

ANEMIA A CONTRIBUTORY FACTOR AFFECTING QUALITY OF LIFE IN TYPE 2 DIABETES MELLITUS PATIENTS

Nadia Kashif¹, Shama Iqbal², Aneela Ambreen³, Afshan Ahsan⁴

ABSTRACT

OBJECTIVES

The study aimed to determine the prevalence of anemia in type 2 diabetes mellitus patients and its effects on the quality of life in diabetic patients.

METHODOLOGY

A cross-sectional study was conducted at the Department of Pathology, Government Naseer Ullah Khan Babar Memorial Hospital, Peshawar, Pakistan. All diabetic patients admitted to the medical ward were included in this study, and their blood samples were obtained in heparinised and Ethylene Diamine Tetracetic Acid (EDTA) tubes by aseptic technique after informed consent. All samples were assessed for sugar levels and complete blood count.

RESULTS

One hundred eighteen diabetic patients were enrolled in this study, 66% of patients were females, and 34% were males. Female patients in age groups 1, 2 and 3 were more than males, and in age group 4, all patients were male. Anemia was found in about 79% of females and 21% of male patients.

CONCLUSION

Albuminuria and renal insufficiency are important factors in understanding and investigations of anemia. Diabetic patients must be screened for anemia and treated accordingly to improve the quality of life in such patients and reduce morbidity and mortality rate.

KEYWORDS: *Diabetes mellitus, Anemia, Mean corpuscular volume, Mean corpuscular hemoglobin..*

How to cite this article:

Kashif N, Iqbal S, Ambreen A, Ahsan A. Anemia a Contributory Factor Affecting Quality of Life In Type 2 Diabetes Mellitus Patients. J Gandhara Med Dent Sci. 2022;9(3): 9-13

Correspondence

¹Nadia Kashif Assistant Professor Hematology, Jinnah Medical College/District Pathologist NKBM Hospital Peshawar, Pakistan

☎: +92-300-2554197

✉: nadia.tila12@gmail.com

²Assistant Professor Biochemistry, Jinnah Medical College Peshawar, Pakistan

³Associate Prof Pediatrics Naseer Teaching Hospital Peshawar, Pakistan

⁴Academic Curriculum Coordinator, Khyber Girls Medical College Peshawar, Pakistan

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of

enormous impact internationally. Epidemiological data revealed that in 2010 285 million people were suffering from this disease worldwide, and it is expected that in the year 2030, there will be about 440 million diabetic patients.¹ The developing countries are more prone to the rapid increase in the prevalence of this disease. About 7% of the population is affected by type 2 diabetes.² This rise in type 2 diabetes mellitus has become a significant public health concern. The number of diabetic patients has been increasing due to high population growth rate and urbanisation, sedentary lifestyle, its associated obesity and more prolonged survival of diabetes mellitus patients.³ Diabetes

can lead to various complications, including limbs amputation, renal disorders, blindness, cardiac disorders and anemia; in addition, impairment of functional capacity and individual quality of life are other devastating complications.⁴ Diabetes can be classified into two main types: type 1, characterised by pancreatic beta cell destruction leading to the absence of endogenous insulin and Type 2, defined by resistance to insulin commonly associated with obesity. Diabetes type 1 and type 2 both produce a hyperglycemia state. Resistance to insulin decreases glucose tolerance mainly in adipocytes and muscles cells, where there is insulin-dependent glucose uptake. As a result, there is an accumulation of glucose in circulating blood and consequently a state of hyperglycemia, generating an imbalance in homeostasis.⁵ Hyperglycemia causes increased expression of IL-6, NF κ B, TNF- α , and pro-inflammatory cytokines. Diabetes and its associated hyperglycemic state have characteristics of inflammatory nature. Previous research showed that the associated inflammatory process depends upon the duration and loss of glycemic control of the disease.^{6,7} This rise in pro-inflammatory cytokine levels plays a vital role in resistance to insulin and produces micro and macrovascular changes in the cardiovascular system, renal disorders, and anemia. Antierythropoietic effect has been observed with high levels of IL-6, as these cytokines alter the sensitivity of progenitor to erythroid growth factor(erythropoietin), IL-6 enhance the apoptosis of erythrocytes that are immature, leading to a reduction in the number of circulating erythrocytes resulting in a reduction of circulating hemoglobin.⁸ Diabetes mellitus is a multisystem disorder, and it affects renal function impairment that other effect the production of erythropoietin by the kidneys, influencing the hemoglobin concentration of an individual.⁹ According to Escorcio et al.¹⁰ about 40% of diabetes mellitus patients are affected by renal disorders. The impairment in renal function and release of pro-inflammatory cytokines are the main factors that result in decreased hemoglobin levels in diabetic patients. The inflammatory condition due to renal disorder interferes with iron absorption in the intestine and mobilisation of iron stores.¹¹ Therefore, patients suffering from diabetes mellitus and accompanying renal disorder are at higher risk of developing anemia. The national kidney foundation defines anemia in chronic renal disease as a hemoglobin level of less than 13.5g/dl in males and 12.0g/dl in females.¹² Anemia negatively affects the quality of life and is an

emerging global health issue that needs ever-greater allocation of healthcare resources.¹³ Symptoms of anemia include reduction in exercise capacity, anorexia, chronic fatigue, depression, cognitive impairment, and decreased libido.¹⁴ Due to these circumstances, anemia in diabetic patients must be treated if diagnosed, as it can contribute to pathogenesis and progression of renal and cardiovascular disorders and retinopathy. Therefore, regular screening for complications associated with diabetes, including anemia, can result in the slow progression of complications in diabetic patients.¹⁵ In diabetic patients, anemia has a significant role in affecting the quality of life and is linked with disease progression and development of its complications.¹⁶ Thus, the current study is conducted to evaluate the prevalence of anemia and other hematological disorders in type 2 diabetic patients.

METHODOLOGY

A cross-sectional study was conducted at the Department of Pathology, Government Naseer Ullah Khan Babar Memorial Hospital, Peshawar, Pakistan. The study population was Type 2 diabetes mellitus patients. The non-random convenient sampling technique was used for the selection of participants. All diabetic patients admitted to the medical ward were included in this study, and their blood samples were obtained in heparinised and EthyleneDiamineTetracetic Acid (EDTA) tubes by aseptic technique after informed consent. The exclusion criteria were Diabetic patients with other morbidities, pregnant diabetic patients, type 1 diabetic patients, and individuals not giving consent. The participants were assessed for sugar levels and complete blood count. Data were analysed using SPSS Version 20.

RESULTS

As shown in figure 1. The patient's ages were recorded into four categories: the first included patients 30 to 45 years of age, the second included 46 to 60 years of age, the third included 61 to 75 years of age, and the fourth included 76 to 91 years of age. The youngest patient was 30 years of age, and the eldest patient was 91 years of age. There was no female patient in this group, suggesting that the prevalence of diabetes increased with age in males and decreased in females. All patients were assessed for anemia, and according to results obtained, shown in figure 2, anemia was more common in females than

males. Different haematological parameters of patients were assessed, and anemia was more common in female diabetic patients. Diabetic females patients were iron deficient, as shown in figure 3. Male patients had a reduced frequency of hypochromia. Female patients had an increased level of MCHC (Mean Corpuscular Hemoglobin Concentration).

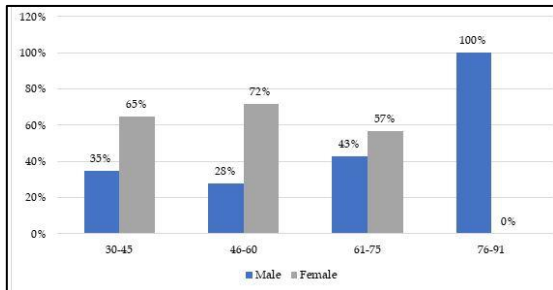


Figure 1: Age & Gender - Wise Patients

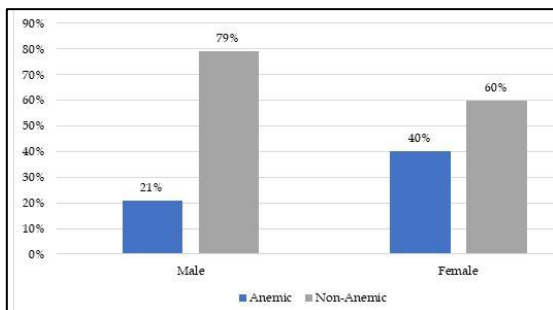


Figure 2: Gender Wise Anaemic & Non-Anemic Patients

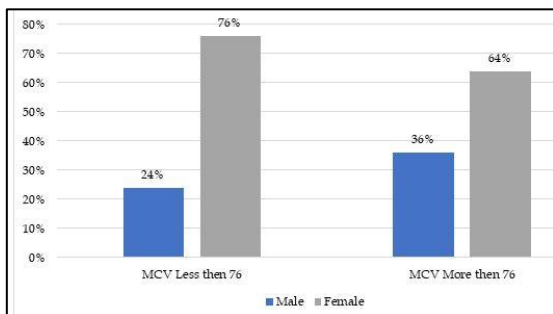


Figure 3: Gender Wise MCV Patients

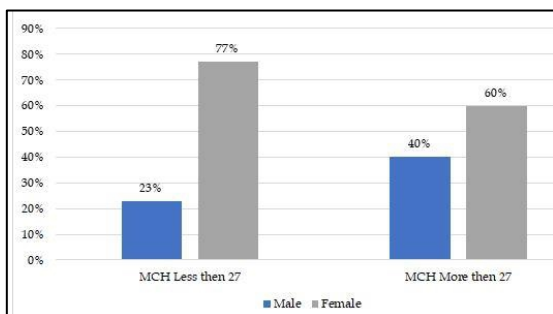


Figure 4: Gender Wise MCH Patients

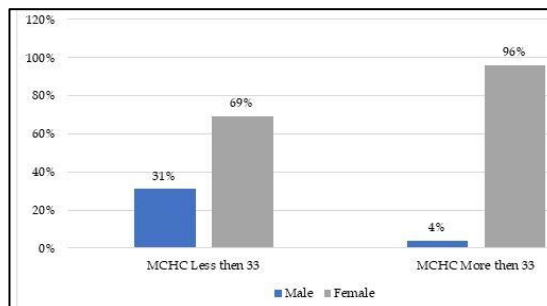


Figure 5: Gender wise MCHC patients

Table 1: Anemic Diabetic Patients having complications

| Anemic Diabetic Patients | Non Anemic Diabetic Patients | Complications |
|--------------------------|------------------------------|---------------------------|
| 21 | 15 | Retinopathy |
| 14 | 9 | Neuropathy |
| 10 | 15 | Diabetic Foot |
| 32 | 34 | Hypertension |
| 23 | 8 | Progressive Renal Failure |
| 20 | 12 | Cardiovascular Events |
| 18 | 7 | Repeated Hospitalisation |

DISCUSSION

The prevalence of diabetes is rising globally. Type 2 diabetes mellitus is a complex multi-factorial endocrine disorder with progressive worsening of beta-cell function and resistance to insulin. The essential causes are changes in the dietary pattern and decreased physical activity.¹⁶ This study shows a statistically significant association between the risk of type 2 diabetes for both sexes and some haematological factors, including blood glucose, hemoglobin, MCV, and MCHC. In this study, anemia is a common finding in diabetic patients, and our results are similar to the study conducted by Youssouf Kachekouche in Algeria published in 2017. Hemoglobin concentration is closely associated with diabetic profiles. It is widely accepted that patients with diabetes are more vulnerable to the effects of anemia.¹⁷ In our study, the MCV of 76 per cent of female patients were below 76 (microcytic RBC), and 64 per cent of female patients were above 76 (normocytic RBC). In male patients, 24 per cent of patients had MCV below 76 (microcytic), and 36 per cent had MCV above 76(normocytic), indicating females are more prone to have microcytosis than males matched with the descriptive study conducted in Congo. 12 males and 23 females showed that 8.3% of men and 21.7% of women had an MCV lower than average ratio. And 91.7% of men and 78.3% had a standard ratio.¹⁸ Microcytic hypochromic blood picture was the most common morphological type of anemia found in our study, followed by Normocytic normochromic blood picture. This is more common in females than male patients, as

shown in Figures 5 and 6 of the result section. It is not astonishing to see Microcytic, hypochromic and Normocytic normochromic blood picture of anemia in this study, as various previous studies conducted in China,¹⁹ Malaysia,²⁰ India,²¹ and Iraq,²² also showed such results. Since the patients of this study were diabetics, anemia of chronic disease is expected, which is Normocytic normochromic mostly in morphology. In addition, Normocytic normochromic anemia might suggest the significance of the renal origin of anemia in diabetic patients.^{23,24}

Diabetic patients must be screened for anemia and treated accordingly to improve the quality of life in such patients and reduce morbidity and mortality rate.

CONCLUSIONS

Anemia is the world's most common preventable disease that is mainly ignored, especially in patients with diabetes. Albuminuria and renal insufficiency are essential factors in understanding and investigations of anemia.

LIMITATIONS

This study was conducted with minimal resources available at DHQ level hospital in Peshawar, To make this research fruitful, more efforts are needed to conduct this research on a large scale where maximum resources are available, and data collection can be performed easily. Administration of oral or intravenous iron infusion in diabetic patients with anemia and its effects on improving quality of life should be the future goal.

CONFLICT OF INTEREST: None.

FUNDING SOURCES: None

REFERENCES

1. Taderegew MM, Gebremariam T, Tareke AA, Woldeamanuel GG. Anemia and its associated factors among type 2 diabetes mellitus patients attending Debre Berhan Referral Hospital, North-East Ethiopia: A cross-sectional study. *J Blood Med* [Internet]. 2020 [cited 2022 Apr 18];11:47–58.
2. Pathak J, Vadodariya V, Jhala A, Bhojwani D, Brahmhatt N. Anemia in type 2 diabetes mellitus in absence of renal insufficiency. *Int J Contemp Med Res [IJCMR]* [Internet]. 2019 [cited 2022 Apr 18];6(11).
3. El-Kebbi IM, Bidikian NH, Hneiny L, Nasrallah MP. Epidemiology of type 2 diabetes in the Middle East and North Africa: Challenges and call for action. *World J Diabetes* [Internet]. 2021;12(9):1401–25.
4. S. HK, S. V. S, K. P. Haematological profile of diabetes and non-diabetes patients in rural tertiary centre. *Int J Adv Med* [Internet]. 2017;4(5):1271.
5. Chadt A, Al-Hasani H. Glucose transporters in adipose tissue, liver, and skeletal muscle in metabolic health and disease. *Pflugers Arch* [Internet]. 2020;472(9):1273–98.
6. Furman D, Campisi J, Verdin E, Carrera-Bastos P, Targ S, Franceschi C, et al. Chronic inflammation in the etiology of disease across the life span. *Nat Med* [Internet]. 2019;25(12):1822–32.
7. Tsalamandris S, Antonopoulos AS, Oikonomou E, Papamikroulis G-A, Vogiatzi G, Papaioannou S, et al. The role of inflammation in diabetes: Current concepts and future perspectives. *Eur Cardiol* [Internet]. 2019;14(1):50–9.
8. Sindhughosa DA, Pranamartha AAGMK. The involvement of proinflammatory cytokines in diabetic nephropathy: Focus on interleukin 1 (IL-1), interleukin 6 (IL-6), and tumor necrosis factor-alpha (TNF- α) signaling mechanism. *Bali Med J* [Internet]. 2017;6(1):44.
9. George C, Matsha TE, Korf M, Zemlin AE, Erasmus RT, Kengne AP. The agreement between fasting glucose and markers of chronic glycaemic exposure in individuals with and without chronic kidney disease: a cross-sectional study. *BMC Nephrol* [Internet]. 2020;21(1):32.
10. Hasan M, Sutradhar I, Gupta RD, Sarker M. Prevalence of chronic kidney disease in South Asia: a systematic review. *BMC Nephrol* [Internet]. 2018;19(1):291.
11. Begum S, Latunde-Dada GO. Anemia of inflammation with an emphasis on chronic kidney disease. *Nutrients* [Internet]. 2019;11(10):2424.
12. Gafter-Gvili A, Schechter A, Rozen-Zvi B. Iron deficiency anemia in chronic kidney disease. *Acta Haematol* [Internet].
13. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, et al. High-quality health systems in the

- Sustainable Development Goals era: time for a revolution. *Lancet Glob Health* [Internet]. 2018;6(11):e1196–252.
14. Awofisoye OI, Adeleye JO, Olaniyi JA, Esan A. Prevalence and correlates of anemia in type 2 diabetes mellitus: a study of a Nigerian outpatient diabetic population. *Sahel Medical Journal*. 2019;22(2).
 15. Bekele A, Teji Roba K, Egata G, Gebremichael B. Anemia and associated factors among type-2 diabetes mellitus patients attending public hospitals in Harari Region, Eastern Ethiopia. *PLoS One* [Internet]. 2019;14(12):e0225725.
 16. Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of type 2 Diabetes Mellitus. *Int J Mol Sci* [Internet]. 2020;21(17):6275.
 17. Katwal PC, Jirjees S, Htun ZM, Aldawudi I, Khan S. The effect of anemia and the goal of optimal HbA1c control in diabetes and non-diabetes. *Cureus* [Internet]. 2020;12(6):e8431.
 18. Ndako JA, Dojumo VT, Akinwumi JA, Fajobi VO, Owolabi AO, Olatinsu O. Changes in some haematological parameters in typhoid fever patients attending Landmark University Medical Center, Omuaran-Nigeria. *Heliyon* [Internet]. 2020;6(5):e04002.
 19. Yilmaz G, Shaikh H. Normochromic Normocytic Anemia. *InStatPearls* [Internet]. StatPearls Publishing; 2021.
 20. Idris I, Tohid H, Muhammad NA, A Rashid MR, Mohd Ahad A, Ali N, et al. Anemia among primary care patients with type 2 diabetes mellitus (T2DM) and chronic kidney disease (CKD): a multicentred cross-sectional study. *BMJ Open* [Internet]. 2018;8(12):e025125.
 21. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Res Clin Pract* [Internet]. 2018;138:271–81.
 22. Gupta A, Gupta S, Gupta V, Gupta V. Evaluation of incidence of anemia in type 2 diabetic patients with normal renal function. *Indian J Pathol Microbiol*. 2017;4(1):132–4.
 23. Bharathi K. Study of hematological profile and its significance in type 2 diabetes mellitus patients. *J Diagn Pathol Oncol*. 2016;1:14–7.
 24. Wang Y, Wei R-B, Su T-Y, Huang M-J, Li P, Chen X-M. Clinical and pathological factors of renal anemia in patients with IgA nephropathy in Chinese adults: a cross-sectional study. *BMJ Open* [Internet]. 2019;9(1):e023479. 2018-023479
 25. Aljohani AH, Alruby MA, Alharbi AB. The relation between diabetes type II and anemia. *Egypt J Hosp Med* [Internet]. 2018;70(4):526–31.

CONTRIBUTORS

1. **Nadia Kashif** - Concept & Design; Data Acquisition; Drafting Manuscript; Supervision; Final Approval
2. **Shama Iqbal** - Data Acquisition; Drafting Manuscript;
3. **Aneela Ambreen** - Critical Revision; Supervision
4. **Afshan Ahsan** - Data Analysis/Interpretation