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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF NEUTROPHIL-LYMPHOCYTE RATIO IN CHRONIC PERIODONTITIS PATIENTS WITH TYPE 2 DIABETES MELLITUS BEFORE AND AFTER NON-SURGICAL PERIODONTAL THERAPY (NSPT)

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Abstract

Background: The neutrophil-lymphocyte ratio (NLR) acts as an indicator of subclinical inflammation. Inflammatory marker NLR significantly increases in prediabetic and diabetic patients. Periodontal therapy can contribute to diabetes control in diabetic patients with periodontitis.

Aims and Objectives: The aim of this study is to evaluate Neutrophil Lymphocyte ratio in type 2 diabetes mellitus patients before and after Non-surgical periodontal therapy.

Materials and Methods: A cross-sectional prospective study was carried with a sample size of 90 patients having Type 2 Diabetes Mellitus. Venous blood samples were collected from each patient at baseline and 1 month after delivering NSPT. NLR was assessed and comparatively evaluated before and after treatment.

Results: There are significant differences in NLR values of diabetic patients at baseline and at one month post non-surgical periodontal therapy ($p = 0.004$). Mean NLR values are higher in diabetic patients at baseline (2.07 ± 0.55) compared to mean NLR of 1.37 ± 0.46 one month after delivering NSPT.

Conclusion: Non-surgical periodontal therapy significantly reduces the NLR in diabetic patients. NSPT may augment diabetes control in patients with Type 2 Diabetes Mellitus.

Introduction:-

Periodontal disease has a high prevalence in adult populations throughout the world with a prevalence rate hovering around 50% , manifesting mostly as mild to moderate forms of periodontitis.[1] The severe forms of periodontitis mostly affects people in their 3rd and 4th decades of life with a prevalence of around 10%.[2] Periodontitis is therefore a highly prevalent, but largely hidden, chronic inflammatory disease.[3] Furthermore, it has negative and profound impacts on many aspects of daily living and quality of life, affecting confidence, social interactions and food choices.[4] The risk factors for periodontal diseases include diabetes, smoking, conditions associated with

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compromised immune responses (e.g. HIV), nutritional defects, osteoporosis, medications that cause drug induced gingival overgrowth (e.g. some calcium channel blockers, phenytoin, ciclosporin), genetic factors (as yet poorly defined), and local factors (e.g. anatomical deficiencies in the alveolar bone).[5]

Diabetes has been unequivocally confirmed as a major risk factor for periodontitis [6,7]. Diabetic patients are more prone to periodontal breakdown in comparison to healthy non-diabetic individuals. The risk of periodontitis is increased by approximately threefold in diabetic individuals compared with non-diabetic individuals [8].

Clinical evidence has shown that inflammatory pathways are the principal, common pathogenetic mediators in the natural course of diabetes especially Type 2 Diabetes (T2D) under the stimulus of the risk factors that include adoption of a western lifestyle, sedentary lives, lack of physical activity and an energy-dense diet.[9,10]

Excessive dental plaque accumulation at the gingival margin leads to inflammation and increasing proportions of proteolytic and often obligately anaerobic species[11]. Periodontal therapy can contribute to diabetes control in diabetic patients with periodontitis.[12] A significant reduction of Glycated hemoglobin and Fasting plasma glucose level on type 2 diabetic and periodontal patients with non-surgical periodontal therapy has been observed. [13]

Neutrophil lymphocyte ratio (NLR) is emerging as a novel inflammatory marker. NLR significantly increases in prediabetic and diabetic patients. NLR values may be reliable predictive markers in prediabetes and diabetes mellitus.[14]

This study investigated the impact of non-surgical periodontal therapy on Neutrophil Lymphocyte ratio in type 2 diabetes mellitus patients before and after the treatment.

Materials andMethods:-

The study sample consisted of 90 known T2DM patients (56 female and 34 male) aged 28 to 75 years. This was a single-centre randomized controlled trial & approval for the study was received from the Ethical Approval Committee of the hospital. The principles in the Declaration of Helsinki were adhered to throughout the trial. Patients were approached during new patient assessment clinics in the Department of Periodontics and Oral Implantology. All participants gave informed, written consent. The inclusion criteria were as follows: Generalized Chronic Periodontitis patients having at least 20 teeth, Type 2 Diabetes mellitus, subjects not having received periodontal treatment for the past 6 months.Patients with acute infections, and diabetic complications, and those that had been diagnosed with other chronic diseases were excluded from the study as were Pregnant patients, patients having any documented immunologic disorders, for being unable to provide written, informed consent.

Venous blood samples were taken from each patient pre-operatively at baseline and day 30. The blood samples were subjected to Differential Leucocyte Count (DLC) (*Sysmex Autoanalyzer*) ®. NLR was calculated for each individual as ratio of total neutrophil count to absolute lymphocyte count. All the patients received NSPT using hand as well as ultrasonic instrumentation. Participants were given comprehensive oral hygiene instructions that were reinforced with a recall every week following NSPT.

Statistical Analysis

SPSS v 23 was used for all statistical analysis. A p value of ≤ 0.05 was considered statistically significant.

Results:-

The mean age of the participants was 42.6 ± 3.26 years. At baseline, the participants had a mean NLR of 2.07 ± 0.55. There was no significant difference in white blood cell counts of patients at baseline($p>0.05$). Neutrophil levels differed significantly among individuals at baseline while as the lymphocyte levels were largely consistent. One month after receiving non-surgical periodontal therapy, the NLR of participants improved to a mean value of 1.37 ± 0.46.

($p=0.04$). NLR improved mainly due to a significant reduction in total neutrophil count of patients post receiving non-surgical periodontal therapy.

Discussion:-

Diabetes and periodontal disease are co related and contributory. Both elicit similar inflammatory pattern. If left untreated and unaccounted for, both lead to a cytokine storm that carries pro-inflammatory factors throughout the body. Periodontitis recently got an undesired distinction of being the sixth complication of diabetes and recent studies suggest direct connection between these two conditions.

NLR has been found to be higher in patients with diabetes.[15,16] Non-surgical periodontal therapy has been typically found to reduce the local inflammatory burden.[17,18] This study was conducted to evaluate and analyze the impact of Scaling and root planing on Neutrophil Lymphocyte ratio in diabetic patients.

Chen et al (2012) in a randomized controlled clinical trial delivered Non-surgical periodontal treatment and supragingival prophylaxis in known diabetic patients. All participants were reexamined at 1.5, 3, and 6 months after initial treatment. At each visit, clinical periodontal examinations were conducted and blood samples were taken to evaluate high-sensitivity C-reactive protein (hsCRP), tumor necrosis factor-α (TNF-α), glycated hemoglobin (HbA1c), fasting plasma glucose (FPG), and lipid profiles. Both treatment groups had a significantly lower hs-CRP level after periodontal therapy ($P < 0.05$). These results are consistent with the results of present study in which NLR improved after delivery of NSPT. Non-surgical periodontal treatment can effectively improve periodontal and circulating inflammatory status.[18]

Yue et al (2020) in a systematic review investigated whether non-surgical periodontal therapy (NSPT) can reduce systemic inflammatory levels and improve metabolism in patients undergoing haemodialysis (HD) and/or peritoneal dialysis (PD).[19] Compared with untreated periodontitis groups, the dialysis patients after NSPT significantly showed decreased hs-CRP levels at less than or equal to 2 months. No significant difference was found in IL-6 and Alb levels following NSPT at either the 3- or 6- month follow-ups. These results are in accordance with the present study. Since the results of our study were concluded at onemonth, long term influence of NSPT over neutrophil lymphocyte ratio couldn't be analysed.

In yet another systematic review by Stoica et al (2022), the correlation between periodontitis and diabetes was underlined.308 articles were identified and 107 were selected.A correlation between advanced periodontitis and elevated blood C-reactive protein (CRP) levels in patients with type 1 diabetes was found; however, periodontal treatment did not significantly reduce CRP values, even in the patients with the best response to this treatment. This finding is to be expected because periodontal disease acts as any other chronic infection or inflammatory process in the body. Periodontitis produces bacteremia and the host responds with elevated levels of interleukin-6 (IL-6).[20] The results of this review are largely consistent with the present study. This finding is to be expected because periodontal disease acts as any other chronic infection or inflammatory process in the body. Periodontitis produces bacteremia and the host responds with elevated levels of interleukin-6 (IL-6).

In another systematic review with two meta-analyses conducted by Baeza M. et al. in 2019 indicated that conventional periodontal treatment, such as SRP, can augment metabolic control and decrease systemic inflammation in patients with DM type 2 by reducing the serum levels of HbA1c and CRP, respectively.[21]

Conclusion:-

Non-surgical periodontal therapy significantly reduces the NLR in diabetic patients. NSPT may augment diabetes control in patients with Type 2 Diabetes Mellitus.

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