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Dual Management: Diabetes and Sickle Cell Anemia in Patient Care

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Abstract

The coexistence of diabetes mellitus (DM) and sickle cell anemia (SCA) presents a complex medical challenge, necessitating an integrated approach to patient care. This review explores the interplay between diabetes and sickle cell anemia, addressing the epidemiology, pathophysiological intricacies, and the compounded complications associated with these comorbidities. Emphasizing the need for an interdisciplinary care model, the review discusses the challenges in patient care, encompassing both physiological and psychosocial dimensions. Furthermore, it outlines innovative treatment strategies, including medication management and lifestyle interventions, aiming to optimize outcomes for individuals navigating the dual management of diabetes and sickle cell anemia. By synthesizing current research findings and highlighting areas for future investigation, this review provides valuable insights into the complexities of dual management and offers a foundation for enhancing the quality of care for this unique patient population.

Keywords: Dual management; Diabetes; Sickle Cell Anemia; Co-morbidity; Patient care; Interdisciplinary approach; Complications; Treatment strategies

Abbreviations: DM: Diabetes Mellitus; SCA: Sickle Cell Anemia.

Introduction

The confluence of diabetes mellitus (DM) and sickle cell anemia (SCA) represents a distinctive clinical challenge, as these two conditions intertwine to create a complex health scenario for affected individuals. Both diabetes and sickle cell anemia independently present intricate pathophysiological landscapes, and their coexistence poses unique challenges in patient management [1-12]. Diabetes mellitus, characterized by dysregulated glucose metabolism, and sickle cell anemia, an inherited hemoglobinopathy, are prevalent conditions with distinct etiologies and clinical manifestations. Diabetes involves the inability of the body to regulate blood sugar levels effectively, while sickle cell anemia results from a genetic mutation affecting hemoglobin, leading to the characteristic sickle-shaped red blood cells. As both conditions are independently associated with a range of complications, their coexistence poses additional challenges that extend beyond the sum of their individual effects [13-24].

Understanding the confluence of diabetes and sickle cell anemia is imperative due to its potential impact on patient outcomes. The prevalence of both conditions, particularly in certain populations, underscores the significance of addressing their synergistic effects. The rationale for exploring dual management lies in the need to optimize patient care, prevent complications, and enhance the overall quality of life for individuals grappling with this complex comorbidity. This review is significant for healthcare professionals, researchers, and policymakers involved in the care of individuals with diabetes and sickle cell anemia. By unraveling the complexities of dual management, it aims to contribute to the development of tailored strategies that address the specific challenges posed by these comorbidities. The insights gained from this exploration may inform clinical practices, guide future research endeavors, and ultimately lead to improved patient outcomes in this unique population.

Coexistence of Diabetes and Sickle Cell Anemia

The coexistence of diabetes and sickle cell anemia presents a distinctive epidemiological landscape that varies across populations. While the prevalence of diabetes continues to rise globally, with an estimated 463 million adults affected in 2019, the prevalence of sickle cell anemia is influenced by genetic factors and is particularly prevalent in regions with a high prevalence of malaria. The interaction of these conditions is of particular concern in populations with a high prevalence of both diseases, accentuating the need for targeted healthcare interventions [25-37]. The pathophysiological interplay between diabetes and sickle cell anemia adds layers of complexity to their management. Diabetes is characterized by insulin resistance and impaired insulin secretion, leading to hyperglycemia and subsequent vascular complications. Sickle cell anemia, on the other hand, involves the polymerization of abnormal hemoglobin, causing red blood cells to assume a sickle shape and leading to vaso-occlusive events. The convergence of these conditions may exacerbate each other, with hyperglycemia potentially promoting sickling and vaso-occlusion, and vaso-occlusive events further compromising glucose metabolism [38-51].

Understanding the molecular and cellular mechanisms at play in the coexistence of diabetes and sickle cell anemia is crucial for tailoring effective therapeutic strategies. Research in this area continues to uncover the specific pathways through which these conditions interact, providing insights into potential targets for intervention. The compounded complications associated with diabetes and sickle cell anemia coexistence are multifaceted. Individuals facing dual management are at an increased risk of developing vascular complications such as stroke, retinopathy, and nephropathy. Additionally, the chronic inflammation and oxidative stress inherent in both conditions may synergistically contribute to organ damage and dysfunction. The increased susceptibility to infections in sickle cell anemia further complicates the clinical course, potentially leading to recurrent and severe infections in individuals with concomitant diabetes. These complications underscore the need for vigilant monitoring, early intervention, and a coordinated approach to prevent the escalation of health issues in this vulnerable population [52-62].

Interdisciplinary Approach

The coexistence of diabetes and sickle cell anemia introduces compounded challenges in patient care, primarily stemming from the increased risk and severity of complications. Vascular complications, a hallmark of both diabetes and sickle cell anemia, are exacerbated in individuals managing both conditions. Chronic hyperglycemia in diabetes can contribute to endothelial dysfunction, while vaso-occlusive events in sickle cell anemia further compromise blood flow, creating a synergistic effect that heightens the risk of stroke, retinopathy, and nephropathy [63].

The challenge lies in developing effective strategies to prevent and manage these complications. Comprehensive monitoring of vascular health, including regular assessments of blood pressure, glucose levels, and organ function, is essential. Early intervention and targeted therapeutic approaches may mitigate the impact of complications, but the intricacies of dual management necessitate a meticulous and personalized approach. Beyond the physiological challenges, the coexistence of diabetes and sickle cell anemia introduces unique psychosocial considerations [64]. The chronic nature of both conditions, the potential for unpredictable pain crises in sickle cell anemia, and the demanding nature of diabetes self-management impose significant burdens on individuals facing dual management [65]. Psychosocial support, therefore, becomes a critical component of comprehensive patient care. Mental health professionals, support groups, and educational resources can assist individuals in coping with the emotional and psychological challenges associated with the dual burden of diabetes and sickle cell anemia. Recognizing and addressing the psychosocial aspects of care are essential for promoting resilience, adherence to treatment plans, and overall well-being in this patient population.

Treatment Strategies

Effectively managing diabetes and sickle cell anemia in tandem requires a nuanced medication management approach. Diabetes medications, such as insulin or oral hypoglycemic agents, must be carefully selected to avoid exacerbating sickling events or interfering with the

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delicate balance of glucose metabolism. Additionally, close monitoring of potential drug interactions is essential, as certain medications used to manage sickle cell anemia, such as hydroxyurea, may impact glucose levels.[68] Innovations in pharmaceutical research may pave the way for medications that address both conditions simultaneously, offering a more streamlined and effective treatment approach. Collaborative efforts between endocrinologists and hematologists are crucial for tailoring medication regimens that optimize glycemic control while mitigating the risks associated with sickle cell anemia. Lifestyle modifications play a pivotal role in the dual management of diabetes and sickle cell anemia. Dietary interventions that consider both conditions are essential, aiming to regulate glucose levels, promote optimal nutrition, and reduce the risk of sickling events. A balanced diet that accommodates the specific needs of individuals with diabetes and sickle cell anemia, such as adequate hydration and nutrient supplementation, is integral to overall well-being.

Regular physical activity is another cornerstone of lifestyle management, contributing to improved insulin sensitivity, cardiovascular health, and overall fitness. However, exercise plans should be tailored to the individual's health status, considering the potential for sickle cell-related complications and the need for adequate hydration. Stress management techniques, including mindfulness and relaxation strategies, can also be beneficial. Chronic stress may exacerbate both diabetes and sickle cell anemia symptoms, emphasizing the importance of incorporating stress-reducing practices into the overall treatment plan [66]. An interdisciplinary approach to patient care is paramount in addressing the multifaceted challenges posed by the coexistence of diabetes and sickle cell anemia. A collaborative care team involving hematologists, endocrinologists, nurses, dietitians, mental health professionals, and other specialists is essential for providing comprehensive and integrated care. Regular and coordinated monitoring, involving both routine check-ups and targeted assessments for complications, ensures that any emerging issues are identified and addressed promptly. Interdisciplinary communication is crucial to align treatment goals, manage potential conflicts between medications, and offer holistic support to individuals navigating the complexities of dual management. Patient education is a cornerstone of the interdisciplinary approach, empowering individuals to actively participate in their care. Providing clear and tailored information on self-management strategies, recognizing warning signs, and fostering open communication between healthcare providers and patients contribute to improved adherence and overall outcomes.

Conclusion

The coexistence of diabetes and sickle cell anemia poses a unique and intricate challenge in patient care, requiring a comprehensive and integrated approach to optimize outcomes. This review has explored the epidemiology, pathophysiological interplay, challenges in patient care, and innovative treatment strategies associated with dual management. As we reflect on the complexities of navigating these two conditions simultaneously, several key conclusions emerge. The compounded complications arising from diabetes and sickle cell anemia underscore the critical need for vigilant monitoring and targeted interventions. Vascular complications, psychosocial considerations, and the potential for unpredictable pain crises necessitate a holistic approach to patient care that extends beyond traditional disease management paradigms.

Psychosocial support emerges as a cornerstone in addressing the unique challenges faced by individuals managing both conditions. Recognizing and addressing the emotional and psychological aspects of care are pivotal for promoting resilience, adherence to treatment plans, and overall well-being in this patient population. The interdisciplinary approach to patient care is not merely beneficial but is imperative in navigating the intricacies of dual management. Collaboration among healthcare professionals from various specialties, including hematologists, endocrinologists, mental health professionals, and others, is essential for providing holistic and individualized care. Innovative treatment strategies encompass both medication management and lifestyle interventions. Careful selection of diabetes medications, considering potential drug interactions, and tailoring lifestyle modifications to accommodate the needs of both conditions are fundamental aspects of optimizing patient outcomes.

References

1. Ifediora AC, Obeagu EI, Akahara IC, Eguzouwa UP (2016) Prevalence of urinary tract infection in diabetic patients attending Umuahia health care facilities. J Bio Innov 5(1): 68-82.

2. Ugwu OP, Alum EU, Okon MB, Aja PM, Obeagu EI, et al. (2023) Ethanol root extract and fractions of Sphenocentrum jollyanum abrogate hyperglycaemia and low body weight in streptozotocin-induced diabetic Wistar albino rats. RPS Pharmacy and Pharmacology Reports 2(2): rqad010.

3. Obeagu EI, Obeagu GU (2018) Utilization of Antioxidants in the management of diabetes mellitus patients. J Diabetes Clin Prac 1(1): 102.

4. Obeagu EI, Okoroiwu IL, Obeagu GU (2016) Some haematological variables in insulin dependent diabetes mellitus patients in Imo state Nigeria. Int J Curr Res Chem Pharm Sci 3(4): 110-117.

Copyright© Emmanuel Ifeanyi Obeagu and Getrude Uzoma Obeagu.

5. Nwakuilite A, Nwanjo HU, Nwosu DC, Obeagu EI (2021) Evaluation of some trace elements in streptozocin induced diabetic rats treated with Moringa oleifera leaf powder. WJPMR 7(2): 9.

6. Obeagu EI, Ochei KC, Nwachukwu BN, Nchuma BO (2015) Sickle cell anaemia: a review. Scholars Journal of Applied Medical Sciences 3(6B): 2244-2252.

7. Obeagu EI (2020) Erythropoeitin in Sickle Cell Anaemia: A Review. International Journal of Research Studies in Medical and Health Sciences 5(2): 22-28.

8. Obeagu EI (2018) Sickle Cell Anaemia: Haemolysis and Anemia. Int J Curr Res Chem Pharm Sci 5(10): 20-21.

9. Obeagu EI, Muhimbura E, Kagenderezo BP, Uwakwe OS, Nakyeyune S, et al. (2022) An Update on Interferon Gamma and C Reactive Proteins in Sickle Cell Anaemia Crisis. J Biomed Sci 11(10): 84.

10. Obeagu EI, Bunu UO, Obeagu GU, Habimana JB (2023) Antioxidants in the management of sickle cell anaemia: an area to be exploited for the wellbeing of the patients. International Research in Medical and Health Sciences 6(4): 12-17.

11. Obeagu EI, Ogunnaya FU, Obeagu GU, Ndidi AC (2023) Sickle cell anaemia: a gestational enigma. European Journal of Biomedical and Pharmaceutical Sciences 10(9): 72-75.

12. Obeagu EI (2018) An update on micro RNA in sickle cell disease. Int J Adv Res Biol Sci 5(10): 157-158.

13. Anyiam AF, Obeagu EI, Obi E, Omosigho PO, Irondi EA, et al. (2022) ABO blood groups and gestational diabetes among pregnant women attending University of Ilorin Teaching Hospital, Kwara State, Nigeria. International Journal of Research and Reports in Hematology 5(2): 159-167.

14. Okafor CJ, Yusuf SA, Mahmoud SA, Salum SS, Vargas SC, et al. (2021) Effect of Gender and Risk Factors in Complications of Type 2 Diabetic Mellitus among Patients Attending Diabetic Clinic in Mnazi Mmoja Hospital, Zanzibar. Journal of Pharmaceutical Research International 33(29B): 67-78.

15. Galano ES, Yusuf SA, Ogbonnia SO, Ogundahunsi OA, Obeagu EI, et al. (2021) Effect of Extracts of Kigelia Africana Fruit and Sorghum Bicolor Stalk on the Biochemical Parameters of Alloxan-Induced Diabetic Rats. Journal of Pharmaceutical Research International 33(25B): 86-97.

16. Kama SC, Obeagu EI, Alo MN, Ochei KC, Ezugwu UM, et al. (2020) Incidence of Urinary Tract Infection among Diabetic Patients in Abakaliki Metropolis. Journal of Pharmaceutical Research International 32(28): 117-121.

17. Nwakulite A, Obeagu EI, Eze R, Vincent CC, Chukwurah EF, et al. (2021) Evaluation of Catalase and Manganese in Type 2 Diabetic Patients in University of Port Harcourt Teaching Hospital. Journal of Pharmaceutical Research International 33(30B): 40-45.

18. Obeagu EI, Babar Q (2021) Covid-19 and Sickle Cell Anemia: Susceptibility and Severity. J Clinical and Laboratory Research 3(5).

19. Obeagu EI, Obeagu GU, Igwe MC, Alum EU, Ugwu OP (2023) Men's Essential roles in the Management of Sickle Cell Anemia. Newport International Journal of Scientific and Experimental Sciences 4(2): 20-29.

20. Obeagu EI (2023) Depression in Sickle Cell Anemia: An Overlooked Battle. Int J Curr Res Chem Pharm Sci 10(10): 41-44.

21. Obeagu EI, Obeagu GU (2023) Evaluation of Hematological Parameters of Sickle Cell Anemia Patients with Osteomyelitis in A Tertiary Hospital in Enugu, Nigeria. Journal of Clinical and Laboratory Research 6(1): 2768-0487.

22. Obeagu EI, Dahir FS, Francisca U, Vandu C, Obeagu GU (2023) Hyperthyroidism in sickle cell anaemia. Int J Adv Res Biol Sci 10(3): 81-89.

23. Obeagu EI, Obeagu GU, Akinleye CA, Igwe MC (2023) Nosocomial infections in sickle cell anemia patients: Prevention through multi-disciplinary approach: A review. Medicine 102(48): e36462.

24. Njar VE, Ogunnaya FU, Obeagu EI (2023) Knowledge And Prevalence of The Sickle Cell Trait Among Undergraduate Students of The University of Calabar. Prevalence 10(8): 64-71.

25. Nwakulite A, Obeagu EI, Nwanjo HU, Nwosu DC, Nnatuanya IN, et al. (2021) Studies on Pancreatic Gene Expression in Diabetic Rats Treated with Moringa oleifera Leaf. Journal of Pharmaceutical Research International 33(28A): 78-86.

26. Nwosu DC, Nwanjo HU, Obeagu EI, Ugwu GU, Ofor IB, et al. (2015) Evaluation of Lipoprotein A and Lipid Tetrad Index Pattern in Diabetic Patients Attending Metabolic Clinic in The Federal Medical Centre, Owerri, Imo State. World Journal of Pharmacy and Pharmaceutical Sciences 4(3): 126-140.

Copyright© Emmanuel Ifeanyi Obeagu and Getrude Uzoma Obeagu.

27. Ezema GO, Omeh NY, Egbachukwu S, Agbo EC, Ikeyi AP, et al. (2023) Evaluation of Biochemical Parameters of Patients with Type 2 Diabetes Mellitus Based on Age and Gender in Umuahia. Asian Journal of Dental and Health Sciences 3(2): 32-36.

28. Adu ME, Chukwuani U, Ezeoru V, Okafor CJ, Amaechi CO, et al. (2021) Studies on molecular docking of moringa oleifera leaf phytochemical constituents on alpha glucosidase, alpha amylase and dipeptidyl peptidase. Journal of Pharmaceutical Research International 33(28A): 239-245.

29. Ezugwu UM, Onyenekwe CC, Ukibe NR, Ahaneku JE, Obeagu EI (2021) Plasma Level of Macromolecules and Mathematical Calculation of Potential Energy in Type 2 Diabetic Individuals at NAUTH, Nnewi, Nigeria. Journal of Pharmaceutical Research International 33(47B): 242-248.

30. Swem CA, Ukaejiofo EO, Obeagu EI, Eluke B (2018) Expression of micro RNA 144 in sickle cell disease. Int J Curr Res Med Sci 4(3): 26-32.

31. Obeagu EI, Nimo OM, Bunu UO, Ugwu OP, Alum EU (2023) Anaemia in children under five years: African perspectives. Int. J. Curr. Res. Biol. Med 8(1): 1-7.

32. Obeagu EI (2018) Sickle cell anaemia: Historical perspective, Pathophysiology and Clinical manifestations. Int J Curr Res Chem Pharm Sci 5(11): 13-15.

33. Obeagu EI, Obeagu GU (2023) Sickle Cell Anaemia in Pregnancy: A Review. International Research in Medical and Health Sciences 6(2): 10-13.

34. Obeagu EI, Mohamod AH (2023) An update on Iron deficiency anaemia among children with congenital heart disease. Int J Curr Res Chem Pharm Sci 10(4): 45-48.

35. Edward U, Osuorji VC, Nnodim J, Obeagu EI (2022) Evaluationof Trace Elements in Sickle Cell Anaemia Patients Attending Imo State Specialist Hospital, Owerri. Madonna University journal of Medicine and Health Sciences 2(1): 218-234.

36. Umar MI, Aliyu F, Abdullahi MI, Aliyu MN, Isyaku I, et al. (2023) Assessment Of Factors Precipitating Sickle Cell Crises Among Under 5-Years Children Attending Sickle Cell Clinic Of Murtala Muhammad Specialist Hospital, Kano. J Bio Innov 12(2): 297-302.

37. Obeagu EI (2018) Vaso-occlusion and adhesion molecules in sickle cells disease. Int J Curr Res Med Sci 4(11): 33-35.

38. Nwakulite A, Obeagu EI, Eze R, Ugochi VE, Vincent CC, et al. (2021) Estimation of Serum Glutathione Peroxidase in Streptozotocin Induced Diabetic Rat Treated with Bitter Leaf Extract. Journal of Pharmaceutical Research International 33(30B): 200-206.

39. Okoroiwu IL, Obeagu EI, San HG, Bote SA, Obeagu GU (2023) Characterisation of HLA-DR antigen in patients type 1 diabetes mellitus in patient attending a tertiary hospital in Enugu, south-east Nigeria. Academic Journal 38(1): 104-110.

40. Okoroiwu IL, Obeagu EI, Obeagu GU, Chikezie CC, Ezema GO (2016) The prevalence of selected autoimmune diseases. Int J Adv Multidiscip Res 3(3): 9-14.

41. Nwakuilite A, Nwanjo HU, Nwosu DC, Obeagu EI (2020) Evaluation of Enzyme Antioxidants in Streptozocin Induced Diabetic Rats Treated with Moringa Oleifera Leaf Powder. European Journal of Biomedical 7(11): 285-288.

42. Nwosu DC, Nwanjo HU, Opara AU, Ofor IB, Obeagu EI, et al. (2015) Evaluation of C-Reactive Protein, Selenium and Glycosylated Haemoglobin Levels in Diabetic Patients Attending Metabolic Clinic in the Federal Medical Centre, Owerri, Imo State. World Journal of Pharmacy and Pharmaceutical Sciences 4(3): 141-152.

43. Ifeanyi OE, Stella EI, Favour AA (2018) Antioxidants In The Management of Sickle Cell Anaemia. Int J Hematol Blood Disord 3(2): 1-2.

44. Buhari HA, Ahmad AS, Obeagu EI (2023) Current Advances in the Diagnosis and Treatment of Sickle Cell Anaemia. Applied Sciences (NIJBAS) 4(1).

45. Nnodim J, Uche U, Ifeoma U, Chidozie N, Ifeanyi O, et al. (2015) Hepcidin and erythropoietin level in sickle cell disease. British Journal of Medicine and Medical Research 8(3): 261-265.

46. Obeagu EI (2023) Burden of Chronic Osteomylitis: Review of Associatied Factors. Madonna University journal of Medicine and Health Sciences 3(1): 1-6.

47. Aloh GS, Obeagu EI, Okoroiwu IL, Odo CE, Chibunna OM, et al. (2015) Antioxidant-Mediated Heinz Bodies Levels of Sickle Erythrocytes under Drug-Induced Oxidative Stress. European Journal of Biomedical and Pharmaceutical sciences 2(1): 502-507.

48. Obeagu EI, Malot S, Obeagu GU, Ugwu OP (2023) HIV resistance in patients with Sickle Cell Anaemia. Newport International Journal of Scientific and Experimental Sciences 3(2): 56-59.

Copyright© Emmanuel Ifeanyi Obeagu and Getrude Uzoma Obeagu.

49. Obeagu EI, Bot YS, Opoku D, Obeagu GU, Hassan AO (2023) Sickle Cell Anaemia: Current Burden in Africa. International Journal of Innovative and Applied Research 11(2): 12-14.

50. Obeagu EI, Obeagu GU (2023) Sickle Cell Anaemia in Pregnancy: A Review. International Research in Medical and Health Sciences 6 (2): 10-13.

51. Obeagu EI, Ogbuabor BN, Ikechukwu OA, Chude CN (2014) Haematological parameters among sickle cell anemia patients' state and haemoglobin genotype AA individuals at Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Int J Curr Microbiol App Sci 3(3): 1000-1005.

52. Nwakuilite A, Nwanjo HU, Nwosu DC, Obeagu EI (2021) Evaluation Of Kidney Injury Molecule-1, Cystatin C, And Serum Electrolytes In Streptozocin Induced Diabetic Rats Treated With *Moringa Oleifera* Leaf Powder. Biochem Mol Biol 7(2): 9.

53. Ugwu OP, Alum EU, Okon MB, Aja PM, Obeagu EI, et al. (2023) Anti-nutritional and gas chromatography-mass spectrometry (GC-MS) analysis of ethanol root extract and fractions of Sphenocentrum jollyanum. RPS Pharmacy and Pharmacology Reports 2(2): rqad007.

54. Obeagu EI, Scott GY, Amekpor F, Ugwu OP, Alum EU (2023) Covid-19 Infection and Diabetes: A Current Issue. International Journal of Innovative and Applied Research 11(1): 25-30.

55. Ugwu OP, Alum EU, Obeagu EI, Okon MB, Aja PM, et al. (2023) Effect of Ethanol leaf extract of Chromolaena odorata on lipid profile of streptozotocin induced diabetic wistar albino rats. IAA Journal of Biological Sciences 10(1): 109-17.

56. Ifeanyi OE (2019) Gestational Diabetes: Haematological Perspective. South Asian Research Journal of Applied Medical Sciences 1(2): 41-42.

57. Ogbu IS, Odeh EJ, Ifeanyichukwu OE, Ogbu C, Obeagu EI, et al. (2023) Prevalence of prediabetes among first degree relatives of type 2 diabetes individuals in Abakaliki, Ebonyi State Nigeria. Academic Journal of Health Sciences: Medicina Balear 38(2): 85-88.

58. Obeagu EI, Abdirahman BF, Bunu UO, Obeagu GU (2023) Obsterics characteristics that effect the newborn outcomes. Int J Adv Res Biol Sci 10(3): 134-143.

59. Obeagu EI, Opoku D, Obeagu GU (2023) Burden of nutritional anaemia in Africa: A Review. Int J Adv Res Biol Sci 10(2): 160-163.

60. Ifeanyi E (2015) Erythropoietin (Epo) Level in Sickle Cell Anaemia (HbSS) With Falciparum Malaria Infection in University Health Services, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Paripex Indian Journal of Research 4(6): 258-259.

61. Ifeanyi OE, Stanley MC, Nwakaego OB (2014) Comparative analysis of some haematological parameters in sickle cell patients in steady and crisis state at michael okpara University of agriculture, Umudike, Abia state, Nigeria. Int J Curr Microbiol App Sci 3(3): 1046-1050.

62. Ifeanyi EO, Uzoma GO (2020) Malaria and The Sickle Cell Trait: Conferring Selective Protective Advantage to Malaria. J Clin Med Res 2: 1-4.

63. Ifeanyi OE (2018) An update on Diabetes Mellitus. Int J Curr Res Med Sci 4(6): 71-81.

64. Pecker LH, Little J (2018) Clinical manifestations of sickle cell disease across the lifespan. Sickle cell disease and hematopoietic stem cell transplantation. 18: 3-39.

65. Carroll CP (2020) Opioid treatment for acute and chronic pain in patients with sickle cell disease. Neurosci Lett 714: 134534.

66. Prussien KV, Crosby LE, Faust HL, Barakat LP, Deatrick JA, et al. (2024) An Updated Equitable Model of Readiness for Transition to Adult Care: Content Validation in Young People with Sickle Cell Disease. JAMA pediatr 178(3): 274-282.

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