Pulmonary tuberculosis (PTB) remains one of the deadliest diseases in the world and is one of the major public health problems in the countries, developing including India. No other disease other than tuberculosis much sociological, economical and health impact on public life. From an overview it appears that the prevalence of tuberculosis is an index of the stage of social organisation and standard of living of the community. Though, it is declined in most of the developed countries, almost to the stage of 'Control', tuberculosis in India still continues to pose a major health problem.

In Saharanpur, being the border city of Uttar Pradesh state and some holy places around it therefore the flow of people remains throughout the year which causes overcrowding, scarcity of nutritious food and water, and poor sanitation leading to unhygienic conditions. This may result in the spread of various microbial diseases including pulmonary tuberculosis. Today, the emphasis in the medical approach to disease is increasingly on its control with the treatment of alternative medicines and knowledge of epidemiology and pathology is essential in understanding as to how it is caused and in developing soundly based preventive measures.

Keeping all this in view, it was considered important to find out the epidemiological and pathological status/aspects of PTB infection in the people of Saharanpur and its adjoining areas; and in vitro efficacy of certain Allopathic, Ayurvedic and Homeopathic drugs against Mycobacterium sp.

A total number of 1430 suspected patients (SPE) were examined for PTB infection. They were subjected to Mantoux test. Those showing positive reactions to the test were considered to be having an infection of tuberculosis and rest were considered normal. The microscopic examination of the smear for Acid and Alcohol Fast Bacilli (AFB) in sputum samples of the patients was carried out for confirmation of the infection to detect the percentage or the infectious population.

The incidence of PTB was observed in different months of the years and among different groups viz. groups, sexes, habitats, habits, socioeconomic classes and blood
groups of the patients. Concomitantly, the abiotic variables i.e. temperature, relative humidity and rainfall were also recorded. Various haematological (Hb, TEC, DLC, ESR, PCV, MCV, MCH and MCHC) and biochemical parameters (SGOT, SGPT, Serum Bilirubin, Serum Alkaline Phosphatase and Serum total Proteins), the SPE were determined in three groups- Group I (Normal) Group II (acute infection) and Group III (Chronic infection).

The study was carried out for a period of two years. viz Oct 2009 Sept 2010 (first year) and Oct 2010 Sept 2011 (Second Year). All the data was analysed statistically.

*In vitro* antimicrobial activity of Allopathic (Streptomycin, Rifampicin, Pyrazinamide, Isoniazid), Ayurvedic (Swarn Vasant Malti, Mahalakshmi Vilas Ras, Rajmrigank, Shringyadi) and Homeopathic (Arsenic iodatum 30, Stannum iodat 30, Kalium iodat 30, Silicea 30) drugs against *Mycobacterium* sp. was determined.

The present study observed that incidence of PTB infection ranged from 2.5% - 15% of the total infection in all the months of both the years. The infection varied differently in different months. It was maximum in May (15.05 – 13.4% Significant at LSD_{0.01}) and minimum in January (2.5% - 2.8%). The incidence had positive correlation with temperature (r-value L +0.8762 to +0.9398); negative correlation with relative humidity (r-value : -0.8731 to -0.6324) and positive correlation with rainfall (r-values : +0.2377 to +0.5143).

The abiotic variables influenced the susceptibility of PTB infection in humans to a great extent. An interaction of these variables seemed to be more responsible for incidence of infection. The maximum incidence the disease in summer may be due to that the high temperature which favours the growth and surveillance of the pathogen, its optimal temperature for growth being 37°C. In rainy season, however the temperature is comparatively low than in summer but in this season the environment becomes unhealthy, humid and chances of contamination become more. The higher temperature in combination with rain results in moderately high PTB infection. In winter, the low temperature and low rainfall become unfavourable for infection proving to be healthy season.
It was observed that nearly half of the patients were Mx. +ve (51.44% - 47.99% non-significant at ANOVA0.05). Among the Mx+ve patients, the frequency of the symptomatic (71.34%-73.18%) was significantly more (ANOVA0.01) than that of non-symptomatics (28.66%-26.82%).

The microscopic examination of sputum smear for AFB test indicated significantly lower percentage of AFB positive (17.45% 15.05%) significant at ANOVA0.01 against higher percentage of AFB negative (82.55% - 84.92%). There were 10.28%-11.73% (significant at ANOVA0.01 in relation to Mx. +ve) Mx. +ve cases who were reinfected i.e. infected more than one time. Out of symptomatics, the percentage of acute cases (30.53% -40.08%) was significantly less (ANOVA0.05) than that of the chronic cases (40.81%-59.92%).

Among different age groups, percentage of PTB infection incidence was found maximum in the age group 21-30 years (29.91 % -29.61%; significant at LSD0.01) and minimum in 0-10 years age group (2.49% -2.79%). The more infection in adolescent/middle age may possibly be because of the reason that the persons of these groups remain more exposed. The lower age group i.e. 0-10 years is mostly taken care of by the elderly people of the family and thus remains protected from the infection. In symptomatics, the percentage of infection was maximum in age group> 70 years (82.61-85.71% ; significant at LSD0.05) and minimum in 0-10 years age group (62.50%-60.0%).

The incidence of infection, were considerably high in males (67.91%-62. 01% significant at ANOVA0.05) than in females 32.09%-37.99%; significant at ANOVA0.05). In symptomatics, the percentage of infection in males (74.31%-76.58%; Significant at ANOVA0.05) was also higher as compared to females (65.05% -67.66%; significant at ANOVA0.05) The more infection in males may be due to the reason that comparatively males are more exposed to the infected cases at their working sites/offices and in travelling etc. since they are primarily the earning members of the family. Secondly, percentage of smokers is generally found higher in males.

Among different socio-economic classes, the percentage of incidence of PTB infection was significantly maximum (61.99%- 63.13%; significant at ANOVA0.05, socio economic class and minimum (8.38%-9.35% nonsignificant - ANOVA0.05 in
upper class. In symptomatics, the maximum percentage (72.36%-75.22% significant at ANOVA_{0.01}) of infection was in lower class and minimum in the upper class (63.33%-70.00%; non significant at ANOVA_{0.05}). A possible reason of this significant difference may be due to that the low income group patients generally do not consult doctors for treatment at an early stage of infection. While in case of upper class the persons generally contact doctors in early stage of symptoms and take drug treatment. Another probability is that it may be due to poor diet, hard over working conditions, poor hygienic conditions, lack of education and lack of health awareness in lower class.

The percentage of infection was found to be non-significantly different in vegetarians (48.04%-52.34%) and non-vegetarians (47.66%-51.96%). However, in symptomatics, the infection was non-significantly higher in non-vegetarians (77.42% -77.78%; non-significant at ANOVA_{0.05}) than in vegetarians (65.48% -68.60%. It showed that the PTB infection was nonselective to the vegetarians and non-vegetarians. However, in symptomatics higher percentage of infection in non-vegetarians may be due to that the non-vegetarians are usually alcoholic, thus more prone to infection because of low body resistance against tuberculosis. The infection was significantly higher (at ANOVA_{0.05}) in smokers (64.80%-68.44%) than in non-smokers (35.20%-31.56%)

Similarly in symptomatics, the percentage of infection was also significantly higher (ANOVA_{0.05}) in smokers (73.56%-75.10%) than in nonsmokers (67.26%- 69.03%). It may be due to that nicotin of the tobacco decreases the resistance and vitality of the respiratory tract. Besides this, the sharing of ciggerates/biris/hukkas also help in spreading the infection.

A non-significantly higher (ANOVA_{0.05}) percentage of infection was observed in urban (53.91 % -56.07%) than in rural (43.93% -46.09%) for PTB infection. Similarly, in symptomatics non-significantly higher percentage was found in urban (73.33%-76.68%) than in rural (68.79% -69.09%). The probable factors responsible for lower percentage of infection in rural areas were-more per captia space, plenty fresh air, pollution free atmosphere and rare TB hospitals.

The study showed that person of all the blood groups, Blood group A (13.21%-18.37%), Blood group B (26.41% - 26.53%), Blood group AB (20.41%-24.53%) and
Blood group O (34.69%-35.85%), had non-significant (ANOVA_{0.05}) variations in PTB infection. Thus PTB infection was not selective to any blood group. The higher and lower percentage of infection in different blood groups appears to be just because of the prevalence ratio of different blood groups.

The study revealed that PTB infection caused various haematological and biochemical changes in patients blood. In acute cases, the values of Hb (9.82g%), TEC (3.96×10^6 cells/cubic mm), MCV (69.32u3) MCH (21.37u mg), MCHC (26.98%), Lymphocytes (28.4%) and Eosinophils (2.2%) (all nonsignificant at LSD_{0.05}) were decreased while values of PCV (42.97%) and polymorphs (71.8%) (non-significant at LSD_{0.05}) were found to increase than in normals. However, the values of ESR (46.53 mm) and TLC (21500 cells/cu.mm) increased (Significant at LSD_{0.05}).

Further, in chronic cases, Hb (7.57g%), TEC (3.87×10^6 cells/cu.mm), PCV (24.03%), MCV (73.31u3 ) MCH (25.00umg), MCHC (28.31%) (all nonsignificant at LSD_{0.05}) were again less than the normal persons. The lymphocytes (19.7%) and eosinophils (0%) (non-significant at LSD_{0.05}) were much reduced further than acute, along with Hb and the than in Mx –ve individuals. The values of ESR (significant at LSD_{0.01}), TLC and polymorphs (significant at LSD_{0.01}) were much increased against the values of non tuberculous individuals.

The possible reasons of changes in different hematological parameters may be due to depletion of host's nutrition, suppression of bone marrow by certain toxins etc. The decrease in TEC, Hb, PCV, MCH, MCHC and increase in ESR may lead to development of microcytic anaemia. Haemolysis of RBCs, suppression of bone marrow and deficiency of folic acid may also result in these changes.

The biochemical parameters also varied in the blood of infected patients. values of SGOT (38.13 IU units), S. Alkaline Phosphatase (206.7/U/L), Significant at LDS_{0.05}; SGPT (42.17 units) (Significant at LSD_{0.01}) Serum Bilirubin (0.97 mg/dl) (non-significant at LSD_{0.05}) were found to increase in acute cases, which further increased in chronic cases of PTB. However, only Serum Total Proteins (6.63 g/dl, non-significant at LSD_{0.05}) were found to decrease in acute cases which further increased in chronic cases of PTB infection. However, only serum total proteins (6.63g/dl. non-significant at LDS_{0.05} were including cases and further more decreased in chronic
cases of PTB infection, as compared to normal ones. The possible cause for the changes may be due to the damage of liver cells, which could be an after effect of antibiotic treatment.

*In vitro* antimicrobial efficacy against *Mycobacterium* sp. at different potencies indicated that among four Allopathic drugs i.e. Streptomycin, Rifampicin, Pyrizinamide and Isoniazid; Rifampicin was found to be most effective in inhibiting the growth of bacteria at 1ug/ml concentration. The Streptomycin was least effective at the concentration of 10 ugm/ml as observed on 21st day. The efficacy was in the order of Rifampicin > Isoniazid > Pyrazinamide Streptomycin.

Among Ayurvedic drugs i.e. Swarn Vasant Malti, Mahalakshmi Vilas Ras, Rajmrigank and Shringyadi; Mahalakshmi Vilas Ras was most effective as it inhibited the growth of bacteria as observed on 21st day, as compared to corresponding potencies of other Ayurvedic drugs. The efficacy was in the order of Mahalakshmi Vilas Ras > Swarn Vasant Malti > Rajmrigank > Shringyadi.

Further, among the Homoeopathic drugs i.e. Arsenic iodatum 30, Stannum iodat 30, Kalium iodat 30 and Silicea 30, Arsenic iodatum 30 was found to be most effective at the concentration of 1ug/ml where as Silicea 30 was least effective at the same concentration. The efficacy was in order Arsenic iodatum 30 > Stannum iodat 30 > Kalium iodat 30 > Siliciea 30.

For all drugs tested at various potencies, no change in OD was observed until 14th day. It showed that all the drugs were effective against the bacteria. After this period the drugs were found ineffective in inhibiting the bacteria completely as indicated by the change in OD. This may the changing of the drugs because of degradation after 14 days long period. Comparing overall efficacy of different drugs, it was revealed that Allopathic drugs were most effective as compared to Ayurvedic, which in turn were better than Homeopathich drugs against *Mycobacterium* sp.

It was concluded that people of Saharanpur and its adjoining area considerably harboured PTB infection amongst suspected patients examined. Saharanpur board city of Uttar Pradesh state and many holy places around it being attract number of people not only from different parts of the country but also from abroad for various socio-
religious rituals and for pilgrimage almost throughout the year resulting in unhygienic conditions. The infection was related to climatic conditions, age, sex, socio-economic status habits and habitats of persons at the infection caused certain changes in haematological and biochemical parameters in the blood of patients. There is a need of strict vigilence on the patients for the screening and monitoring of PTB. Various means have been suggested to minimize the possibility of the PTB infection. Comparing the overall efficacy of different drugs, it was revealed that Allopathic drugs were most effective as compared to Ayurvedic, which in turn were better than Homeopathic drugs against *Mycobacterium* sp. Though Allopathic drugs showed supremacy, it is suggested that more Ayurvedic and Homeopathic drugs and/or there combinations should also be tried. It will help in establishing a sound and better line of PTB management with no adverse side effects.