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A Study on Correlation between Absolute Eosinophil Count and Body Mass Index

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Abstract: Eosinophils are granulocytes derived from myeloblast in the bone marrow circulating in the blood. It is a specialized cell of immune system and eosinophils plays an important role in allergic conditions. Body mass index (BMI) correlates with total body fat. BMI is a measurement of a person height respect to his or her body weight. aim and objectives of this study is to find the Correlation between AEC and BMI. A Total number of people subjected to the study were 50 within the age group of 18-23-year-old of both the sexes. The study group has BMI >24 and the control group have BMI <24. The AEC were done using improved neubauer method. Then Body mass index calculated with respect to their height and weight. In study group mean and SD of BMI is 26.64 ± 1.28 and AEC is 381 ± 42.91 which is statistically significant (p value is ≤ 0.05). And in control group mean and SD of BMI is 20.68 ± 1.83 and AEC is 147 ± 74.22 and it is statistically not significant (p value is ≥ 0.05). In our study we found significantly high absolute eosinophil count having body mass index >25. As cited above high absolute eosinophil count in BLD is associated with higher prevalence of asthma, wheezing, asthma attacks and asthma related emergency, allergic dermatitis, It will be a beneficial effect to control BMI, so that prevalence of these types of diseases and consequences can be reduced.

Keywords: AEC, BMI, Eosinophil, Body weight, blood

I. INTRODUCTION

Eosinophils are predominantly tissue dwelling cells present in the peripheral blood can increase in a wide array of disease states ranging in severity from mild to life threatening. Eosinophils are granulocyte derived from myeloblast in the BM circulating in the BLD. It is also a specialized cell of the immune system. It has a nucleus with 2 lobes and cytoplasm filled with granule. (1) Eosinophils plays an important role in allergic conditions. In Asthma like allergic condition increases in the number of eosinophils. (2) Normal eosinophil count is 40-400 mm³. Absolute Eosinophil Count (AEC) is a BLD test that measures the number of eosinophils. AEC BLD is diluted 1 in 10 with eosinophil diluting fluid, charged and counted under low power objective. The diluting fluid stains the eosinophils. (3) Body mass index (BMI) is correlates with total body fat. BMI is a measurement of a person height respect to his or her body weight. Normal BMI value is 18.5 – 24. Below 18.5 considers as underweight and more than 25 is overweight. (4) Obesity is a fastest growing problems attaining epidemiological proportion worldwide. (5) It is associated with an increased risk of premature death due to many allergic diseases. Individuals have high BMI are more prone to allergic diseases. (6) Epidemiological data indicate that obesity increases of asthma. There is hot debate about whether eosinophils are involved in pathogenesis of asthma (7,8). The present study is attempted to find out any correlation between AEC and BMI.

II. AIM AND OBJECTIVES

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A. Aim

To find out any relation between AEC and BMI

B. Objectives

- 1) To access the Body Mass Index of both control and study group
- 2) To find out their absolute eosinophil count.
- 3) To find the Correlation between AEC and BMI.

III. MATERIALS AND METHOD

This study was conducted at pathology laboratory in, presentation centre of allied science, Ernakulam during the years 2023-2024. The subject was explained about the study and their consent was taken. A Total number of persons subjected to the study was 50 within the age group of 18- 23-year-old of both the sexes. The study group has BMI >24 and the control group have BMI <24. 01 ml of EDTA venous BLD was collected from each subject. The AEC were done using improved Neubauer method. Then Body mass index calculated with respect to their height and weight. All paragraphs must be indented.

A. Inclusion Criteria

Apparently healthy males and females of the age group 18 – 23 years were included.

B. Exclusion Criteria

Subject with asthma, skin allergy, worm infection, history of drug allergy and steroid therapy

C. BMI

The individuals were first subjected to anthropometry. First age was recorded. Standing height was recorded without shoes with a standiometer in centimeter. Weight was recorded without shoes and with light clothes on a weighing machine. Then BMI was calculated as: weight in kg/height in meter square.

D. BLD Collection

A written consent was obtained from the students who participated in this study. Study protocol was explained to the students, and also explains about the venous BLD collection.

E. Materials

. Disposable single use 21 gauge needle • Disposable single use syringe • Penicillin bottles • Tourniquet • Cotton • 70 % alcohol • Anticoagulants : EDTA

F. METHOD

• The patient is seated comfortably with his/her arm extended on the table and palm face upwards. • Apply tourniquet just above the elbow. • Select the vein for puncture and clean the site with spirit. • The needle is attached to the syringe. • It is introduced into the vein is denoted by the appearance of BLD in the hub of the needle or in the syringe. • Withdraw the piston till the required amount of BLD fills the barrel. • Place a cotton swab at the site of puncture and withdraw the needle in a single movement. • BLD is transferred to EDTA tube. • Mix thoroughly

G. Absolute Eosinophil Count

Take BLD up to 1 mark and dilute fluid up to 11 marks of WBC pipette • Mix well keeps for 2 minutes and discard first 2-3 drops • Charge the counting chamber placed on a flat surface and keep for 5 minutes. • Focus the WBC area under low power objective and count the number of cells present in the whole ruled area. [counting should be done within 30 minutes after mixing the diluting fluid with BLD as the cell disintegrate after a period of time] • Calculate the absolute eosinophil count using the standard formula

$$\frac{N \times 100}{9}$$

IV. RESULT

The study was conducted at pathology laboratory of Presentation Centre of Allied Science. A total of 50 students were participated in this study. From each participant 1 ml of BLD was collected. The study group has BMI >24 and the control group have BMI <24. 01 ml of EDTA venous BLD was collected from each subject. The AEC were done using improved Neubauer method. Then Body mass index calculated with respect to their height and weight.

In study group mean and SD of BMI is 26.64±1.28 (table 3) and AEC is 381±42.91 (table 4) which is statistically significant (p value is ≤0.05) (table 4). And in control group mean and SD of BMI is 20.68±1.83 (table 3) and AEC is 147±74.22 (table 4) and it is statistically not significant (p value is ≥0.05). In Figure 6 study group show AEC is positively correlated with high BMI. And in figure 7 control group show AEC is negatively correlated with BMI.

So, in the study we found that high BMI is positively correlated with high AEC and it is more significant in study group.

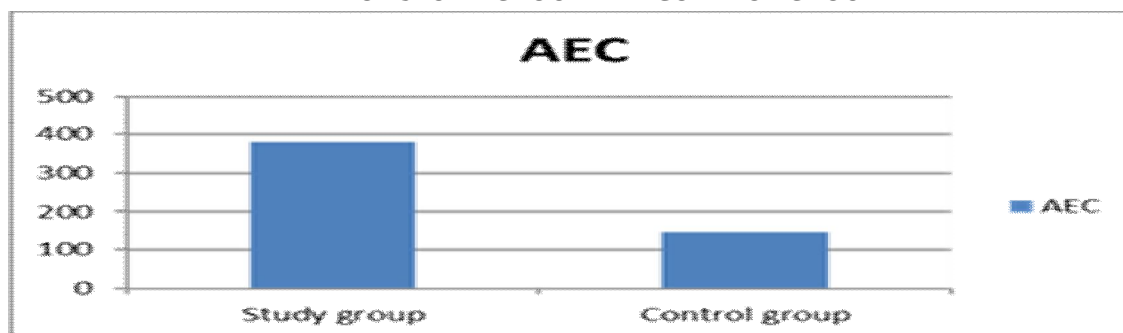
TABLE I
COMPARISON OF ANTHROPOMETRIC OF STUDY GROUP AND CONTROL GROUP

	STUDY GROUP	CONTROL GROUP
AGE MEAN $\pm$ SD	20.48 $\pm$ 1.36	20.68 $\pm$ 1.89
HEIGHT[CM] MEAN $\pm$ SD	162.6 $\pm$ 7.95	161.48 $\pm$ 9.19
WEIGHT[KG] MEAN $\pm$ SD	70.8 $\pm$ 8.40	53.64 $\pm$ 7.14
BMI MEAN $\pm$ SD	26.64 $\pm$ 1.22	20.68 $\pm$ 1.80

TABLE 2
Comparison of AEC and BMI between study and control group

	STUDY GROUP	CONTROL GROUP
BMI MEAN $\pm$ SD	26.64 $\pm$ 1.28	20.68 $\pm$ 1.83
AEC MEAN $\pm$ SD	381 $\pm$ 42.91	147 $\pm$ 74.22
P value	0.01	0.09

GRAPH 1:
MEAN OF STUDY GROUP AND CONTROL GROUP



Graph: 2
Mean Of Study Group And Control Group

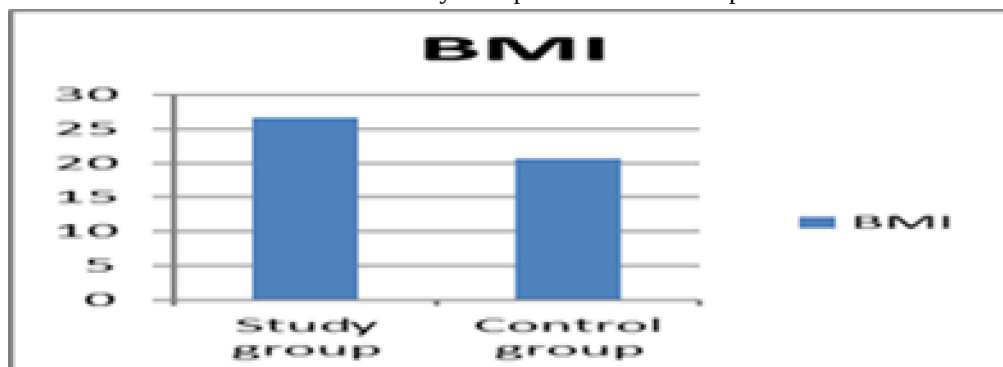


Figure no:1 scattered diagrams represent BMI (X) and AEC (Y) of study group

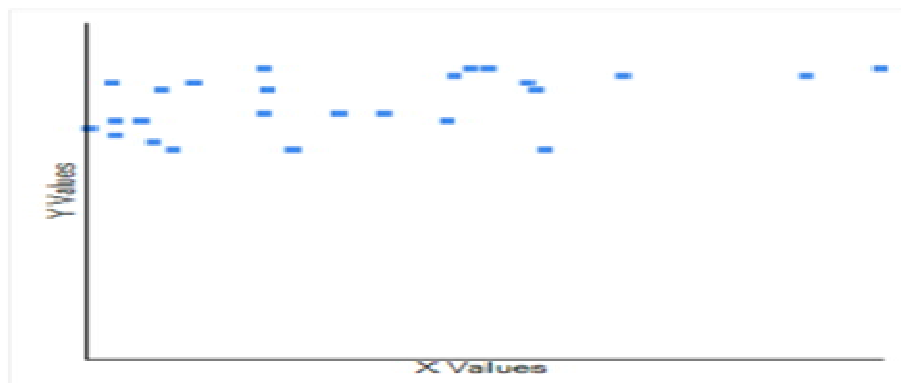
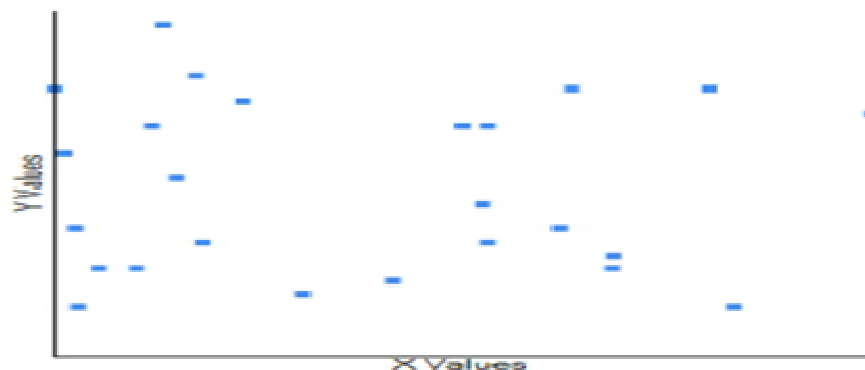


Figure no: 2 scattered diagrams represent BMI (X) and AEC (Y) of control group



V. DISCUSSION

The study was aimed at analyzing the correlation between high BMI and high AEC. Weight gain during adult life or even during adolescence seems to have a greater probability risk for many skin diseases (dermatitis), allergic rhinitis, asthma, diabetes, gastro esophageal reflux, sleep disorders and many other cardiovascular risks. As the present study aims to correlate the Body mass index BMI and AEC it is pertinent to discuss the possible causes of eosinophilia. Any conditions that relates to eosinophilia will be invited by increasing BMI. Epidemiological data also indicate that obesity increases prevalence and incidence of asthma.

Fat tissue is a source of adipokines which are considered to play a role in the low grade systemic inflammation. Leptin, mainly produced by adipose tissue is proinflammatory agent. Serum leptin is markedly increased in obese humans correlating to BMI.⁽⁵³⁾ It activates eosinophils and increases their survival. Again, Exotoxin is an eosinophil specific chemokine that is increased in obesity.⁽⁵⁴⁾ Adiposities produce more exotoxin when stimulated by leptin.⁽⁵⁴⁾ Plasma adiponectin, an anti-inflammatory hormone is inversely correlated to BMI]. These facts may be related to positive correlation of absolute eosinophil count to high body mass index.

These facts may be related to positive correlation of absolute eosinophil count to high body mass index.

Originally, the Eosinophils were considered only as a protective cell, e. g. in host defense against parasites. At present, the Eosinophils are regarded also as pro-Inflammatory cell that can mediate allergic disease.⁽³⁹⁾ Recent studies indicate a role for Eosinophils disruption and degranulation in inducing tissue destruction. A large observational study (National Health and Nutrition Examination Survey) showed that elevated BLD eosinophil counts are associated with higher prevalence of asthma, wheezing, asthma attacks and asthma related emergency department visits (PMID 23890753). Moreover, clinical studies have demonstrated a significant co-relation between peripheral BLD eosinophil counts and clinical severity of asthma and pulmonary function. Eosinophilia is frequently associated to Allergic Dermatitis (AD) and generally its degree correlates with the severity of the disease. Although the pathophysiology of AD is not fully understood, there is evidence that Eosinophils may play an important role in this process. Several potent, toxic and cationic proteins have been described in the Eosinophils granules.

Hese include Major Basic Protein (MBP), Eosinophil-derived Neurotoxin (EDN), Eosinophil Cationic Protein (ECP), and Eosinophil Peroxidase (EPO). Hese granule matrix cationic proteins have been implicated in tissue damage associated with cutaneous Inflammation He eosinophil granule proteins MBP, EPO, and ECP are toxic to diverse tissues, and hyper eosinophilia is known to induce tissue damage and dysfunction in the brain, heart, skin, and lungs [17-20]. Eosinophils are not only active in mediating allergic inflammation, but interact in cellular networks with Ag presenting cells, mast-cells, and T lymphocytes. These other cells influence Eosinophils maturation, mobilization, tissue localization and activation.

Eosinophil cationic proteins in serum of patients with AD usually, serum levels of MBP are elevated in patients affected by various disorders associated to Eosinophilia and correlate significantly with the number of peripheral BLD Eosinophils. ^(54, 55)

The observation is in agree with Correlation of Absolute Eosinophil Count (AEC) and Body Mass Index (BMI) of MBBS Students in an Indian Scenario Mahapatra AK1, Panigrahi R2 and Pattnaik JR1 Department of Physiology, Hi-Tech Medical College, Bhubaneswar, Odisha, India and Department of Orthopaedics Hi-Tech Medical College, Bhubaneswar, Odisha, India.

There are few study also agree with this are Correlation between eosinophil count, its genetic background and body mass index: The Nagahama Study Hironobu Sunadome a , Hisako Matsumoto a, Yumi Izuhara a , Tadao Nagasaki a , Yoshihiro Kanemitsu a, b , Yumi Ishiyama a , Chie Morimoto a , Tsuyoshi Oguma a , Isao Ito a , Kimihiko Murase c , Shigeo Muro a, d , Takahisa Kawaguchi e, Yasuharu Tabara e , Kazuo Chin c , Fumihiko Matsuda e , Toyohiro Hirai a

VI.CONCLUSION

Individuals having high BMI are more prone to have allergies of any type. In our study CORRELATION BETWEEN ABSOLUTE EOSINOPHIL COUNT AND BODY MASS INDEX, we have found significantly high absolute eosinophil count having body mass index>25. As cited above high absolute eosinophil count in BLD is associated with higher prevalence of asthma, wheezing, asthma attacks and asthma related emergency, allergic dermatitis, it will be a beneficial effect to control BMI, so that prevalence of these types of diseases and consequences can be reduced.

VII. ACKNOWLEDGMENT

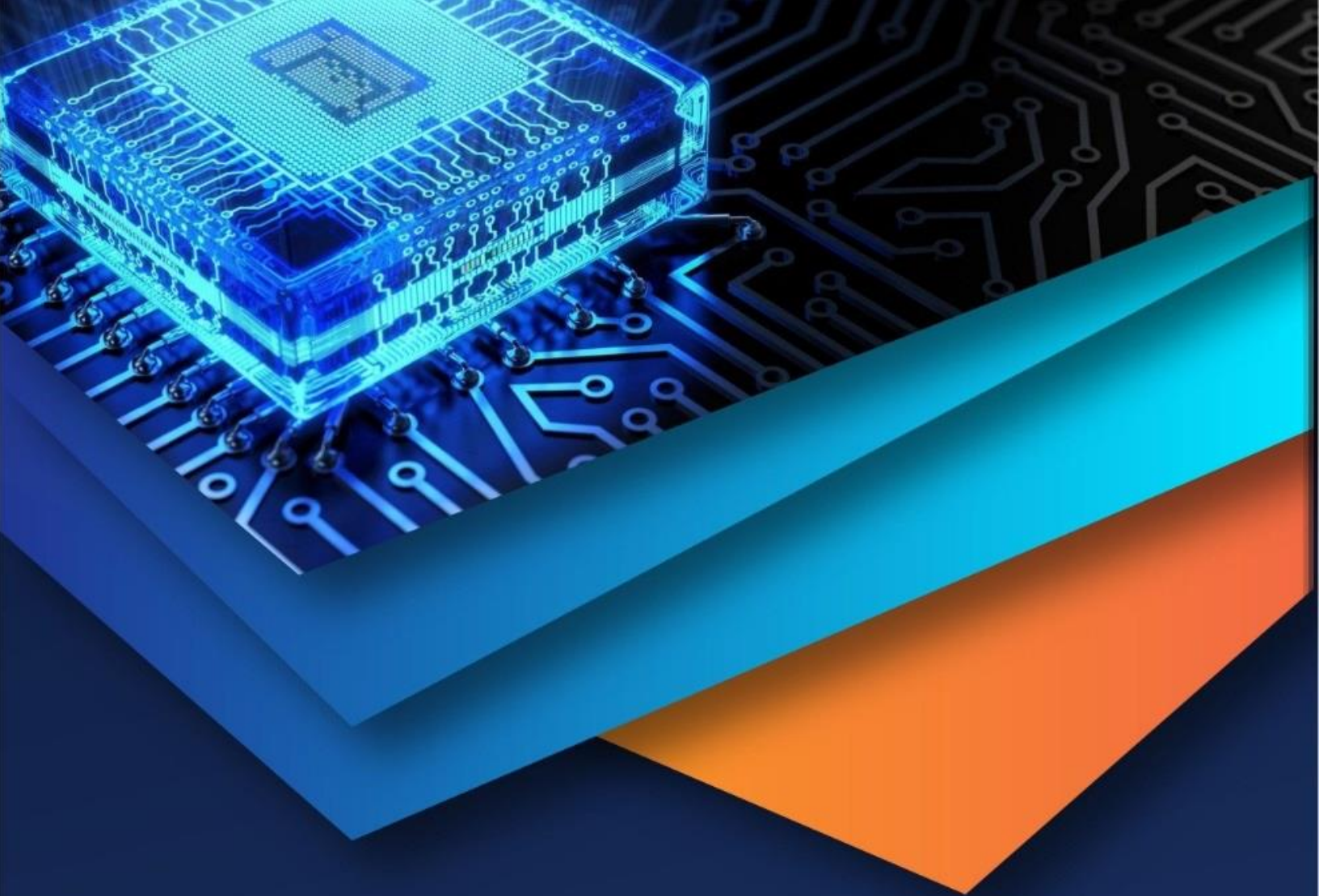
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