CHAPTER 7
SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Summary

Type 2 diabetes mellitus is a heterogeneous metabolic disorder with hyperglycemia due to disturbances in carbohydrate, lipid and protein metabolism. It grossly affects all age group people in different regions. The long term complications of DM are retinopathy, hyperlipidemia, neuropathy, nephropathy and cognitive decline [2]. Despite many newer drugs are developed for DM they are not devoid of their side effect, this lead to the search for indigenous drugs for the treatment of DM.

In the present study, selected plants *Casearia elliptica* roots (Family-Flacourtiaceae), whole plant of *Cissus quadrangularis* Linn (Family- Vitaceae) and root tubers of *Cyperus rotundus* (Family- Cyperaceae) were individually evaluated for phytochemical screening, hypoglycemic and antidiabetic activity. The hypoglycemic activity was assessed by OGTT and antidiabetic effect in STZ induced diabetic model. The plant extracts at various doses significantly reduced the blood glucose levels and showed their potential as antidiabetic agents. They also normalized the lipid profile, improved liver glycogen content and regenerated the damaged pancreas caused by STZ. But the study, cannot predict the order of preference for the selected plants as no statistical difference was noticed in the antidiabetic activity among the plants.

The PHF was prepared based on the EC\textsubscript{50} values obtained from OGTT of all individual extracts. Hypoglycemic and antidiabetic activity of PHF was screened similarly like individual extracts. The PHF showed significant antidiabetic activity and found to possess synergistic effect compared to the individual extracts.

PHF significantly improved the cognition and memory in dexamethasone induced insulin resistance model. This was confirmed by decreasing the levels of fasting blood glucose, serum insulin levels and HOMA-IR. It also ameliorated the behavioral changes induced by dexamethasone insulin resistance and increased the inflexion ratio in elevated
plus maze, decreased the escape latency in morris water maze and improved motor coordination and retention time on the rota rod.

To confirm the mechanism of action, *in vitro* studies were carried out with individual extracts and PHF. The order of efficacy of plant extracts and PHF in the *in vitro* models were as follows

- Total phenolic content - PHF > EECE > EECR > EECQ
- Total flavonoid content – PHF > EECQ > EECR > EECE
- α-amylase inhibitory activity– PHF > EECE > EECQ > EECR
- α-glucosidase inhibitory activity – PHF > EECR > EECE > EECQ
- % of protection in MTT assay in SH-SY5Y neuronal cells – PHF, EECE > EECQ > EECR
- Hyperglycemia induced ROS in SH-SY5Y neuronal cells – PHF > EECR > EECQ > EECE

**Conclusion**

From the study it was concluded that the prepared polyherbal formulation might be helpful in the management of diabetes mellitus and associated cognitive impairment. This effect of PHF might be attributed to its antioxidant property, improved insulin sensitivity, α-glucosidase and α-amylase inhibition activity.

**Recommendations**

The current study recommends the following scope of future work

- Exploring the molecular mechanism of action of PHF.
- Standardization and development of quality control (QC) and quality assurance (QA) parameters for scale up of PHF formulation.
- Evaluation of the efficacy and safety of PHF in clinical studies.

The further studies on PHF might play a momentous role in developing the PHF as an alternative for management of diabetes mellitus and associated complications.