Summary and Conclusion
7.0 SUMMARY AND CONCLUSION

The results of the present study are summarized as follows:

- The suspected urinary tract infection occurring in different age groups coming from three localities reveals that, the UTI is not very common under one year of age. However, similar percentage of UTI was observed with age group of 2-15 and 16-19. The incidence of occurrence is in the rise in the age group of more than 19 years compared to other age groups studied. Under this age group the UTI infection is approximately similar between the localities taken for this investigation.

- The prevalence of UTI is equal in both the sexes irrespective of the age groups from the data collected. The distribution bacteriuria from various age of suspected UTI patients clearly shows that, there is no bacteriuria in 20% of the urine samples tested. However, more than 80% suspected UTI patients had significant bacteriuria in all age groups except 0-1 year group. The numbers of cases were high in the age group of above 19 years. When the bacteriuria is present in more than 100000 colonies per milliliter it is designated as significant
bacteriuria. If the urine contains bacteria between 10000 to 100000 colonies per milliliter is referred as probably significant bacteriuria and if the colonies are less than 10000 colonies it is classified as insignificant bacteriuria.

- The present study also made an attempt to find out the species level identification of the isolated bacterial strains responsible for the urinary tract infections. It reveals that, Pseudomonas aeruginosa and Klebsiella pneumoniae had maximum resistance to commercial antibiotics (33%) compared to other organisms. Next to these organisms Escherichia coli 13% of resistance to commercial antibiotics used. A minimum percentage of 6.6% was noted in case of Staphylococcus aureus and Proteus morgoni. The present study also observed that, among the cases bacteriuria 10% of the bacteria was resistant to antibiotics and 90% was susceptible to available commercial antibiotics.

- The antibiotic activity on bacteria isolated from urinary tract infecting bacterial pathogen reveals that, the most effective antibiotics against resistant urinary pathogen isolated are Amikacin, Ciprofloxacin, and Gentamycin, Cefaclor followed by Ofloxacin, Moxifloxacin and Pefloxacin. Minimum effect is recorded with Amoxicillin, Amphicillin
and Sparfloxacin and mediocre effect is reflected with Norfloxacin, Penicillin, Cotrimoxazole, Roxithromycin, Gatifloxacin, Flucnozolle, Ceftaxime, Cefoprazone, Ceftriazone and Linezolid.

- The present study also made an attempt to find out the alternative therapeutic agents from mangrove halophytes to overcome the problem of antibiotic resistance. It indicates that, the extracts from hypocotyls of *Rhizophora mucronata* showed maximum zone of inhibition against *Staphylococcus aureus* (16mm dia.). However, the extracts from *Rhizophora mucronata* and also *Ceriops deandra* showed maximum sensitivity against all the tested UTI bacterial pathogens. And also, the extracts from bark of *Avicennia marina* showed maximum sensitivity (16mm dia.) against *Pseudomonas aeruginosa*. The average zone of inhibition among the plant parts used reveals that, the bark extracts zone maximum zone of inhibition than the other plant parts.

- And also the present study observed that, among the marine plant species tested, *A. marina* showed maximum sensitivity than the other mangrove plant species. It is also interesting to notice that, among the pathogens tested the average zone of inhibition was found maximum in *Proteus morgonii* than the other bacterial pathogens.
The most effective plant extracts from the hypocotyls of *Avicennia marina* was subjected for the quality analysis such as phytochemicals, heavy metals/trace metals and microbial counts and also organoleptic and physical properties. It reveals that, the extract having bitter taste, odourless, brown color, paste in nature and also the extractive value is 9.4%, total ash is 18%, alcohol soluble ash is 20%, water soluble ash is 28%. The extract also subjected for the toxic inorganic chemicals such as Aluminium (17.2ppm), cadmium -below detectable limit, cobalt-0.011 ppm, chromium-0.102ppm, copper-0.338ppm, iron-27.03ppm, manganese-0.727ppm, nickel-0.205ppm, lead-0.013ppm, zinc-0.152ppm, arsenic-0.633ppm. Among the phytochemicals, sugars alone present in the crude bark extracts of *Avicennia marina*. The biological toxicants such as *E.coli*-250 CFU/g, fungi-57 CFU/g, *E.coli*, *Salmonella* and *Enterobacter* are found in the limit as per the WHO guidelines.

The extracts also subjected for toxicity analysis by using mice/rat as animal model. The LD$_{50}$ value of the crude extract of bark from *Avicennia marina* is 3000 mg.kg$^{-1}$ and it is slightly toxic. At the dose level of 3000 mg.kg$^{-1}$ five animals are dead. The animals tolerated at high doses. These animals showed abnormal secretions only. The
LD$_{50}$ value of the sample *Avicennia marina* is 3000 mg.kg$^{-1}$ as per the Hodge and Sterner scale and hence the drug is slightly toxic. During the fourth weeks of treatment, no mortality was observed. The animals initially showed jumping, hyperactivity and later labored respiration. No adverse clinical manifestations like diarrhea, haematuria, restlessness and impaired movement were observed in the experimental animals during the dosing period.

- The sub-acute toxicity studies revealed that, no distinct clinical signs were observed in the mice at the dose levels tested. There were no changes in the properties of stool, urine and eye color of all the animals. No mortality was observed during the dosing period, the rats were well tolerated in the given dose level. From day 0 to day 28, there were variable changes in the body weight of rats. The control rats gained weight throughout the duration of the treatment. The rats treated with the halophytic plant extract of *Avicennia marina* group gained weight in a similar lesion as the control rats. But, these changes in the body weight of treated rats were not significant when compared to the control group. It is also evident that, the rate of food consumption is in coincidence with the body weight in both control and treated rats groups.
The effect of *Avicennia marina* extract on the elite organs weight of rats reveals that, there is no marked difference was observed in heart, liver and testis analyzed by the present study in both the control and treated groups. However, there is increase in the weight of kidney and spleen when compared to the control. The histopathological studies revealed that, the extracts from *Avicennia marina* treated in rats in general showed mild changes in the elite organs when compared to control rats. However, it is negligible. They appear to be normal as control. However, no significant changes were observed in haematological parameters.

It is concluded from the present study that, the bacterial species responsible for the urinary tract infections can be alternatively treated by the bark extracts from *Avicenna marina* so as to enable to reduce the antibiotic resistance among the infectious microrganism.