



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 06(B), pp. 32817-32821, Jun, 2019

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

OUTCOME OF INTERVENTIONS FOR DEMODEX BLEPHARITIS IN A TERTIARY CARE CENTRE

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DOI: <http://dx.doi.org/10.24327/ijrsr.2019.1006.3550>

ARTICLE INFO

Article History:

Received 13th March, 2019
Received in revised form 11th
April, 2019
Accepted 8th May, 2019
Published online 28th Jun, 2019

Key Words:

Demodex mite, Scaly blepharitis,
Non-scaly blepharitis, Pre-diabetes,
Rosacea, Tea tree oil

ABSTRACT

Ocular Demodicosis is a commonly underdiagnosed and most frequently overlooked pathology of the eyelid margins causing chronic anterior and posterior blepharitis leading to meibomian gland dysfunction, recurrent chalazion, chronic ocular surface inflammation and refractory keratoconjunctivitis. Identification of the demodex can be done only by examining the lash follicle and detection of the mite under microscope and in-vivo detection using confocal microscopy. Establishing the etiology of chronic blepharitis is important for instituting the right treatment for cure and relief of signs and symptoms. Seventy patients who were detected to have demodex mite in the lash root were treated with Tea tree oil (TTO) which is the current treatment of choice and were followed after 4 weeks for assessment of the subjective signs and symptoms and detection of the mite in the lash root. Tea tree oil contains terpinen-4-ol which helps in reducing the demodex mite count and eradicating the parasite from lid margins.

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INTRODUCTION

Blepharitis is a common chronic inflammation of the eyelid margins characterized by itching, burning, irritation, watering, redness and photophobia, scaly lesions at the base of lashes, madarosis, thickening of lid margins and trichiasis causing ocular discomfort impairing the patient's quality of life.¹ The etiology of chronic blepharitis is staphylococcal and seborrheic blepharitis in anterior blepharitis and demodex infestation in posterior blepharitis causing meibomian gland dysfunction.² Patients with chronic demodex blepharitis would have attempted multiple unsuccessful treatments as the causative mite would not have been identified. Demodex blepharitis is the most common overlooked etiology of chronic blepharitis and its treatment poses a therapeutic challenge.³

The Demodex mite of phylum arthropoda is an ectoparasite has two species Demodex folliculorum and Demodex brevis which harbours in the base of the lash follicle.⁴ 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.⁵ There has been a reported high prevalence of demodex in the eyelashes with cylindrical blepharitis and these mites in the lash root can be isolated only by lash sampling and counting and in-vivo confocal microscopy.⁶ The number of

demodex increases with age, poor ocular hygiene, in patients with diabetes, acne rosacea, chronic sunlight exposure, skin phenotype, alcohol intake, smoking, stress and immune compromised state causing more ocular discomfort.⁷

Tea tree oil that is Terpinen-4-ol, is natural oil obtained from the leaf of Melaleuca alternifolia was found to be effective in killing Demodex in vitro and in vivo. When used as a scrubbing agent, it helps in eradicating the mite.⁶ Tea tree oil is found to have anti-bacterial, anti-fungal and anti-inflammatory properties because of which it is effective in treating the superadded bacterial infection in patients with demodex blepharitis. The mite digest the epithelium of the lash follicle, the wastes and debris produced by the mite accumulate at the lash root forming cylindrical dandruff, which is a pathognomonic finding for mite infestation.⁶ The mite acts as a vector to carry the bacteria like staphylococci and streptococci causing anterior blepharitis. The antigens produced by these bacteria are also responsible for causing the skin and face infection, Acne rosacea.⁸ Demodex mite infestation is present in both scaly and non-scaly blepharitis patients, and it remains as an undiagnosed aetiology and establishing its presence aids in initiating the appropriate treatment.

In this study, we treated the already demodex detected seventy patients in 2 phases, first with lid scrubbing with baby shampoo and antibiotic ointment for 2 weeks followed by scrubbing of

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the lid margins with a mixture of TTO and olive oil for 4 weeks and analysed the therapeutic effects of TTO in terms of the relief of symptoms and demodex detection in the lash follicle under the dissecting microscope.

Aims and objectives

- To analyse the relief of symptoms
- To detect the presence of demodex in the lash follicle after instituting TTO
- To estimate the prevalence of demodex in scaly and non scaly blepharitis after treatment
- To evaluate the causes for the persistence of demodex even after treatment

MATERIALS AND METHODS

Study Design

This is a hospital based prospective experimental and analytical study on patients attending the outpatients department in whom the presence of Demodex infestation had been detected and the treatment had been instituted in 2 phases and evaluated for the relief of symptoms and the presence of demodex mite after 6 weeks.

Inclusion Criteria

- ✓ Scaly and non-scaly Blepharitis patients with Demodex mite detected in their lashes
- ✓ Patients who have had no treatment earlier for blepharitis

Exclusion Criteria

Post operative patients

Sample size

Among the 73 patients in whom Demodex was detected, 70 patients were taken for study as three patients had undergone cataract surgery. Among the 70 patients, Group 1 patients consisted of scaly blepharitis and Group 2 consisted of non-scaly blepharitis and the effects of treatment on these patients were evaluated.

The study was carried out after getting Institute Ethics Committee Clearance. Informed consent was obtained from each participant after explaining about the study.

Patients who came to the Ophthalmology Out Patient Department with any of the complaints of itching, burning sensation and foreign body sensation in the eyes, thickening of 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 of the lash. 170 patients were examined and the evaluation of their lash revealed positive demodex infestation in 73 patients. Three patients had advanced immature cataract who underwent cataract surgery. 70 Demodex positive patients were explained about the disease and the need for treatment in 2 phases and re-examination of the lashes at the end of treatment to assess the effect of treatment.

Phase 1

Lid scrubs with diluted baby shampoo with cotton tipped buds to remove the crusts at the lid margins. This would help in

removing epithelialized Meibomian orifices and would facilitate opening of the Meibomian ducts and enhance its secretion.

Phase 2

A self-mixed solution made up of few drops of 50% Tea Tree Oil with few drops of Olive 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. This should be done once a day for 4 weeks

Patients were evaluated for the relief of signs and symptoms by a questioner with grades from 0 to 10 after 2 weeks and 6 weeks. Two lashes per eye were removed to get four eyelashes per patient. The epilated eyelashes were kept in the glass slide with a drop of absolute alcohol (99.9%) over a cover slip. This prepared mount was taken to the microbiology laboratory within 20 minutes to prevent the evaporation of alcohol and examined under dissecting microscope. The presence or absence of demodex was noted, the results tabulated and analysed.

Statistical Analysis

The data collected was entered in the excel sheet and analysed using SPSS software.

OBSERVATION AND RESULTS

A total of 70 demodex positive patients were selected among whom 33 patients ie 78.5% of people had scaly blepharitis and 37 patients ie 88.0% of people had non-scaly blepharitis after fulfilling the inclusion and exclusion criteria

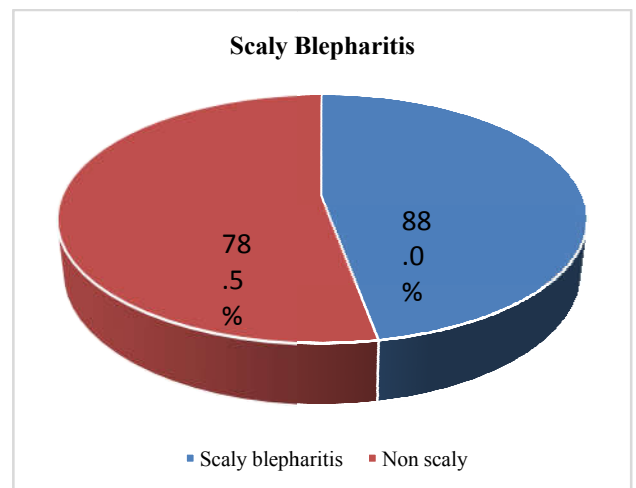


Figure 1 Distribution of Demodex among the 2 groups in the study population

Out of 70 patients, 32 persons (46%) are male and 38 persons (54%) are females. Group I (Patients with scaly Blepharitis): Out of 33, 17 persons (51.5%) are male and 16 persons (48.4%) are female. Group II (Patients with non-scaly blepharitis): Out of 37, 18 persons (48.6%) were male and 19 persons (51.3%) were female. There is no statistically significant difference between the gender and the occurrence of the demodex mite in the study population

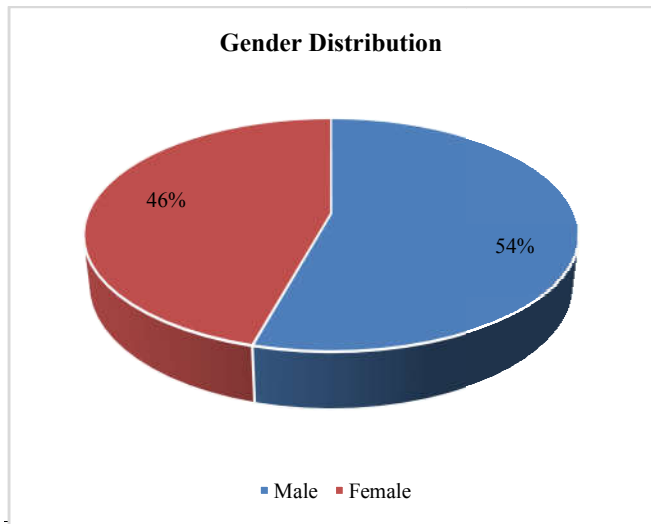


Fig 2 Distribution of Gender among the study population:

After the treatment was instituted in the demodex positive patients in 2 phases, the patients were reviewed after 6 weeks and the lashes were examined and the prevalence of the demodex was calculated. Demodex was positive in 42 cases (60%) and negative in 28 patients (40%)

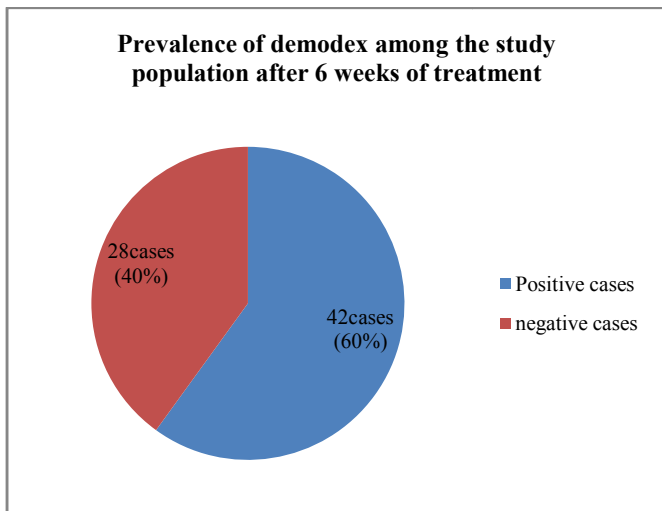


Fig 3 Prevalence of demodex among the study population after 6 weeks of treatment

Table 1 Distribution of male and female among 2 groups:

Gender	Blepharitis		Total
	Scaly Blepharitis	Non-Scaly Blepharitis	
Male	8	17	25
Female	7	10	17
Total	15	27	42
Chi - Square	0.371	P - Value 0.542	

Among the demodex positive 42 patients, in group 1 scaly blepharitis, 8 persons were men and 7 persons were female. In group 2 non scaly blepharitis, 17 persons were men and 10 persons were females. The chi-square value and the p value 0.542 >0.05 is not statistically significant. Hence there is no gender predilection for the occurrence of the demodex mite infestation

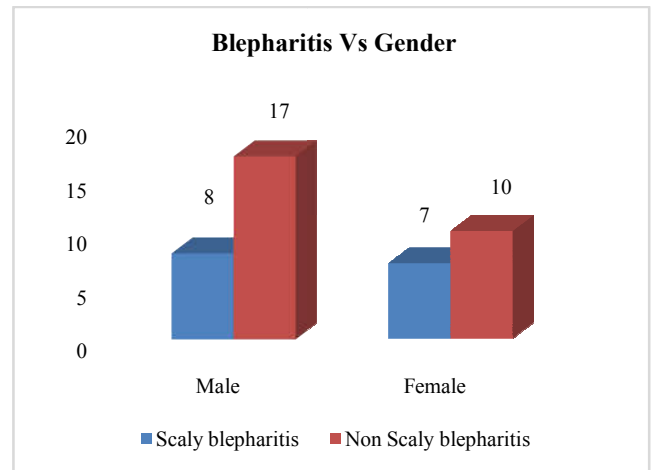


Fig 4 Association between Gender and Blepharitis in the study population

Table 2 Age of pts in the study group

Age Yrs	Min	Max	Mean	SD
	16	84	70.14	14.71

The mean age in which there was maximum demodex positive cases were 70.14 years with a standard deviation of +/- 14.71.

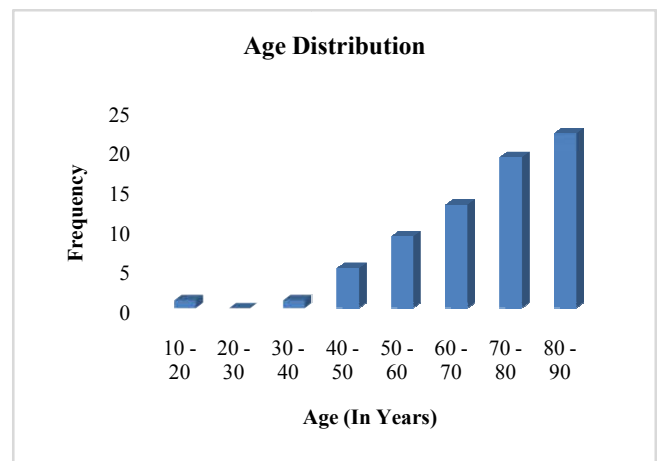


Fig 5 Age distribution among the demodex positive population:

The above figure shows the prevalence of Demodex in each age group of population under the study. The maximum prevalence of 80% was seen in the age group of 81-90 and the minimum prevalence of 1% was seen in the age group of 20-30. This shows clearly that the prevalence of Demodex increases with age as found in other studies.

Association between scaly and non-scaly blepharitis after 6 weeks of treatment

It was found that among the 42 demodex positive patients, 15 patients ie 35.7% of scaly blepharitis and 27 patients ie 64.2% of non-scaly or cylindrical blepharitis patients were found to have persistence of demodex in the lash follicles after 6 weeks of treatment with TTO.

From the figure, the distribution of Demodex positive cases in both the groups (i.e) the patients with scaly Blepharitis (I) and the patients without scaly Blepharitis(II) was showing significant statistical difference in the non-scaly group (p - value 0.0003)

$$\text{Prevalence of Demodex Infestation among patients with Scaly Blepharitis} = \frac{\text{Number of Positive Cases for Demodex}}{\text{Patients with Blepharitis}} \times 100$$

$$= \frac{15}{37} \times 100 = 40.54\%$$

37

P – Value = 0.245

$$\text{Prevalence of Demodex Infestation among patients without Scaly Blepharitis} = \frac{\text{Number of Positive Cases for Demodex}}{\text{Patients without Blepharitis}} \times 100$$

$$= \frac{27}{33} \times 100 = 81.81\%$$

33

P – Value= 0.0003

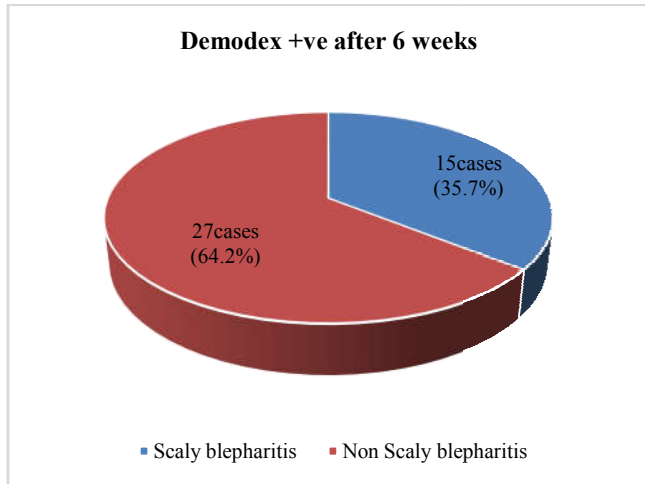


Fig 6 Association between scaly and non-scaly blepharitis after 6 weeks of treatment

It has been found that among the 42 patients who had positive demodex had normal fasting and post prandial blood sugar values but had abnormal glucose tolerance values at 1 hour peak in 28 patients (66.66%) indicating glucose intolerance and pre diabetic state in these patients. Their blood pressures were however found to be within normal limits.

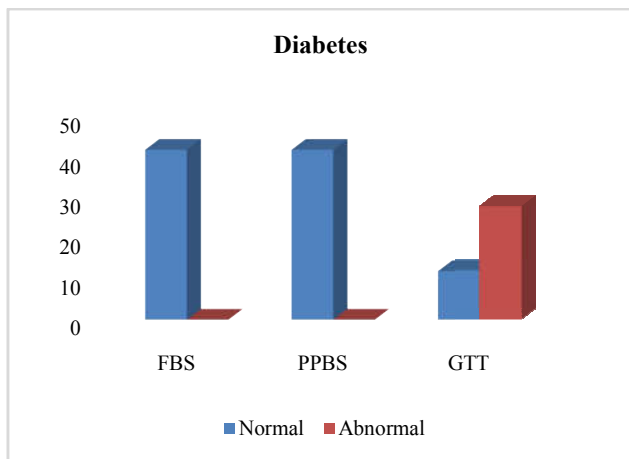


Fig 7 Association of Diabetes and demodex in the demodex positive study population

It has been found that patients who had lid scrubs with baby shampoo twice a day for 2 weeks had relief of symptoms in 6 patients (8.5%) in scaly blepharitis patients and 10 patients (14.2%) in non-scaly blepharitis after phase 1 of treatment and 12 patients (17.1%) in scaly blepharitis and 18 patients (40%) in non-scaly blepharitis after 4 weeks of phase 2 treatment with lid scrubs daily with 50% Tea tree oil and 50% olive oil. No relief of symptoms in either of the group was found in 77% of

patients following phase 1 treatment and in 42% following phase 2 treatment.

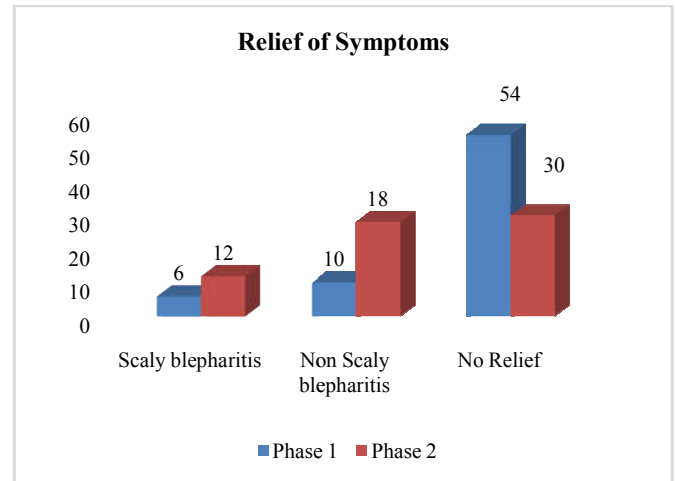


Fig 8 Relief of symptoms after phase 1 and phase 2 treatment:

Questionnaire about compliance of the treatment revealed non-availability of TTO in 40 patients, unaffordable cost in 36 patients, incorrect technique of lid scrubbing with baby shampoo and application of the TTO in 31 patients, irritation in 22 patients and associated with acne in 4 patients.

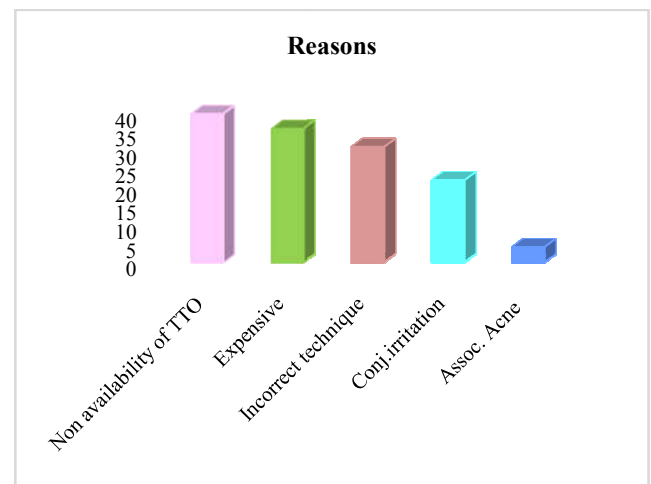


Fig 9 Possible reasons for treatment failure

DISCUSSION

In this study, from a total of 70 demodex positive persons with complaints of itching, redness, scaly lesions on lid margins, watering from eyes and who had not received any treatment earlier were selected and treated in 2 phases. In the 1st phase, patients were advised lid hygiene by scrubbing of the lid margins with baby shampoo twice daily and application of antibiotic eye ointment for 2 weeks. They were advised once a day application of 50% solution of tea tree oil and olive oil through a bud and kept on the lid surface for 10 minutes and washed off. This application of TTO had to be continued for a period of 4 weeks. Patients were reviewed after the 2nd and 6th week. The signs and symptoms and the relief were assessed through a questioner with a severity grading from 0-10. 2 lashes from each eyelid was removed from the patient using epilation forceps and placed on a glass slide with a drop of absolute alcohol and the lashes were quickly examined under the dissecting microscope within 20 minutes for the presence or

absence of demodex mite. The results were tabulated in the excel sheet and analysed using the spss software.

Among the 70 demodex positive cases, 42 patients were found to have persistent demodex mite infestation inspite of the treatment with TTO. Out of the 42 patients, 33 persons (78.5%) had scaly blepharitis and 37 patients (88.01%) had non-scaly blepharitis. There was no statistical significance between the two groups. This is supported by the study done by Kemal M *et al* on prevalence of demodex in blepharitis and normal population. This study also established that the mite was highly prevalent in both scaly and non-scaly blepharitis.⁹

There was slightly more number of patients with demodex mite in the non-scaly blepharitis group. This could be explained by the fact that the demodex mite tightly holds to the lash follicle in cylindrical blepharitis and has a predilection to the meibomian glands and not easily amenable during cleaning of the lid margins. The persistence of these mite is responsible for causing the sub-clinical blepharitis and the continuing of the lid margin inflammation leading to chronic blepharitis as explained by Scheffer Tseng *et al.*¹⁰ The incidence of demodex was higher in the elderly population due to the fact that there would be decreased immunity as age advances and also the lid muscles would have lost the tone and pumping action on the meibomian glands causing stagnation of the secretions and superadded bacterial and demodex infections. This finding 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 ($p < 0.05$). Also the demodex was found in 28 persons (66.66%) with abnormal glucose tolerance test supporting the study which postulates that there is an increase and refractory demodex blepharitis in patients with diabetes. Fasting and post prandial glucose values were found to be normal in all these patients. This finding was supported by the study conducted by GoKce C *et al* on "Opportunistic Demodex folliculorum mites in patients with type 2 diabetes mellitus" "11 postulated that the demodex infestation might be due to the poor metabolic control of glucose in diabetic patients. Therefore in patients with chronic blepharitis in whom demodex is suspected, along with fasting and post prandial blood sugars, GTT should also be tested so that measures to prevent the conversion from pre-diabetic to frank diabetes can be instituted to the patient which will eventually not only decrease the chronicity of demodex blepharitis but also the other retinal and vision threatening complications due to diabetes. The reasons that were evaluated for the failure of the treatment in spite of using the advocated TTO were non availability of the drug easily in the pharmacies in the right concentration, its expensiveness, severe conjunctival irritation caused by the TTO, incorrect technique and irregular lid hygiene and scrubbing techniques. Also acne rosacea was found in 4 persons and this finding is supported by the study by *et al* Li J *et al*¹² that there is a correlation between ocular demodicosis with the Bacillus protein found in patients with acne rosacea .

CONCLUSION

The study postulates that

- Demodex infestation is an easily overlooked etiology of chronic blepharitis

- Demodex infestation is difficult to eradicate by conventional measures
- Information, education and measures to detect and isolate demodex should be propagated
- TTO should be freely and commercially available with a 5% concentration
- Should be cheaper to be affordable for people from low socio-economic group
- Co-existent abnormal glucose metabolism should be suspected and investigated in chronic blepharitis patients
- Facial demodicosis should also be suspected and treated in chronic blepharitis patients
- Health education, awareness and importance of ocular hygiene should be promoted

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