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RESEARCH ARTICLE

STUDY OF VITAMIN B12 LEVELS IN PATIENT WITH TYPE 2 DIABETES MELLITUS

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Abstract

Aims :-Evaluation of serum Vitamin B_{12} levels in type 2 diabetic population.

Objectives:-1) To define the prevalence of vitamin B_{12} deficiency in type 2 diabetic population.2) To determine the risk factors associated with Vit B12 deficiency in type 2 diabetes like Age and Metformin use.3) To Assess the co-relation of Serum B12 levels and Diabetic Retinopathy in Type II Diabetes mellitus.

Material and Methods:-This case control study was conducted in OPD of Department of General Medicine, Sarvajanik Hospital, Pune between June 2012 to May 2013. A total of 50 type 2 Diabetes Mellitus patients and 50 controls between 40 to 60 years were included. Serum Vitamin B12 levels and serum homocysteine levels were measured in all patients.

Results:-The Vitamin B_{12} deficiency was present in 56% of the diabetics and 32% of the non-diabetics. Vitamin B_{12} deficiency was present in 48.4% of patients who were not on metformin and 68.4% of than those were on metformin. No significant increase in the prevalence of neuropathy, anaemia, or MCV was found in the Vitamin B12 deficient patients as compared to patients with normal

Conclusions:- The study has shown that the diabetes was common after the age of 40 years. Male sex, Overweight and Obesity were other risk factors. Majority of the patients in this study had the diabetes more than 5 years and their blood sugar markers were disturbed. This study has shown that the vitamin B_{12} deficiency was found in more than half of the diabetics, metformin users and those who were on vegetarian diet.

Introduction:-

Diabetes mellitus is the commonest metabolic abnormality in clinical practice. The recent estimates of diabetes mellitus shows that around 285 million people around the world are affected with disease amounting to a prevalence of 6.6% especially in 20 – 79 years age group. The long term uncontrolled sugar level result in development of complications which may long term or short term. Hence the primary care physicians should be able to manage the disease and its complications. Diabetes mellitus and its treatment especially with metformin result in vitamin B_{12} deficiency. The deficiency of vitamin B_{12}can also be related to aging process also.[5, 6, 7, 8] With the treatment using biguanides, the Vitamin B_{12} deficiency emerged as a potential co morbidity which is often overlooked even though many diabetic patients are at risk for this specific disorder. The old age of diabetic patients also increases the chance of metabolically confirmed Vitamin B_{12}deficiency and its prevalence ranges from 12% to 23%.[9, 10, 11] A substantial proportion of population especially in a country like India consumes mainly vegetarian diet due to cultural and

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religious reasons. The non vegetarian food consumed by the Indian population contains less animal derived protein compared to Western countries.[12] A strict vegetarian diet is associated increased risk of cobalamine deficiency.[13]

Material & Methods:-

A total of 50 patients aged 40 – 60 years suffering with type 2 diabetes mellitus (old & newly diagnosed) were compared with 50 Healthy non diabetic control population admitted in hospital**. The p**atients whose diabetes status was already diagnosed were subjected for blood glucose examination and reconfirmed with ADA criteria. A detailed history & examination was conducted with special emphasis on history of Inj. Insulin, intake of oral hypoglycaemic drugs, like metformin, multivitamin supplementation, history of tingling, numbness & weakness of any peripheral muscle, A detailed and complete Sensory System Examination and Fundus Examination was conducted for all the patients.The patients were also subjected for Laboratory investigations including complete blood count, urine examination, blood sugar profile, lipid profile, renal function test. Serum vitamin B12 &homocystine level were determined by using Kit based CMIA (Chemiluminesecent Microparticle Immunoassay) method, in Architect 2000 (Abott) Machine. Chemiluminescence receptor assay for vitamin B12 in serum in which an acridinium ester label is used with magnetic particle separation was conducted. The individual venous blood samples 3 ml in plain bulb is taken and assayed within the laboratory for Vitamin B12 levels & Homocysteine level. When Vitamin B12 levels <200 pg/mL, the condition was considered as deficient whereas B12 levels >350 pg/mL was considered as normal. Blood levels of B12 between 200 and 350 pg/mL was considered as indeterminate and the corresponding blood specimens are send for homocysteine levels (reference range, 5.4 –11.9 nmol/L). Specimens with homocysteine levels above the upper limit of the laboratory reference range are considered elevated and indicative of B12 deficiency.

Results:-

A case control study was undertaken in Department of Medicine, Bharathi Hospital, Pune. Fifty diabetic patients who met the inclusion and exclusion criteria were included in the study.the mean age of the subjects was 49.44 ± 5.93 years. The mean age of diabetic patients (group 1) patients was 49.6 ± 5.68 and non diabetic patients (group 2) was 49.28 ± 6.23 years. Majority of the diabetic subjects belonged to 41 – 50 years age group in both the groups.There was no significant difference in age between the two groups. Hence the two groups were comparable with respect to age.The mean serum glucose was 139.6 (± 67.35) mg/dl in group 1 and 69.4 (± 21.0) mg/dl in group 2 patients. This difference in blood sugar levels between the two groups was statistically significant. The mean HbA_1c percentage in group 1 was 6.97 (± 1.27) and 6.01 (± 0.42) mg/dl in group 2 study subjects. The difference between the HbA_{1c} levels between the groups was also statistically significant. The A_{1c} average glucose was 179.34 (± 64.4) mg/dl in group 1 and 109.15 (± 16.22) mg/dl in group 2 patients respectively. There was a statistically significant difference between the average A_{1c} levels between the two groups.The vitamin B_{12} levels were normal in 44% of the group 1 and 68% of the group 2 patients. The Vitamin B_{12} deficiency was present in 56% of the group 1 and 32% of the group 2 patients. This difference between the group 1 and group 2 was statistically significant.(Figure 1).The homocysteine levels were normal in 38.6% deficient Vitamin B_{12} patients and 10.7% of the normal Vitamin B_{12} patients. The homocysteine was excess in 61.4% of the vitamin B_{12} deficient and 10.7% of the normal vitamin B_{12} patients. This difference between the deficient and normal group was statistically significant.(Figure 2).

The vitamin B_{12} levels were normal in 51.6% of the diabetic patients who were not on metformin and 31.6% patients who were on metformin. Vitamin B_{12} deficiency was present in 48.4% of patients who were not on metformin and 68.4% of than those were on metformin. This difference between the consumption of metformin and vitamin B_{12} level was statistically significant.(Figure 3)

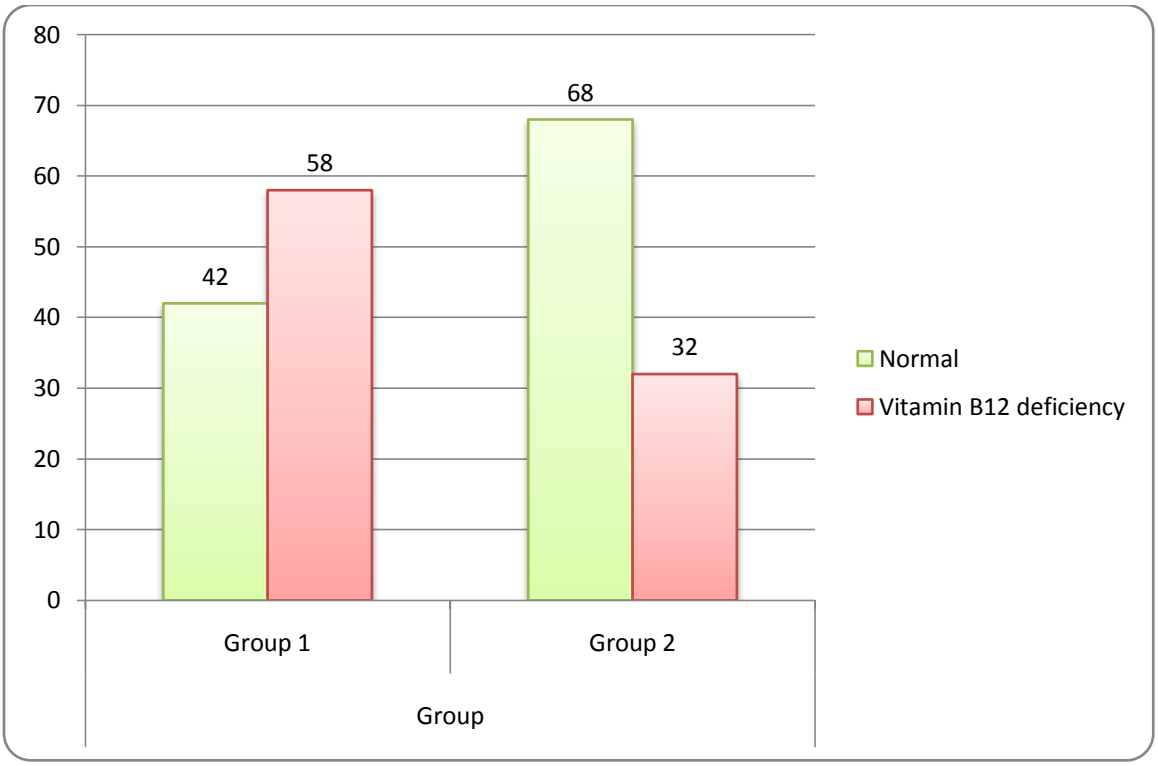

Figure1:- Distribution of the study groups according to Vitamin B_{12} levels.

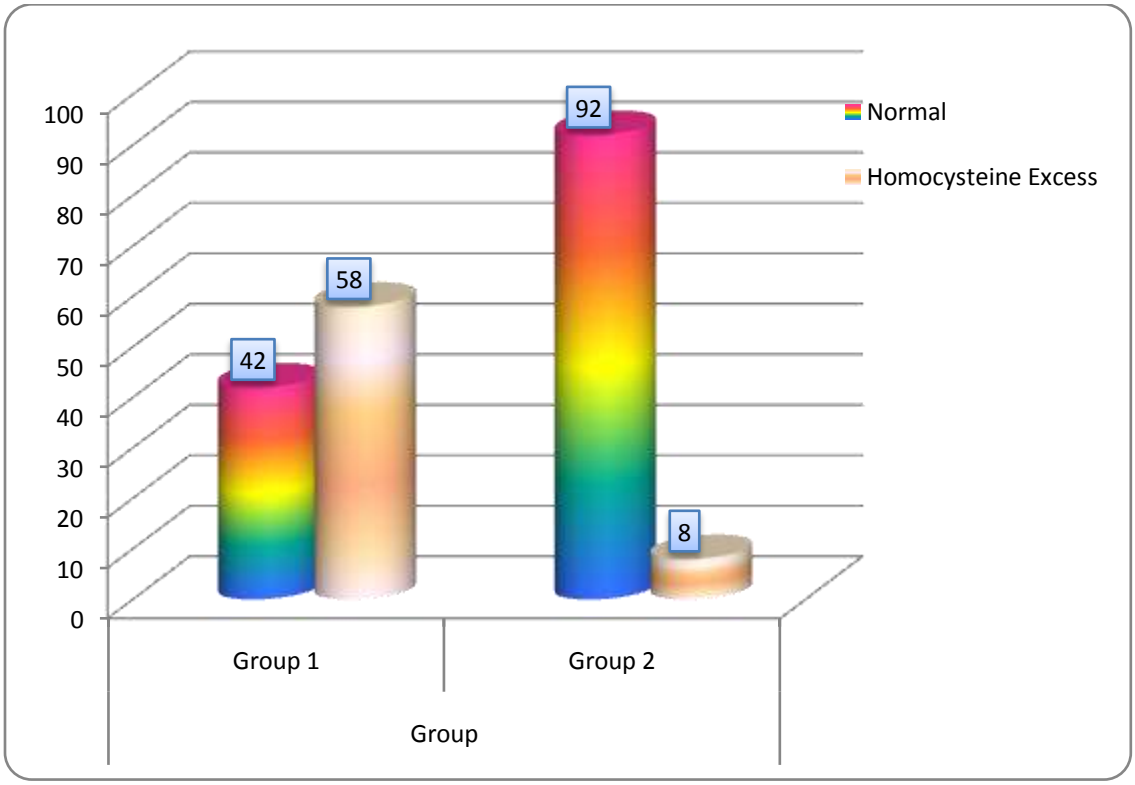

Figure 2:- Distribution of the study groups according to Homocysteine levels.

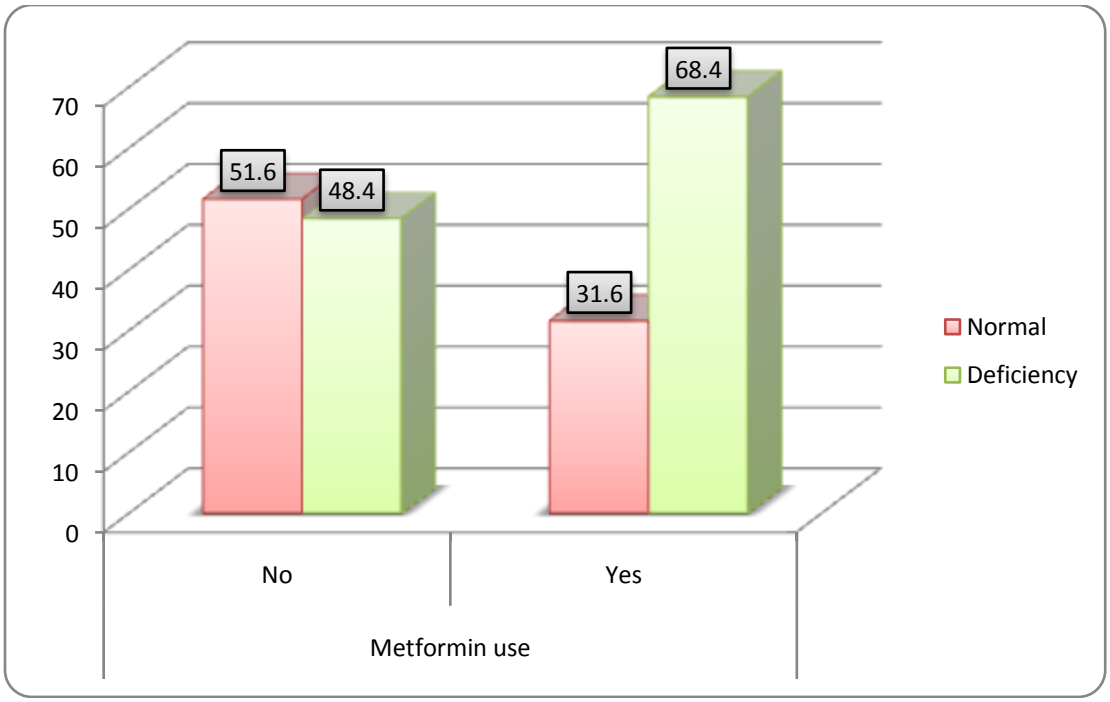

Figure3:- Distribution of the study groups according to Vitamin B_{12} levels and use of metformin.

Discussion:-

Diabetes Mellitus is most common metabolic abnormality in physician practice. The developing country like India is often changing as the "Diabetic capital of the world" due to increase in the prevalence of diabetes mellitus. Currently around 63 million people in India have diabetes mellitus with a prevalence of 9.01%.[3] Initially the diabetes mellitus was considered as disease of middle ages but increasing in individuals with age of less than 20 years. Long term uncontrolled diabetes is prone for complications and hence needs to be managed in an effective manner by the primary care physician. Vitamin B_{12} deficiency is a noticeable complication which leads to anemia, neurological symptoms, myelopathy and has been emerged as potential co morbidity. However, age related deficiency is also been reported by many studies. [5, 6, 7, 8] The treatment using biguanides still reduces the vitamin B_{12} levels. The literature about the deficiency of vitamin B_{12} is scant in India. Hence this study was undertaken in a group of diabetics in order to find the prevalence of the vitamin B_{12} deficiency.

A case control study was undertaken in the Department of Medicine, sarvajanik Hospital, Pune between June 2012 to May 2013. A total of 50 diabetes mellitus patients and 50 controls were enrolled in this study.

In our study the Vitamin B_{12} deficiency was present in 56% of the diabetics and 32% of the non diabetics. Vitamin B_{12} deficiency was present in 48.4% of patients who were not on metformin and 68.4% of than those were on metformin. In a study by Reinstatler et al, the serum vitamin B_{12} levels were 317.5 picomol/L in metformin users and 386.7 picomol/L non metformin users. But the non diabetics had a mean vitamin B_{12} of 350.8 picomol/L. The weighted prevalence of deficiency of biochemical vitamin B_{12} levels in meformin users was 5.8%, non metformin users was 2.2% and 3.3% in non diabetics.[5] In a study by Pflipson et al, the prevalence of Vitamin B_{12} deficiency was 22% in diabetics in contrary to these results.[14] In a study by De Jager et al, the mean vitamin B_{12} levels was 378 picomols/L in metformin users and 380 picomols/L in placebo group.[7] Liu et al in their study had shown that the mean Serum vitamin B_{12} levels in metformin users was 282.1 picomols/L and 381.0 picomols/L in non metformin users. About 29% of the metformin users had definite deficiency of vitamin B_{12} and 52% had possible deficiency. Only 5% of the non metformin users had definite deficiency and 27% had possible deficiency of vitamin B_{12}.[73] The mean levels of vitamin B_{12} in metformin users was 247.98 ng/L and 323.23 ng/L in non metformin users in a study by Morar et al.[8] In another study by Calva Romero et al, the mean vitamin B_{12} levels in metformin users was 393.5 pg/ml and 509 pg/ml in non metformin users.[8] In a study by Hermann et al, the mean levels of serum cobalamin in metformin users was 289 picomols/L and 395 picomols/L in non metformin users.[14]

The homocysteine was excess in 58% of the group 1 and 8% of the group 2 patients. The homocysteine was excess in 61.4% of the vitamin B_{12} deficient and 10.7% of the normal vitamin B_{12} patients. The mean levels of serum homocysteine in Metformin users was 9.8 µmol/L, 10.4 µmol/L in non metformin users and 9.7 in µmol/L in people without diabetes.[5]In another study by De Jager et al, the mean homocysteine levels was 14.4 µmol/L in metformin users and 14.6 µmol/L in non metformin users. The homocysteine levels in metformin group was higher compared to placebo group.[7]

Conclusion:-

This study was undertaken with the aim of studying the levels of Vitamin B_{12} in group of diabetics in comparison with non diabetics. The study has shown that the diabetes was common after the age of 40 years. Male sex, Overweight and Obesity were other risk factors. Majority of the patients in this study had the diabetes since 5 years and their blood sugar markers were disturbed. This study has shown that the vitamin B_{12} deficiency was found in more than half of the diabetics, metformin users and those who were on vegetarian diet. Hence, it should be a practice for all the physicians and diabetologists to anticipate the deficiency and prevent the complications by treating them in effective manner. However, this study is not without limitations. This is a cross sectional study and sample size was not calculated. Hence it is recommended to take up randomized controlled trials.

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