

Estimating the prevalence of dry eye among patients attending a tertiary ophthalmology clinic in Eastern India

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ABSTRACT

Background: Dry eye disease is a common multifactorial problem with increasing worldwide prevalence. Keeping all these facts in mind, the present study was undertaken to assess the magnitude of the problem reigning in this region. The present study was done to determine the prevalence, clinical features, and diagnostic test of dry eye disease in symptomatic patients attending the outpatient Department (OPD) of Ophthalmology, Mata Gujri Memorial Medical College and L.S.K. Hospital, Kishanganj, Bihar.

Materials and Methods: An effort was made to formulate a better approach for diagnosis and management of dry eye. In this hospital-based study, patients of aged >20 years and both sexes presenting with symptoms related to dry eye were subjected to a detailed history taking and a thorough ocular examination under a slit lamp biomicroscope. Then, a series of objective dry eye test was conducted in the following sequence: Tear meniscus height, tear break-up time test fluorescein staining, Schirmer's I test, and rose Bengal staining.

Results: The prevalence of dry eye in the ophthalmology OPD, Mata Gujri Memorial Medical College, Kishanganj, was found to be 52%. The prevalence of dry eye increased progressively with age having a peak in the age group >70 years was 11.4%. The prevalence of dry eye was found to be higher in females (31.2%) than in males (20.8%). A higher prevalence of dry eye was found in rural residents (36%) than in urban dwellers (16%).

Conclusion: Dry eye is an increasingly prevalent multifactorial condition. Subjective symptoms of dryness can hide diseases other than dry eye. Hence, combined clinical and laboratory tests are required to make a diagnosis coupled with a proper understanding of the subject. The prevalence of dry eye falls within the range of previous reported studies. Further studies are needed to determine whether this is due to racial or environmental factors. More research is needed to delve into the causes of dry eye to have a proper overview of the existing problem to enable the development of new treatments with promising effectiveness.

Key words: Dry eye, Eastern India, objective dry eye tests, prevalence, symptoms

INTRODUCTION

Dry eye disease is a common multifactorial problem with increasing worldwide prevalence. Lemp defined dry eye as “the disorder of tear film due to tear deficiency or excessive tear evaporation which causes damage to the inter palpebral ocular surface and is associated with symptoms of ocular discomfort.”^[1] The Dry Eye Workshop in 2007 decided to improvise the definition as follows: Dry eye is a multifactorial disease of the tear and ocular surface that results in symptoms of discomfort visual disturbance and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface.^[2,3]

The term “dry eye” can be attributed to the Swedish Ophthalmologist Henrik Sjogren, who described the triad of dry eye, dry mouth, and joint pains in the year 1933.^[4] The

term used commonly to denote dry eye in clinical practice is “keratoconjunctivitis sicca.” Keratoconjunctivitis sicca, also known as dry eye syndrome, dry eye disease, chronic dry eye disease, or keratitis sicca, refers to disorder of the tear film caused by reduced tear production, poor tear quality, or excessive tear evaporation. These disorders are associated with such symptoms of ocular discomfort as irritation foreign body sensation or redness and may cause disease of the ocular surface.^[4]

Dry eye is a chronic, multifactorial condition characterized by disturbances in the tear film and the ocular surface. It can be caused by deficiency of any one or more of the tear film components or can be component of systemic disease, including Sjogren's syndrome, lupus, and Stevens-Johnson syndrome. In addition, factors such as contact lens wear and adverse environmental exposure such as arid environments, windy conditions, or visual tasking can (computer vision

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syndrome) exacerbate the symptoms of dry eye. Furthermore, the prevalence of dry eye increases with age. It is estimated that nearly 75% of people over 65 will experience dry eye syndrome.^[5]

Majority of patients visiting our outpatient department (OPD) of Kishanganj area belongs to lower socioeconomic class. Residing in an unhygienic environment and being exposed to dust, smoke winds, etc., suffer from allergic conjunctivitis. Chronic untreated cases of allergic conjunctivitis present to our OPD with symptoms of dry eye. Hence, our study topic will have a strong correlation of prevalence of the disease with symptom.

Dry eye disease is one of the most common reasons for patients to visit an eye care professional. With the number of patients presenting with symptoms of dry eye ever increasing, the continuously changing lifestyle and environment, the development of newer diagnostic instrument, and the recent knowledge of the dry eye we are today better equipped to treat dry eye. However, a better understanding of the key and important presenting symptoms, the external and systemic factors contributing to dry eye, and the ideal battery of test of dry eye will help in early diagnosis of this chronic condition, with more efficient and effective treatment and long-term patient satisfaction.

The prevalence of dry eye varies from 10.8% to 57.1%,^[4-8] thereby showing wide disparity. Much of this disparity seems from the fact that there is no standardization of the types of patients selected for the study, dry eye questionnaires, objective tests, and dry eye diagnostic criteria.

The present study was conducted to determine the prevalence, clinical features, and diagnostic test of dry eye disease in symptomatic patients attending the OPD of Ophthalmology, Mata Gujri Memorial Medical College and L.S.K. Hospital, Kishanganj, Bihar.

MATERIALS AND METHODS

The present clinical study of dry eye was conducted at OPD of Ophthalmology, Mata Gujri Memorial Medical College Medical College and LSK Hospital, Kishanganj.

Duration of Study

The study duration was 2 years from August 2014 to July 2016.

Study Design

This was a cross-sectional, hospital-based study.

Inclusion Criteria

Patient above 20 years presenting with following symptoms in both eyes were included in the study:

1. Foreign body sensation
2. Burning sensation
3. Sand gritty feeling
4. Itching.

The above symptoms increase in conditions of low humidity and wind.

Exclusion Criteria

Patients <20 years of age, unilateral symptoms, H/O increased mucoid discharge and watery sensation suggestive of vernal keratoconjunctivitis, alkali burns, trachoma, acute ocular infections, ocular surgery within the past 6 months, and H/O impaired eyelid function such as Bell's palsy and nocturnal lagophthalmos were excluded from the study.

A detailed case sheet was prepared to each patient and the following patients were recorded. The study examination included a symptom interview that assessed foreign body sensation, burning sensation, and sand gritty feeling. The response was defined as positive when the subject reported a symptom to occur occasionally, frequently, or constantly. A complete general and ophthalmic history (e.g., h/o night blindness) was elicited. Exposure to sunlight/high temperatures, excessive winds, air pollution, smoking, and drugs was inquired for information about current occupation was also stressed on. It was followed by a through ocular and systemic examination (as mentioned in the pro forma). Then, a series of objective dry eye tests (under room temperature condition) were conducted in the following sequence: Tear meniscus height, tear break up time test, fluorescein staining, Schirmer test, and rose Bengal staining. A 5 min gap was allowed in between the tests to minimize reflex tearing and ocular surface changes secondary to staining. The presence of strands/filaments/meniscus floaters was looked for before and after the tests. Schirmer's test value ≤ 5 mm in 5 min on Whatman's filter paper No. 41, tear film break up time (TBUT) value < 0.3 mm, fluorescein/rose Bengal staining (Van Bijsterveld scoring), and presence of strands and/or filaments in either/both eyes were taken as indicators of dry eye. If two or more of the above observations were positive, the patient was deemed to be suffering from dry eye.^[9]

Ophthalmological Examinations and Investigations

The following examinations and investigations were done in the given sequence of orders.

1. Slit lamp examination
 - a. Anterior and posterior lid margins - For signs of blepharitis, meibomian gland evaluation.
 - b. Lower tear meniscus height - It is seen as a fluid meniscus along the upper edge of the lower lid margin under slit lamp magnification. The highest height of the lower tear meniscus was measured by comparing it with the 1 mm beam light of the slit lamp. A cut point of ≤ 0.3 mm was used for classifying an abnormal tear meniscus height.
 - c. Tear meniscus floaters - These were seen as bits of debris being carried along in the upper and lower tear menisci. They are composed of dead epithelial cells and small fibrils of lipid contaminated mucus.
 - d. Conjunctiva - Special emphasis was given on.
 - i. Bitot's spot - Seen as foamy dry spot in the bulbar conjunctiva near the limbus.
 - ii. Conjunctival xerosis - Appears as loss of smoothness of conjunctiva which wrinkles on movement of the eye ball.
 - iii. Symblepharon.
 - e. Rose Bengal staining - A sterile dye-impregnated rose Bengal strip is placed in the inferior cul-de-sac at

the junction of the middle and lateral one-third. The excess of dye is rinsed from the eye with normal saline solution, and then, the eye is then examined using red free illumination provided by the green filter in the slit lamp. The spots of staining will be noted as blackish red areas. Rose Bengal stains dead and devitalized cells on the ocular surface and also mucus and filaments. Next, the intensity of staining is assigned a score according to van Bijsterveld scoring. Here, the ocular surface is divided into three zones: Nasal bulbar conjunctiva, cornea, and temporal bulbar conjunctiva. Each zone is assigned a score in an arbitrary manner ranging from 0 to 3.^[10]

- Score 0 = No staining
- Score 1 = Mild staining
- Score 2 = Moderate staining
- Score 3 = Severe staining.

Minimum score - 0, maximum score - 9, and dry eyes - >4.

Fluorescein staining

A sterile, moist, dye-impregnated fluorescein paper strip is gently placed in the lower fornix of the junction of middle and lateral one-third. Early dry eye typically manifests as interpalpebral corneal staining with some spillover onto the lower one-third. Staining limited to the inferior one-third of the corneal surface denotes lid margin disease.^[11]

Schirmer I test

It is intended to provide a measure of tear production per unit time (both basal and reflex tear secretion). No. 41 Whatman’s filter paper of size 5 × 35 mm, with a notch cut at 5 mm from one end, is bent at the notch and placed at the junction of the middle and the lateral one-third in the conjunctival cul-de-sac of the lower lid. The patient is then asked to blink normally. The strip is then removed after 5 min and the extent of wetting from the 5-mm fold is recorded in millimeters; ≤5 mm of wetting in 5 min is taken as the cutoff value while a value of <10 mm is deemed to be a dry eye suspect whom is to be confirmed by other tests.^[11]

TBUT

It is done to measure tear film stability. It is the interval between a complete blink and the appearance of the first randomly distributed dry spot on the cornea. The test is performed with the patient seated at the slit lamp and all fans in the room switched off. The tear film is stained with fluorescein, and the patient is asked to blink a few times to allow tear film homeostasis. The eye is observed through the ocular of the slit lamp using diffuse illumination with the cobalt blue filter. The patient is asked to blink once and then keep the eye open normally till instructed to blink again. After a blink, the fluorescein-stained tear film is spread evenly across the corneal surface resulting in a uniform yellow-green appearance. As the tear film breaks up, a dark spot appears which rapidly enlarges as the tears recede from the lipid stained area of the corneal surface. The time taken for the appearance of the first random dark spot is noted. The test is repeated and the average of three values is noted as the tear BUT. It is important that the same spot does not appear each time because this could indicate a problem in that area of the cornea, which results in poor mucin and tear uptake. A TBUT of 10 s is recommended as the cutoff point for normal individuals by both Western and Indian authors.^[12]

RESULTS

In the present study, during the study period, a total of 13435 cases attended the Ophthalmology Outpatients Departments of Mata Gujri Memorial Medical College and LSK Hospital, Kishanganj, Bihar, with various ailments. Among those in unit-1, about 1173 patients had complained of dry eye. Out of which we had selected randomly 500 cases of symptomatic dry eye for data analysis. 673 patients were non-eligible because they did not fulfill our inclusion criteria and were in exclusion criteria group.

The total number of patients attending eye OPD in 2 years (August 1st, 2014–July 2016) was 13,435, of which the total number of patients presenting with symptoms related to dry eye was 5775 which accounts to 42.98%. The total number of OPD cases with symptoms related to dry eyes in unit-1 was 1173. Of which, the total number of cases surveyed was 500 based on inclusion criteria [Table 1].

The highest number patients presenting with symptoms related to dry eye belonged to the age group of 31–40 years (20%), followed closely by the age group of 61–70 years (19%) [Figure 1]. In the present series, the number of males 270 (54%) who had reported to us with symptoms related to dry eye was more than the females 230 (46%). Of 500 patients presenting with symptoms related to dry eye, 380 patients (76%) belonged to the rural setup while 120 patients (24%) belonged to the urban locality [Figure 2 and Table 6].

Table 2 shows that highest number of patients who presented with symptoms related to dry eye were farmers 37%, followed by housewife 25% [Figure 3]. The total number of cases surveyed

Table 1: The total number of patients attending eye OPD and number of patients with symptoms related to dry eye

Category	Number of cases (%)
Total number of cases in OPD	13,435
Total number of cases with symptoms related to dry eye	5775 (42.98)
Number of cases in unit-1	1173
Number of cases surveyed	500
	-

OPD: Outpatient department

Table 2: Distribution of dry eye according to occupation

Occupation	Number of patients with symptoms related to dry eye (%)
Housewife	125 (25)
Others with low exposure*	20 (04)
Farmers	185 (37)
Office workers	30 (06)
Others with high exposure**	65 (13)
Factory workers	75 (15)

*Retried person, **Computer operators, drivers salesman, mechanics, field workers, cooks, etc.

in 2 years was 500, of which the total number of cases clinically detected to have dry eye was 260 (52%).

Table 3 shows that the highest number of clinically detected dry eye belonged to the age group of >70 years (76%) followed by the age groups 31–40 years (55%). The variation between the other groups was not much either.

According to Table 3, though the number of male patients presenting with symptoms related to dry eye was more than the females, the number of clinically detected dry eye exceeded in the female (60%) than the males (40%).

According to Table 4, the prevalence of dry eye was highest in the farmers (24%) followed by housewife (12.4%).

DISCUSSION

The present study was focused in determining the prevalence of dry eye based on symptoms and dry eye objective tests in a period of 2 years in the eye OPD of Mata Gujri Memorial Medical College and LSK Hospital, Kishanganj, Bihar, to comprehend the magnitude of the problem in this region. The dry eye objective tests were conducted only on patients presenting with symptoms related to dry eye. At the end of the study period, 5775 patients presented with symptoms related to dry eye of 13435 patients that accounted to 42.98%.

Prevalence Rate of Dry Eye in 1 Year

Of the 5775 patients presenting with symptoms related to dry eye, a total of 1173 patients were treated in unit-1 of eye OPD. Of those, 500 patients were randomly surveyed for the study. Of which, 260 patients were found to have clinically detected dry eye. The prevalence rate of dry eye was thus found to be 52% (260/500) in 2 years. The prevalence of dry eye according to various past studies has a very wide variation, data ranging from 10.8% to 57.1%. The wide disparity emerges mainly due to the different dry eye diagnostic criteria employed and different cutoff values for objective dry eye tests. Our dry eye prevalence rate is high and falls with this range. This may be due to climatic and occupation implication with a high degree of patients belonging to low socioeconomic status. Furthermore, a selection bias based on symptoms alone cannot be ruled out. Finally, the relative lack of health awareness may be major factor undermining the actual

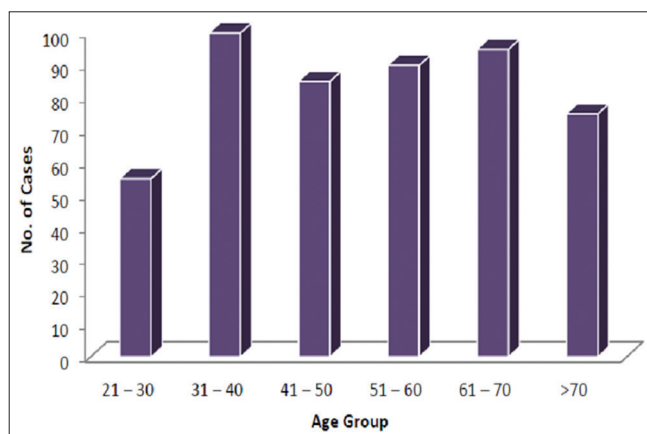


Figure 1: Age distribution in patients with symptoms related to dry eye

scenario of the problem. Table 5 shows the prevalence rate as found by some of the studies.

Our present study shows prevalence rate of 52%, which is comparable to the similar study done by Versura *et al.*^[8]

Dry Eye Prevalence According to Age Group

In our study, dry eye prevalence increased progressively with age, which is consistent with findings in other dry eye studies, and the age group >70 years (11.4%) showed a relative peak. This corresponds to the study by Moss *et al.*^[13] which showed an association between older age and an increase in dry eye symptoms. The next age group with peak is 31–40 years. According to Sahai and Malik,^[16] this peak reflects a dry eye state induced by environmental exposure, to which this age group, being the most active occupationally, is exceptionally prone. However, more research is required in this arena before a final conclusion can be drawn [Table 6].

Most studies report a higher prevalence of dry eye in females than in males. Our study was no exception; 31.2% females in the present study had dry eye compared to 20.8% in males [Table 7]. However,

Table 3: Percentage of clinically detected dry eye in symptomatic patients according to age

Age group (years)	Number of patients with symptoms related to dry eye	Number of dry eye patients (%)
21–30	55	28 (50.90)
31–40	100	55 (55)
41–50	85	34 (40)
51–60	90	40 (44.44)
61–70	95	46 (48.42)
>70	100	57 (76)

Table 4: Prevalence of dry eye in various occupational groups in 2 years (n=500)

Occupation	Number of patients with symptoms related to dry eye (%)
Housewife	62 (12.4)
Others with low exposure*	40 (08)
Farmers	120 (24)
Office workers	24 (4.8)
Others with high exposure**	09 (1.8)
Factory workers	05 (1)

Table 5: Comparison of the prevalence rate as found by some of the studies

Author	Prevalence rate (%)
Hikichi <i>et al.</i> ^[6]	17
Moss <i>et al.</i> ^[13]	14.4
Versura <i>et al.</i> ^[8]	57.1
Lee <i>et al.</i> ^[14]	27.5
Lin <i>et al.</i> ^[15]	33.7
Sahai and Malik ^[16]	18.4
Present study	52

Table 6: Comparison of prevalence rate in various age groups

Authors	Prevalence (%) in various age group (in years)					
	21-30	31-40	41-50	51-60	61-70	>71
Sahai and Malik ^[16]	13.9	20	16.2	16.9	19.4	36.1
Present study	5.6	11	6.8	8	9.2	11.4

Table 7: Dry eye prevalence according to sex in different studies

Authors	Prevalence (%)	
	Male	Female
Moss <i>et al.</i> ^[13]	11.4	16.7
Sahai and Malik ^[16]	14.9	22.8
Present study	20.8	31.2

Table 8: Comparison of dry eye prevalence according to place of residence by various authors

Authors	Prevalence (%)	
	Rural	Urban
Sahai and Malik ^[16]	19.6	17.5
Present study	36	36

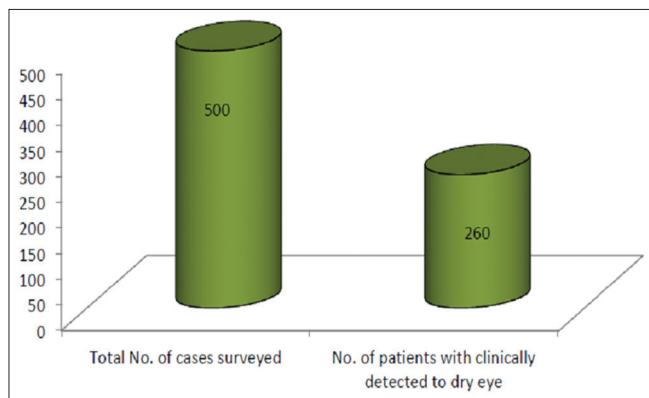


Figure 2: Prevalence of dry eye among study participants

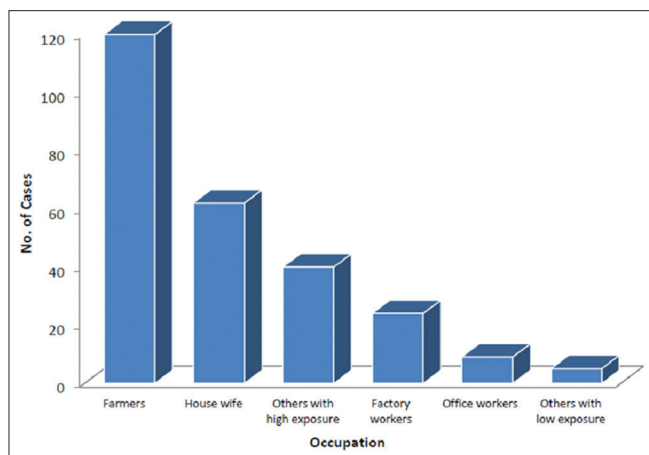


Figure 3: Prevalence of dry eye in various occupational groups in 2 years

the study by Jamaliah and Fathilah^[17] found no difference between females and males. Deficient tear secretion from estrogen deficiency in menopausal women that alters the local hormonal milieu of the lacrimal gland has been hypothesized to explain the sex difference, although studies have found that woman on hormone replacement therapy may have an increased risk of dry eye.

Dry Eye Prevalence According to Place of Residence

Our study noted higher dry eye prevalence in rural residents (36%) than in urban dwellers (16%) similar to results found by Sahai and Malik.^[16] However, reports from Japan by Hikichi *et al.*^[6] found the condition significantly more common in Tokyo than in suburban areas ($P < 0.01$). In our opinion, the increased rural prevalence in our study population was a consequence of the exposure of the rural residents, largely farmers, and manual laborers to sunlight and wind [Table 8].

Dry Eye Prevalence in Various Occupational Groups

In the present study, farmers (24%) were most affected with dry eye [Table 9].

CONCLUSION

Dry eye represents multifactorial, heterogeneous disorders of the pre-ocular tear film, which results in ocular surface disease. The tear film and the ocular surface form a complex and stable system that can lose its equilibrium through numerous disturbing factors. The quality of life reduces inevitably when symptoms of dry eye occur. These symptoms range from mild transient irritation to persistent dryness, burning, itching, redness, pain, ocular fatigue, and visual disturbance. Dry eye currently is most frequent disorder in ophthalmology practice worldwide, and the prevalence varies from 10.8% to 57.1%.

Keeping all these facts in mind, the present study was undertaken to assess the magnitude of the problem reigning in this region. Our main aim was to determine the prevalence of dry eye in the OPD ophthalmology, Mata Gujri Memorial Medical College and LSK Hospital, Kishanganj, Bihar (August 2014–July 2015). Furthermore, an effort was made to formulate a better approach for diagnosis and management of dry eye. In this hospital-based study, patients of aged >20 years and both sexes presenting with symptoms related to dry eye were subjected to a detailed history taking and a thorough ocular examination under a slit lamp biomicroscope. Then, a series of objective dry eye test was conducted in the following sequence: Tear meniscus height, tear break up time test fluorescein staining, Schirmer I test, and rose Bengal staining.

The result was documented in a presented pro forma and analyzed at the end of the study which can be summarized as follows:

Table 9: Dry eye prevalence in various occupational groups by various authors

Authors	Prevalence					
	Farmers	Housewife	Other with high exposure	Factory workers	Office workers	Others with low exposure
Sahai and Malik ^[6]	25.3	20.5	20.7	14.3	12.8	12.4
Present study	24	12.4	8	4.8	1.8	1

- The prevalence of dry eye in the ophthalmology OPD, Mata Gujri Memorial Medical College, Kishanganj, was found to be 52% which was well in the expected range of the existing studies.
- The prevalence of dry eye increased progressively with age having a peak in the age group >70 years (11.4%).
- The prevalence of dry eye was found to be higher in females (31.2%) than in males (20.8%).
- qA higher prevalence of dry eye was found in rural residents (36%) than in urban dwellers (16%).
- Finally, farmers (24%) were most affected by dry eye followed by the housewife group (12.4%).

The predominant cause of dry eye was oil deficient dry eye (i.e., anterior blepharitis and meibomian gland dysfunction) in all the age groups, whereas acquire primary lacrimal gland disease reigned in the older age groups, particularly in those above 70 years of age. Pterygium was seen to be a common cause of dry eye in the age group of 31–40 years followed by that in 41–50 years. Secondary Sjogren's syndrome particularly rheumatoid arthritis was also found to be a common cause of dry eye in the age group of 41–50 years and 51–60 years.

The suggested sequence of the tests for the diagnosis of dry eye is as follows: Tear meniscus height, tear breakup time test, fluorescein staining, Schirmer I test, and rose Bengal staining. Artificial tears remained the quintessential agent used in the treatment of dry eye with majority of the patients attaining relief from the discomforting symptoms of dry eye. Furthermore, every effort was made to treat the primary cause in each with moderate success.

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