Present study was carried out from May, 2012 to June, 2015 in rural population (exposed to biomass fuel smoke) around Meerut at following villages – Shivaya, Mataur, Daurala, Pavli, Palhera, Datawali, Geshupur, Gokulpur, Hashanpur-Kaddim, Murlipur, Rithani, Kazipur, Sakauti, Walidpur, bhagwanpur, Panchgaon, Badla, Sisoli.

Data were collected from 180 women, who gave their consent to participate in the study. Few women, approximately 45% had prevalence of Asthma, cough and tuberculosis diagnosed by the physician. At the time of survey most rural women were using at least biomass fuel for cooking.

Women exposed to biomass smoke were less educated but some were well educated and reported less income than those currently using natural gas and LPG. Women cooking with biomass stove (Chulha) at the time of survey had used biomass chulha (Stove) for more days, for many years other occupational exposure to dust and smoke were also present in houses where population is living because kitchen and rooms were not separated.

Kitchens were situated mostly in same room and in small premise of the house. In the present investigation we find the prevalence of respiratory symptoms, disease and level of lung function, chronic obstructive lung diseases. Women of different age group, currently burning biomass fuel, frequently reported respiratory
symptoms.

The amount of breathing particles was the highest during cooking. These dusts enter into the lungs of women and children by inhalation where biofuel was using for cooking. These exposures exert effects on the physiology, biochemistry and all the biological system. So, in these rural women some showed anaemic condition also.

They also showed many diseases like acute respiratory infection, chronic obstructive disease, asthama, lung cancer, nasopharyngeal cancer, pulmonary tuberculosis, low birth weight and infant mortality, cataract, eye irritation and many other blood related disease. The present study determines the activity of biofuel smoke exposure on all hematological parameters viz.

Hb, RBC, TLC, PC, PCV, MCV, MCH, MCHC, and DLC and biochemical parameters viz. Total serum protein, albumin, globulins, glucose, creatinine, cholesterol, SGPT, SGOT, acid and alkaline phosphate and immunological parameters viz. IgM, IgG, IgA and IgE.

The results made during the experiment comprise of three phases: Phase-I: Haematological study Phase-II: Biochemical study Phase-III: Immunological study

PHASE-I: HAEMATOLOGICAL STUDY

(Table 1 & Fig. 1, 2, 3, 4, 5, 6, 7, 8) The haematological observations were made in all the three groups of control and biomass fuel smoke exposed women.
Group A: 15-35 years age women Haemoglobin (Hb): The mean value of Hemoglobin of control women was observed to be 14.6 gm/dl. The mean value of Hb level was observed to be 13.4 gm/dl in the biomass fuel using women. It was lower than the value of control women. However, it was not significantly decrease as control.

Red blood cells (RBC) count: The mean value of RBC count of control women was observed to be 5.5 million/mm³ blood. The mean value of RBC count in exposed women of this group was found to be 4.6 million/mm³ blood. It was found lower than the control group women. No significant alteration was observed.

Total leucocyte count (TLC): The mean vale of TLC of control women was observed to be 6500/mm³ blood. The mean value of TLC in exposed women of this group was observed slightly increased as 6800/mm³ blood. It was found higher than the control group women. No significant alteration was observed.

Platelets counts (PC): The mean value of platelets count of control women was observed to be 2.8 Lac/mm³. The mean value of platelets count was observed in exposed women of this group was observed decreased as 2.0 lac/mm³ blood. It was lower than the control women. The statistical analysis revealed the significant (p<0.05) decreased count of platelets in the above caused the abnormal as compared to the control group.

Packed cell volume (PCV): The mean value of PCV level of control women was
observed to be 45.00%. The mean value of PCV of exposed women of this group was observed to be slightly decreased 44.0%. It was slightly lower in comparison to control group women. Statistically no significant alteration was observed.

**Mean corpuscular volume (MCV):** The value of mean corpuscular volume of control women was observed to be 81.81 fl. The mean value of MCV in exposed group was observed to be 95.65 fl. This value was higher in comparison to control group. Statistically no significant alteration was observed.

**Mean corpuscular Haemoglobin (MCH):** The mean corpuscular haemoglobin value of control women was observed to be 26.54 pg. The mean corpuscular haemoglobin value of exposed women was found to be 29.15 pg. This value was higher in comparison to control group. Statistically no significant alteration was observed.

**Mean corpuscular haemoglobin concentration (MCHC):** The mean corpuscular haemoglobin concentration of control women was found to be 32.44%. The mean corpuscular haemoglobin concentration of exposed women of this group was found to be 30.45%. This value was lower in comparison to control group. Statistically no significant alteration was observed.

**Group B: 36-50 years age women**

**Haemoglobin (Hb):** The mean value of Haemoglobin of control women was observed to be 13.5 gm/dl. The mean value of Hb level was observed to be 12.2
gm/dl in the biomass fuel using women. It was lower than the value of control women. However, it was not significantly decrease as control.

**Red blood cells (RBC) count:** The mean value of RBC count of control women was observed to be 5.2 million/mm³ blood. The mean value of RBC count in exposed women of this group was observed to be 4.8 million/mm³ blood. It was lower than the control group women. No significant alteration was observed.

**Total leucocyte count (TLC):** The mean value of TLC of control women was observed to be 7000/mm³ blood. The mean value of TLC in exposed women of this group was observed slightly increased as 7200/mm³ blood. It was higher than the control group women. No significant alteration was observed.

**Platelets counts (PC):** The mean value of platelets count of control women was observed to be 2.5 Lac/mm³. The mean value of platelets count was observed in exposed women of this group was observed decreased as 1.95 lac/mm³ blood. It was lower than the control women. The statistical analysis revealed the significant (p<0.05) decreased count of platelets in the above caused the abnormal as compared to the control group.

**Packed cell volume (PCV):** The mean value of PCV level of control women was observed to be 44.5%. The mean value of PCV of exposed women of this group was observed to be slightly decreased 43.80%. It was slightly lower in comparison to control group women. Statistically no significant alteration was observed.
Mean corpuscular volume (MCV): The value of mean corpuscular volume of control women was observed to be 85.57 fl. The mean value of MCV in exposed group was observed to be 91.25 fl. This value was higher in comparison to control group. Statistically no significant alteration was observed.

Mean corpuscular Haemoglobin (MCH): The mean corpuscular haemoglobin value of control women was observed to be 25.96 pg. The mean corpuscular haemoglobin value of exposed women was found to be 25.41 pg. This value was same as comparison to control group. Statistically no significant alteration was observed.

Mean corpuscular haemoglobin concentration (MCHC): The mean corpuscular haemoglobin concentration of control women was found to be 30.33%. The mean corpuscular haemoglobin concentration of exposed women of this group was found to be 27.85%. This value was lower in comparison to control group. Statistically no significant alteration was observed.

Group C: 51-65 years age women

Haemoglobin (Hb): The mean value of Hb of control group women was observed to be 12.5 gm/dl. The mean value of Hb of biomass fuel smoke exposed women of this group was observed to be 11.0 gm/dl. It was lower than the control group women. The statistical analysis revealed the significant (p<0.05) decrease of Hb level in comparison to control group women.
Red blood cells (RBC) count: The mean value of RBC count of control group women was observed to be 4.5 million/mm³ and the mean value of RBC count of exposed women found to be 3.0 million/mm³. It was lower than the control group. The statistical analysis revealed the significant (p<0.05) decrease of RBC level in the above group as compared to the control group.

Total leucocyte count (TLC): The mean value of TLC was observed to be 7000/mm³. The mean value of TLC level of exposed women found to be 7600/mm³. The value was higher than the control. Statistically no significant alteration was observed.

Platelets counts (PC): The mean value of platelets count of control women was observed to be 2.4 Lac/mm³. The mean value of platelets count of exposed women found to be 2.0 Lac/mm³. It was approximately similar to the control group. No significant alteration was observed.

Packed cell volume (PCV): The mean value of PCV level of control group women was observed to be 43.20%. The mean value of PCV level of exposed women found to be 41.20%. It was lower than the control group. The statistical analysis revealed no significant alterations as compared to control group.

Mean corpuscular volume (MCV): The value of mean corpuscular volume was observed to be 123.42 fl in control group women. Mean Corpuscular Volume of exposed women found to be 137.33 fl. This value was significantly increased in
The statistical analysis revealed the significant (p<0.05) increase of MCV level in exposed group as compared to the control group.

**Mean corpuscular Haemoglobin (MCH):** The mean corpuscular haemoglobin value of control group women was observed to be 35.71 pg. Mean corpuscular haemoglobin of exposed women found to be 36.66 pg. This value was slightly increased in comparison to control group. Statistically no significant alteration was observed.

**Mean corpuscular haemoglobin concentration (MCHC):** The mean corpuscular haemoglobin concentration of control group women was found to be 28.93%. Mean corpuscular haemoglobin concentration of exposed women was observed to be 26.69%. This value was lower in comparison to control group. Statistically no significant alteration was observed.

**DIFFERENTIAL LEUCOCYTE COUNT**

(Table 2; Fig. 9, 10, 11, 12, 13, 14)

**Group A: 15-35 years age women**

**Polymorphs:** The mean value of polymorphs in control group women was observed to be 60.5% however, the mean value of polymorphs in exposed women was observed to be 45.35%. The statistical analysis revealed the significant (p<0.05) decrease in the number of polymorphs in the exposure group as compared
Lymphocytes: The mean value of lymphocytes in control group women was observed to be 32.0% and the mean value of lymphocyte in exposed group women was observed to be 48.35%. It was the higher count than control. The statistical analysis revealed the significant (p<0.05) elevation of lymphocytes showing humoral immune response in the above group as compared to the control group.

Neutrophils: The mean value of neutrophils in control group women was observed to be 50.60%. The mean value of neutrophils in exposed women was observed to be 45.35%. This value was decrease in comparison to control group. No significant alteration was noticed in exposed women group in comparison to control women.

Eosinophils: The mean value of eosinophils in control group women was observed to be 2.2%. The mean value of eosinophils in exposed women was observed to be 2.35%. It was increased than the control group. No significant alteration was observed.

Monocytes: The mean value of monocytes in control group women was observed to be 2.5%. However, the mean value of monocytes in exposed women was observed to be 2.65%. It was approximately similar to the control group. No significant alteration was observed.

Basophils: The mean value of basophils in control group women was observed to be 0.33%. The mean value of basophils in exposed women was observed to be
0.33%. It was just similar to the control group.

**Group B: 36-50 years age women**

**Polymorphs:** The mean value of polymorphs in control group women was observed to be 59.5% however, the mean value of polymorphs in exposed women was observed to be 55.67%. The statistical analysis revealed the significant (p<0.05) decrease in the number of polymorphs in the exposure group as compared to the control group.

**Lymphocyets:** The mean value of lymphocytes in control group women was observed to be 28.0% and the mean value of lymphocyte in exposed group women was observed to be 39.0%. It was the higher count than control. The statistical analysis revealed the significant (p<0.05) elevation of lymphocytes showing humoral immune response in the above group as compared to the control group.

**Neutrophils:** The mean value of neutrophils in control group women was observed to be 52.60%. The mean value of neutrophils in exposed women was observed to be 33.0%. This value was decrease in comparison to control group. The statistical analysis revealed the significant (p<0.05) decrease of neutrophils in the above group as compared to the control group.

**Eosinophils:** The mean value of eosinophils in control group women was observed to be 2.25%. The mean value of eosinophils in exposed women was observed to be 2.30%. It was increased than the control group. No significant alteration was
Monocytes: The mean value of monocytes in control group women was observed to be 2.55%. However, the mean value of monocytes in exposed women was observed to be 3.55%. It was approximately similar to the control group. No significant alteration was observed.

Basophils: The mean value of basophils in control group women was observed to be 0.33%. The mean value of basophils in exposed women was observed to be 0.33%. It was just similar to the control group.

Group C: 51-65 years age women

Polymorphs: The mean value of polymorphs in control group women was observed to be 62.3% however, the mean value of polymorphs in exposed women was observed to be 54.0%. The statistical analysis revealed the significant (p<0.05) decrease in the number of polymorphs in the exposure group as compared to the control group.

Lymphocytes: The mean value of lymphocytes in control group women was observed to be 25.0% and the mean value of lymphocyte in exposed group women was observed to be 40.6%. It was the higher count than control. The statistical analysis revealed the significant (p<0.05) elevation of lymphocytes showing humoral immune response in the above group as compared to the control group.
Neutrophils: The mean value of neutrophils in control group women was observed to be 39.0%. The mean value of neutrophils in exposed women was observed to be 34.0%. This value was decrease in comparison to control group. No significant alteration was noticed in exposed women group in comparison to control women.

Eosinophils: The mean value of eosinophils in control group women was observed to be 3.0%. The mean value of eosinophils in exposed women was observed to be 3.6%. It was increased than the control group. No significant alteration was observed.

Monocytes: The mean value of monocytes in control group women was observed to be 2.4%. However, the mean value of monocytes in exposed women was observed to be 4.2%. It was increased in comparison to control group. The statistical analysis revealed the significant (p<0.05) elevation of monocytes showing humoral immune response in the above group as compared to the control group.

Basophils: The mean value of basophils in control group women was observed to be 0.33%. The mean value of basophils in exposed women was observed to be 0.33%. It was just similar to the control group.

PHASE-II: BIOCHEMICAL STUDY

(Table 3 & Fig. 15, 16, 17, 18, 19, 20, 21, 22, 23)

The biochemical observations were made in all the three groups of control and
biomass fuel smoke exposed women. The observations are described below:

**Group A: 15-35 years age women**

**Serum total protein:** The mean value of total serum protein of control women was observed to be 7.85 gm/dl, however, the mean value of total serum protein of exposed women was observed to be 7.0 gm/dl. It was approximately similar, to the control group. Statistically no significant alteration was observed.

**Serum albumin:** The mean value of serum albumin level of control women was found to be 4.15 gm/dl. The mean value of serum albumin level of exposed women found to be 3.5 gm/dl. It was lower than the control. The statistical analysis revealed the significant (p<0.05) decrease of serum albumin level in the above group as compared to the control group.

**Serum globulin:** The mean value of serum globulin level of control women was examined to be 3.70 gm/dl. The mean value of serum globulin level of exposed women was found to be 3.50 gm/dl. It was higher than the control group. The statistical analysis revealed the significant (p<0.05) elevation of serum globulin level in the above group as compared to the control group.

**Serum alkaline phosphatase (ALP):** The mean value of ALP of control women was observed to be 110.3 IU/L. The mean value of serum ALP level of exposed women was observed to be 105 IU/L. It was lower than the control. The statistical analysis revealed the no significant alteration in the above group as compared to
the control group.

**Serum acid phosphatase:** The mean value of acid phosphatase level of control women was observed to be 2.0 IU/L. However, the mean value of serum acid phosphatase level of exposed women was observed to be 2.45 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate pyruvate transaminase (SGPT):** The mean value of SGPT level of control women was observed to be 22.0 IU/L. However, the mean value of SGPT level of exposed women was observed to be 23.10 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate oxalacetate transaminase (SGOT):** The mean value of SGOT level of control women was observed as 20.0 IU/L. The mean value of SGOT level of exposed women was observed to be 17.50 IU/L. It was lower than the control. The statistical analysis revealed the significant (p<0.05) decrease in the above group as compared to the control group.

**Serum creatinine:** The mean value of creatinine level of control women was found to be 0.40 mg/dl. However, the mean value of serum creatinine level of exposed women was observed to be 0.45 mg/dl. It was higher than the control. The statistical analysis revealed the non significant elevation in the above group as
compared to the control group.

**Serum glucose:** The mean value of serum glucose level of control women was observed to be 110.0 mg/dl. The mean value of glucose serum level of exposed women was observed to be 99.65 mg/dl. It was lower than the control values. However, statistical analysis did not reveal significant value.

**Serum cholesterol:** The mean value of serum cholesterol level of control women was observed to be 170.0 mg/dl. The mean value of serum cholesterol level of exposed women was observed to be 172.0 mg/dl. It was approximately similar to the control group. The statistical analysis revealed no significant alteration in the above group as compared to the control group.

**Group B: 36-50 years age women**

**Serum total protein:** The mean value of total serum protein of control women was observed to be 7.20 gm/dl, however, the mean value of total serum protein of exposed women was observed to be 6.10 gm/dl. It was lower to the control group. Statistically no significant alteration was observed. **Serum albumin:** The mean value of serum albumin level of control women was found to be 5.20 gm/dl. The mean value of serum albumin level of exposed women found to be 4.45 gm/dl. It was lower than the control. Statistically no significant alteration was observed.

**Serum globulin:** The mean value of serum globulin level of control women was examined to be 2.0 gm/dl. The mean value of serum globulin level of exposed
women was found to be 1.65 gm/dl. It was lower than the control group. Statistically no significant alteration was observed.

**Serum alkaline phosphatase (ALP):** The mean value of ALP of control women was observed to be 128.0 IU/L. The mean value of serum ALP level of exposed women was observed to be 118.65 IU/L. It was lower than the control. The statistical analysis revealed significant (P<0.05) alteration in the above group as compared to the control group.

**Serum acid phosphatase:** The mean value of acid phosphatase level of control women was observed to be 1.65 IU/L. However, the mean value of serum acid phosphatase level of exposed women was observed to be 2.85 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate pyruvate transaminase (SGPT):** The mean value of SGPT level of control women was observed to be 22.5 IU/L. However, the mean value of SGPT level of exposed women was observed to be 29.0 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate oxalacetate transaminase (SGOT):** The mean value of SGOT level of control women was observed as 12.4 IU/L. The mean value of SGOT level of exposed women was observed to be 24.0 IU/L. It was higher than the control.
The statistical analysis revealed the significant (p<0.05) increase in the above group as compared to the control group.

**Serum creatinine:** The mean value of creatinine level of control women was found to be 0.45 mg/dl. However, the mean value of serum creatinine level of exposed women was observed to be 0.52 mg/dl. It was higher than the control. The statistical analysis revealed the non significant elevation in the above group as compared to the control group.

**Serum glucose:** The mean value of serum glucose level of control women was observed to be 120.0 mg/dl. The mean value of glucose serum level of exposed women was observed to be 111.0 mg/dl. It was lower than the control values. However, statistical analysis did not reveal significant value.

**Serum cholesterol:** The mean value of serum cholesterol level of control women was observed to be 185.0 mg/dl. The mean value of serum cholesterol level of exposed women was observed to be 195.0 mg/dl. It was higher to the control group. The statistical analysis revealed no significant alteration in the above group as compared to the control group.

**Group C: 51-65 years age women**

**Serum total protein:** The mean value of total serum protein of control women was observed to be 7.0gm/dl, however, the mean value of total serum protein of exposed women was observed to be 6.0 gm/dl. It was lower to the control
Statistically no significant alteration was observed.

**Serum albumin:** The mean value of serum albumin level of control women was found to be 5.02 gm/dl. The mean value of serum albumin level of exposed women found to be 4.15 gm/dl. It was lower than the control. Statistically no significant alteration was observed.

**Serum globulin:** The mean value of serum globulin level of control women was examined to be 1.98 gm/dl. The mean value of serum globulin level of exposed women was found to be 1.85 gm/dl. It was lower than the control group. Statistically no significant alteration was observed.

**Serum alkaline phosphatase (ALP):** The mean value of ALP of control women was observed to be 130.5 IU/L. The mean value of serum ALP level of exposed women was observed to be 112.50 IU/L. It was lower than the control. The statistical analysis revealed significant (P<0.05) alteration in the above group as compared to the control group.

**Serum acid phosphatase:** The mean value of acid phosphatase level of control women was observed to be 2.0 IU/L. However, the mean value of serum acid phosphatase level of exposed women was observed to be 2.85 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate pyruvate transaminase (SGPT):** The mean value of SGPT
level of control women was observed to be 20.3 IU/L. However, the mean value of SGPT level of exposed women was observed to be 25.0 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) elevation in the above group as compared to the control group.

**Serum glutamate oxalacetate transaminase (SGOT):** The mean value of SGOT level of control women was observed as 14.9 IU/L. The mean value of SGOT level of exposed women was observed to be 26.67 IU/L. It was higher than the control. The statistical analysis revealed the significant (p<0.05) increase in the above group as compared to the control group.

**Serum creatinine:** The mean value of creatinine level of control women was found to be 0.64 mg/dl. However, the mean value of serum creatinine level of exposed women was observed to be 0.76 mg/dl. It was higher than the control. The statistical analysis revealed the non significant elevation in the above group as compared to the control group.

**Serum glucose:** The mean value of serum glucose level of control women was observed to be 122.0 mg/dl. The mean value of glucose serum level of exposed women was observed to be 99.30 mg/dl. It was lower than the control values. The statistical analysis revealed significant (P<0.05) alteration in the above group as compared to the control group.

**Serum cholesterol:** The mean value of serum cholesterol level of control women
was observed to be 200.0 mg/dl. The mean value of serum cholesterol level of exposed women was observed to be 205.0 mg/dl. It was higher to the control group. The statistical analysis revealed no significant alteration in the above group as compared to the control group.

**PHASE - III: IMMUNOLOGICAL STUDIES**

(Table 4 & Fig. 24, 25, 26, 27)

The immunological observations were made in all the three groups of control and biomass fuel smoke exposed women. The results are described below.

**Group A: 15-35 years age women**

**Immunoglobulin M (IgM):** The mean value of serum IgM of control women was observed to be 92.6 mg/dl. The mean value of IgM level of biomass smoke exposed was calculated as 126.7 Mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgM antibodies showing augmentation of humoral immune response in the above group as compared to the control group.

**Immunoglobulin G (IgG):** The mean value of serum IgG of control group women was found to be 1265.55 mg/dl. The mean value of IgG level of exposed women was found to be 1375.75 mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgG antibodies showing increased humoral immune response in the above group as compared to
control group.

**Immunoglobulin A (IgA):** The mean value of serum IgA of control group was observed as 195.65 mg/dl. The mean value of IgA level of exposed women was observed to be 235.45 mg/dl in the above age group. The value was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgA antibodies revealing increased humoral immune response in the above diseases as compared to control group.

**Immunoglobulin E (IgE):** The mean value of serum IgE of control group was observed as 54.0 mg/dl. The mean value of IgE level of exposed women was found to be 51.5 mg/dl in the above age group. It was approximately similar to the control group.

**Group B: 36-50 years age women**

**Immunoglobulin M (IgM):** The mean value of serum IgM of control women was observed to be 97.2 mg/dl. The mean value of IgM level of biomass smoke exposed was calculated as 158.5 Mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgM antibodies showing augmentation of humoral immune response in the above group as compared to the control group.

**Immunoglobulin G (IgG):** The mean value of serum IgG of control group women was found to be 1322.45 mg/dl. The mean value of IgG level of exposed women
was found to be 1587.75 mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgG antibodies showing increased humoral immune response in the above group as compared to control group.

**Immunoglobulin A (IgA):** The mean value of serum IgA of control group was observed as 192.65 mg/dl. The mean value of IgA level of exposed women was observed to be 240.60 mg/dl in the above age group. The value was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgA antibodies revealing increased humoral immune response in the above diseases as compared to control group.

**Immunoglobulin E (IgE):** The mean value of serum IgE of control group was observed as 57.0 mg/dl. The mean value of IgE level of exposed women was found to be 52.7 mg/dl in the above age group. It was slightly lower than the control group.

**Group C: 51-65 years age women**

**Immunoglobulin M (IgM):** The mean value of serum IgM of control women was observed to be 115.45 mg/dl. The mean value of IgM level of biomass smoke exposed was calculated as 131.50 Mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgM antibodies showing augmentation of humoral immune response in the above group.
as compared to the control group.

**Immunoglobulin G (IgG):** The mean value of serum IgG of control group women was found to be 1115.0 mg/dl. The mean value of IgG level of exposed women was found to be 1320.55 mg/dl in the above group. It was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgG antibodies showing increased humoral immune response in the above group as compared to control group.

**Immunoglobulin A (IgA):** The mean value of serum IgA of control group was observed as 182.0 mg/dl. The mean value of IgA level of exposed women was observed to be 202.65 mg/dl in the above age group. The value was higher than control. The statistical analysis revealed the significant (P<0.05) elevation of IgA antibodies revealing increased humoral immune response in the above diseases as compared to control group.

**Immunoglobulin E (IgE):** The mean value of serum IgE of control group was observed as 65.04 mg/dl. The mean value of IgE level of exposed women was found to be 68.20 mg/dl in the above age group. It was about to similar to the control group.

**LUNG FUNCTION TEST:** The physiological responses of the lungs were done by using spyrometer to assess the pulmonary status and type of pulmonary abnormalities prevalent in exposed and control rural women. The observations
revealed that the smoke exposed women of old age (40-65 years) found effected with COPD.

**DIAGNOSIS OF TUBERCULOSIS:** It was done from the test of sputum of suspected exposed and control rural women. Sputum samples were diagnosed in pathology laboratory and observations were revealed that the some women of Group –C (51-65 years) found Tuberculosis positive.

**DIAGNOSIS OF HYPERTENSION:** It was diagnosed by recording of blood pressure of biomass fuel smoke exposed and control women with the help of digital sphygmomanometer. The observations revealed that the systolic and diastolic blood pressure found elevated of smoke exposed women of group-B and group –C (40-65 years age).