Relation of Obesity with Total Leucocyte Count in Metabolic Syndrome

Dr .Nerella Sharvani	Ms Pagadala Pravallika	Mr. R. Nasar Ahamed
Associate professor Dept of physiology padmavathi medical college for women(SVIMS) Tirupathi -517507 Chittor dist , Andhrapradesh	Tutor , dept of physiology Sambhram institute of medical sciences & research D.K Halli plantation K.G.F Karnataka	Tutor , dept of physiology Rajiv Gandhi institute of medical sciences Putlampalli Kadapa -516001 YSR dist Andhrapradesh

ABSTRACT *Considerable amount of interest has been focused on the positive relationship between inflammation and the metabolic syndrome. However few studies have been performed to evaluate the relationship between baseline total leucocyte count and future risk for developing metabolic syndrome. Therefore we assess the relation of total leucocyte count (TLC) with obesity in the patients of Metabolic Syndrome. Waist circumference, as a criteria for obesity was used to compare the total leucocyte count in 50 controls and 50 patients aged 20 – 50 years. TLC was determined using automated Coulter (Diatron) by venepuncture . In Comparison with the controls, TLC was higher in patients and statistically significant difference (p<0.0001) was observed between the two groups. This finding could be attributed to pro inflammatory cytokines (TNF-α and IL- 6) released from adipose cells, insulin resistance mediated increase in inflammatory markers, decrease in adiponectin and increase in leptin. Thus, TLC in obese patients of Metabolic syndrome can be used as a predictor for future complications in them.*

Introduction

White blood cell count is an objective marker of acute infection ,tissue damage and other inflammatory conditions. Metabolic Syndrome has received increased attention in the past few years. It is a cascade of disorders characterized by the presence of obesity, insulin resistance, fasting hyperglycaemia, lipid abnormalities and hypertension. All these features of metabolic Syndrome are closely related to excess weight gain especially when it is associated with accumulation of adipose tissue in abdominal cavity around visceral organs. Since this syndrome mainly increases the risk of Diabetes Mellitus and cardiovascular complications, its early diagnosis becomes essential in clinical practice. There are growing evidences that obesity is associated with a host of medical disorders like hypertension, diabetes, cardiovascular and respiratory diseases. In addition, obese tend to have higher levels of functional limitation than the non – obese. Though clinically BMI is most commonly used method for the assessment of obesity, it is not a direct estimate of obesity. It does not take into account the fact that some individuals have high BMI due to a large muscle mass. Wang et al [1] studied that obesity related health risks can be better explained by waist circumference than by BMI. Moreover, an increased girth is most readily recognized clinically and an excess abdominal fat is correlated more closely Metabolic Syndrome risk factors than total body fat. Recent research works have stressed upon the prognostic importance of TLC in obesity and its related complications. The potential involvement of leucocytes in obese has been emphasized upon by a study conducted by Anna Veronelli [2] et al. They stressed on the importance of weight loss in reducing WBC count in morbid obesity. This strongly suggests that obesity and increased TLC are inter – related.

Materials and methods

The present study was conducted in Padmavati medical College, Tirupati. 100 subjects (both males and females) in the age group of 20 – 50 years were selected for the study. Among these, 50 were controls (Group 1) and 50 were diagnosed patients of Metabolic Syndrome (Group 2). Written informed consent was obtained from the study groups after explaining the full details of the protocol.

The study met the approval of Ethical Committee of the institute. Detailed history was taken and thorough clinical examination of the subjects was done. Those with history of infection, allergies, malignancy, malnutrition, smoking, alcoholism and medication with sulphonamides, steroids, barbiturates, chloramphenicol and anti – thyroid drugs were excluded from the study. Female subjects with history of recent child birth, pregnancy, menstruation were also excluded. Group 1 included 50 healthy males and females with TLC within normal range (4,000 – 11,000/cumm). Group 2 included 50 male and female patients diagnosed with Metabolic Syndrome based on International Diabetes Foundation (IDF) criteria for Asian population [3, 4].(Table 1)

Subjects showing increased waist circumference plus any two or more features as per IDF criteria and TLC > 11,000cumm were included in Group 2.

Results

Table 1. IDF criteria for diagnosis of Metabolic Syndrome

Parameters	Cut off values
Body Weight	>90cms(35")in males >80 cms (32")in females
Lipid	Triglycerides>150mg/dl HDL <40mg/dl in men HDL < 50mg/dl in women Or on hypo-lipidaemic treatment
Blood Pressure	> 130mmHg systolic or >85mm Hg diastolic or on anti-hypertensives
Fasting blood sugar	>100mg/dl Or on anti-diabetics

The waist circumference of all the subjects was taken by a measuring tape placed in a horizontal plane around abdomen at the level of iliac crest. It was ensured that the tape snugged but did not compress the skin. Measurement was made at the end of normal expiration.

TLC was determined using automated Coulter (Diatron) by venepuncture technique. The subjects were made comfortable and their samples were collected during morning hours after having a light breakfast.

Statistical analysis

Data was expressed as Mean±S.D. All the statistical analysis was done using SPSS 9.0 version software. Unpaired t–test with a P value < 0.05 was considered statistically significance

Table 2 and 3 show the statistical values of waist circumference and TLC for Group 1 and Group 2 respectively. It has been observed that waist circumference of Group 2 (38.53 ± 2.285) was higher than that of Group 1 (33.80 ± 3.836) [figure 1]. Also, TLC in Group 2 (13,350 ± 49.845) was found to be higher than that of Group 1 (8412 ± 1025.638)[Figure2]. shows statistical comparison between the waist circumference and TLC along with their level of significance in Group 2 .It is found that there is a strong association between waist circumference and TLC in patients of Metabolic Syndrome and values are highly significance. (p value < 0.0001)

Table 2. Statistical Values of Group 1

Parameters	Mean	S.D
Waist Circumference in inches	33.80	3.836
Total Leucocyte Count/cumm	8412	1025.638

Table 3. Statistical Values of Group 2

Parameters	Mean	S.D
Waist Circumference in inches Group 2	38.53	2.285
Total Leucocyte Count/cumm	14000	820.735

Discussion

As observed in prior studies, TLC appears to be a simple, inexpensive and powerful prognostic tool in Metabolic Syndrome. Despite the potential prognostic importance of other novel biochemical inflammatory markers like C-reactive protein many of them are not routinely available. However, TLC being a simple test, available universally, immediately applicable at bed side proves to be better indicator. The present study reveals an increase in total leukocyte count in obese patients of Metabolic Syndrome. Obesity and metabolic Syndrome which often co –exist are associated with an increased cardiovascular risk [5]. High TLC is also associated with increased cardiovascular risk [6]. This suggests a strong relationship between obesity and TLC. Some studies have also reported similar findings. Desai MY [7] et al sought to assess the influence of Metabolic Syndrome on association of obesity and leucocyte count. Higher TLC was observed in patients in whom obesity co-existed with other components of Metabolic Syndrome.

Anna Veronelli [2] studied TLC in obese and diabetic patients and concluded that TLC was more increased in obese persons than in diabetics. There were studies where BMI was used as a measure of obesity instead of waist circumference but their results were similar as that of present study. Thang et al [8] reported a positive correlation between TLC and BMI.

The observation made in the current study could be due to the release of tumor necrosis factor –α (TNF –α) and interleukin 6 (IL- 6) which are found to be in higher concentrations in the obese. These pro- inflammatory cytokines act as growth factors causing increased WBC production in the bone marrow.

Visceral fat accumulation causes dysregulation of adipocyte functions including over secretion of TNF –α, Plasminogen activator inhibitor type I and heparin binding epidermal growth factor. All these adipocytokines contribute to the development of vascular disorders [9]. Recently, visfatin, a visceral-fat-specific protein has been identified as one of the contributors of obesityrelated diseases[10]. Visceral obesity also causes hyposecretion of adiponectin. Adiponectin is an adipose tissue product which is anti inflammatory, anti atherogenic and anti diabetic. Obese patients have generally low levels of adiponectin and hence may be deprived of its anti inflammatory effects. This may have a major role in the occurrence of complications of Metabolic Syndrome like diabetes, atherosclerosis, hypertension and hyperlipidaemia. It is also been reported that TNF- α is a strong inhibitor of adiponectin promoter activity. Over secretion of TNF – α in obese decreases the anti-inflammatory effect of adiponectin leading to inflammation and increase in TLC [10]. It is observed that insulin resistance plays an important role in the genesis of Metabolic Syndrome and obesity accelerates insulin resistance. As insulin reduces the mediation of acute phase response by interleukin – 6, insulin resistance could lead to higher concentrations of inflammatory markers. This may support the hypothesis that subclinical inflammation is a component of Metabolic Syndrome leading to an increase in TLC. Another factor which may be held responsible could be Leptin which is increased in obesity. Leptin is a hormone secreted by fat cells and is especially important in appetite regulation It stimulates myeloid differentiation from human bone marrow and causes proliferation, differentiation and activation of WBCs . Thus, keeping in mind the role of these inflammatory markers like WBCs which increase in number in patients of Metabolic Syndrome, [13,14] their count may be an useful indicator of complications of Metabolic Syndrome.

Thus, to conclude, TLC has a strong association with obesity in Metabolic Syndrome. Hence, it can serve as a better prognostic indicator and an early diagnostic marker for obesity-related complications of Metabolic Syndrome.

conclusion

Thus, to conclude, TLC has a strong relation with obesity in metabolic Syndrome. Hence, it can serve as a better prognostic indicator and an early diagnostic marker for obesity-related complications of Metabolic Syndrome.

REFERENCE [1] Wang YY, Lin SY, Liu PH, Cheung BM, Lai WA. Association between | hematological parameters and metabolic syndrome components in a | Chinese population. J Diabetes Complications. 2004 Nov- Dec; 18(6): | 322-327. | [2] Anna Veronelli, MD, Marco Laneri, MD, Roberto Ranieri, MD, Diana | Koprivec, MD, Deboro Vardaro, BSc, Michele Paganelli, MD, Franco Folli, | MD and Antonio E. Pontiroli, MD. White Blood cells in Obesity and | Diabetes. Diabetes Care. 2004; 27: 2501-2502. | [3] Anoop Misra, MD, Jasjeet Singh Wasir, MD and Ravinder Mohan Pandey | PHD. An Evaluation of Candidate Definitions of the Metabolic Syndrome | in Adult Asian Indians. Diabetes Care. 2005; 28: 398-403. | [4] Nobue Nagasawa, MS, Koji Tamakoshi, MD, Hiroshi Yatsuya, MD, Yoko | Hori PhD, Miyuki Ishikawa, ME, Chiyoe Murata MPh, Huimimg Zhang, MD, | Keiko Wada MD, Rei Otuska, MS, Tomoko Mabuchi, MS, Takaaki Kondo, | MD, Hideaki Toyoshima, MD. Association of white blood cell count and | clustered components of Metabolic Syndrome in Japanese men. Circ J. | 2004; 68: 892-897. | [5] Bo Isomaa, MD, Peter Almgren, MSc, Tiinamaija Tuomi,MD, Bjorn Forsen, | MD, Kaj Lahti, MD, Michael Nissen, MD, Marja- Riitta Taskinen, MD and | Lief Groop, MD. Cardiovascular morbidity and Mortality Associated With | the Metabolic Syndrome. Diabetes Care. 2001; 24: 683-689. | [6] Madjid M, Awan I, Willerson JT, Casscells SW. Leukocyte count and | coronary heart disease: implications for risk assessment. Coll Cardiol. | 2004; 44: 1945-1956. | [7] Desai MY, Dalal D, Santos RD, Carvalho JA, Nasir K, Blumenthal RS. | Association of body mass index, metabolic syndrome and leukocyte | count. Am J Cardiol. 2006. Mar 15; 97(6): 835-838. | [8] Thang S Han, Ken Williams, Naveed Sattar, Kelly J. Hunt, Michael E.J. Lean | and Steven M. Haffner. Obesity Research. 2002; 10: 923-931. | [9] Jeong A Kim, Youn Seon Choi, Jeong Ik Hong, Su Hyun Kim, Hoe Hyun Jung | and Seon Mee Kim. Association of Metabolic Syndrome with White Blood | Cell Subtype and Red Blood Cells. Endocrine Journal. 2006; 53(1): 133-139.