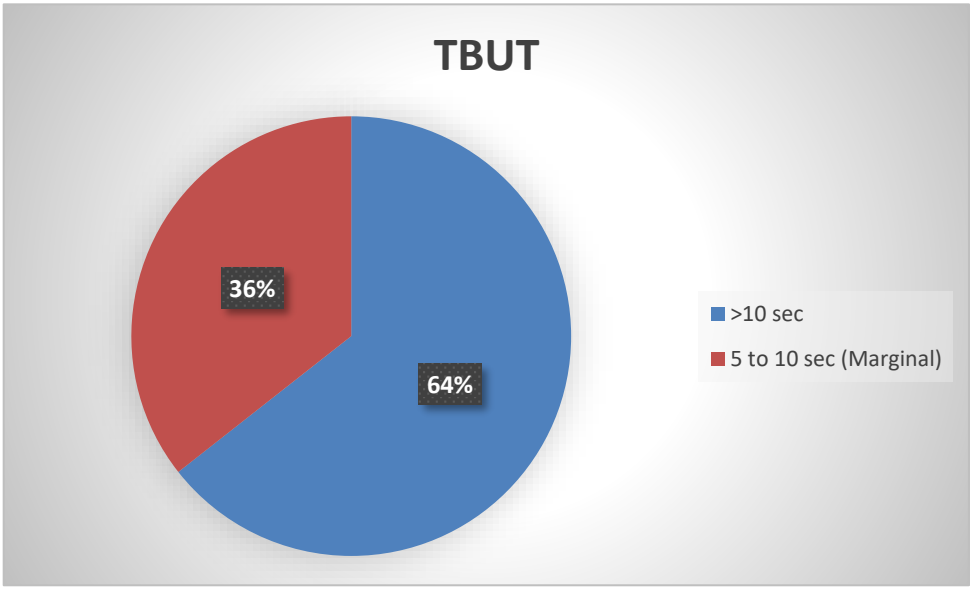

Figure 10: Distribution of tear break up time test among the study participants (N=73)

The present study has shown that around 64.4% had TBUT more than 10 seconds. About 35.6% had 5 to 10 sec.

Table 11: Distribution of OSDI questionnaire among the study participants (N=73)

Slno	Grading of dry eye	Frequency	Percentage
1	Mild (13-22)	28	38.4%
2	Moderate (23-32)	22	30.1%
3	Severe (>33)	11	15.1%
4	Normal	12	16.4%

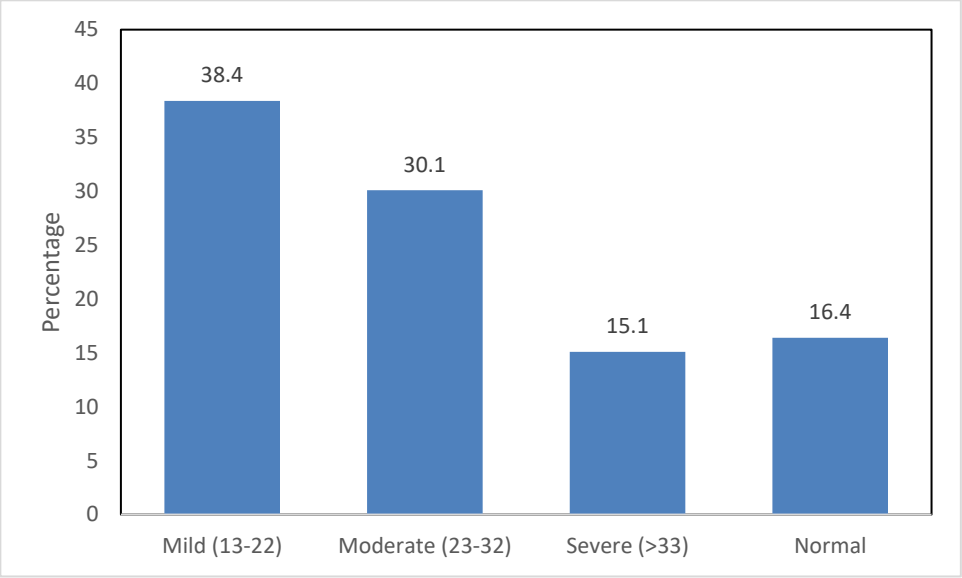

Figure 11: Distribution of OSDI questionnaire among the study participants (N=73)

The present study has shown that based on the OSDI questionnaire around 16.4% had normal tear function followed by mildly dry eye in 38.4%, moderately dry eye in 30.1% and severely dry eye in 15.1% of the study participants.

Table 12: Distribution of rose Bengal test among the study participants (N=73)

Slno	Rose Bengal test	Frequency	Percentage
1	Positive	32	43.8%
2	Negative	41	56.1%

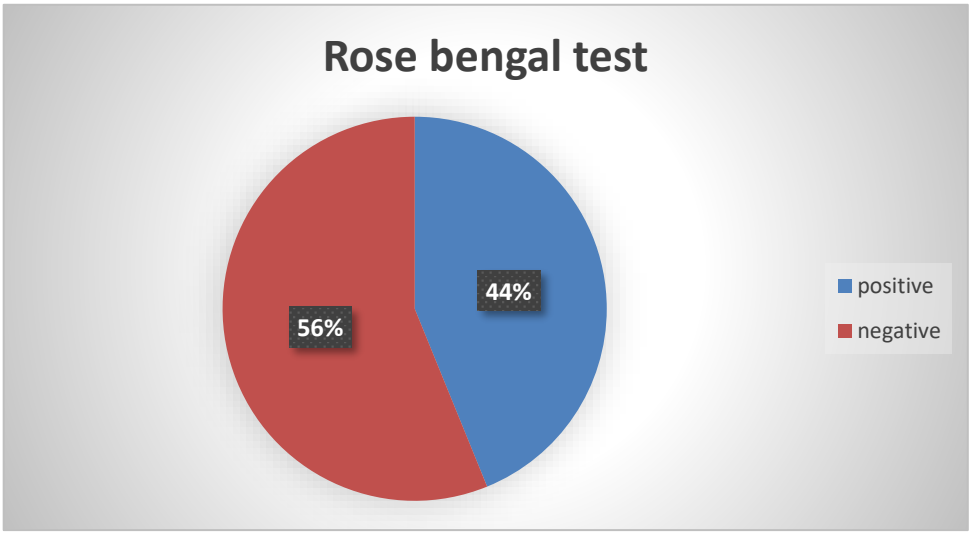

Figure 12: Distribution of rose Bengal test among the study participants (N=73)

Rose Bengal test was seen positive in 43.8% of patients and was absent in 56.1% of patients, which indicated that ocular surface damage related to dry eye syndrome was a common finding in autoimmune disorders and is a valuable tool for the early detection and effective management strategies

Table 13: Association of dry eye syndrome with autoimmune diseases among the study participants (N=73)

Diagnosis	Dry Eye		Total	X^2 (df), p
	Negative (n=34)	Present (n=39)		
Ankylosing spondylitis	1 (2.9)	2 (5.1)	3 (4.1)	0.22 (1), 0.64
Psoriasis	8 (23.5)	12 (30.8)	20 (27.4)	0.47 (1), 0.48
Rheumatoid arthritis	12 (35.3)	12 (30.8)	24 (32.9)	0.17 (1), 0.68

Scleroderma	1 (2.9)	1 (2.6)	2 (2.7)	0.01 (1), 0.92
Sjogrens syndrome	4 (11.8)	5 (12.8)	9 (12.3)	0.02 (2), 0.89
SLE	1 (2.9)	1 (2.6)	2 (2.7)	0.01 (1), 0.92
Vitiligo	7 (20.6)	6 (15.4)	13 (17.8)	0.34 (1), 0.56
Total	34 (100)	39 (100)	73 (100)	0.98 (6),0.98

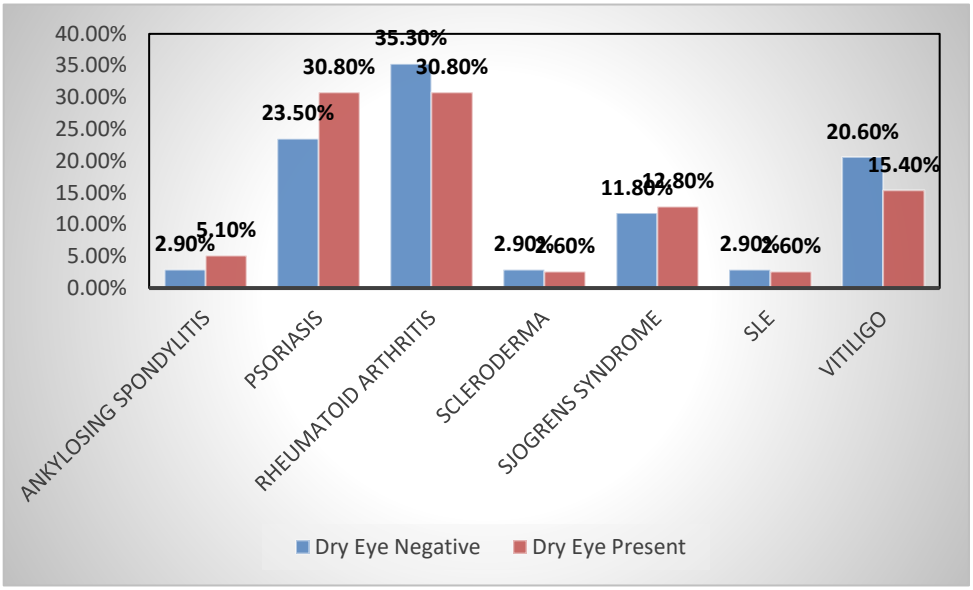

Figure 13: Association of dry eye syndrome with autoimmune diseases among the study participants (N=73)

The present study has shown that dry eye was present in 30.8% of patients presenting with rheumatoid arthritis,15.4% in vitiligo patients,30.8% in patients with psoriasis,12.8% in patients with Sjogrens syndrome,2% in ankylosing spondylitis and 1% in patients diagnosed with scleroderma and SLE.

The presents study has shown that there is significant association of dry eye syndrome with various autoimmune conditions.

4. Discussion:

The study provides insightful data on the prevalence of dry eye syndrome among individuals with various autoimmune conditions, shedding light on the distribution of age, gender, and specific autoimmune disorders within the study population.

Dry eye disease is one of the most common complications observed in autoimmune disease and the prevalence of dry eye was higher in patients with rheumatoid arthritis. Paulsen et al suggested that arthritis was significantly associated with dry eye syndrome. Allah et al found that rheumatoid arthritis can be accompanied by severe dry eye symptoms.

One striking observation is the age distribution, with a significant proportion (43.8%) falling within the 41-50 age group. This finding prompts considerations about the potential impact of age on the development of dry eye syndrome in individuals with autoimmune conditions. It would be interesting to explore whether the prevalence of dry eye varies across different age groups and if there are specific risk factors associated with certain age brackets. In a study by Tirakunwichcha et al[5] the mean age of the study participants were 43.6 years. In a study by Lai et al[6] the mean age of the study participants among rheumatoid arthritis patients were 49.6 years.

The gender distribution also stands out, indicating a female preponderance in the study population (56.2% females compared to 43.8% males). This raises questions about the potential influence of gender on the development of dry eye syndrome in autoimmune conditions. In a study by Tirakunwichcha et al[7] the female to male ratio were 4.75:1. In a study by Lai et al[8] 33.9% were males and 66.1% were females.

The breakdown of autoimmune conditions within the study population is comprehensive, with notable percentages for conditions such as Psoriasis, Rheumatoid arthritis, and Sjogren's syndrome.Exploring the relationship between specific autoimmune disorders and the prevalence or severity of dry eye syndrome could provide valuable clinical insights. For instance, understanding whether certain autoimmune conditions

predispose individuals to a higher risk of developing severe dry eyes could guide targeted management strategies.

The ocular findings, including conjunctival congestion and corneal dryness, provide additional dimensions to the study. The prevalence of these ocular manifestations and their association with dry eye severity could be explored further. Additionally, the visual acuity data on both eyes offer a comprehensive overview, indicating that a majority of participants had normal vision, but a subset exhibited varying degrees of impairment. Investigating the correlation between visual acuity and dry eye severity may offer valuable clinical correlations.

The assessment of tear function through parameters like Schirmers test 1, Schirmers test 2, TFMH (tear film meniscus height),TBUT (tear breakup time) and the Rose Bengal test provides valuable information on the physiological aspects of dry eye. Regarding Tear Break-Up Time (TBUT), our study showed that 64.4% of participants had TBUT more than 10 seconds, while 35.6% had TBUT between 5 to 10 seconds. In comparison, Rathore et al[9]. reported that 43.8% had normal TBUT and 56.2% had abnormal TBUT. In the study by Shrestha et al[10]., TBUT less than 10 seconds was observed in 86.3% for the right eye and 85.3% for the left eye. Our results suggest a better tear film stability among our participants compared to those in Rathore et al. and Shrestha et al., indicating a lower prevalence of tear film instability.

In our study, the OSDI questionnaire revealed that 16.4% of participants had normal tear function, while 38.4% had mild dry eyes, 30.1% had moderate dry eyes, and 15.1% had severe dry eyes. Comparatively, in the study by Rathore et al[9]., 18.5% of participants had normal OSDI scores, and 81.5% had abnormal scores. Shrestha et al[10]. provided a detailed breakdown, where moderate to severe dry eye was observed in 42.5% of participants, mild to moderate in 38%, mild in 18.25%, severe in 0.75%, and moderate in 0.5%. Our findings show a slightly higher prevalence of mild and moderate dry eyes compared to Rathore et al[9]., but align more closely with Shrestha et al[10]. regarding the distribution of severity.

In our study, Schirmer's test-I results showed normal tear function in 13.6% of participants, with 32.8% having mild dry eyes, 35.6% moderate dry eyes, and 17.8% severe dry eyes. Schirmer's test-II indicated 10.9% with normal tear function, 31.5% with mild dry eyes, 36.9% with moderate dry eyes, and 20.5% with severe dry eyes. Rathore et al[9]. reported that 50.8% had normal Schirmer test results and 49.2% had abnormal results. Shrestha et al[10]. found that in Schirmer's test, 81.8% for the right eye and 84.5% for the left eye had values greater than 10 mm, indicating better tear production. Our study indicates a higher prevalence of abnormal Schirmer's test results compared to Rathore et al[9]. and a significantly higher prevalence of dry eyes compared to Shrestha et al[10].

All the patients who had presented with autoimmune disorders associated with dry eye were given multifaceted treatment[11]. Artificial eye drops were used as the first line therapy for all patients. Cyclosporine eye drops was added for those patients with severe dry eye. Patients were counseled regarding nutritional supplements and avoiding environmental triggers like smoke and dry air[12]. The underlying autoimmune conditions were managed accordingly by the rheumatology department which help to alleviate dry eye symptoms[13].

STRENGTH:

The study includes a diverse range of autoimmune conditions, allowing for a comprehensive examination of dry eye syndrome across different disorders. This diversity enhances the generalizability of the findings to a broader population with autoimmune diseases. The study employed a thorough clinical assessment, including visual acuity, tear function parameters (TBUT, Rose Bengal test), and ocular manifestations (conjunctival congestion, corneal dryness). This comprehensive approach provides a nuanced understanding of the ocular status of participants. The study stratified participants by age and gender, enabling a detailed analysis of dry eye syndrome within different demographic groups. This approach enhances the ability to identify trends and potential risk factors specific to certain populations.

LIMITATIONS:

This cross-sectional study provides a snapshot of the prevalence and characteristics of dry eye at a specific point in time, but longitudinal studies would be needed to explore the temporal relationship between autoimmune conditions and the development of dry eye over time. The research may lack external validity due to its confinement to a single center. Regional variations in environmental factors, genetics, and healthcare access could influence the generalizability of the findings to broader populations. While the study identifies the

prevalence of dry eye and its association with autoimmune conditions, it may not extensively explore factors influencing the severity of dry eye symptoms, such as disease activity or specific treatment regimens.

5. Conclusion:

The study provides a valuable understanding of the prevalence and characteristics of dry eye syndrome in a diverse population with various autoimmune conditions. The findings highlight important demographic patterns, ocular manifestations, and tear function parameters among individuals with autoimmune diseases. The study contributes significantly to the current understanding of dry eye in individuals with autoimmune conditions, it serves as a foundation for further investigations. The identified trends and patterns underscore the need for future research to adopt longitudinal designs, address potential confounders, and explore treatment effects. A more nuanced exploration of the relationship between specific autoimmune disorders and dry eye severity could guide tailored interventions, ultimately improving the management and quality of life for individuals living with both autoimmune conditions and dry eye syndrome.

CONFLICT OF INTEREST: NIL:

FUNDING: SELF

APPROVAL OF INSTITUTIONAL ETHICAL REVIEW BOARD: INSTITUTIONAL HUMAN ETHICS COMMITTEE,002/SBMCH/IHEC/1876,26/12/2022

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AUTHORS' CONTRIBUTIONS : LETTER ENCLOSED

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