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RESEARCH ARTICLE

A STUDY OF LIPID PROFILE IN ANAEMIA

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Abstract

Background: Anaemia and dyslipidemia are widely prevalent public health problems in the Indian population, irrespective of their socioeconomic status. Some link has been suggested between the two potentially morbid conditions but a sufficient Indian study could not found in this regard. So the objective is to study the lipid profile in anaemic patients and to compare them with age and sex matched controls.

Method: An observational study was conducted on total of 100 patients out of which 50 patients with anaemia were included in one group and 2nd group contains 50 normal (non-anaemic) individuals.Their complete haemogram, lipid profile and other investigations were performed to find out if any.Data was analysed by means of correlation and regression analysis to find out the association of lipid levels in both the groups under study.

Results: Dimorphic anaemia is most common type of anaemia. Microcytic anaemia is second most common type. Younger individuals are more likely to have severe anaemia. Majority of the cases were middle aged(30-60years) and the youngest case was of 18 years old and older was of 60 years old.in case of sex matched controls,24 males and 26 females were present.Sex was not associated with haemoglobin levels.

Conclusion: This study reveals that anaemia is associated with hypocholesterolemiawith lowering in all lipid subfractions and decrease is more strongly associated with total cholesterol and HDL levels compared to other subfractions. The extent of hypocholesterolemia is proportional to severity of anaemia.The type of anaemia has no effect on the hypocholesterolemia.

Introduction:-

Anaemia and dyslipidemia are widely prevalent public health problems in the Indian population, irrespective of their socioeconomic status.A study done by Choi et al.11 in young Korean girls with severe iron deficiency anaemia, reported low levels of triglycerides and total cholesterol (TC) which returned to normal after the iron therapy. Despite such a high prevalence of both anaemia and dyslipidemia, no relevant study could be found, linkinganaemia and lipid profile. The primary aim of our study was to find the effect of anaemia on various lipid sub fractions. This study was also intended to see if any particular type of anemia has any particular effect on any lipid subfraction and

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is there any effect of severity of anaemia on lipid subfractions.

Material and Methods:-

The present study was a hospital based case control, prospective study carried out at AcharyaShriChander College Of Medical Science and Hospital,Jammu (J&K),India, in Department of medicine for a period of one year. A total of 100 patients were enrolled in study after taking approval from Institutional Ethics Committee for Human Research.Patients were allocated into two groups .Group1which comprised of 50 patients of anaemia .Group 2 included 50normal individuals (non anaemic).Patients from both the groups were apprised of the type of study being carried out and their written consent was obtained regarding permission for inclusion in the study.

Inclusion criteria:

Patients of age 18 – 60 of either sex who are diagnosed cases of anaemia(men:Hb<13gm% and women :Hb<12 gm%).

Patients with specific causes of anaemia like pica,dysphagia,abdominalpain,weight loss,jaundice,bleeding,melana,haemoglobinuria,menorrhagia,pregnancy,postmenopausal bleeding.

Exclusion criteria:

Children below 18 years suffering from Obesity/overweight; BMI >25 kg /m2, Malnutrition ; BMI <19kg /m2 or serum total protein <6 gm/dl or serum albumin <3.5 gm/dl

Known cases of diabetes mellitus or RBS >200 gm/dl.

Known hypertensives or blood pressure persistently more than 140/90 mm of Hg on three consecutive readings taken on different days.

Alcoholics, Smokers, Known cases of AIDS, Known case of ischaemic heart disease/cerebrovascular accident.

History of recent blood loss.

History of use of steroids, oral contraceptives,diuretics, and beta blockers.

Blood urea>40 gm% or serum creatinine>1.4 mg%,

SGOT>40 U/L OR SGPT>40 U/L OR Serum Alkaline phosphatase>250U/L, TSH.7.0micro U/ml or TSH<0.3micro U/ml.

Patients receiving lipid lowering drugs.

For all cases, detailed history was taken and thorough general and systemic examination was done and recorded . The investigations like complete haemogram along with peripheral blood smear , lipid profile(estimation ofHDL,LDL,VLDL,triglycerides,total cholesterol) , urine analysis including albumin, sugar and microscopy , random blood sugar, fasting blood sugar, post prandial blood sugar, liver function tests, blood urea, serum creatinine, thyroid profile(T3,T4), iron studies and bone marrow aspiration cytology in selected cases based on clinical assessment for estimation of iron stores and malignancies, ultrasound of abdomen to assess the organomegaly was done.Then the two groups were compared to fulfil the study objective.

Data analysis:

All data was analysed with the help of computer software SPSS version 17.0 and epi-info version 6.0 for windows. Correlation and regression statistics was applied to assess the association of lipid levels in both groups under study.

Results:-

Cases and controls were matched for age.Majority of the cases weremiddleaged(30-60 years).the youngest case was 18 years old.The oldest was 60 years old.Cases and control were matched for sex. The cases consisted of 24 males and 26 females. Sex was not associated with haemoglobin levels.

Regarding distribution of cases according to type and severity of Anaemia:
Out of 50 cases, 19 cases had dimorphic anaemia (DM) according to peripheral smear, 13 cases had microcytic hypochromic anaemia (MH), 9 cases had normocytic hypochromic anaemia (NH) and 5 cases had a normocytic normochromic blood picture (NN). Out of the 4 cases grouped together as 'others' for the purpose of analysis, 2 cases had megaloblasticanaemia, 1 cases had pancytopenia, and one case each had chronic myeloid leukemia and leukoerythroblastic blood picture. A total of 12 cases had haemoglobin less than 6 gm/dl, 20 cases had haemoglobin between 6 and 9 gm/dl, and 18 cases had haemoglobin more than 9 gm/dl

In Symptoms:
The most common presenting symptom was easy fatigability, which was present in 25 cases. The next common symptoms were dyspnoea (15 cases), palpitations (14 cases) and giddiness (12 cases). Other symptoms were loss of appetite (5 cases), fever (4 cases), weight loss (3 cases), menorrhagia (3 cases), angina, dysphagia, jaundice (2 cases each), bony pain and bleeding (1 case) each. Symptoms not seen in the study group were pica, abdominal pain, malaena, haemoglobinuria and pregnancy.

Symptoms and severity of anaemia:
Cases with more severe anaemia were found to be more likely to have symptoms. All cases with haemoglobin less than 6 gm/dl had at least one symptom, while out of 18 cases with haemoglobin more than 9 gm/dl, only 12 cases (66.6%) had at least one symptom. Most symptoms were found more frequently in cases with more severe anaemia. 100 % of cases with haemoglobin less than 6 gm/dl complained of fatigue, compared to just 11.1 % of cases with haemoglobin more than 9 gm/dl.Angina and dysphagia were the symptoms which were found in cases only. Cases with severe anaemia also had more number of symptoms.

Symptoms and type of anaemia:
Fatigue was most common symptom of Dimorphic Anemia (DM), Microcytic Hypochromic Anemia (NM) and other types of anemia .Second most common symptom was dysponea followed by giddiness and palpitations in Dimorphic Anemia (DM). In Microcytic Hypochromic Anemia (NM) group second most common symptom was palpitations followed by giddiness and dysponea.Palpitations were present in all types of anemia except others type of anemias.loss of appetite was common symptom of all types of anemia except Normocytic NormocromicAnaemia(NN) and was second most common symptom of other types of anemia after fatigue and dysponea.Angina was present in Microcytic Hypochromic Anemia(MH) only(15.38% cases) and bleeding was present in normocytic hypochromic anemia group only(11.11% cases).

General physical examination:
The most common finding on general physical examination was pallor, which was present in 34 cases. Also seen were glossitis (10 cases), koilonychia (06 cases), angular stomatitis (05 cases), knuckle pigmentation (4 cases), pedal oedema (3 cases), icterus (2 cases), lymphadenopathy (1 case) and perioral pigmentation (1 case). None of the cases had petechiae, haemolyticfacies or ankle ulcers.

General physical examination and type of anaemia:
Pallor was equally frequent in the different types of anaemia, except normocytic hypochromic anaemia and cases with normocytic normochromic blood picture. This is possibly due to the fact that these cases had less severe anaemia. Koilonychia, lymphadenopathy, glossitis and angular stomatitis were seen only in cases with dimorphic anaemia and microcytic hypochromic anaemia. Knuckle pigmentation and periioral pigmentation was seen only in cases with megaloblasticanaemia and dimorphic anaemia.

Pulse Rate:
The mean pulse rate was 85.66/ minute in cases and 83.72/ minute in controls. The mean pulse rate was significantly increased (89.33/ minute) in cases with haemoglobin less than 6 gm/dl. There was no significant difference between systolic blood pressure,diastolic blood pressure and basal metabolic rate with severity of anaemia.Mean pulse rate was significantly higher in other types of anaemia with p value <0.0001.there was no difference in mean systolic blood pressure (SBP),diastolic blood pressure(DBP) ,and basal metabolic rate(BMR) in different types of anaemia.

Systemic examination:
The most common findings on systemic examination were venous hum(6 cases) and flow murmurs (5 cases). Abdominal examination revealed 4 cases with splenomegaly and 3 cases with hepatomegaly. CNS findings were

impairment of vibration sense (2 cases) and joint position sense (2 cases), suggestive of peripheral neuropathy. Elevated JVP, cardiomegaly, and basal crepitations were seen in 1 cases each. Cardiovascular and respiratory findings such as elevated JVP, venous hum, cardiomegaly, flow murmurs and basal crepitations were found only in cases with haemoglobin less than 6 gm/ dl, with the exception of one case with haemoglobin between 6 and 9 gm/ dl, who had a flow murmur. Impairment of vibration and joint position sense were also found only in cases with severe anaemia. Hepatomegaly and splenomegaly were found in all groups of cases equally.

Systemic examination and type of anaemia:
Elevated JVP, venous hum, cardiomegaly, flow murmurs and basal crepitations were not found in cases with normocytic hypochromic anaemia and normocytic normochromic blood picture. This is possibly due to the fact that these cases had less severe anaemia. Hepatomegaly was not seen in normocytic hypochromic and normocytic normochromic blood picture. splenomegaly was seen in all types of anaemia except cases with normocytic normochromic blood picture. Impairment of vibration and joint position sense was seen only in cases with dimorphic anaemia and megaloblasticanaemia.

Anaemia and Lipid profile:
The mean serum total cholesterol levels were significantly lower ($P<0.01$) in cases (131.7 mg/dl) as compared to controls (173.4 mg/dl). The effect of anaemia on the total cholesterol levels was very large.The mean serum HDL levels were significantly lower ($P<0.01$) in cases (30.9mg/dl) as compared to controls (38.8 mg/dl). The effect of anaemia on the HDL levels was very large.The mean serum LDL levels were significantly lower ($P<0.01$) in cases (79.3 mg/dl) as compared to controls (110.1 mg/dl). The effect of anaemia on the LDL levels was very large.The mean serum VLDL levels were significantly lower ($P<0.01$) in cases (21.5 mg/dl) as compared to controls (24.5 mg/dl). The effect of anaemia on the VLDL levels was mild.The mean serum triglyceride levels were significantly lower ($P<0.01$) in cases (107.8 mg/dl) as compared to controls (122.8 mg/dl). The effect of anaemia on the triglyceride levels was moderate.The mean LDL / HDL ratio was significantly lower ($P<0.01$) in cases (2.6) ascompared to controls (3.0). The effect of anaemia on LDL/HDL ratio was mild.The mean total cholesterol / HDL ratio was significantly lower ($P<0.05$) in cases (4.2) as compared to controls (4.7). The effect of anaemia on TC/HDL ratio was mild.

Anaemia and Lipid profile:
The mean serum total cholesterol levels were significantly lower ($P<0.01$) in cases with haemoglobin less than 6 gm/dl (106.0 mg/dl), as compared to cases with haemoglobin more than 9 gm/dl (153.7 mg/dl).The mean serum LDL levels were significantly lower ($P<0.01$) in cases with haemoglobin less than 6 gm/dl (61.0 mg/dl), as compared to cases with haemoglobin more than 9 gm/dl (95.8 mg/dl). The mean serum triglyceride levels were significantly lower ($P<0.01$) in cases with haemoglobin less than 6 gm/dl (94.4 mg/dl), as compared to cases with haemoglobin more than 9 gm/dl (116.5 mg/dl).The mean serum VLDL levels were significantly lower ($P<0.01$) in cases with haemoglobin less than 6 gm/dl (18.9 mg/dl), as compared to cases with haemoglobin more than 9 gm/dl (23.3 mg/dl).The mean serum HDL levels were significantly lower ($P<0.05$) in cases with haemoglobin less than 6 gm/dl (26.3 mg/dl), as compared to cases with haemoglobin more than 9 gm/dl (34.5 mg/dl).The mean serum total cholesterol/HDL ratio was significantly lower ($P<0.05$) in cases with Hb less than 6 gm/dl (4.16), as compared to cases with Hb more than 9 gm/dl (4.8). The mean serum LDL/HDL ratio was significantly lower ($P<0.05$) in cases with Hb less than 6 gm/dl (2.3), as compared to cases with Hb more than 9 gm/dl (2.9).

Type of Anaemia and Lipid Profile:
Since the severity of anaemia was found to have a significant effect on the lipid profile, analysis of the effect of type of anaemia on lipid profile was done by further subdividing the types of anaemia on the basis of severity and comparing the lipid profile in groups having varying types of anaemia with similar severity.There was no significant difference ($P>0.05$) in the mean total cholesterol levels in different types of anaemia with similar levels of haemoglobin.There was no significant difference ($P>0.05$) in the mean HDL levels in different types of anaemiawith similar levels of haemoglobin.There was no significant difference ($P>0.05$) in the mean LDL levels in different types of anaemia with similar levels of haemoglobin.There was no significant difference ($P>0.05$) in the mean VLDL levels in different types of anaemia with similar levels of haemoglobin.There was no significant difference ($P>0.05$) in the mean triglyceride levels in different types of anaemia with similar levels of haemoglobin.There was no significant difference in the mean total cholesterol / HDL ratio ($P>0.05$) and mean LDL / HDL ratio ($P>0.05$) in different types of anaemia with similar levels of haemoglobin.

Discussion:-

Anaemic cases younger than 50 years were more likely to have more severe anaemia, as compared to cases older than 50 years, who were more likely to have less severe anaemia. This is probably due to younger individuals having a higher risk of worm infestations, and also the onset of menopause with cessation of menstrual blood loss after the age of 50 years.There was no correlation between sex and severity of anaemia and is in accordance with study of **S.** Vetrivel, et al. (2017).

Regarding type and severity of Anaemia:

Dimorphic anaemia was the most commonly seen type of anaemia in this study. Microcytic hypochromic anaemia was the second most common, followed by normocytic hypochromic anaemia, and those with normocytic normochromic blood picture. Only a few cases of megaloblasticanaemia and pancytopenia, and one case of chronic myeloid leukemia were seen. This is consistent with standard textbooks of medicine like Wintrobe's Clinical Hematology. 11thed,andOxford Textbook of Medicine. 4thed.which describe nutritional deficiencies, especially iron deficiency, to be the most common cause for anaemia. Most cases had mild to moderate anaemia, as defined by a haemoglobin level above 6 gm/dl. None of the cases with normocytic hypochromic anaemia or normocytic normochromic blood picture had severe anaemia.

Symptoms:

Cases commonly presented with nonspecific symptoms of anaemia, such as fatigue, dyspnoea, palpitations and giddiness. Symptoms suggestive of a specific cause for anaemia were rarely seen.

Cases with more severe anaemia were more likely to have symptoms and had more number of symptoms. Patients with haemoglobin more than 10 gm/dl were usually asymptomatic, and incidentally detected to have on anaemia on routine evaluation. This is consistent with standard textbooks of medicine like WarrelDa,et al Oxford Textbook of Medicine. 4thed which state that mild anaemias of insidious onset are usually asymptomatic.

Non specific symptoms such as fatigue, dyspnoea, giddiness, palpitations, loss of appetite and loss of weight were equally frequent in the different types of anaemia, except normocytic hypochromic anaemia and cases with normocytic normochromic blood picture. This is possibly due to the fact that these cases had less severe anaemia.

General physical examination:

Pallor was the most common finding on general physical examination. Cases with more severe anaemia were found to be more likely to have findings on general physical examination. Signs were usually not seen in cases with haemoglobin less than 9 gm/dl. Koilonychia, glossitis and angular stomatitis and knuckle pigmentation were seen mostly in cases with dimorphic anaemia and microcytic hypochromic anaemia. Knuckle pigmentation and perioral pigmentation was seen only in cases with megaloblasticanaemia and dimorphic anaemia. This is consistent with descriptions given in standard textbook of medicine. Greer JP et al Wintrobe's Clinical Hematology. These observations were also similar to study of S. Vetrivel, et al. (2017)

Pulse Rate:

The mean pulse rate was higher in anaemic cases when compared to non anaemic controls. The mean pulse rate was higher in cases with more severe anaemia. The pulse rate has been described to be higher in case of anaemia, in standard textbooks of medicine. This is part of a compensatory mechanism to raise cardiac output and maintain tissue oxygenation as described by Varat MA et al.(1972) and also by Ickx et al (2000).

Blood Pressure:

The mean blood pressure was comparable in cases and controls. It was lower in cases with more severe anaemia. This is due to peripheral vasodilatation, another compensatory mechanism to raise cardiac output and maintain tissue oxygenation. However it was not statically significant in our study.

Body Mass Index:

The mean body mass index was comparable in cases and controls. It was lower in cases with more severe anaemia.but not found to be statically significant in our study.

Systemic examination:

The most common findings on systemic examination were venous hum and flow murmurs. Features suggestive of hyperdynamic state of circulation and congestive cardiac failure were only seen in cases with severe anaemia.

Features suggestive of peripheral neuropathy were seen only in cases with megaloblasticanaemia and dimorphic anaemia. This was consistent with a study done by Graettinger et al. (1963), which demonstrated that anaemia leads to significant haemodynamic changes only when it is severe. These observations were also similar to study of S. Vetrivel, et al. (2017)

Anaemia and Lipid profile:
The results of this study confirm the findings of previous investigators that the mean serum total cholesterol, HDL, LDL, VLDL and triglyceride levels are decreased in anaemia.The mean total cholesterol was found to be lower in anaemic cases when compared to controls. The decrease in mean serum cholesterol was not due to a specific lowering of any of the serum lipoprotein families; hypocholesterolemia was caused by a reduction in all the major lipoprotein families, including mean HDL, LDL, VLDL and triglycerides. There was a very large decrease in mean total cholesterol and HDL levels, and a large decrease in mean LDL levels, resulting in a mild fall in mean TC/HDL and LDL/HDL ratios. There was a mild decrease in mean VLDL and moderate decrease in triglyceride levels. These findings were in accordance with Rifkind et al (1967 and 1970.Elwood PC et al (1970) conducted a study 4,070 women, and demonstrated a significant difference in cholesterol between women with haemoglobin levels above and below 10.5g/dL.These observations were similar to study of Nithiyananda, et al .(2017) and S. Vetrivel, et al. (2017)

Severity of Anaemia and Lipid profile:
Patients with more severe anaemia were found to have a larger fall in mean total cholesterol and all the lipid sub fractions. This suggests that the severity of anaemia is responsible for the hypocholesterolemia seen in anaemia.

A study conducted by Choi et al (2001) showed that lipid levels in patients with iron deficiency anaemia were directly related to the hemoglobin levels. These observations were similar to study of S. Vetrivel, et al. (2017)

Type of Anaemia and Lipid Profile:
The type of anaemia did not have a significant effect on the mean lipid levels. This suggests that it is anaemia per se, and not the type of anaemia that is responsible for the lowering of lipid levels in anaemia.

A study by Westerman MP (1975) examined the relationship between hypocholesterolemia and various types of anaemia, including megaloblasticanaemia, hereditary spherocytosis, homozygous sickle cell disease, aplastic anaemia, and liver associated anaemia. The study showed that the plasma cholesterol level is closely related to haematocrit levels, both initially and throughout the course of the anaemias associated with hypocholesterolemia. This association was maintained regardless of the cause of changes in haematocrit levels. The authors concluded that low haematocrit, not the type of anaemia, is the cause of low cholesterol levels.

Nithiyananda, et al .(2017) in their study also found that all lipoprotein fractions in serum of anaemic patients were decreased but there had been no statical difference between cases of different types of anaemia. Similar observations were noticed in study by S. Vetrivel, et al. (2017).

Summary:
The primary aim of our study was to find the effect of anaemia on various lipid sub fractions. This study was also intended to see if any particular type of anemia has any particular effect on any lipid subfraction and is there any effect of severity of anaemia on lipid subfractions.This study was done on 50 anaemic cases and 50 non anaemic controls

In our study we found that Younger individuals are more likely to have severe anaemia. Cases with severe anaemia had more symptoms. They had higher mean pulse rate. Vegetarians are more likely to have severe anaemia. Cases with severe anaemia also have more signs on examination.

Our study revealed that anaemia is associated with significant hypocholesterolemia, with lowering in all lipid subfractions. The extent of hypocholesterolemia is proportional to the severity of anaemia. The type of anaemia has no effect on the hypocholesterolemia seen in anaemia.

Conclusion:-

In our study it has been found that dimorphic anaemia is most common type of anaemia ,microcyticanaemia is second most common type. Younger individuals are more likely to have severe anaemia.cases with severe anaemia have more symptoms. Fatigue is consistent complaint in severe anaemia(<6g%).they have higher mean pulse rate, anaemia has no effect on blood pressure.vegetarian are more likely to have severe anaemia,cases with severe anaemia also have more signs on examination.pallor is most common sign of anaemia

Our study reveals that anaemia is associated with hypocholesterolemiawith lowering in all lipid subfractions. Decrease is more strongly associated with total cholesterol and HDL levels compared to other subfractions. The extent of hypocholesterolemia is proportional to severity of anaemia.The type of anaemia has no effect on the hypocholesterolemia.this is consistent to the studies of Rifkind et al (1967 and 1970) and s.vetrieval,et al ,2017.

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