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RESEARCH ARTICLE

HEMATOLOGICAL CHANGES AND NUTRITIONAL CHANGES IN RHEUMATOID ARTHRITIS AND OSTEOARTHRITIS PATIENT AS COMPARED TO CONTROL

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Abstract

Background: Rheumatoid Arthritis is a chronic multisystem disease of unknown etiology. The characteristic feature of Rheumatoid arthritis is persistent inflammatory synovitis, usually involving peripheral joints in a symmetric distribution. Hematologic disorders including anemia, white blood cells abnormalities, platelet abnormalities, coagulopathy and hematological malignancies can be manifested in many autoimmune rheumatic diseases

Objective: The objective of this study to calculate the energy intake and check the hematological changes in study group and compared with control.

Material and Methods: The study was undertaken in the Department of Biochemistry, S.R.N. Hospital and Medical College Allahabad. In this study 300 samples collected of the age 20-70 year. In which 100 normal individuals they are free from any disease and 100 OA and RA patient collected.

Conclusion: On the basis of data we have conclude that arthritis patients have lower level of hemoglobin, higher levels of hemolysis and ESR as compared to control. Lower level of Hb, Iron and increased levels of TIBC is a marker of IDA and ACD which plays a significant role in the etiopathogenesis in Anemia in Rheumatoid arthritis and Osteoarthritis.

Introduction:-

Rheumatoid Arthritis is a chronic multisystem disease of unknown etiology. The characteristic feature of Rheumatoid arthritis is persistent inflammatory synovitis, usually involving peripheral joints in a symmetric distribution.

Hematologic disorders including anemia, white blood cells abnormalities, platelet abnormalities, coagulopathy and hematological malignancies can be manifested in many autoimmune rheumatic diseases [1].

Rheumatoid Arthritis is a chronic multisystem disease of unknown etiology. The characteristic feature of Rheumatoid arthritis is persistent inflammatory synovitis, usually involving peripheral joints in a symmetric distribution. This synovial inflammation causes cartilage destruction and bone erosion and subsequent changes in joint integrity. The rheumatoid synoviam is witness to a complex interplay between a wide variety of cellular chemical, enzymatic, nutritional and genetic elements and is characterized by the presence of a number of secreted

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products of activated lymphocytes, macrophages and fibroblasts. The local production of these cytokines and chemokines may account for many of the pathological and clinical manifestation of rheumatoid arthritis. One of the most common extra- articular features of rheumatoid arthritis is anemia. Anemia of different severity is found in more than 50% of patient with rheumatoid arthritis and represented with anemia of chronic diseases (ACD) and iron deficiency anemia (IDA). There is correlation between the indicators of anemia and rheumatoid arthritis activity.

Anemia is chronic disease (ACD) and iron deficiency anemia (IDA) are considered the most common hematological manifestation in patients with rheumatic diseases, with an estimated prevalence in RA (30%- 70%) in different studies [2]

The most prevalent form of arthritis is osteoarthritis (OA). It is associated with overuse of the joints, injury, metabolic and inflammatory factors, and accounts for more than 10% of disabilities and symptomatic diseases of the elderly population [3,4]. Joint pain and progressive degeneration of articular cartilage are hallmarks of the disease which include remodeling of all joint tissues (bone, synovium, ligaments) resulting in painful articular cartilage loss, manifested as radiographic joint space narrowing (JSN) [4].

I have described here a series of routine hematological, biochemical and nutritional investigations, designed to assess whether any changes occur in the serum of patients with rheumatoid arthritis and osteoarthritis patients as compared to normal healthy adults. The hematological parameters taken are: Hb%, ESR where as biochemical parameters taken are: Iron, Total Iron Binding Capacity (TIBC) and Cell fragility. Nutritional assessment is total calorie intake and Body Mass Index (BMI).

Material and Methods:-

The study was undertaken in the Department of Biochemistry, S.R.N. Hospital, M.L.N. Medical College, and Allahabad. In which 300 individuals of different age (20-70 years). In the study we have taken 100 normal individuals and 100 rheumatoid arthritis and 100 osteoarthritis patients with anemia.

For their anthropometric and dietary assessments, subjects completed a pre- experimental, questionnaire regarding age, sex, height and weight. Height and weight were measured with the subject barefoot and lightly dressed. The body mass index (BMI) was calculated as

$$\text{Body Mass Index} = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}}$$

A three days self- recorded food record was obtained from each subject. Each subject was instructed on how to complete their food. Instructions included how to estimate serving sizes based on food models and common household measuring units. The reported food intake, vitamin and protein.

For the biochemical parameters to be analyzed, blood samples were drawn from the anticubital vein avoiding venostasis. In all subjects a blood samples was collected after an overnight fast. Plain and double oxalate vials were used for the estimation of Hb, ESR, Cell-fragility, Iron and TIBC respectively. Hb percentage, ESR, Cell-Fragility, Iron and TIBC were measured by Cyanide method, Win robe's method, Dacie & Lewis method and Ferrozine method.

Statistical – Analysis:-

The data expressed as mean ± SD. Statistical comparisons were performed by student t test. The null hypothesis was rejected for $p < 0.05$.

Result:-

Table shows the levels of anthropometric measurement and energy intake. There is no significantly change in energy intake in rheumatoid arthritis and osteoarthritis patients as compared to control. The level of hemoglobin is significantly decreased ($p< 0.001$) in rheumatoid arthritis and osteoarthritis patients as compared to control. Table shows the significantly increased ($p<0.001$) Erythrocyte sedimentation rate in both the group as compared to control. Table shows the levels of cell- fragility in whole blood. The level of cell-fragility is significantly increased ($p<0.001$) in rheumatoid arthritis and osteoarthritis patients as compared to control. A rheumatoid arthritis patient

shows much higher cell- fragility levels as osteoarthritis patients. The Iron level were significantly decreased ($p<0.001$) in both the group as compared to control. The iron level is slightly decreased in rheumatoid arthritis patients as osteoarthritis patients.Table shows the levels of total iron binding capacity in serum. The increased levels are found in both the group as compared to cont

Observation table:

Levels of Energy intake, BMI, Hemoglobin, ESR, Iron, TIBC and Cell Fragility in both the study group compared with control:

S.N.	Particulars	Control N= 100	Osteoarthritis Patients N= 100	Rheumatoid patients N=100
1	BMI	28.4± 3.4	26.3± 3.9	29.2±2.9
2	Energy	1875±204	1565±265	1325±186
3	Hb	12.29±0.79	10.69±2.01	10.2±1.86
4	ESR	11.04±1.8	15.69±6.46	24.33±3.21
5	Iron	118.37±20.79	112.98±44.04	68.22±47.11
6	TIBC	329.29±36.01	306.08±183.94	170.94±90.47
7	Cell- Fragility	0.186±0.26	0.665±0.537	1.59±1.3

Discussion:-

The present study was performed to evaluate nutrient intake in patients with rheumatoid arthritis and osteoarthritis and to assess oxidative stress marker in blood. Results from this study indicate that daily intake of total calories was lower in rheumatoid arthritis and osteoarthritis as compared to control. The results are statistically insignificant. Sang et al[6] also reported a decreased calorie intake in rheumatoid arthritis patients as compared to control. Roubenoff et al

[7] Showed Protein –energy malnutrition (PEM) among rheumatoid arthritis patients. Therefore, the increased production of inflammatory cytokines may be a possible cause of PEM in rheumatoid arthritis patients.

In this era of evidence based clinical practice, addition of laboratory based investigations like some haematological parameters including Haemoglobin (Hb) level, Platelet count and Mean Platelet Volume (MPV) which are found to be altered in this chronic inflammatory disease can further improve the assessment status of disease activity.The concept of disease activity is essential in rheumatology, for guiding the treatment and influencing the outcome in RA [8]. This study was focused on finding an association between different haematological parameters (Hb, Platelet count and MPV) and DAS 28-3 score (Modified Disease Activity Score) so that these evidence-based and cost-effective parameters can be used to assess disease activity and thus, can improve clinical management of RA. The study clearly proved that patients with high disease activity had significantly lower Hb level than the patients with low to moderate disease activity both in male and female groups which is consistent with previous studies done by Jeffrey MR., Agrawal S et al., and Borah DJ et al., [9–11].

In our study, ESR and cell fragility levels were found to be higher in the osteoarthritis patients than in the control group. This is in accord with previous studies. ESR and CRP levels in osteoarthritis patients are used in studies as inflammation indicators [12-14]

Uric acid (UA) is a metabolically active molecule. Urate deposition within joints and soft tissues can induce acute painful gouty arthritis. However, UA can also drive low-level chronic inflammatory state, even in the absence of gout [15, 16]. Epidemiologically, old age and obesity are common risk factors for OA and urate deposition in tissues and both conditions share a common tendency for certain joints, including the knee joint [17].

Al Arfaj et al [18] also reported increased percent hemolysis and decreased Hb levels in their study. Hemolysis can occur due to their oxidative effect on the lipids of RBC membranes. Lipid peroxidation products and particularly aldehyde derivatives can inhibit protein synthesis, block macrophage action and cause changes in chemotaxis and enzymatic activity. GSH depletion and subsequent low stores of protein thiol result in both in release from intracellular stores and inhibition of Ca. extrusion, producing a marked increase in cytosolic Ca concentration which triggers cytotoxicity. This may be the one of the cause for the increase tendency of the RBC for hemolysis and is

turn significant decreased in the Hemoglobin levels in the study group. Decreased erythrocyte stability is reflected by the increase in the percent hemolysis [19].

Kamanli et al [20] reported, significantly decreased hemoglobin levels in Rheumatoid arthritis patients as compared to control. This result is in concordance with our findings.

According to Ravindra et al [21] the hemoglobin, Iron and TIBC levels are significantly low in Rheumatoid arthritis patients as compared to healthy subject. These results are in concordance with our finding. Anemia of chronic disease frequently present in RA. Decreased iron absorption was shown to be the result of active RA rather than a cause of ACD or iron deficiency. It has been hypothesized that bone marrow iron availability decrease due to decreased iron release by the mononuclear phagocyte system or that the anemia in ACD is due to ineffective erythropoiesis; these remain controversial theories.In Severe osteoarthritis, excessive and unopposed oxidative stress may cause anemia [22-23]**.** Thus, it is possible that an inadequate dietary intake of antioxidants often found in older adults, possibly associated with excessive oxidative stress, may be the main cause of unexplained aneamia in older persons [24].

Present study shows the decreased Hb status in RA patients as compared to control. A Ducth study has found that about 60% of patients with RA are anemic. Long term use of non-steroidal inflammatory drugs can cause gastrointestinal blood loss resulting in iron deficiency anemia. Patients with chronic inflammatory conditions such as RA may also have inflammation related anemia.

Conclusion:-

On the basis of present findings we can concluded that arthritis patients have lower level of hemoglobin, higher levels of hemolysis and ESR as compared to control. Lower level of Hb, Iron and increased levels of TIBC is a marker of IDA and ACD which plays a significant role in the etiopathogenesis in Anemia in Rheumatoid arthritis and Osteoarthritis. An increased level of ESR and percent hemolysis is a marker of inflammation which plays a significant role in the etiopathogenesis of RA and OA. Thus the assessment of blood hemoglobin may be helpful in prevention of anemia in both the study group. Based on our reports, diet high in major dietary antioxidants such as Vitamin E and C and phenolic compounds have been suggested to alleviate RA and OA symptoms, possibly by reducing disease related oxidative stress**.**

Reference:-

1. Yukawa N. Hematologic, biochemical and immunological tests in clinical practice of rheumatoid arthritis; Nihon rinsho. Japanese journal of Clinical Medicine. 2013;71(7):1178-82
2. Baer AN, Dessypris EN, Krantz B. The pathogenesis of anemia in rheumatoid arthritis: a clinical and laboratory analysis . Semin Arthritis Rheum
3. Cross M, Smith E, Hoy D, et al.. The global burden of hip and knee osteoarthritis: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis 2014; 73:1323–1330. [PubMed] [Google Scholar]
4. Lotz M, Martel-Pelletier J, Christiansen C, et al.. Value of biomarkers in osteoarthritis: current status and perspectives. Ann Rheum Dis 2013; 72:1756–1763. [PMC free article] [PubMed] [Google Scholar]
5. Siebuhr ASAS, He Y, Gudmann NSNS, et al.. Biomarkers of cartilage and surrounding joint tissue. Biomark Med 2014; 8:713–731. [PubMed] [Google Scholar]
6. Tekeolu I, Gürol G, Karakeçe E, Harman H, Çiftçi IH. Mean Platelet Volume: A Controversial Marker of Disease Activity in Rheumatoid Arthritis. Ann Rheum Dis. 2014;73:885. [Google Scholar]
7. Jeffrey MR. Some observations on anemia in rheumatoid arthritis. Blood. 1953;8:502–18. [PubMed] [Google Scholar]
8. Agrawal S, Misra R, Aggarwal A. Anemia in rheumatoid arthritis: high prevalence of iron-deficiency anemia in Indian patients. Rheumatol Int. 2006;26(12):1091–95. [PubMed] [Google Scholar]
9. Borah DJ, Iqbal F. Anemia in recent onset Rheumatoid Arthritis. JK Science. 2007;9(3):120–22. [Google Scholar]
10. Pearle AD, Scanzello CR, George S, Mandl LA, DiCarlo EF, Peterson M et al. Elevated highsensitivity C-reactive protein levels are associated with local inflammatory findings in patients with osteoarthritis. Osteoarthritis Cartilage. 2007;15:516- 23.

11. Sipe JD. Acute-phase proteins in osteoarthritis. Semin Arthritis Rheum. 1995;25:75-86. 28. Spector TD, Hart DJ, Nandra D, Doyle DV, Mackillop N, Gallimore JR et al. Low-level increases in serum C-reactive protein are present in early osteoarthritis of the knee and predict progressive disease. Arthritis Rheum. 1997;40:723-7
12. Murray CJ, Atkinson C, Bhalla K, Birbeck G, Burstein R, Chou D et al (2013) The state of US health, 1990-2010: Burden of diseases, injuries, and risk factors. JAMA 310:591–608
13. Hoy DG, Smith E, Cross M, Sanchez-Riera L, Buchbinder R, Blyth FM et al (2014) The global burden of musculoskeletal conditions for 2010: an overview of methods. Ann Rheum Dis 73(6):982–989.