CHAPTER-7

SUMMARY AND CONCLUSIONS
7.1 Summary

Infectious diseases have emerged as a serious cause of morbidity and mortality, with 16.2 percent (equivalent to 57 million) deaths each year worldwide. Hence, WHO has listed such diseases in 2nd place among the lead cause of death.

Now, medicinal world has conquered many deadly infectious diseases and immensely brought down the mortality rate to some extent. But still diseases like pneumonia, tuberculosis (TB), typhoid, H1N1, dengue and HIV are matter of big concern at present. Further, emerging antimicrobial resistance has created a major public health dilemma, compounded by a dearth of new antimicrobial options. In addition, the alarming rates of emerging and reemerging microbial threats coupled with increasing antimicrobial resistance, particularly in regard to multi drug-resistant Gram-positive bacteria and mycobacterium, are major concerns to the public health as well as scientific communities worldwide. These developments have emphasized the pressing need for new, more effective and safe antimicrobial agents and which in turn has opened up a new area of research for the scientists.

The heterocyclic chemistry is a vast subject its feverish activity is attested by countless research papers appearing in established journals and by the proliferation of monograpahy and reviews on varied subjects like photochemistry, pharmacology, industrial to mention a few. This expansion of knowledge and application poses pedagogical problems; it is difficult for only an organic chemist to be cognizant of development over the whole field in all the important areas of its application. Yet the field of heterocycles provides an opportunity for an organic chemist to synthesize new molecules whose structural activity relationship may present areas of applications in the field of medicinal sciences and alike. Based on these extensive applications of heterocycles we have synthesized various heterocycles carrying interesting pharmacophore like Chromeno-pyrimidines, Chromeno-oxadiazoles, Pyrazolo-oxadiazoles, β-Aminoketone and Homoallylamines. Structures of the newly synthesized compounds
were confirmed by IR, $^1$H NMR, $^{13}$C NMR, mass spectral studies and also by C, H, N elemental analyses. The application of newly synthesized compounds was confirmed by biological assays.

7.2 Conclusions

The conclusions of present research work are summarized as follows:

- Five new series of Nitrogen containing heterocyclic derivatives were synthesized.

- Characterizations of newly synthesized compounds were successfully done by means of spectral methods like IR, $^1$H NMR, $^{13}$C NMR, mass spectral and elemental analysis.

- Newly synthesized compounds were tested for their antimicrobial activities.

- The investigation of antimicrobial activity among the Chromeno-pyrimidine series ($160a-l$) reveals that many compounds showed good level of antibacterial properties and few of them showed results comparable to that of standards. Compounds N-(1-benzylpiperidin-4-yl)-5H-chromeno [2,3-d]pyrimidine-4-amine ($160d$) and N-benzyl-5H-chromeno [2,3-d]pyrimidin-4-amine ($160e$) have emerged as the lead compounds.

- In the substituted chromeno-oxadiazoles ($210a-n$), it has been observed that presence hydroxyl and olefin functional group showed enhanced antimicrobial activity. Among the tested molecules, N-(2-hydroxybenzylidene)-3- (5-(2-hydroxyphenyl) -1,2,4-oxadiazol-3-yl) -3,4 -dihydro-2H-chromen-2-amine ($210e$) and 3,4-dihydro-N- (3-phenylallylidene) -3- (5-styryl-1,2,4-oxadiazol-3-yl)-2H-chromen-2-amine ($210f$) have emerged as the lead.

- In the pyrazole-oxadiazole series ($263 a-l$) few of the compounds have been shown to possess good antibacterial and antifungal activity. Amongst them, two compounds, 3-(4-chlorophenyl)-5-(4-(3-methoxyphenyl)-1H-pyrazol-3-yl)-1,2,4-oxadiazole ($263c$) and 3-(4-fluorophenyl)-5-(4-(3-methoxyphenyl)-1H-pyrazol-3-yl)-1,2,4-oxadiazole ($263d$) have shown excellent antimicrobial
and antifungal activity. These molecules are ideally suited for further modification to get more efficacious chemical entities.

- Of the two newly designed homoallylamine (331 a-q) and β- amino ketone (335 a-k) series, compounds 331d, 331g, 331n, 331o have showed excellent antibacterial activity at 1.6125 µg/ml concentrations against all microorganisms as compared to the standard drug Ceftriaxone. Similarly in β- amino ketone series Compounds 335b, 335c, 335d, 335e, 335g and 335k have showed excellent antimicrobial activity as that of the standard drug at the same concentration.

The present research study has mainly focused on the synthesis, characterization and investigation of antimicrobials activities of some new nitrogen heterocycles namely Chromeno-pyrimidines, Chromeno-oxadiazoles, Pyrazolo-oxadiazoles, β-Aminoketone and Homoallylamine derivatives. It is interesting to note that nearly 60-70% of all the targeted compounds have been found to be active against at least one of the pathogenic strains, used in the present investigation. From the study, it can be concluded that above mentioned nitrogen heterocycles and its derivatives are potent and reliable scaffold for new antimicrobial agents.