Prevalence of Demodex Species Infestation in Patients with And Without Scaly Blepharitis

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ABSTRACT

Blepharitis is a common condition causing inflammation of the eyelid margins resulting in itching and inflamed eyelids. Staphylococcal dermatitis, seborrheic dermatitis, rosacea, contact dermatitis and parasitic infestations are some of the causes for blepharitis. Identification of the causative organism is important for instituting the right treatment for the relief of signs and symptoms.

Keywords: Demodex mite, madarosis, scaly blepharitis, seborrheic dermatitis, trichiasis, sub-clinical blepharitis

1. INTRODUCTION

Blepharitis is one of the most common inflammatory condition of the lids for which patients seek ophthalmic care. It is a chronic condition of eyelids which are associated with itching, redness, watering, burning sensation and foreign body sensation in the eye, scaly lesions at the base of lashes, loss of lashes, thickening of lid margins, misdirection of lashes, causing ocular discomfort impairing the patient’s quality of life [1].

Other than staphylococcal bacteria, there is growing evidence that blepharitis is caused by the mite called Demodex folliculorum or Demodex brevis which is a hair follicular mite living primarily in the eyelashes [2]. The adult Demodex folliculorum is 0.3 to 0.4 mm long and commonly found in the root of eyelashes whereas Demodex brevis is 0.15 to 0.2mm and it lives deep in the sebaceous glands and meibomian glands. These mites infest the epithelial cells of follicles and causes follicular distention and micro abrasions. This leads to misdirection of lashes and reactive hyper keratinization around the base of lashes respectively [3]. Due to these inflammatory reactions, it disrupts the lipid layer of the tear film and the patients will present with dry eye symptoms [4]. Dryness can cause irritation and burning sensation of eyes and it can affect the quality of life of an individual. Chronic dryness can also cause corneal epithelial defects, secondary bacterial or fungal infections and can also lead to devastating complications like corneal perforation and blindness if the corneal ulcer is not treated early and effectively. Hence it is essential to examine the patients with Blepharitis for Demodex mite [5].
It has also been found that these mites harbor in asymptomatic individuals. Even if these individuals are not having the symptoms of ocular surface inflammation, they are prone for getting the manifestations of blepharitis sooner or later [6]. Demodex infestation is often overlooked in the clinical investigation of blepharitis and may be a cause of treatment failure. Therefore, it is also necessary to examine the asymptomatic individuals for Demodex infestation as they would be having subclinical blepharitis. Demodex infestation is diagnosed by identification of the parasite at the root of the lashes with dissecting microscopy. The prior establishment of the parasite in individuals with subclinical blepharitis helps for their better treatment and outcomes [7].

With the knowledge of many previous studies, Demodex infestation is more common among old aged people and the risk of infestation also increases with age. Chronic sun light exposure, skin phenotype, alcohol intake, smoking, stress, severe rosacea and immune compromised state are suggested risk factors for developing Demodex infestation [4]. The Demodex mite harboring in the lash follicle will cause micro abrasions by its claws which result in epithelial hyperplasia and reactive hyper keratinization around the base of lashes forming cylindrical dandruff. Hence the cylindrical dandruff in the eyelash is one of the common findings in patients with Blepharitis and it has been regarded as pathognomonic of Demodex infestation by various studies [8].

The Demodex mites can also cause blepharitis indirectly by carrying bacteria on its surface [9].

The purpose of writing this paper is to reinforce that demodex mite infestation is present in both scaly and non-scaly blepharitis patients, which largely remains as an undiagnosed etiology and establishing its presence aids in initiating the appropriate treatment measures.

The aims and objectives of this study were:

1. To detect the presence of Demodex species in patients with blepharitis.
2. To estimate the prevalence of infestation of Demodex mites in patients with blepharitis.
3. To establish that blepharitis is caused by Demodex.
4. To detect the presence of Demodex in individuals without clinical blepharitis.
5. To estimate the risk of Demodex infestation in individuals with subclinical Blepharitis.

2. METHODS

Study setting
This is an observational, analytical and cross-sectional study in which patients with and without blepharitis coming to the ophthalmology Out Patient Department were included.

Study duration
This is a hospital-based study which was conducted over a period of 2 months.

Study population
Inclusion criteria
Two groups of individuals will be included in this study.

Group I: Individuals with clinical blepharitis (patients having scaly lesions in their lid margin)
Group II: Individuals without clinical blepharitis (patients coming with Any of following complaints without scaly lesions in their lid margin,

- Burning sensation in the eye
- Foreign body sensation in the eye
- Watery eye
- Itching in the eye
- Loss of lashes
- Misdirection of lashes

Exclusion criteria
- Patients with diabetes mellitus
- Post-operative patient

Sample size
The sample size is calculated by taking the prevalence as 43% at 5% significance level and 25% allowable error, Based on the formula, \( P= \frac{4PQ}{L^2} \)

\( P= \) Proportion of blepharitis patients with Demodex infestation (43%)
\( Q= 1-P \) (57%)
\( L= 25\% \) of \( P \)

Required sample size
85 patients with scaly blepharitis and 85 without clinical scaly blepharitis will be included in the study.

Study design and data collection
The study was carried out after getting Institute Ethics Committee Clearance. Informed consent was obtained from each participant after explaining about the study. Patients coming to the Ophthalmology Out Patient Department with any of the complaints of itching, burning sensation and foreign body sensation in the
eyes, thickening pf lid margins, irritation in the eyes, loss of eye lashes, misdirection of lashes with scaly lesions at the base of lashes and also without scaly lesions of the lid margin were examined under the slit lamp after explaining the need for the evaluation. After the meticulous examination under the slit lamp, patients with scaly lesions and without scaly lesions were categorized into patients with blepharitis (Group I) and without scaly blepharitis (Group II) respectively.

For the patients with blepharitis, presence of anterior or posterior blepharitis was noted. In blepharitis patients, the eyelashes from the eyelid more preferably at the site of scaly lesions and eyelashes with cylindrical dandruffs were removed carefully under slit lamp bio-microscope using epilation forceps. Two lashes per eye was removed to get four eyelashes per patient. In the patients without scaly blepharitis, the eyelashes were removed randomly. The epilated eyelashes were kept in the glass slide with a drop of absolute alcohol (99.9%) and it was covered by coverslip. This prepared mount was taken to the microbiology laboratory within 20 minutes to prevent the evaporation of alcohol. The root of the follicles, two lashes per mount were examined under dissecting microscope for the presence or absence of Demodex. After the meticulous examination of the mount, the inference was made as Demodex positive sample or negative sample.

**Statistical analysis**

The data collected was subsequently entered in the EXCEL Sheet and analyzed using SPSS software. The data was described using descriptive statistics such as frequency, mean and standard deviation. Chi square test was used to test the association in nominal data.

### 3. RESULTS

A total of 170, 85 patients with scaly blepharitis and 85 patients without scaly blepharitis were selected after ensuring that they satisfied inclusion and exclusion criteria.

**Prevalence of Demodex infestation among patients with scaly blepharitis**

\[
\text{Prevalence} = \left( \frac{\text{number of positive cases of demodex}}{\text{patients with blepharitis}} \right) \times 100 = \left( \frac{37}{85} \right) \times 100 = 42.5\%
\]

**Prevalence of Demodex infestation among patients without scaly blepharitis**

\[
\text{Prevalence} = \left( \frac{\text{number of positive cases of demodex}}{\text{patients without blepharitis}} \right) \times 100 = \left( \frac{36}{85} \right) \times 100 = 42.353\%
\]

Out of 170 people in the study group, 42.9% of people that is 73 persons were found to have Demodex infestation whereas 57.1% of people that is 97 persons were found negative for Demodex infestation.
Table 1: Age of Patients

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>84</td>
<td>48.27</td>
<td>19.002</td>
</tr>
</tbody>
</table>

In the study population of 170, Age of the patients ranged between the minimum a of 8 years to the maximum of 84 years with the mean of 48.27 with the standard deviation of 19.002

![Figure 3: Distribution of age among the study population](image)

This figure shows the prevalence of Demodex in each age group of population under the study. From the table the maximum prevalence of 80% was seen in the age group of 81-90 and the minimum prevalence of 0% was seen in the age group of 1-10. It was clearly seen that the prevalence of Demodex increases with the age which implies that the risk of Demodex Infestation is increasing with the increase of age.

![Figure 4: Prevalence of Demodex in each age group](image)

Table 2: Distribution of male and female among the two groups

<table>
<thead>
<tr>
<th>Gender</th>
<th>Blepharitis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Scaly Blepharitis</td>
<td>Scaly Blepharitis</td>
</tr>
<tr>
<td>Male</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>Female</td>
<td>43</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Chi Square</td>
<td>0.212</td>
<td>P – Value 0.645</td>
</tr>
</tbody>
</table>

Out of 170, 81 persons (47.6%) are male and 89 persons (52.4%) are female.

Group I (Patients with scaly Blepharitis): Out of 85, 39 persons (45.9%) are male and 46 persons (54.1%) are female.

Group II (Patients with non-scaly blepharitis): Out of 85, 42 were male and 43 were female.

![Figure 5: Association between Gender and Blepharitis](image)

There is no statistically significant difference in the distribution of male and female among the study groups (p=0.645 > 0.05)

4. DISCUSSION

In the present study, a total of 170 participants were selected from the population who were coming to the Ophthalmology Outpatient Department of tertiary care center and satisfying the inclusion and exclusion criteria. Two eyelashes from each lid was removed. These eyelashes were mounted on a glass slide and a drop of absolute alcohol was applied and cover slips were placed over the lashes. The lashes were examined under the dissecting microscope for detecting the presence of Demodex and their presence or absence.
were noted and entered into the excel sheet which was already prepared.

In this study, out of 170 participants, 73 persons (42.94%) were found to have Demodex mite infestation. Out of 73 positives, 37 persons (50.7%) were the Blepharitis patients with scaly lesions and 36 persons (49.3%) were the patients without scaly Blepharitis.

The Demodex positive cases were not statistically showing difference between Scaly Blepharitis group and the group without Scaly Blepharitis (p=0.877 >0.05). The result of our study is supported by the study by Kemal M et al. titled “The Prevalence of Demodex folliculorum in blepharitis patients and the normal population”. According to his study, Demodex mite was found in 28.8% of patients with blepharitis and in 26.7% of controls in which the difference between the two groups was not statistically significant (p>0.05). Therefore, the study had concluded that Demodex mite was highly prevalent in both the Scaly and Non-scaly Blepharitis [10].

In our study, the overall prevalence of Demodex mite was found to be 42.94%. The prevalence of Demodex mite among Scaly Blepharitis Group was 43.5% (37/85) and the prevalence of Demodex mite among the patients without Scaly Blepharitis was 42.35% (36/85) showing that the prevalence of Demodex was high among both the groups which was nearly equal. This could be explained by the fact that the Demodex mite harbours in the lash follicle and those mites which hold tightly to the lash comes out with the lash and they are detected and many more of the mites could be left in the lash follicle as quoted in Costons observations in “Demodex folliculorum blepharitis” [11].

The subclinical patients presenting with symptoms such as itching, redness, watering, burning sensation and foreign body sensation in the eye, loss of lashes and misdirection of lashes without scaly lesions should be carefully examined under slit lamp and their lashes should be examined for the presence of Demodex as they also have the risks of Demodex infestation like that of Scaly blepharitis patients. The addition of an immersion solution such as absolute alcohol dissolves the cylindrical dandruff-Demodex complex formed by keratins and lipids and helped to achieve accurate counting of Demodex as explained by Scheffer C.G.Tseng et al [12] in their article “High prevalence of Demodex in eyelashes with cylindrical dandruff”.

In our study, the age of patients ranged from 8 years to 84 years with mean of 48.27 years. From figure 4, it is found that the prevalence was the highest in the maximum age group and also the prevalence of Demodex infestation was increasing with increase of age that is from 0% in 1-10 years of age to 80% in 81 - 90 years of age. From the results it is clearly found that the risk of Demodex infestation is high among old age and the risk increases proportionately with increasing age. This result is in consistent with the study done by SeokHyunlee et al titled “The Relationship between Demodex and ocular discomfort” in which the Demodex showed positive correlation with increased age (p<0.05).

Out of 73 Demodex positive cases, 38 persons (52.1%) were male and 35 persons (47.9%) were female. There was no significant association found between the Demodex infestation and sex of the individual as consistent with other studies [10].

According to our study Demodex was isolated almost equally from both blepharitis patients with scaly lesions and without scaly lesions. This could be due to the fact that the Demodex infestation could be high and could be buried under the skin as the predilection for the mite is in the lash follicle and meibomian gland as supported by the study done by Scheffer Tseng et al [12].

5. CONCLUSION

The results of the study prove the fact the problem of Demodex infestation is still at large not only in patients presenting with scaly lesions but also in patients without and most of the times it is left undiagnosed and untreated.

The large percentage of sub-clinical blepharitis is caused due to Demodex which is unsuspected and remains undiagnosed. As a result, patients continue to have chronic inflammation of lid margins affecting the function of meibomian glands and causes lid margin abnormalities like madarosis, tylosis and trichiasis. Ocular surface disorders like severe dry eye occurs due to altered lipid layer of the tear film leading on to corneal epithelial defects, corneal ulceration and sometimes even perforation of these ulcers and blindness. Therefore, judicious suspicion for the possible Demodex infestation in patients with complaints of itching, irritation, loss of lashes, and abnormality of lid margins associated with burning sensation of eyes and evaluation of lids under slit lamp, microbiological evaluation and its identification helps in arriving at the right diagnosis.

The conventional method of treating blepharitis to scrub the lids with baby shampoo and to apply antibiotic steroid eye ointments along with oral

tetracycline 500mg three times daily for a period of 4 weeks would only cure Blepharitis due to bacterial infection but does not eradicate the infestation due to the Demodex mite. Therefore, identification of this mite would be prudent for effective diagnosis, treatment and eradication of this mite to prevent the devastating vision threatening complications which would eventually ensue if left untreated.

6. SUMMARY

This study shows that Demodex mite infestation exist both in patients with scaly blepharitis and in non-scaly blepharitis. This leads on to the fact that there is a large population of chronic sub-clinical Blepharitis patients who are left undiagnosed and untreated. Demodex infestation also as a cause of blepharitis in patients with both scaly lesions and non-scaly lesions had been established. Demodex infestation is also found increasingly in the elderly population. Knowledge of the causative mite for blepharitis and other ocular surface disorders throws light on various treatment options.

7. SUGGESTIONS

Following the results of the study Blepharitis could be treated in 3 phases.

Phase 1
Lid scrubs with diluted baby shampoo with cotton tipped buds to remove the crusts at the lid margins. This helps in removing epithelialized Meibomian orifices and facilitates opening of the Meibomian ducts and thereby enhances its secretion.

Phase 2
A self-mixed solution made up of 50% Tea Tree Oil mixed with 50% Macadamia nut oil is applied with cotton tipped bud on both the upper and lower lid margins and left for 10 minutes and this procedure is again repeated and left for 10 minutes and rinsed thoroughly. The lid margins are re-assessed and repeated after 2 weeks.

Phase 3
2 weekly review and review once in 6 months Can be supplemented with one dose of oral Ivermectin 200 mcg/kg and the treatment is repeated after 7 days. By this intervention the Demodex Blepharitis could be treated and eradicated.

REFERENCES

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