Summary and Conclusion
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Eye is a vital organ endowed with innate immune potential to eliminate any allergen or infectious agents through lacrimal secretion, eye lashes etc. Today eye care is given much attention because of the environmental pollutants and drug resistant air borne pathogens. Increased radiation, exposure to illumination, digital and LED devices etc have reduced the working mechanism of the muscles involved in eye functioning and lacrimal secretion. So human beings are highly susceptible to many viral, bacterial and fungal infections. The higher level of ultra violet radiation and the changes in the life style and food habits have induced a greater incidence of cataract problem.

Malnutrition or under nutrition or Vitamin A deficiency and metabolic disorders like diabetes have reduced the functioning and the defence mechanism offered by the eyes. Poor quality goggles, constant wearing of contact lenses and frequent application of the dyes in eye brows and eye lashes etc make the eye environment susceptible to many bacterial and fungal infections. In this context it is imperative to study the growing incidence of eye disorders and eye infections, to prevent total or partial blindness. In order to get a clear picture of the eye health of the people of south Tamil Nadu, a survey was made on the demographic characteristics of people with eye infections. Also it is essential to develop a safe antimicrobial agent for eyes to prevent the possible threats to eye and its vision.

With this great concern the socio-economic and demographic history of 100 people visited an eye care centre at Tirunelveli was recorded for an year. From this survey it was understood that eye infection is correlated with gender, ergonomic status, contact lens usage, systemic diseases and other pre disposing risk factors. Economically weaker and rural population are more susceptible to eye infection
through vegetative solids. In the present study male population and agricultural labourers are highly prone to eye infection. Chronic eye infection had caused conjunctivitis, corneal ulcer, cataract, keratitis and macular degeneration.

From the patients screened for eye infection 10 bacterial isolates and 5 fungal strains were isolated. Also the common antibiotics used by the ocular patients was also analysed. The isolated bacterial and fungal strains were tested for antibiotic sensitivity. The antibiogram shows that 28 percent of the isolates were resistant to vancomycin and 20 percent were resistant to chloramphenicol. The sensitivity was high for moxiflaxacin and gatifloxacin. The study revealed a growing development of antibiotic sensitivity in ocular pathogens to many antibiotics.

In context of developing resistance towards prevailing antibiotics extracted from bacteria and fungi alternative source of antibiotics from other plant materials are searched. As many plants have co-evolved with pathogens they understandably have also developed a chemical protection pathways against the invading organisms through their secondary metabolic products. The petals of flowers which provide physical protection to the reproductive components and developing embryos also synthesize bio active compounds. The symptoms of most plant diseases of bacterial and fungal origin have been reported mostly on the leaves, stems, roots and seldom on petals. The medicinal value of petals of flowers was well known to many traditional healers and tribal people.

The petals of the flowers of *M. oleifera* and *T. divaricata* have been used indigenously to treat the eye infection. But there is no scientific validation of the mechanism behind the curative effect of the extracts of the flowers of *M. oleifera* and *T. divaricata*. Hence, by advanced scientific protocols the active compounds in these
flowers were extracted by cold extraction method using solvents like Methanol, DCM and Ethyl acetate in different combinations. The crude extract of the flowers of these two plants as well as the column separated extracts of these two flowers were tested for their inhibitory potential against ten bacterial species and five fungal species isolated from eye infection. The study revealed that the extracts of the petals of the flowers of *M. oleifera* was effective to inhibit the growth of ten bacterial isolates and the extracts of petals of *T. divaricata* inhibited nine bacterial isolates. As reported earlier the presence of lipophylic compounds in the extracts of petals must have interfered with the functional aspects of cytoplasmic membrane of bacterial cell wall.

The inhibitory potential of the extract varied with concentration of the extract and the bacterial species tested. Of the different ocular pathogens *C. macbinleys* was found to be more sensitive to Ethyl acetate, Methanol and DCM extracts on *M. oleifera* petals. But the extracts *T. divaricata* obtained using DCM and Ethyl Acetate alone registered a high inhibitory potential on *C. macbinleys*.

The antifungal activity of the extracts of the flowers of *M. oleifera* and *T. divaricata* were tested against 5 fungal isolates from ocular infection. Of the 5 fungal isolates tested except *A. flavus, C. albicans* and *Fusarium sp* all the other fungal strains showed resistance to both the flower extracts. However, DCM, extracts possessed more antifungal potential than other extracts. From the present study it was observed that the bioactive compounds in the petals of both the plants can be extracted, isolated and identified to develop a broad spectrum antimicrobial agents.

Oxidative stress in the cellular machinery is believed to be associated with the development of various health related problems. To scavenge the free oxygen radicals phytoremedies are believed to be a potential solution. In the present study also the
extracts of the flower of *M. oleifera* and *T. divaricata* were tested for *invitro* scavenging of Reactive oxygen species using several mechanisms. The results indicated that the extracts of the flowers have natural antioxidants to a greater extent. Between the two extracts studied the free radical scavenging activity of *T. divaricata* is more than *M. oleifera*.

In the present study the extracts of the flowers of *M. oleifera* and *T. divaricata* was subjected to TLC, UV spectral studies, FTIR studies and GC - MS analysis. The results indicated the presence of Bio active compounds in the extracts of both the flowers. However, the major compounds present in *M. oleifera* flowers are quercetin, glucoside and kaempferol glucoside. The structural analysis revealed this compound to be C₆H₉O₆ - **Overcetin - 3-0-Beta glycuromide.** In the extracts of the flower of *T. divaricata* also several Bio - active compounds were observed. Among the isolated compounds the compound with highest peak value was identified as **O-acetyl vallesamine** (C₂₂H₂₂N₂O₄). Experimental studies and previous work revealed that the Bio active compounds of *T. divaricata* contain alkaloids. - a good antimicrobial agent.

For the development of effective antimicrobial agents against the pathogens isolated form eyes, the accurate identification of those pathogens is vital. The molecular characterization of the bacterial and fungal isolates will help to develop target oriented drugs. With this concern in the present study the bacterial and fungal isolates form eye infections were sequenced partially. The sequencing informed the major bacterial isolate to the *Achromobacter xylosoxidants*. The sequence of this bacteria has been deposited in Gene Bank.
Molecular identification of the fungal isolates indicated the presence of *Cochliobolus sp.* This is a first report on this fungal pathogen in human eye. This sequence is also submitted in Gene Bank. The present study concludes that Socio economic condition is an important parameter in relation to eye infection. Many bacterial isolates from infected eyes are gradually developing resistance to many drugs. The extracts of the flowers of *M. oleifera* and *T. divaricata* have a good antimicrobial potential against eye pathogens. This result scientifically validates the traditional use of these flowers in eye infection related problems. The molecular characterization of bacterial and fungal isolates informed the presence of new eye pathogens among the patients tested.

A further study has been planned in future to analyse the pharmacological activities of the identified compounds on microbial pathogens of human eye.