Aims and Objectives
Aim of the Study

To characterize the presence of T cell responses in active pulmonary and extra-pulmonary tuberculosis with or without type 2 diabetes mellitus.

Objectives of the study

1. Immune responses in pulmonary tuberculosis and tuberculous lymphadenitis

   I. To study roles of T cell cytokines and potential regulatory factors, in M.tb antigen-specific induction of Type 1, 2, and 17 responses as well as production of IL-10 and TGFβ in pulmonary TB (PTB), tuberculous lymphadenitis (TBL) and latent TB (LTB) individuals.

   II. To identify the role of Th1, Th17, and Th22 cells in multi-focal TB lymphadenitis and to examine mycobacteria–specific immune responses in the whole blood of individuals with PTB and compared them with those with TBL.

   III. To identify the role of CD4+ , CD8+ T and NK cells expressing Type1 and Type 17 cytokines in tuberculous lymphadenitis (TBL) and to examine mycobacteria–specific immune responses in the whole blood of individuals with PTB and compared them with TBL.

   IV. To study the roles of Heme oxygenase-1 (HO-1), acute phase proteins and pro-inflammatory cytokines in PTB, TBL, LTB and Healthy Controls (HC).
2. Immune responses to tuberculosis with coincident diabetes mellitus

I. To identify the influence of coincident diabetes mellitus (DM) on cytokine levels in pulmonary TB and to examine circulating levels of a panel of cytokines and chemokines in the plasma of individuals with tuberculosis with diabetes and compare them with those without diabetes.

II. To identify the role of CD4$^+$ T cells Th1 and Th17 cells in tuberculosis with coincident DM and to examine mycobacteria-specific immune responses in the whole blood of individuals who had tuberculosis with DM and compared them to those in individuals who had tuberculosis without DM.

III. To identify the role of CD8$^+$ T and NK cells in pulmonary TB with diabetes and to examine mycobacteria-specific immune responses in the whole blood of individuals with TB-DM and compared them with those without DM (TB-NDM).

IV. To examine the systemic levels of heme oxygenase-1 (HO-1), acute phase proteins, tissue metalloproteinases (MMPs) and their inhibitors (TIMPs) as well as cytokines and chemokines in active pulmonary TB with coincident TB-DM individuals.

V. To identify the influence of coincident DM on cytokine levels in pulmonary TB, and to examine circulating levels of adipocytokines, pancreatic hormones and gut hormones in the plasma of individuals with or without DM.