Studying the risk of anemia in patient with chronic diabetes

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ABSTRACT

Patients with DM2 and anemia were those with high body mass,hypertension ,increased waist circumference ,and longer time of the disease. This set of changes characterizes the anemia as chronic disease,which has a significant adverse effect on quality of life of diabetic patients and is associated with the progression of the disease; the development of comorbidities significantly contributes to the increased risk of cardiovascular disease. However, against what was expected, the results of blood glucose were higher in non anemic patients, which is contradictory due to the anemia of these patients being associated with an inflammatory condition, for being characterized as normocytic normochromic anemia.

Keywords: anemia, Diabetes mellitus, chronic disease

Introduction

Diabetes mellitus (DM) can be defined as a set of metabolic defects resulting from hyperglycemia, due to impaired secretion of insulin and/or action (Association of American Diabetes et al., 2014). It appears as one of the mostly prevalent chronic disease in human populations. The symptoms of high characteristics are polyuria (frequently of urine), polydipsiae (elevation of thirst) and polyphagiae (highly hunger). Hyperglycemia may lead to damage of irreversible state in a different area of tissues, specially the retina of the eye lead to defect of them with end result of diabetic retinopathy, affect the renal glomeruli cause diabetic nephropathy, diabetic neuropathy resulting from damage of the neural tissue and blood vessels (Wolfs et al., 2009).

Anemia is a condition characterized by a decrease in the concentration of hemoglobin in the blood. Hemoglobin is necessary for transporting oxygen to tissues and organs in the body. The reduction in oxygen available to organs and tissues when hemoglobin levels are low is responsible for many of the symptoms experienced by anemic people. The consequences of anemia include general body weakness, frequent tiredness, and lowered resistance to disease. Anemia can be a particularly serious problem for pregnant women, leading to premature delivery and low birth weight. It is of concern in children since anemia is associated with impaired mental and physical development. Overall, morbidity and mortality risks increase for individuals suffering from anemia (Sharmanov, 1998).

Hemoglobin testing is the primary method of anemia diagnosis. The TDHS 2000 included direct measurement of hemoglobin levels in all women 15-49 and their children age 5 and under (born since January 1995). The HemoCue system was used in the TDHS 2000 for hemoglobin testing. This system consists of a battery-operated photometer and a disposable microcuvette,1 coated with a dried reagent that serves as the blood-collection device. After obtaining consent from each respondent (in the case of children, the consent of the child's mother), a drop of capillary blood taken from a person's fingertip or heel was drawn into a microcuvette. The blood in the microcuvette was analyzed using the photometer, which displayed the hemoglobin concentration (Sharmanov, 2000(.

1.1 Purpose:

Anemia is one of the common complications of diabetes mellitus(DM),which has an adverse effect on the progression and development of other diabetes-related complications. In spite of this, relatively little information is available on the prevalence of anemia and associated factors among type 2 diabetes mellitus (T2DM) patients, particularly in the study area. Thus, this study show the prevalence of anemia .

3.1 Diabetes and anemia

Diabetes does not directly cause anemia, but certain complications and conditions associated with diabetes can contribute to it. For example, bothdiabetes-related kidney disease (nephropathy) and nerve damage (neuropathy) can contribute to the development of anemia. In addition, taking certain oral diabetes drugs can raise the risk of developing anemia. People with diabetes can also have anemia as a result of not eating well or of having a condition that interferes with the absorption of nutrients[5].

3.1.1 Kidney disease.

Normally, the kidneys secrete a hormone called erythropoietin, which stimulates the bone marrow to produce red blood cells. In diabetic nephropathy, the tiny blood vessels that filter waste products from the body become damaged and start -leaking|| substances (such as protein) into the urine. At the same time, the amount of erythropoietin produced by the kidneys is reduced, leading to anemia. Some studies have shown that reduced erythropoietin production and anemia happen earlier in people with diabetes and kidney disease than in those with kidney diseaseand no diabetes.[5]

Both chronically high blood glucose levels and high blood pressure can cause kidney damage.

3.1.2 Neuropathy.

In people who have a type of neuropathy called autonomic neuropathy, the body may not be able to properly signal the kidneys to produce more erythropoietin in response to anemia[14].

3.1.3 Heart failure.

People who have diabetes are at increased risk for heart failure, or the inability of the heart to pump adequate blood to meet the body's needs. Decreased heart function can cause kidney dysfunction, and many people with heart failure also have nutritional deficiencies; both of these can contribute to anemia. About 20% of people with heart failure are anemic[9].

3.1.4 Nutrient deficiencies.

Many people who have diabetes have nutrient deficiencies that can cause anemia. Nutrient deficiencies can be caused by either not eating enough nutrients (because a person restricts his food choices, for example) or by the body's inability to absorb the nutrients that are eaten. Deficiencies in iron, vitamin B12, vitamin B6, and folate can all cause anemia.

One condition that affects the body's ability to absorb nutrients is celiac disease. In celiac disease, the body cannot tolerate gluten, a protein found in wheat, barley, and rye. If gluten is eaten, the normal, fingerlike folds ofthe small intestine flatten out, preventing the absorption of not just the gluten but of other nutrients, as well. About one in 20 people who have diabetes also have celiac disease.[24]

Bariatric (weight-loss) surgery can also lead to nutrient deficiencies thatcause anemia. Vitamin and mineral supplements are generally needed after bariatric surgery to prevent this.

3.1.5 Diabetes drugs.

Metformin is the most widely prescribed treatment for people with Type 2 diabetes. It is now recognized that metformin can cause malabsorption of vitamin B12 and that long-term use (12–15 years) of metformin leads to vitamin B12 deficiency in 30% of people who use it. Vitamin B12 deficiency can cause anemia and also peripheral neuropathy (nerve damage in the feet, legs, hands, and arms

Another type of diabetes drug, the thiazolidinediones, which include pioglitazone (Actos) and rosiglitazone (Avandia), can also cause mild anemia by slightly decreasing hemoglobin levels and hematocrit, a measurement of the proportion of blood that is made up of red blood cells.

3.2 Pathophysiology of Anemia in Diabetic Patients

EPO release by renal cells has been shown to be modulated by kidney splanchnic innervation. Indeed, renal denervation in animal models led to a loss of EPO production in response to hypoxic stimuli. Furthermore, EPO deficiency has recently been observed in anemic type 1 diabetic patients with severe symptomatic diabetic autonomic neuropathy [15]. In Bosmans' study [31], involving a small cohort of patients, the serum EPO levels in anemic diabetic patients were found to be inappropriately low compared to the values observed in a control group of iron deficiency anemic subjects. In comparing the regression lines for the whole DN group with those of the non-anemic and anemic control groups, they found a difference in the slope of the logarithm of EPO values in relation to hemoglobin level when allowing non-parallel regression lines in the model [31]. It has thus been postulated that EPO deficiency in these patients may be caused at least in part by efferent sympathetic denervation of the kidneys leading to the loss of appropriate production of EPO in the presence of damaged producing fibroblasts in the renal cortex. This is supported by observations [16] that EPO-deficient anemia can occur prematurely in patients with type 1 diabetes and diabetic nephropathy, even before the onset of advanced renal failure. However, transplanted kidneys, which are also denervated, seem to be able to produce normal levels of EPO. A reduced number of specific erythropoietin synthesizing interstitial cells and impairment of the regular processes enabling oxygen sensing through hypoxia-inducible transcription factor-1· (HIF-1·) secondary to interstitial fibrosis or vascular lesions are the main factors involved in anemia in diabetes. Other mechanisms may involve cytokine-induced EPO synthesis inhibition [20], hyporeninemia [21], urinary loss of EPO (in patients

with nephritic range proteinuria) [22] glycation of the EPO receptor by or secondary to hyperglycemia. It has been suggested that the widespreaduse of angiotensin-converting enzyme (ACE) inhibitors in diabetes, particularly in patients with high urinary albumin level or renal impairment

may contribute to a reduction in hemoglobin levels [11]. Recent evidence fails to support any significant link between ACE inhibitor use and hemoglobin levels.

Symptoms

A person with very mild anemia may have no symptoms, but moreserious anemia can cause tiredness, weakness, dizziness, irritability, shortness of breath, and/or depression. It can also cause brittle nails; pale skin; cold hands and feet; numbness and/or tingling in the fingers, toes,and feet; chest pain; an irregular heartbeat; cravings to eat unusual thingssuch as ice; difficulty concentrating; and sexual problems.

If you have these symptoms, ask your health-care provider to check to seeif you are anemic.

4.1 Materials and Methods

Hospital-based cross-sectional study was conducted among T2DM patients at DM follow up clinics at Al Refie Hospital over a period of two months. There are different units and clinics that provide service for clients. Among these clinics, the diabetes clinic registers, treat and provide care for all diagnosed diabetic patients. A total of 249 T2DM patients with more than six months' follow-up at the diabetic clinic were included in the study by using a systematic random sampling technique. All adult T2DM patients (≥18 years) attending the diabetes clinic in the study periods were considered in the study. Patients with known hematological diseases, patients who had a history of delivery within 3 months before the data collection period and, pregnant women ,those who were critically ill, and those patients with a history of acute or chronic blood loss and blood transfusion within 3 months of enrollment were excluded. Patients were also excluded if they were known chronic liver disease (CLD) patients, human immunodeficiency virus infection, and malignancy including hematological malignancies. Sample size was calculated using a single population proportion formula, taking p=29.8% (anticipated proportion of anemia in T2DM),32 5% tolerable margin of error (d=0.05) and confidence interval (CI) of 95% (Z a/2 =1.96). Thenthe minimum sample size obtained was 321. A correction formula was employed and became 226. By adding 10% non-response rate, a total of 249 T2DM patients were included in the study. To select the study participants, a systematic random sampling technique (i.e., every third patient) was used. Data were collected by using semi-structuredquestionnaire. Three data collectors (one nurse and two laboratory professionals) were collect the data. The collected information includes socio-demographic characteristics, clinical characteristics, anthropometric measurements, and laboratory analysis. Socio-demographic data and clinical characteristics like duration of DM were collected using an interview guide; whereas the presence of diabetes-related complications like; retinopathy, neuropathy, nephropathy, and other complication; history of hypertension and current diabetic medications were collected from reviewing of patient's medical records. Four consecutive fasting blood glucose measurements, including measurement at the time of the data collection period were also recorded from the patient's medicalrecords for calculating the mean blood glucose level.

An thropometric measurements such as weight(kg),height (m), and waist circumference were measured according to WHO recommendations. The body mass index (BMI) was computed as weight in kilograms divided by the square of the height in meters (kg/m2). The BMI of the participants were classified as: underweight less than 18.5 kg/m2, normal (18.5–24.9kg/m2),overweight(25–29.9kg/m2),and obese (≥ 30 kg/m2).41 Central obesity as measured by waist circumference is defined as>102cminmalesand>88cminfemales.42 Blood pressure (BP) was measured using an aneroid sphygmomanometer after 10 mins of rest in a sitting position. Hypertension was defined as Systolic Blood Pressure (SBP) ≥130 mmHg and/or Diastolic Blood Pressure (DBP)≥80 mmHg or current use of antihypertensive medication

For laboratory data, from each participant six mL of venous blood was collected under aseptic conditions by venous puncture from the veinusing a disposable syringe as follows: 3 mL into ethylene di amine tetra acetate (EDTA) tube for hemoglobin and red blood cell (RBC) indices determination, and the remaining 3 mL into a plain tube for serum creatinine analysis. Hemoglobin (Hgb) values and RBC indices (MCV, MCH, and MCHC) were calculated using the ABX Micros 60

Hematology Analyzer (HoribaABX, Montpellier, France). For serum creatinine analysis, the remaining 3 mL of blood was collected in a clot activator with a gel test tube and allowed to clot at room temperature for 30 mins. After complete coagulation, the cells were separated from the serum by centrifugation at 3000 RPM for 5 mins. Then serum creatinine was determined using ECHO XPC automatic chemistry analyzer (Edif instruments, Italy) as mg/dl. World Health Organization (WHO) criteria was used to define anemia as: Hgb concentration <13 g/dl for males and <12 g/dl for females.43 It was further classified into mild anemia (female: 11–11.9 g/dl; male: 11–12.9 g/dl), moderate anemia (8–10.9 g/dl) and severe anemia (< 8 g/ dl).44 Microcytic was defined as MCV < 80 fl, macrocytic: MCV >100 fl and hypochromic: MCHC value < 31 g/dl.29 Serum creatinine values were considered as abnormal if values of serum creatinine analysis were > 1.5 mg/dl for males and > 1.3 mg/dl forfemales.45 Good glycemic control: an average of four consecutive fastingblood glucose measurement was ≤ 130 mg/dl and Poor glycemic control: an average of four consecutive fasting blood glucose measurement was

>130 mg/dl.46 Kidney function was estimated by using the simplified version of the Modification of Diet in Renal Disease (MDRD) study equation: 186 × SCr (mg/dl)−1.154 ×age (years) −0.203 × 0.742 (iffemale) × 1.210 (as the study participants are black). Based on the result, it was classified as normal or increased estimated glomerular filtrationrate (eGFR ≥ 90 mL/min/1.73 m2), mild renal impairment (eGFR 60–

89.9 mL/min/1.73 m2), moderate and severe renal impairments (eGFR

<60 mL/min/1.73 m2).47 To ensure good data quality, the questionnaire was pretested on 5% of the actual sample size on those people who did not participate in the study, training was given for data collectors, physical measurements were recorded three times, and close follow-up of the data collection process was carried out. Blood sample quality was also ensured during pre-analytical, analytical, and post-analytical stages by following the standard operating procedures.

Before entry, data were cleaned and checked; for any missing values

Then ,it entered into Epi-data manager version 4.4.1.0 and was exported to SPSS version 22 statistical software for analysis. Then the data were processed by using descriptive analysis like frequency distribution, cross tabulation, and summary measures. Multivariate logistic regression analysis (backward stepwise) was carried out for the selected variables with p-value < 0.25 in the bivariate logistic regression analysis and the corresponding adjusted odds ratios (AOR) with 95% confidence intervals (CI) were used to identify factors independently associated with anemia. P-value with< 0.05wasconsidered as statistically significant

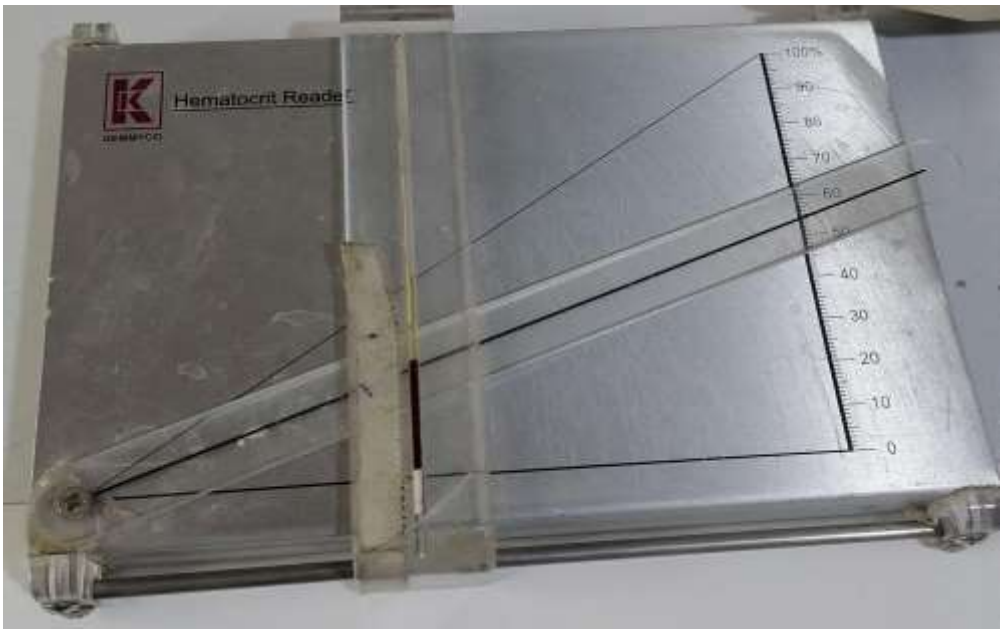

Figure (1) : Spectrophotometer Figure (2) :hematocrit reader

Figure (3) : centrifuge Figure (4) : hematocrit centrifuge

Figure (5) : ESR Figure (6) : roll mixer

Figure (7) : CBC

5.1 Results

5.1 Demographic Characteristics of the Participants

A total of 249 T2DM patients, of which 128(51.4%) were females included in the study. Their ages ranged from 36 to 80 years with a mean (± SD) of 53.71 ± 10.41 years. More than half of the participants, 132 (53%) were aged 45 to 60 years. From the total of the respondents, 172 (69.1%) were married while 31(12.4%) were single, and 46(18.4%) were divorced and widowed .One hundred seventy-two(69.1%)of the participants were from urban areas. About 71(28.5%) of the respondents had a higher educational status. Regarding the employment status of the participants, 104 (41.8%) were a government employee and 45 (18.1%) employed at a private organization (Table 1).

Table 1 Socio-Demographic Characteristics of T2DM Patients at Al-Refie Hospital, 2023 (n=249)

Variable		Frequency (n=249)	Percentage (%)
Sex	Male	121	48.6
	Female	128	51.4
Age (years)	< 45	58	23.3
	45–60	132	53.0
	>60	59	23.7
Marital Status	Single	31	12.5
	Married	172	69.1
	Divorced	21	8.4
	Widowed	25	10.0
Educational status	No formal education	65	26.1
	Primary school (1–8)	55	22.1
	High school (9–12)	58	23.3
	Higher education	71	28.5
Employment status	Farmer	60	24.1
	Housewife	34	13.6
	Government employee	104	41.8
	At private organization	45	18.1
	Others*	6	2.4
Residence	Urban	172	69.1
	Rural	77	30.9

5.2 Prevalence of Anemia Among T2DM Patients

The hemoglobin level of the participants was, from 9.4 g/ dl to 17.5 g/dl, with a mean (± SD) of 14.32 ± 1.68 g/dl. The mean (± SD) of hemoglobinwas 14.73 ± 1.53 g/dl and 13.93 ± 1.73 g/dl in male and female participants, respectively. The overall prevalence of anemia in the study participants was found to be 20.1% (95% CI = 15.3–25.3%); with 23

(19.01%) in males, and 27 (21.1%) in females. The mean (± SD) of Hb levels for males and females anemic patients were 12.2± 0.73 g/dl and

11.4 ±0.58 g/dl, respectively. Out of anemic T2DM patients, 42 (84%)and 8 (16%) had mild and moderate anemia, respectively. Severe anemia was not detected in this study. From these anemic patients, none of them was ever screened for anemia . The mean (± SD) of MCV was 92.5 ± 5.2 fL and 91.6 ± 4.9 fL in anemic and non-anemic patients, respectively Likewise, the mean MCHC (± SD) was 33.9 ± 1.6 g/dl and 34.2 ± 1.6g/dl in anemic and non-anemic patients, respectively. The differences in the distribution of both MCV and MCHC in non-anemic and anemic groups were not statistically significant ($p>0.05$). The majority of anemic patients, 42 (84%) had MCV between 80–100 fL, and 45 (90%) of anemic patients had MCHC above 32 g/dl. Overall 42 (84%) of patients had normocytic normochromic, 3 (6%) had microcytic hypochromic, and 5 (10%) macrocytic anemia.

Table 2 Clinical Characteristics of the Study Participants at Al-RefieHospital

Variables		Frequency (n=249)	Percentage (%)
Duration of DM (years)	<5 5–10 >10	102 84 63	41.0 33.7 25.3
BMI (Kg/m^2)	Below 18.5 18.5–24.9 25 and above	11 162 76	4.4 65.1 30.5
Central obesity	Yes No	45 204	18.1 81.9
Hypertension	Yes No	83 166	33.3 66.7
SBP (mmHg)	≥ 130 < 130	77 172	30.9 69.1
DBP (mmHg)	≥ 80 < 80	63 186	25.3 74.7
Serum creatinine level	High Normal	37 212	14.9 85.1
Complications of DM	Yes No	78 171	31.3 68.7
Glycemic control	Poor Good	135 114	54.2 45.8
Types of treatment	Oral hypoglycemic agents *Combined	191 58	76.7 23.3
eGFR (mL/min/1.73 m^2)	> 90 60–89.9 < 60	157 49 43	63.1 19.7 17.2

6.1 Diagnosing anemia

Anemia is diagnosed with a blood test. The blood sample is analyzed forthe amount of hemoglobin in the blood and for the hematocrit.

For men, the normal hemoglobin range is 13.8–;17.2 grams per deciliter(g/dl), and the normal hematocrit is 40.7% to 50.3%.

For women who are not pregnant, the normal hemoglobin range is 12.1–

15.1 gm/dl, and the normal hematocrit is 36.1% to 44.3%.

The normal ranges for both men and women may vary somewhat from one laboratory to another and also vary according to altitude. At higher altitudes, the body produces more red blood cells in response to the decreased oxygen available. A higher number of red blood cells means that hemoglobin levels and hematocrit are also increased.

Test results below the low end of the normal range for either hemoglobin or hematocrit can indicate anemia. If initial tests show anemia, more blood tests may be done to establish the cause of the anemia and the best approach to treatment. For example, a test for the level of iron in the blood is often done, since iron deficiency is the most common cause of anemia. Other diagnostic tools include a physical examination and asking about such things as family history of anemia, diet, use of prescription or over-the-counter drugs, heavy menstrual bleeding (in premenopausal women), and any signs of internal bleeding, such as blood in stools.

As a side note, blood glucose meters have a hematocrit range at which they give accurate results. Having a hematocrit that falls outside your meter's range may mean you are getting inaccurate results when monitoring your blood glucose. The package insert that came with your meter should state its hematocrit range.

6.2 Treatment and prevention

The treatment for anemia depends on the cause and severity of it. For example, if anemia is due to blood loss and it's not severe, identifying thesource of bleeding and stopping it will often be enough to reverse the anemia. For other causes or more serious cases, other steps may need to be taken, such as treating an underlying disease, taking vitamin or mineral supplements, and making dietary changes .

In all cases, it takes time for the body to create new, healthy red blood cells, so a person is likely to feel better gradually .

Because anemia can recur, depending on the cause, the steps taken totreat it may need to be continued — possibly for life — to prevent it fromcoming back .

Kidney disease. If you have kidney problems, you should be under the care of a nephrologist, a physician who specializes in kidney diseases. Treatment for

anemia related to kidney disease may include both steps to reverse the anemia and steps to improve kidney function (or prevent it from worsening). For example, to reverse the anemia, injections of a type of drug called an erythropoiesis-stimulating agent may be prescribed to stimulate your bone marrow to produce red blood cells. In addition, drug therapy with certain types of blood pressure drugs may be prescribed to prevent further kidney damage .

Also important for preventing further kidney damage are attaining and maintaining blood glucose levels as near to normal as possible and a blood pressure level below 130/80 mm Hg. If your kidney damage is already severe, however, you may need dialysis or a kidney transplant .

No matter how severe your kidney disease, you should meet with aregistered dietitian who specializes in kidney diseases to help you with your food choices. People with diabetes and kidney disease have dietary needs that are somewhat different from those of people who have diabetes and no kidney disease. In particular, they need individualized guidelines for protein, potassium, phosphorus, and fluid intake, as well asfor carbohydrate intake .

Heart failure. Take your medicines as prescribed, and follow your healthy lifestyle plan. Weigh yourself every morning, and report a weight gain of 3 pounds in one day or 5 pounds in one week to your health-care team. Rapid weight gain such as this can mean that your heart function is worsening, and fluid is accumulating somewhere in your body.

Diabetes drugs. If you take either metformin or a thiazolidinedione (Actos or Avandia), ask your health-care provider to check your blood to see if you are anemic. If your lab results show a low vitamin B12 level, you may be prescribed B12 supplementation. If your hematocrit andhemoglobin are low, your dose of Actos or Avandia may reduced, you may be advised to eat more foods that are higher in iron, and/or you may be advised to start taking iron supplements .

Nutrient deficiencies. If your anemia is due to blood loss or a nutrient deficiency, you may be instructed to eat more iron-rich foods and possibly to take iron supplements .

Iron-rich foods include beef, organ meats, pork, poultry, fish, clams, and oysters. The iron in foods of animal origin such as these is usually easily absorbed by the body. The iron in plant foods, such as fruits, vegetables, dried beans, nuts, and grain products, is less easily absorbed, but absorption can be increased by eating these foods along with foods high in vitamin C, such as dark leafy greens, broccoli, bell peppers (particularly red, yellow, and orange peppers), tomatoes, mangoes, papayas, and kiwifruits .

Taking vitamin C supplements is another option for helping your body absorb iron. However, vitamin C supplements can affect the accuracy of some blood glucose meters. Before you take vitamin C supplements, ask your meter's manufacturer if taking vitamin C (also called ascorbic acid) affects the performance of your meter .

If your nutrient deficiency is due to a lack of vitamins or minerals other than iron, such as folate or vitamin B12, you may be prescribed a supplement, and you will be encouraged to eat foods high in folate and B12 .

Foods high in folate include green leafy vegetables, eggs, seafood, lean beef, organ meats, orange juice, dry beans, lentils, asparagus, and broccoli .

Foods high in vitamin B12 include all animal products, including eggs, dairy products, and meat. People who follow a vegan diet are at risk of vitamin B12 deficiency and should take a vitamin B12 supplement .

If your nutrient deficiency is found to be a consequence of having celiac disease, you will need to follow a strictly gluten-free diet for the rest of your life to allow your small intestine to heal and remain healthy.

Anyone diagnosed with a nutrient deficiency should meet with a registered dietitian or nutritionist to discuss healthy food choices and howto prevent such a deficiency from happening again. Meeting with a dietitian may be particularly helpful for people diagnosed with celiac disease, since switching to a gluten-free diet can be a challenge.

Discussion

Patients with diabetes suffer the consequences of impaired renal function earlier in the course of their disease than do their non diabetic counterparts. In diabetic nephropathy (DN), anemia tends to be more severe than in non-diabetic renal disease and occurs at an earlier stage of the disease. However, because most patients with DN have little overt renal impairment, primary care physicians or endocrinologists are often the first-line health care providers and may not be aware of the critical importance of screening for anemia in this population. Therefore, anemia may often be unrecognized or untreated. Several studies based on a small number of patients with overt nephropathy, have suggested that prevalence of anemia is higher in diabetic patients. Bosman D, Winkler A, Marsden J,2001].

Systemic inflammation, inhibition of erythropoietin (Epo) release,damage to the renal interstitium, efferent sympathetic denervation of the kidney, loss of appropriate Epo, drugs, altered iron metabolism, and hyperglycaemia are some of the factors suggested as the reason for the earlier onset of anaemia in DM patients.10 Anaemia represents an emerging global health problem that negatively impacts the quality of lifeand requires an ever-greater allocation of healthcare resources. It also induces reduced exercise capacity, fatigue, anorexia, depression, cognitive dysfunction, and decreased libido that increase the risk of cardiac disease and depress the life expectancy of patients. Anaemia is found to contribute to the development and progression of micro-and macro-vascular complications in DM patients.11 It is associated with a rapid decline of renal function and an increased need for renal replacement therapy, which is often unavailable or unaffordable in most developing countries like Ethiopia.12 People who have both DM and anaemia are more likely to die early than those who have DM but not anaemia.13

Under these circumstances, anaemia in patients with DM must be treated once diagnosed, since it may contribute to the pathogenesis and progression of cardiovascular disease and serious diabetic nephropathy and retinopathy. The regular screening for anaemia along with other DM-associated complications can help slow the progression of vascular complications in these patients.

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