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A CASE–CONTROL STUDY OF PREVALENCE OF ANAEMIA AMONG PATIENTS WITH TYPE 2 DIABETES.

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Abstract:

Anaemia is characterised as a drop in haemoglobin blood levels that thereby decreases the oxygen ability of red blood cells to prevent them from satisfying the physiological demands of the body. Several findings also suggested that anaemia often exists in patients with diabetes with renal insufficiency although few tests also reported the occurrence of anaemia in persons with diabetes due to signs of renal failure. Anemia has since been known in other trials as a risk factor for the need for diabetes renal replacement therapy. Understanding the pathogenesis of diabetes-related anaemia will lead to therapies to improve the findings of these cases. Consequently, the purpose of this research was to evaluate the prevalence of anaemia in Type 2 diabetes patients. ***Methods:*** *We recruited 100 participants for our study (50 of them with type 2 diabetes and 50 controls). Blood tests of participants, including blood fasting, blood count and kidney function were tested for fasting blood glucose. Anemia prevalence was also objectively determined.* ***Results:*** *In the cases a high prevalence of anaemia has been observed. Of the diabetes cases, 79.8 percent had a slightly lower haemoglobin concentration than controls. In comparison with monitors, a substantial increase was found in the blood glucose, urea, sodium, potassium, and calcium ions. In the cases, a strong correlation was also found between haemoglobin concentration and fasting blood glucose.* ***Conclusion:*** *It indicates that in patients with poorly regulated insulin and asthma, and renal insufficiency, a high rate of anaemia is likely to occur.*

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INTRODUCTION:

Anemia could be indicated by deficiency in blood oxygen-carrying capacity due to reduced erythrocyte mass or a decline in the blood haemoglobin (Hb) concentration. Which implies that the blood cannot fulfil the physiological requirements of the body (1). It is either caused by excessive destruction or by decreased red blood cell production. Anemia is linked to increasing perinatal mortality, morbidity of children and mortality, mental impairments, immune incompetence, increased susceptibility to leading to intoxication and lowered labour efficiency (2).

Anemia is widely common in developing and developed countries and is considered a public health concern. It is present in all life stages, especially in women and children who are pregnant. In children of pre-school age the highest prevalence is 47.4% and in males the least prevalence is 12.7% (3). The most affected population was in Africa (47.5–67.6%), while the most affected population in Southeast Asia is affected by 315 million people, across the three demographic groups, according to WHO regionally produce numbers for pre-school infants, pregnant women and non- pregnant women (4). In Ghana anaemia was ranked fourth and second to contribute to death after a study of the disease profile and pathology records of selected hospitals as the key cause for admissions into hospitals (5).

Diabetes mellitus has a high global prevalence and is a non-infective disease. It is a condition of the metabolism of carbohydrates leading to elevated blood glucose because of an absolute lack of insulin or a decreased reaction to insulin or to both. Diabetes leads to complications, particularly poorly regulated ones, such as nephropathy, retinopathy and neurology (6). It also contributes to several metabolic disorders including oxidative stress which destroy tissue and cells by causing oxidative harm. Anemia in patients with diabetes is one of the most common diseases of the blood. Many studies have observed anaemia in diabetes patients, who are also deficient in the renal system (7).

A few other studies have also reported an incidence of anemia in diabetics prior to evidence of renal impairment. Anemia occurs earlier and at a greater degree in patients presenting with diabetic nephropathy than those presenting with other causes of renal failure.

The most reported cases of anaemia in developing countries, including Ghana, are mostly multifactorially etiological. Anemia can also induce iron in the diet, malaria, schistosomiasis, and micro-nutrient deficiencies such as folate, Vitamin B12 and Vitamin A, as well as hereditary disorders affecting red blood cells such as sickle and thalassemia. People who are at greater risk of anaemia, once again, have underlying disorders such as kidney problems, cancer, and diabetes and associated conditions (8). Nevertheless, iron deficiency, sometimes used as the synonym of anaemia, and the incidence of anaemia, as a marker for anaemia, is the most important factor.

Therefore, 50% of anaemia is due to iron deficiency, but this ratio will vary according to local circumstances among communities in different areas. The key risk factors for iron deficient anaemia are inadequate iron consumption diets, low iron absorption from diets rich in phenolic compounds, and a life span where iron demands are extremely strong (i.e., development and pregnancy) (9). Loss of blood from menstrual and parasite infestations such as hookworm, ascaris, and schistosomiasis often contributes to decreased anaemia in Hb. The strain of anaemia may also be caused by malaria, cancer, tuberculosis and HIV (10).

A rise in the risk of anaemia may also arise from deficiencies in copper and riboflavin. The effect of hemoglobinopathies on the occurrence of anaemia among certain populations also needs to be addressed. The multiple causes of anaemia can work in concert, so different nutrient deficiencies, chronic diseases and various infestations can all play a role in a single individual. Therefore, it remains important to determine the role that various causative factors play in the troubling aggregate incidence of anaemia in different populations.

In addition, several diseases, disorders, and factors which cause our body to lose it's RBCs which lead to hemolytic anaemia. These causes may be inherited or acquired but the cause is sometimes unknown. Hemolytic anaemia can cause various health complications, such as exhaustion, discomfort, arrhythmias, and heart failure. There are many types of hemolytic anaemia and it depends on what type and how severe it is (11). The disorder may grow unexpectedly, and may vary from mild to extreme symptoms. Hemolytic anaemia may also be treated or managed with effectiveness. Mild hemolytic anaemia may need no treatment, whereas serious hemolytic anaemia may need immediate and adequate care, or may be fatal (12).

Inherited causes of hemolytic anaemia are life-long disorders that can need lifelong care, but once the cause of the disease is detected and treated, inherited variants may go away. Examples of disorders contributing to hemolytic anaemia are as follows: sickle cell disease, thalassemia, inherited spherocytosis, and deficiency in glucose-6-phosphate dehydrogenase (G6PD), deficiency in

pyruvate kinase, acquired hemolytic anemia, immune hemolytic anaemia and mechanical hemolytic anemia (13).

Results from a Rossing et al. Study showed a significant association between a lower concentration of Hb and a decrease in glomerular filtration (GFR) rate. Other recent studies have also identified anaemia as a risk factor for diabetes-related renal replacement therapy (14). In addition, anaemia has a detrimental effect on the survival of diabetes patients, and is considered a significant risk factor associated with diabetes and renal disease. More trials of anaemia in patients suffering from diabetes, in particular renal dysfunction, are therefore required (15).

Therefore, the purpose of this research was to determine the prevalence of anaemia due to renal insufficiency for patients with type 2 diabetes. The results indicate, especially when poorly controlled, that anaemia is likely to occur in diabetes with renal insufficiency. The analysis of the findings is thus assumed to help raise anaemia sensitivity and understanding of diabetes patients, leading eventually to measures that improve the treatment effects.

METHODS:

Study design:

The study was a case–control study conducted between the months of February and July 2020.

Ethical consideration:

Legal approval for this study was requested from the Ethics and Policy Review Committee in compliance with the Helsinki Resolution of 1964 and its subsequent revisions or equivalent ethical principles. Before their samples were extracted all the participants gave their informed consent.

Specimen collection and processing:

6 ml of an overnight fasting venous blood was collected from each participant as follows: 2 ml in a hematologically profiled ethylenediaminetetraacetate (EDTA) tube, 2 ml in a plain tube for renal function tests (RFTs), and 2 ml in a fluoride tube for FBG and HbA1c study.

Statistical analysis:

The data gathered was cleaned up and entered in the 20.0 version of the SPSS. In order to sum up categorical variables such as gender, descriptive statistics such as frequencies and percentages were used (16). The medium and standard deviation were used to quantify continuous variables including HB concentration, ferritin concentration and TIBC. In order to evaluate mean differences between means of categorical variables in two types, a separate t-test was used, while an ANOVA was used for three categories. A p-value of 0.05 was considered significant.

Results:

The survey consisted of 100 participants, including 50 diabetes participants (15 men/35 women) and 50 diabetes-free participants (14 men/36 women) who approved participation. The study involved 100 participants. Mean ages of 55.62±10.37 years and 44.11±15.30 years respectively were reported for cases and controls. The participants' medical histories have been checked for signs and symptoms of anaemia and taken into a physical examination. But none showed any signs of anaemia, maybe because some people who have anaemia may not have any symptoms. Other conditions, such as cancer, myelodysplasia and other anaemia causes discussed in the initial study group were excluded.

In contrast to controls, Hb concentration in the cases was found to be slightly lower. Ferritine and Complete TIBC were shown to be average in most cases and lower in the monitoring subjects considered to be anaemic. TIBC levels were stated to be high. The mean volumes of cells (MCVs) in these situations is larger than the controls.

In contrast to controls, there was a substantial rise in the rapid blood glucose (FBG) concentration (p=0,000). In comparisons to controls, significant increases were also observed in the concentrations of urea, sodium (Na), potassium (K) and calcium (Ca). Although they were elevated on the side, creatinine concentrations were nearly equal in all instances and controls. EPO and estimated glomerular filtration rate (eGFR) levels were lower in cases than in controls. In cases (especially those with anaemia), glycated Hb (HbA1c) levels were also higher than control levels.

Serum level creatinine > 1.5 mg / dL and eGFR < 60 ml / minute/1.73 m2 were determined to have insufficient renal function. In patients with diabetes, a high rate of renal insufficiency (54.0%) in accordance with controls was found. Of the 42(84%) cases of anaemia, 31(73, 8%) have low renal eGFR, with the remaining 11 (26, 2%) having higher EGFR and hence normal renal activity. This is an indicator of a kidney malfunction. Of the study, 9 (18%) were anaemic and 7 (14%) had strong eGFR, with the other 2 (4%) having low eGFR.

A strong association was observed in patients with diabetes between the degree of anaemia and HbA1c and supports the theory that the anaemia in poorly regulated diabetics is greater (17). In the diabetic population, there was also a negative correlation between Hb and hyperglycemia (FBG) by gender.

But only the correlation between the female populations was significant.

DISCUSSION:

A low blood Hb level is known as an anaemia and shown by decreased red blood cell functions (18). Our research findings indicate a high prevalence of diabetes anaemia (86.7% in men; 82.9% in women) and the need for diagnosis and care for diabetes patients. Specifics are included in this report. In patients with diabetes, HbA1c has been seen to have a positive correlation while FBG demonstrated a negative association with anaemia. This indicates a potential for anaemia in poorly regulated diabetes, which can help decrease the risk of diabetes by lowering blood glucose levels.

Anemia is a key CKD indicator, but it occurs earlier and more serious than previously reported in the course of diabetic renal disease. Anemia may result in the decreased development of EPO by the failed kidney in patients with diabetes (19). In other studies, a decrease in the number of specified EPOs synthesis interstitial cells and interstitial anatomy and vascular structure disruption have been suggested. It has been suggested. A position in autonomic breakdown was also proposed, based on the hypothesis that the development of the EPO may be partly moduled by the autonomic nervous system, by partial or total variance of the sympathetical/ parasympathetic complexity (20).

Most diabetes patients are anaemic checked and do not know the correlation between anaemia and kidney failure. Therefore, Stevens et al (2003) performed a pan-European study to examine diabetes patients' level of consciousness and perception of anemia. They concluded that, while anaemia is aware of anaemia, it is poor in their understanding of anaemia tests, which has a major effect on the quality of life of patients with diabetes (21).

A comparatively limited number of participants, about half of whom displayed renal insufficiency, may be blamed for the high incidence of anaemia found in our research. Renal insufficiency is induced by anaemia mostly through decreased secretion of the EPO by defective kidneys, and anaemia is then caused by less than 50 mL / minute creatinine clearance. In patients with renal insufficiency or illness, this has been noted before. Other risk factors related to DM may also cause the high incidence of anaemia (22).

Several studies have identified factors raising the risk of anaemia, including damage to kidneys due to chronic hyperglycemia, and consequent development of advanced products of glycation by-reactive species of oxygen, systemic inflammation and reducing levels of androgen caused by diabetes (23). Our sample size is a small consideration to mention; a larger sample would have improved the impact of the study result. We also did not determine the HIV status of our study participants and cannot comment on the role of HIV on the prevalence of anemia in this particular study population, although infection with HIV has emerged as an additional risk factor for anemia.

CONCLUSION:

Our results show that the high degree of renal failure found amongst other variables in participants with diabetes could have caused the high incidence of disease anaemia. This leads to anaemia in poorly regulated diabetes and patients with renal insufficiency diabetes. Routine hematologic (Hb) monitoring of diabetes may help reduce diabetes, anaemia, and potential risks associated with diabetes, and consider factors such as glycemic control and renal sufficiency.

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