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TRAFFIC RELATED AIR POLLUTION EXPOSURE EFFECT ON CIRCULATING WHITE BLOOD CELL COUNTS IN HEALTHY INDIVIDUALS

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ABSTRACT

During this short term study a total of 110 samples were collected from the selected individuals of study area. This study was aimed to count the White blood cells in the blood samples of individuals, who were mostly exposed to exhaust fumes (air pollution), like traffic constables, cooks and shopkeepers. For this purpose blood samples were taken into an evacuee container having anticoagulant Ethylene diamine tetra-acetic acid (EDTA) so to prevent coagulation of blood, for the count of WBCs, heamocyto-meter was used. During the study the body mass index and blood pressure was also measured by digital blood pressure measuring apparatus. Samples were observed under the microscope. It was found that 15% (13,133±2544.081) sampled individuals had increased WBCs and 85% (7821±1482.76) normal WBCs. In female samples 50% (11900±2151.27) were observed with above range of WBCs and other 50% (8540±844.39) with normal range of WBCs count, non-had WBCs count lower than the normal WBCs. Mostly had normal and few had above the range. One way ANOVA has been used to analyze connection of exposure to air pollution with counts of circulating white blood cells.

Key words: Lymphocytes, air pollution, coagulation, heamocyto-meter.

INTRODUCTION

Air pollution is a mixture of gases and particles that can feast damaging absorptions equally open-air and privileged. The connection of air pollutants with blood plasma is a debatable relic (Brigham et al., 2019). Blood is a connective tissue that helps to hold fluids, protects in contradiction of contagions and maintains the body's heat. Blood components include plasma, red blood cells (RBCs) and white blood cells (WBCs). An important part of the immune system is the WBC, also called leukocytes (Kelishadi et al., 2010). These leukocytes help body by attacking bacteria, viruses and germs that enter the body, these cells help combat infections. In the bone marrow, white blood cells are produced but circulate throughout the bloodstream. In calculation, the WBC works in the body as a self-protective mechanism (Bhattacharya et al., 2014). There are many types of WBC that perform particular roles, such as Neutrophils (65 to 70% of the total WBC) directing and consuming the invading bacterial lymphocytes (25% of WBC) mature antibodies that shield the body from the antigen and therefore have protection to infection. Basophils secrete heparin, an anticoagulant, which reduces clotting in the blood cells. Eosinophils and monocytes also help by being active against particular antigens in the body's security system (Goyal, 2020).

The white blood cell Count (WBC) is an important measure of the health of the healthy surroundings. Moreover, it is emerging as a danger issue for never-ending conditions. Elevated absolute WBC and its differential cell line levels have been documented as hazardous factors, including asthma, for plentiful diseases. Coronary artery disease (Madjid et al., 2004; Weijenberg et al., 1996) myocardial infarction (Gudbjartsson et al., 2009) and cancer (Nalls et al., 2008;Gudbjartsson et al., 2009). The deterrent of the hematopoietic system, primarily the bone marrow, is an integral part of the underlying strong response, contributing to the distribution of white platelets (WBC) and platelets. Big population-based trials have consistently demonstrated in previous decades that the circling WBC levels are a straight indication of cardiovascular well-being outcomes, even when other risk factors have been changed (Majid et al., 2004; Bekwelem et al., 2011). Steenhof et al., (2011) played out a broad arrangement of human presentation concentrates in which willing volunteers were presented to encompassing air contamination at true areas with significant contrasts in air contamination qualities. Understanding the general effect of these sorts of presentations is restricted, nonetheless, because of an absence of information on the connection between mellow to moderate immune suppression and irresistible illness results (Lund et al., 2005). Air pollution, which has a real toxicological impact on human health and ecology, is a big concern of the late decades. Contamination wellsprings differ from small units of nicotine and traditional causes such as volcanic eruption to massive amounts of emanation from vehicle engine engines and mechanical exercises (Sharma et al., 2014).

Long-term effects of air pollution on the onset of illnesses, such as respiratory diseases and irritations, cardiovascular dysfunctions, and malignancy, are generally recognized; thus, foreign air contamination is linked with a significant number of deaths per year. The association between male barrenness and air pollution has been uncovered by an ongoing study (Azam et al., 2016). Assessments have been made of the weight of cancer owing to natural factors and of the commitment of air pollution to lung cancer explicitly. These appraisals have been in the scope of 3-5% for the division of lung cancer cases owing to encompassing air pollution. For encompassing air pollution, the assessed number of lung cancer occurring overall was 62000 every year (Cohen et al., 2004). Momentary symptoms are short and vary from basic distress, such as inflammation of the eyes, nose, skin, mouth, loss of breath, hacking and chest snugness, and respiratory problems, to more genuine conditions, such as asthma, pneumonia, bronchitis, and problems with the lungs and heart. These problems can be disturbed by extended long-term introduction to the poisons, which is harmful to the neurological, reproductive, and respiratory frameworks and causes cancer and even, rarely, passing. The impacts drawn out are constant, going on for a considerable length of time or throughout life and can even promptly disappear (Manisalidis et al., 2020).

In patients with recurrent aspiratory disorders such as chronic bronchitis, chronic obstructive pneumonic disorder, and asthma, air pollution causes a modification of the characteristic white platelet. In patients with chronic pneumonic conditions, the expansion of particulate and vaporous air emissions has been associated with numerous modifications in the differential white platelet (Irene et al., 2014). Certain conditions can be suggested by differential outcomes. Acute stress, inflammation, gout, rheumatoid arthritis, thyroiditis, trauma and pregnancy can cause a rise in neutrophils in your blood. A drop in the blood neutrophils can be caused by: anemia, bacterial infection, chemotherapy, measles or other infectious diseases and exposure to radiation (Rosales, 2018).

Chronic infection, mononucleosis, leukaemia and viral infections such as mumps or measles etc. may cause a rise in lymphocytes in your blood. Chemotherapy, HIV infection, leukaemia, sepsis, radiation exposure, either accidental or from radiation therapy (Notkins et al., 1970), may cause a decrease in lymphocytes.

Chronic inflammatory conditions, tuberculosis, respiratory infections, such as measles, mononucleosis, and mumps may be caused by a rise in monocytes. Bloodstream inflammation, chemotherapy, bone marrow disease, skin infections caused drop in monocytes (Zumla and James, 1996). There may be a spike in eosinophil due to: allergic response, parasitic infection. Acute allergic reactions (Cottin, and Cordier, 2005) and can cause a decrease in basophils.

MATRIALS AND METHODS

The city of Bagh was selected for collection of data. A cross-sectional survey was made to collect the samples from the subjected people. A total of 100 male blood samples and 10 blood samples from selected females individuals were taken from the population of study area.

A small amount (5 ml) of blood sample was taken to count WBCs. This procedure was also known as a blood draw or venipuncture by following the safety measures, wearing the gloves, lab coat and mask. An elastic tie was banded around upper arm so that blood collected in vein, insert a sterile needle into vein to draw blood into evacuees container had anticoagulant, EDTA. We disposed the needles immediately after taking the blood. Pressure was applied to the wound to stop bleeding and prevent bruising. A sample was taken to a laboratory, where the number and type of white blood cells found for each specimen was measured. Blood was taken by puncturing the vein with sterile lancet needle; clean the skin with alcohol swab put in into the evacuee container. Blood was sucked in WBC pipette to accurately the 0.5 mark. The tip of diluting pipette was wiped and cleaned with a piece of dry gauge without touching the notch and it was absorbed in the fleshy filtered diluting fluid. The white blood cells diluting fluid were strained by the same pipette till the 1.1 mark above the bulb. The contents of the pipette were mixed well by rising and falling the pipette in between the palms and the rolling area of the neubauer chamber is covered by a thick cover slip provided specifically. After 5 minutes the contents of the WBC diluting pipette were mixed well again and few drops of the contents were excluded out, So that the blood mixed solution coming to the tip of the pipette. The tip of the pipette was kept at the boundary of the cover slip on the ruled area of the neubauer chamber. The blood mixed solution was gently expelled. So that the solution spreads gradually in between the covers slip and ruled area of the neubauer chamber. After 3 minutes the loaded neubauer chamber was observed under the low power objective microscope for including the total no of leucocytes. After a clean view for the ruled area was obtained and it was observed for the calibration. The total area of ruling is 9 mm^2 (3mm x 3mm). There is four corner's mm^2 (1mm x 1mm) WBCs is viewed like this spots and the average number of White blood cells for $1mm^2$ is calculated, from this value the total WBC count/mm^3 is calculated. The main focus of this study was leukocytes analysis of blood taken from the persons who had exposure directly to the air pollution. The other variables for the analysis were anthropometric data (height, weight, body mass index were determined by using the formula: kg/m^2.

In Body Mass Index the value taken from the person's weight and weight. The result was used to determine, if that individual were under weight, normal weight or overweight, or obese, depending on where they fall within the BMI grouping ranges. Body Mass Index was calculated by taking person's height and weight .This formula was used BMI=kg/m^2 where kg is person's mass (weight) in kilogram and height in meters square (m^2). For the analysis of collected data one way ANOVA was used.

RESULTS AND DISCUSSION

During this study the 110 individuals were observed had a greater exposure to the polluted environment. Their blood samples were taken for WBCs count. Among them 100 were male and 10 females were observed. Among males 85 individuals had normal WBCs count (7821±1482.76) and only 15 peoples had above number of WBCs range (13,133± 2544.08). Among the male 47 individuals were found that had normal BMI. Among them 38 (80.85%) individuals had the normal BMI (22±1.63) and normal WBC (7,724±1362.12) count within the normal range. And 09 (19.17%) among the 47 had the normal BMI (21.42±1.87) but their WBC count above the normal range (13,722±3122.01). But 04 individuals had low range of BMI (15.89±1.31) with normal WBC range (7,050±645.49). Only one individual was found under normal range of BMI (17.63) and WBC count above the normal range (13.100).

Similarly 33 individuals were found that with overweight (26.968±1.24) but had the normal WBC count (8,075±1545.97). But only 05 individuals were overweight (28.01±1.60) and their WBC count was above the normal range (12,080±995.99). In these persons we found that their Lymphocyte and Neutrophils level increased. Ten individuals were Obese (34.055±1.3.94) with abnormal range of WBCs (7,669±1919.60).

There is no apparent effect of BMI on WBCs count (p=0.64) (Table 1). We took the samples that belonged to four different professions, among them 35 were Traffic constable and 40 were Cooks, 15 were Shopkeepers and only 10 were randomly selected.

Table 1: Comparison between WBC and BMI.

BMI	N	Mean± STDV	P value
Below range	5	0.20±0.44	0.64
Normal range	47	0.19±0.39	
Above range	38	0.13±0.34	
Obesity	10	0.00±0.00	
Total	100	0.15±0.35	

Twenty five (71.42%) Police constable were performed their traffic duties on roads and 10 (28.57%) in offices. Among them 33 (94.29%) have the normal WBCs count (7,873±1336.57) and only two (5.71) which perform their duties on roads were had the above range of WBCs (61,700±69862.15). Forty Cooks were observed during the study and their height, weight, and age for WBCs count were taken. Among them 30 (75%) cooks have normal WBCs range (7,550±1244.18) and only 10 (25%) had the WBCs count above the normal range (13,390±3017.89). Fifteen Shopkeepers were observed, among them 14 (93.33%) had the normal range of WBCs count (7880±1848.62) and only one has the abnormal value (14100). Among 100 male samples 10 sample were randomly collected, 08 (80%) were with normal WBCs count (8,600±2010.68) and only 02 (20%) with above range of WBCs (12,800±1414.21). Profession has the significant effect on WBCs count (p=0.00) (Table 2).

Table 2: Comparison between WBC and Profession.

Professions	N	Mean± STDV	P value
P.C	35	0.00±0.00	0.00
C	40	0.2±0.43	
S.K	15	0.33±.48	
R.C	10	0.00±0.00	
Total	100	0.15±.35	

P.C (Police Constable) C (Cooks) S.K (Shopkeepers) R.C (Randomly Collected)

Age factor was also noted. We made five classes 16-24, 26-35, 36-45, 46-55 and 56-65.The persons having the age between 16-25 years were 23 in numbers. Among them 08 were with greater number of WBCs then normal range (14175±3094.11), they were more vulnerable to the environmental factor. The 15 (65.21) with normal no of WBCs (14175±3094.11). The individuals who were in class 26-35 were 31 among them 29 (93.54%) had the normal no of WBCs (7924,14±1468.15) and 02 (6.45%) had the above range of WBCs (11450±494.97). Twenty two people were in class 36-45, among them 17 (77.27%) had the normal range of WBCs (8176.47±3040.55), 05(22.72%) were above the no of WBCs (61600±2192.03).

Table 3: Comparison between WBCs and AGE.

Age Group	N	Mean± STDV	P value
16-25	23	0.30±0.47	0.11
26-35	31	0.10±0.30	
36-45	22	0.18±.39	
46-55	20	0.05±0.22	
56-65	4	0.00±0.00	
Total	100	0.15±.35	

Twenty people were in class 46-55 from them all had the normal range of WBCs count (7545±1425.51). Only four individuals were present in class 56-65, they all had the normal no of WBCs count (27800±141.42). The impact of age on the WBC count is also not evident (*P*= 0.11) (Table 3).

Among the 10 females 50% had normal range and 50% had above range of WBCs count. Among the females 06 (60%) individuals were found that had normal BMI, 03 (50%) of them had with normal range of WBCs count (8,600±1178.98), BMI (22.87±0.80) and 03 (50%) with above no of WBCs count (19.883±1.39) and BMI (19.88±1.39). Only 02 (20%) individuals were overweight (26.32±1.52) with normal range of WBCs count (8,450±212.13). Only one (10%) individual that was overweight (29.44) with abnormal WBCs count (12,100) and one (10%) with low BMI level (15.31) and above WBCs count (11,800). There is no significance effect of BMI on WBCs count (*p*=0.60) (Table 4).

Table 4: Comparison between WBC and BMI.

BMI	N	Mean± STDV	P Value
Below range	1	1.00	0.60
Normal range	6	0.50± 0.54	
Above Range	3	0.33± 0.57	
Total	10	0.50± 0.52	

Among females classes were also formed for compared the age with WBCs count. Five individuals were with normal WBCs count (8540±844.39) and 05 with WBCs count above the normal range (12620±1377.32). In class 16-25 one female (10%) was present with above no of WBCs (12,100). In class 26-35 three females (30%) were present two with normal range of WBCs (8,300+8600) and one with above count of WBCs (11800). In class 36-45 two females (20%) were present with above no of WBCs (13,700+11,100). In next class 46-55 only two females (20%) were present one with normal range of WBC count (8300) and one with above range of WBCs (14400). In last class two (20%) females were present with normal range of WBCs count (9900+7600). There is no apparent effect of age on WBCs count (*p*=0.34) (Table 5).

Age Group	N	Mean±STDV	P Value
16-25	1	1.00	0.34
26-35	3	0.33±0.57	
36-45	2	1.00 ±0.00	
46-55	2	0.50 ±0.70	
56-65	2	0.0 ±0.00	
Total	10	0.50± 0.52	

Table 5: Comparison between WBC and AGE.

Females belonging to two professions 06 (60%) were kitchen housewives and 04 (40%) were common housewives. Among kitchen housewives 05 (50%) with above WBCs count (11900±2151.27) and one (10%) with normal WBCs count (8,300). Four (40%) common housewives have the normal range of WBCs count (8600±962.63). Profession has significant effect on WBCs count (*p*=0.04) (Table 6).

Table 6: Comparison between WBC and Profession.

Profession	N	Mean± STDV	P Value
K.H	5	0.80±0.44	0.04
C.H	5	0.80±0.44	
Total	10	0.50±0.52	

K.H (Kitchen Housewives) C.H (Common Housewives)

DISCUSSION

The results obtained in this study are favored by the results of Herve et al., 2019. There is a substantial variation (decrease) in the amount of white blood cells from the normal range in commercial motorcyclists relative to rural residents in 2019, according to Herve et al., 2019 and an elevated risk of lung cancer and mortality in bus drivers.

There is also some proof that employee outdoor air pollution is correlated with negative health effects for commercial drivers. Jorres et al., 1995 found that number of leukocytes was elevated in individuals who are exposed to air pollution for longer time. There were discrepancies in results of this study, probably due to the differences in air quality (pollution concentrations) and period of exposure. Our data indicated that the studied subjects as well as healthy subjects do not show significant alterations of leukocytes cellular composition longer exposure increased leukocyte number. Whereas this study results were in accordance with some of the studies performed. It does not agree with the decreased number of leukocytes reported by Herve et al., 2019, but in accordance with the results of Sandstrom et al., 1991.

CONCLUSION

This discrepancy may be due to the location of study area and thick plants cover and less urbanization as well as factories and absence of heavy traffic in the area. The existing literature is limited and few studies and small sample size due to covid-19 and limited time and socioeconomic constraints, and contradictory findings thus, further research is recommended.

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