

Advancements in Immune Augmentation Strategies for HIV Patients

^{*}Emmanuel Ifeanyi Obeagu¹, Getrude Uzoma Obeagu², Esther Ugo Alum^{3,4} and Okechukwu Paul-Chima Ugwu⁴

¹Department of Medical Laboratory Science, Kampala International University, Uganda.

²School of Nursing Science, Kampala International University, Uganda.

³Department of Biochemistry, Ebonyi State, Abakaliki, Ebonyi State, Nigeria

⁴Department of Publication and Extensions, Kampala International University, Uganda.

^{*}Corresponding author: Emmanuel Ifeanyi Obeagu, Department of Medical Laboratory Science, Kampala International University, Uganda.

E-mail: emmanuelobeagu@yahoo.com, obeagu.emmanuel@kiu.ac.ug

ORCID: 0000-0002-4538-0161

ABSTRACT

The management of HIV has witnessed a transformative shift owing to innovative approaches aimed at bolstering immune status in affected individuals. The landscape of HIV treatment has undergone a profound transformation with the emergence of innovative approaches dedicated to fortifying the immune status of individuals living with the virus. This abstract provides a succinct yet comprehensive overview of groundbreaking strategies aimed at augmenting immune health in HIV patients. Encompassing advancements in immunotherapy, personalized medicine, lifestyle modifications, and telemedicine, this overview highlights the promising trajectory and potential impact of these novel interventions in the realm of HIV care. By exploring the multifaceted dimensions of immune enhancement strategies, this abstract sets the stage for a deeper understanding of these innovative approaches and their pivotal role in shaping the future of HIV management.

Keywords: HIV, immunotherapy, personalized medicine, lifestyle modifications, telemedicine, immune health, treatment strategies

INTRODUCTION

Human Immunodeficiency Virus (HIV) infection remains a global health challenge, necessitating continual innovation in treatment modalities. Conventional antiretroviral therapies (ART) have significantly prolonged the lives of HIV patients by suppressing viral replication; however, emerging approaches targeting immune enhancement offer new avenues for augmenting overall health outcomes [1-10]. The field of HIV care has witnessed a dynamic shift in recent years, marked by a concerted effort to explore innovative methodologies aimed at bolstering the immune status of individuals afflicted with the Human Immunodeficiency Virus

(HIV). Historically, the primary focus of HIV management has centered on antiretroviral therapy (ART) to suppress viral replication, extending patient life expectancy but often falling short in addressing immune system restoration [11-20]. However, amidst this landscape, a new frontier has emerged, one that accentuates the significance of immune enhancement strategies beyond viral suppression. This paradigmatic evolution recognizes the pivotal role of a robust immune system in not just combating the virus but also in fostering overall health, resilience, and potential functional cures. This paper seeks to provide an overview of the groundbreaking advancements and

multifaceted approaches dedicated to improving immune status in HIV patients. From innovative immunotherapy interventions to the tailoring of treatments through personalized medicine, the

exploration of lifestyle modifications, and the integration of telemedicine into patient care, these strategies collectively represent a transformative era in HIV management.

Immunotherapy

Recent developments in immunomodulatory approaches have garnered attention for their potential to bolster immune response against HIV. Cytokine therapy, therapeutic vaccines, and immune checkpoint inhibitors represent forefront interventions intended to fortify the body's defenses, aiming not only for viral suppression but also immune restoration. Immunotherapy, a burgeoning field in HIV research and treatment, represents a paradigm shift in how healthcare professionals approach managing the disease. Unlike traditional antiretroviral therapies (ART) that directly target the virus, immunotherapy aims to harness the body's immune system to combat HIV [21-30]. This innovative approach encompasses a diverse range of strategies designed to boost immune responses against HIV. One notable avenue involves therapeutic vaccines, which trigger an immune response to either prevent infection or control viral replication in already infected individuals. While the development of an effective HIV vaccine remains an ongoing challenge, recent advancements have shown promising results, providing hope for potential preventive measures or therapeutic adjuncts. Cytokine therapy, another facet of immunotherapy, involves using specific proteins or signaling molecules to modulate the immune system's response. Certain cytokines, such as interleukins or interferons, have been investigated for their ability to enhance immune function against HIV. These

therapies aim to bolster the body's defense mechanisms, potentially controlling viral replication and aiding in immune restoration [31-43]. Moreover, immune checkpoint inhibitors, known for their success in cancer treatment, are being explored in HIV therapy. By blocking inhibitory signals that dampen immune responses, these inhibitors can potentially "release the brakes" on the immune system, allowing it to better recognize and eliminate HIV-infected cells [44-49]. Despite the promise of immunotherapy, challenges persist. HIV's ability to mutate rapidly and evade the immune system poses a formidable obstacle. Additionally, side effects and the complexities of balancing immune activation without causing excessive inflammation remain significant considerations in developing safe and effective immunotherapeutic interventions [50-57]. As research in immunotherapy for HIV continues, collaboration between scientists, clinicians, and pharmaceutical companies is crucial. This collaborative effort aims to refine existing strategies, explore novel approaches, and overcome obstacles in pursuit of more effective treatments that not only control viral replication but also strengthen the immune system, potentially leading to long-term remission or functional cure for HIV. Immunotherapy stands as a beacon of hope, offering promising prospects for transforming the landscape of HIV management and improving the lives of those affected by the virus.

Personalized Medicine

Personalized medicine in the context of HIV care represents a revolutionary approach tailored to the individual characteristics of each patient. This innovative paradigm utilizes an array of tools, including genomics, proteomics,

and other molecular analyses, to customize treatment strategies based on a patient's unique genetic makeup, immune response, and viral factors [58-62]. The integration of personalized medicine in HIV management allows for a more precise

and nuanced understanding of how the virus interacts with an individual's immune system. By analyzing genetic variations, researchers and healthcare providers can identify specific markers that influence how a person responds to HIV and antiretroviral therapies. This knowledge facilitates the selection of the most effective treatment regimens while minimizing potential side effects [63-66]. Genetic testing plays a pivotal role in personalized medicine for HIV. It enables the identification of genetic variations that might impact drug metabolism, efficacy, or susceptibility to side effects. Pharmacogenomic testing, for instance, assists in determining the most suitable antiretroviral medications based on an individual's genetic profile, optimizing treatment outcomes and minimizing adverse reactions [67]. Furthermore, personalized medicine extends beyond genetics to encompass the immune system's unique characteristics. Understanding a patient's immune response profile enables healthcare professionals to tailor interventions aimed at bolstering immune function. This

Lifestyle Modifications and Adjunctive Therapies

Lifestyle modifications and adjunctive therapies play an increasingly recognized and integral role in augmenting the immune status and overall well-being of individuals living with HIV. These complementary approaches, when integrated into HIV care plans, contribute significantly to enhancing immune function, managing symptoms, and improving the quality of life for patients [68]. Nutritional interventions stand as a cornerstone in optimizing immune health for HIV patients. A well-balanced diet rich in essential nutrients, vitamins, and antioxidants supports immune function and aids in mitigating complications associated with the virus and its treatments. Nutritional counseling and supplementation tailored to individual needs can help address deficiencies and maintain optimal health [69]. Regular physical activity has shown numerous benefits in HIV management. Exercise not

approach helps in predicting a patient's response to treatment and optimizing therapies for better long-term outcomes. The concept of personalized medicine also encompasses the management of co-occurring conditions and comorbidities in HIV patients. Considering individual health profiles, including factors such as age, lifestyle, and concurrent diseases, allows for a more holistic approach to care. Tailoring treatment plans based on these multifaceted aspects ensures comprehensive and personalized healthcare delivery [67]. Despite its potential, the implementation of personalized medicine in HIV care faces challenges, including cost, accessibility to advanced technologies, and the need for large-scale data interpretation. However, as technology advances and our understanding of HIV and genomics deepens, personalized medicine holds immense promise in revolutionizing HIV management, improving treatment outcomes, and potentially moving closer to personalized therapies that could lead to better control or even eradication of the virus in individual patients.

only helps in maintaining a healthy body weight but also contributes to enhancing immune function, reducing inflammation, and improving overall cardiovascular health. Structured exercise regimens, adapted to each patient's abilities and preferences, are incorporated as part of holistic care plans [68]. Stress management techniques and mental health support are equally crucial in bolstering immune resilience. Chronic stress can adversely impact the immune system, making individuals more susceptible to infections and hampering overall health. Mindfulness practices, meditation, counseling, and support groups aid in reducing stress levels, promoting mental well-being, and indirectly supporting immune function. Complementary therapies, such as acupuncture, massage therapy, and herbal remedies, are often utilized as adjuncts to conventional HIV treatment. While evidence supporting their

direct impact on immune status may vary, many patients report subjective improvements in overall well-being, symptom management, and quality of life when incorporating these therapies into their care routine. Smoking cessation, reduction of alcohol intake, and avoidance of illicit substances are essential lifestyle modifications for HIV patients. Substance abuse and smoking can exacerbate immune suppression, complicate treatment efficacy, and lead to additional health complications. Support programs aimed at substance abuse cessation and smoking cessation counseling are integral components of comprehensive HIV care

Telemedicine in HIV Care

Telemedicine has emerged as a transformative tool in the continuum of care for individuals living with HIV, offering a spectrum of benefits that revolutionize healthcare delivery, patient engagement, and disease management [71]. In the context of HIV care, telemedicine platforms facilitate remote consultations, monitoring, and support, transcending geographical barriers to provide accessible and timely healthcare services. Through secure video conferencing, telemedicine allows healthcare professionals to conduct routine check-ups, discuss treatment plans, and address patient concerns, fostering continuous engagement and adherence to care regimens. One of the fundamental advantages of telemedicine in HIV care is its role in enhancing patient access to specialized healthcare services. Especially for individuals residing in remote or underserved areas, telemedicine bridges the gap, providing access to infectious disease specialists, HIV experts, and mental health professionals, thereby ensuring comprehensive care that might otherwise be limited or unavailable [71]. Telemedicine also promotes proactive disease management through remote monitoring of viral loads, CD4 counts, and medication adherence. Remote data collection and transmission enable healthcare providers to closely monitor patient progress, intervene promptly in

[70]. The integration of these lifestyle modifications and adjunctive therapies into HIV care plans is imperative for optimizing immune health and overall well-being. However, individualized approaches considering patient preferences, cultural factors, and access to resources are crucial in ensuring the feasibility and success of these interventions. Holistic care that encompasses not only medical treatment but also lifestyle adjustments and supportive therapies serves as a cornerstone in the comprehensive management of HIV.

case of anomalies, and make informed decisions regarding treatment adjustments or interventions. Moreover, telemedicine serves as an educational tool, offering a wealth of resources and information to patients. Through online portals, educational materials, and teleconsultations, patients can access vital information about their condition, treatment options, and self-management strategies, empowering them to actively participate in their care. The integration of telemedicine has proven particularly beneficial during public health emergencies or pandemics, ensuring continuity of care while minimizing the risk of exposure to infectious diseases, including HIV. Telemedicine platforms became indispensable during times of crisis, enabling uninterrupted care delivery and support for HIV patients. Despite its numerous advantages, challenges exist in the widespread adoption of telemedicine in HIV care. Issues related to technological barriers, disparities in access to internet connectivity or devices, and privacy concerns require attention to ensure equitable and effective implementation. Telemedicine stands as a pivotal tool in modern healthcare, revolutionizing HIV care by enhancing accessibility, continuity, and quality of services. Its integration into HIV care models not only improves patient outcomes but also

empowers individuals to actively engage in their treatment journey, ultimately contributing to better management and control of the disease. As technology

The landscape of HIV care has witnessed a remarkable transformation driven by innovative strategies aimed at enhancing immune status and overall well-being in individuals living with the virus. Immunotherapy, with its diverse interventions targeting the immune system's response to HIV, holds promise in supplementing traditional antiretroviral therapies. These novel strategies, including therapeutic vaccines, cytokine therapy, and immune checkpoint inhibitors, signify a new frontier in bolstering immune resilience and exploring avenues beyond viral suppression. The integration of personalized medicine, leveraging genomic insights and tailored treatments, embodies a personalized approach to HIV care. By understanding individual immune profiles and genetic variations, healthcare providers can optimize treatment

advances and healthcare systems adapt, the integration of telemedicine will continue to play an increasingly vital role in shaping the future of HIV care.

CONCLUSION

regimens, predict responses, and minimize adverse effects, thereby advancing precision medicine in the field. Moreover, lifestyle modifications and adjunctive therapies have emerged as indispensable components in promoting immune health and overall quality of life for HIV patients. Nutritional support, exercise regimens, stress management techniques, and complementary therapies play pivotal roles in augmenting immune function, addressing co-occurring conditions, and supporting mental well-being. In essence, the collective advancements in immunotherapy, personalized medicine, lifestyle modifications, and telemedicine signify a promising trajectory in HIV care, offering hope for continued progress towards more effective treatments, improved immune health, and ultimately, the aspiration for a future free from the burden of HIV/AIDS.

REFERENCES

1. Chinedu K, Takim AE, Obeagu EI, Chinazor UD, Eloghosa O, Ojong OE, Odunze U. HIV and TB co-infection among patients who used Directly Observed Treatment Short-course centres in Yenagoa, Nigeria. *IOSR J Pharm Biol Sci.* 2017;12(4):70-5.
2. Offie DC, Obeagu EI, Akueshi C, Njab JE, Ekanem EE, Dike PN, Oguh DN. Facilitators and barriers to retention in HIV care among HIV infected MSM attending Community Health Center Yaba, Lagos Nigeria. *Journal of Pharmaceutical Research International.* 2021;33(52B):10-9.
3. Nwovu AI, Ifeanyi OE, Uzoma OG, Nwebonyi NS. Occurrence of Some Blood Borne Viral Infection and Adherence to Universal Precautions among Laboratory Staff in Federal Teaching Hospital Abakaliki Ebonyi State. *Arch Blood Transfus Disord.* 2018;1(2).
4. Ifeanyi OE, Uzoma OG, Stella EI, Chinedum OK, Abum SC. Vitamin D and insulin resistance in HIV sero positive individuals in Umudike. *Int. J. Curr. Res. Med. Sci.* 2018;4(2):104-8.
5. Ifeanyi OE, Leticia OI, Nwosu D, Chinedum OK. A Review on blood borne viral infections: universal precautions. *Int. J. Adv. Res. Biol. Sci.* 2018;5(6):60-6.
6. Obeagu EI, Obarezi TN, Omeh YN, Okoro NK, Eze OB. Assessment of some haematological and biochemical parameters in HIV patients before receiving treatment in Aba, Abia State, Nigeria. *Res J Pharma Biol Chem Sci.* 2014; 5:825-30.
7. Obeagu EI, Obarezi TN, Ogbuabor BN, Anaebio QB, Eze GC. Pattern of total white blood cell and differential count values in HIV positive patients receiving

- treatment in Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria. *International Journal of Life Science, Biotechnology and Pharama Research*. 2014; 391:186-9.
8. Obeagu EI. A Review of Challenges and Coping Strategies Faced by HIV/AIDS Discordant Couples. *Madonna University journal of Medicine and Health Sciences* ISSN: 2814-3035. 2023; 3 (1): 7-12.
 9. Oloro OH, Obeagu EI. A Systematic Review on Some Coagulation Profile in HIV Infection. *International Journal of Innovative and Applied Research*. 2022;10(5):1-1.
 10. Nwosu DC, Obeagu EI, Nkwuocha BC, Nwanna CA, Nwanjo HU, Amadike JN, Ezemma MC, Okpomeshine EA, Ozims SJ, Agu GC. Alterations in superoxide dismutase, vitamins C and E in HIV infected children in Umuahia, Abia state. *International Journal of Advanced Research in Biological Sciences*. 2015;2(11):268-71.
 11. Obeagu EI, Malot S, Obeagu GU, Ugwu OP. HIV resistance in patients with Sickle Cell Anaemia. *NEWPORT INTERNATIONAL JOURNAL OF SCIENTIFIC AND EXPERIMENTAL SCIENCES (NIJSSES)*. 2023;3(2):56-9.
 12. Ifeanyi OE, Obeagu GU. The Values of CD4 Count, among HIV Positive Patients in FMC Owerri. *Int. J. Curr. Microbiol. App. Sci*. 2015;4(4):906-10.
https://www.academia.edu/download/38320134/Obeagu_Emmanuel_Ifeanyi_and_Obeagu_Getrude_Uzoma.EMMA2.pdf.
 13. Obeagu EI, Okeke EI, Anonde Andrew C. Evaluation of haemoglobin and iron profile study among persons living with HIV in Umuahia, Abia state, Nigeria. *Int. J. Curr. Res. Biol. Med*. 2016;1(2):1-5.
 14. Alum EU, Ugwu OP, Obeagu EI, Okon MB. Curtailing HIV/AIDS Spread: Impact of Religious Leaders. *Newport International Journal of Research in Medical Sciences (NIJRMS)*. 2023;3(2):28-31.
 15. Obeagu EI, Obeagu GU, Paul-Chima UO. Stigma Associated With HIV. *AIDS: A Review. Newport International Journal of Public Health and Pharmacy (Nijpp)*. 2023;3(2):64-7.
 16. Alum EU, Obeagu EI, Ugwu OP, Aja PM, Okon MB. HIV Infection and Cardiovascular diseases: The obnoxious Duos. *Newport International Journal of Research in Medical Sciences (NIJRMS)*. 2023;3(2):95-9.
 17. Ibebuike JE, Nwokike GI, Nwosu DC, Obeagu EI. A Retrospective Study on Human Immune Deficiency Virus among Pregnant Women Attending Antenatal Clinic in Imo State University Teaching Hospital. *International Journal of Medical Science and Dental Research*, 2018; 1(2):08-14.
<https://www.ijmsdr.org/published%20paper/li1i2/A%20Retrospective%20Study%20on%20Human%20Immune%20Deficiency%20Virus%20among%20Pregnant%20Women%20Attending%20Antenatal%20Clinic%20in%20Imo%20State%20University%20Teaching%20Hospital.pdf>.
 18. Obeagu EI, Okwuanaso CB, Edoho SH, Obeagu GU. Under-nutrition among HIV-exposed Uninfected Children: A Review of African Perspective. *Madonna University journal of Medicine and Health Sciences*. 2022 ;2(3):120-7.
 19. Obeagu EI, Alum EU, Obeagu GU. Factors associated with prevalence of HIV among youths: A review of Africa perspective. *Madonna University journal of Medicine and Health Sciences*. 2023;3(1):13-8.
<https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/93>.
 20. Obeagu EI. A Review of Challenges and Coping Strategies Faced by HIV/AIDS Discordant Couples. *Madonna University journal of*

- Medicine and Health Sciences. 2023;3(1):7-12.
<https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/91>.
21. Vijayan V, Mohapatra A, Uthaman S, Park IK. Recent advances in nanovaccines using biomimetic immunomodulatory materials. *Pharmaceutics*. 2019;11(10):534.
 22. Obeagu EI, Obeagu GU. An update on premalignant cervical lesions and cervical cancer screening services among HIV positive women. *J Pub Health Nutri*. 2023; 6 (2). 2023;141:1-2.
[links/63e538ed64252375639dd0df/An-update-on-premalignant-cervical-lesions-and-cervical-cancer-screening-services-among-HIV-positive-women.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310/links/63e538ed64252375639dd0df/An-update-on-premalignant-cervical-lesions-and-cervical-cancer-screening-services-among-HIV-positive-women.pdf).
 23. Ezeoru VC, Enweani IB, Ochiabuto O, Nwachukwu AC, Ogbonna US, Obeagu EI. Prevalence of Malaria with Anaemia and HIV status in women of reproductive age in Onitsha, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(4):10-9.
 24. Omo-Emmanuel UK, Chinedum OK, Obeagu EI. Evaluation of laboratory logistics management information system in HIV/AIDS comprehensive health facilities in Bayelsa State, Nigeria. *Int J Curr Res Med Sci*. 2017;3(1): 21-38.DOI: [10.22192/ijcrms.2017.03.01.004](https://doi.org/10.22192/ijcrms.2017.03.01.004)
 25. Obeagu EI, Obeagu GU, Musiimenta E, Bot YS, Hassan AO. Factors contributing to low utilization of HIV counseling and testing services. *Int. J. Curr. Res. Med. Sci*. 2023;9(2): 1-5.DOI: [10.22192/ijcrms.2023.09.02.001](https://doi.org/10.22192/ijcrms.2023.09.02.001)
 26. Obeagu EI, Obeagu GU. An update on survival of people living with HIV in Nigeria. *J Pub Health Nutri*. 2022; 5 (6). 2022;129.
[links/645b4bfcf3512f1cc5885784/An-update-on-survival-of-people-living-with-HIV-in-Nigeria.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310/links/645b4bfcf3512f1cc5885784/An-update-on-survival-of-people-living-with-HIV-in-Nigeria.pdf).
 27. Offie DC, Obeagu EI, Akueshi C, Njab JE, Ekanem EE, Dike PN, Oguh DN. Facilitators and barriers to retention in HIV care among HIV infected MSM attending Community Health Center Yaba, Lagos Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(52B):10-9.
 28. Obeagu EI, Ogbonna US, Nwachukwu AC, Ochiabuto O, Enweani IB, Ezeoru VC. Prevalence of Malaria with Anaemia and HIV status in women of reproductive age in Onitsha, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(4):10-9.
 29. Odo M, Ochei KC, Obeagu EI, Barinaadaa A, Eteng UE, Ikpeme M, Basse JO, Paul AO. TB Infection Control in TB/HIV Settings in Cross River State, Nigeria: Policy Vs Practice. *Journal of Pharmaceutical Research International*. 2020;32(22):101-9.
 30. Obeagu EI, Eze VU, Alaebob EA, Ochei KC. Determination of haematocrit level and iron profile study among persons living with HIV in Umuahia, Abia State, Nigeria. *J BioInnovation*. 2016;5:464-71.
[links/592bb4990f7e9b9979a975cf/DETERMINATION-OF-HAEMATOCRIT-LEVEL-AND-IRON-PROFILE-STUDY-AMONG-PERSONS-LIVING-WITH-HIV-IN-UMUAHIA-ABIA-STATE-NIGERIA.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310/links/592bb4990f7e9b9979a975cf/DETERMINATION-OF-HAEMATOCRIT-LEVEL-AND-IRON-PROFILE-STUDY-AMONG-PERSONS-LIVING-WITH-HIV-IN-UMUAHIA-ABIA-STATE-NIGERIA.pdf).
 31. Kumar AR, Devan AR, Nair B, Vinod BS, Nath LR. Harnessing the immune system against cancer: current immunotherapy approaches and therapeutic targets. *Molecular Biology Reports*. 2021:1-21.
 32. Pires IS, Hammond PT, Irvine DJ. Engineering strategies for immunomodulatory cytokine therapies: challenges and clinical progress. *Advanced therapeutics*. 2021;4(8):2100035.
 33. Ifeanyi OE, Obeagu GU. The values of prothrombin time among HIV positive patients in FMC owerri.

- International Journal of Current Microbiology and Applied Sciences. 2015;4(4):911-6.
https://www.academia.edu/download/38320140/Obeagu_Emmanuel_Ifeanyi_and_Obeagu_Getrude_Uzoma2.EMMA1.pdf.
34. Izuchukwu IF, Ozims SJ, Agu GC, Obeagu EI, Onu I, Amah H, Nwosu DC, Nwanjo HU, Edward A, Arunsi MO. Knowledge of preventive measures and management of HIV/AIDS victims among parents in Umuna Orlu community of Imo state Nigeria. *Int. J. Adv. Res. Biol. Sci.* 2016;3(10): 55-65. DOI: [10.22192/ijarbs.2016.03.10.009](https://doi.org/10.22192/ijarbs.2016.03.10.009)
 35. Chinedu K, Takim AE, Obeagu EI, Chinazor UD, Eloghosa O, Ojong OE, Odunze U. HIV and TB co-infection among patients who used Directly Observed Treatment Short-course centres in Yenagoa, Nigeria. *IOSR J Pharm Biol Sci.* 2017;12(4):70-5. [links/5988ab6d0f7e9b6c8539f73d/HIV-and-TB-co-infection-among-patients-who-used-Directly-Observed-Treatment-Short-course-centres-in-Yenagoa-Nigeria.pdf](https://doi.org/10.5988ab6d0f7e9b6c8539f73d/HIV-and-TB-co-infection-among-patients-who-used-Directly-Observed-Treatment-Short-course-centres-in-Yenagoa-Nigeria.pdf)
 36. Oloro OH, Oke TO, Obeagu EI. Evaluation of Coagulation Profile Patients with Pulmonary Tuberculosis and Human Immunodeficiency Virus in Owo, Ondo State, Nigeria. *Madonna University journal of Medicine and Health Sciences* ISSN: 2814-3035. 2022;2(3):110-9.
 37. Nwosu DC, Obeagu EI, Nkwocha BC, Nwanna CA, Nwanjo HU, Amadike JN, Elendu HN, Ofoedeme CN, Ozims SJ, Nwankpa P. Change in Lipid Peroxidation Marker (MDA) and Non enzymatic Antioxidants (VIT C & E) in HIV Seropositive Children in an Urban Community of Abia State. Nigeria. *J. Bio. Innov.* 2016;5(1):24-30.
[links/5ae735e9a6fdcc5b33eb8d6a/CHANGE-IN-LIPID-PEROXIDATION-MARKER-MDAAND-NON-ENZYMATIC-ANTIOXIDANTS-VIT-C-E-IN-HIV-SEROPOSITIVE-CHILDREN-IN-AN-URBAN-COMMUNITY-OF-ABIA-STATE-NIGERIA.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310).
 38. Igwe CM, Obeagu IE, Ogbuabor OA. Clinical characteristics of people living with HIV/AIDS on ART in 2014 at tertiary health institutions in Enugu, Nigeria. *J Pub Health Nutri.* 2022; 5 (6). 2022;130. [links/645a166f5762c95ac3817d32/Clinical-characteristics-of-people-living-with-HIV-AIDS-on-ART-in-2014-at-tertiary-health-institutions-in-Enugu.pdf](https://doi.org/10.22192/ijarbs.2016.03.10.009).
 39. Ifeanyi OE, Obeagu GU, Ijeoma FO, Chioma UI. The values of activated partial thromboplastin time (APTT) among HIV positive patients in FMC Owerri. *Int J Curr Res Aca Rev.* 2015;*3:139-44.
https://www.academia.edu/download/38320159/Obeagu_Emmanuel_Ifeanyi3_et_al.IICRAR.pdf.
 40. Obiomah CF, Obeagu EI, Ochei KC, Swem CA, Amachukwu BO. Hematological indices o HIV seropositive subjects in Nnamdi Azikiwe University teaching hospital (NAUTH), Nnewi. *Ann Clin Lab Res.* 2018;6(1):1-4. [links/5aa2bb17a6fdccd544b7526e/Haematological-Indices-of-HIV-Seropositive-Subjects-at-Nnamdi-Azikiwe.pdf](https://doi.org/10.5988ab6d0f7e9b6c8539f73d/Haematological-Indices-of-HIV-Seropositive-Subjects-at-Nnamdi-Azikiwe.pdf)
 41. Omo-Emmanuel UK, Ochei KC, Osuala EO, Obeagu EI, Onwuasoanya UF. Impact of prevention of mother to child transmission (PMTCT) of HIV on positivity rate in Kafanchan, Nigeria. *Int. J. Curr. Res. Med. Sci.* 2017;3(2): 28-34. DOI: [10.22192/ijcrms.2017.03.02.005](https://doi.org/10.22192/ijcrms.2017.03.02.005)
 42. Aizaz M, Abbas FA, Abbas A, Tabassum S, Obeagu EI. Alarming rise in HIV cases in Pakistan: Challenges and future recommendations at hand. *Health Science Reports.* 2023;6(8): e1450.
 43. Obeagu EI, Amekpor F, Scott GY. An update of human immunodeficiency virus infection:

- Bleeding disorders. *J Pub Health Nutri.* 2023; 6 (1). 2023;139. [links/645b4a6c2edb8e5f094d9bd9](https://doi.org/10.59298/IAAJB/2023/1.2.23310) /An-update-of-human-immunodeficiency-virus-infection-Bleeding.pdf.
44. Castelli V, Lombardi A, Palomba E, Bozzi G, Ungaro R, Alagna L, Mangioni D, Muscatello A, Bandera A, Gori A. Immune checkpoint inhibitors in people living with HIV/AIDS: facts and controversies. *Cells.* 2021;10(9):2227.
 45. Obeagu EI, Scott GY, Amekpor F, Ofodile AC, Edoho SH, Ahamefula C. Prevention of New Cases of Human Immunodeficiency Virus: Pragmatic Approaches of Saving Life in Developing Countries. *Madonna University journal of Medicine and Health Sciences.* 2022 Dec 20;2(3):128-34. <https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/86>.
 46. Walter O, Anaabo QB, Obeagu EI, Okoroiwu IL. Evaluation of Activated Partial Thromboplastin Time and Prothrombin Time in HIV and TB Patients in Owerri Metropolis. *Journal of Pharmaceutical Research International.* 2022:29-34.
 47. Odo M, Ochei KC, Obeagu EI, Barinaadaa A, Eteng EU, Ikpeme M, Basse JO, Paul AO. Cascade variabilities in TB case finding among people living with HIV and the use of IPT: assessment in three levels of care in cross River State, Nigeria. *Journal of Pharmaceutical Research International.* 2020;32(24):9-18.
 48. Jakheng SP, Obeagu EI. Seroprevalence of human immunodeficiency virus based on demographic and risk factors among pregnant women attending clinics in Zaria Metropolis, Nigeria. *J Pub Health Nutri.* 2022; 5 (8). 2022;137. [links/6317a6b1acd814437f0ad268](https://doi.org/10.59298/IAAJB/2023/1.2.23310) /Seroprevalence-of-human-immunodeficiency-virus-based-on-demographic-and-risk-factors-among-pregnant-women-attending-clinics-in-Zaria-Metropolis-Nigeria.pdf.
 49. Obeagu EI, Obeagu GU. A Review of knowledge, attitudes and socio-demographic factors associated with non-adherence to antiretroviral therapy among people living with HIV/AIDS. *Int. J. Adv. Res. Biol. Sci.* 2023;10(9):135-42. DOI: [10.22192/ijarbs.2023.10.09.015](https://doi.org/10.22192/ijarbs.2023.10.09.015) [links/6516faa61e2386049de5e828](https://doi.org/10.22192/ijarbs.2023.10.09.015) /A-Review-of-knowledge-attitudes-and-socio-demographic-factors-associated-with-non-adherence-to-antiretroviral-therapy-among-people-living-with-HIV-AIDS.pdf
 50. Obeagu EI, Onuoha EC. Tuberculosis among HIV Patients: A review of Prevalence and Associated Factors. *Int. J. Adv. Res. Biol. Sci.* 2023;10(9):128-34. DOI: [10.22192/ijarbs.2023.10.09.014](https://doi.org/10.22192/ijarbs.2023.10.09.014) [links/6516f938b0df2f20a2f8b0e0/](https://doi.org/10.22192/ijarbs.2023.10.09.014) Tuberculosis-among-HIV-Patients-A-review-of-Prevalence-and-Associated-Factors.pdf.
 51. Obeagu EI, Ibeh NC, Nwobodo HA, Ochei KC, Iwegbulam CP. Haematological indices of malaria patients coinfecting with HIV in Umuahia. *Int. J. Curr. Res. Med. Sci.* 2017;3(5):100-4. DOI: [10.22192/ijcrms.2017.03.05.014](https://doi.org/10.22192/ijcrms.2017.03.05.014) [https://www.academia.edu/download/54317126/Haematological_indices_of_malaria_patients_coinfected_with_HIV.pdf](https://doi.org/10.22192/ijcrms.2017.03.05.014)
 52. Jakheng SP, Obeagu EI, Abdullahi IO, Jakheng EW, Chukwueze CM, Eze GC, Essien UC, Madekwe CC, Madekwe CC, Vidya S, Kumar S. Distribution Rate of Chlamydial Infection According to Demographic Factors among Pregnant Women Attending Clinics in Zaria Metropolis, Kaduna State, Nigeria. *South Asian Journal of*

- Research in Microbiology. 2022;13(2):26-31.
53. Viola N, Kimono E, Nuruh N, Obeagu EI. Factors Hindering Elimination of Mother to Child Transmission of HIV Service Uptake among HIV Positive Women at Comboni Hospital Kyamuhunga Bushenyi District. *Asian Journal of Dental and Health Sciences*. 2023 ;3(2):7-14.
<http://ajdhs.com/index.php/journal/article/view/39>.
54. Okorie HM, Obeagu Emmanuel I, Okpoli Henry CH, Chukwu Stella N. Comparative study of enzyme linked immunosorbent assay (Elisa) and rapid test screening methods on HIV, Hbsag, Hcv and Syphilis among voluntary donors in. Owerri, Nigeria. *J Clin Commun Med*. 2020;2(3):180-83.DOI: [DOI: 10.32474/JCCM.2020.02.000137](https://doi.org/10.32474/JCCM.2020.02.000137)
[links/5f344530458515b7291bd95f/Comparative-Study-of-Enzyme-Linked-Immunoassay-ELISA-and-Rapid-Test-Screening-Methods-on-HIV-HBsAg-HCV-and-Syphilis-among-Voluntary-Donors-in-Owerri-Nigeria.pdf](https://www.researchgate.net/publication/358515b7291bd95f/links/5f344530458515b7291bd95f/Comparative-Study-of-Enzyme-Linked-Immunoassay-ELISA-and-Rapid-Test-Screening-Methods-on-HIV-HBsAg-HCV-and-Syphilis-among-Voluntary-Donors-in-Owerri-Nigeria.pdf).
55. Ezugwu UM, Onyenekwe CC, Ukibe NR, Ahaneku JE, Onah CE, Obeagu EI, Emeje PI, Awalu JC, Igbokwe GE. Use of ATP, GTP, ADP and AMP as an Index of Energy Utilization and Storage in HIV Infected Individuals at NAUTH, Nigeria: A Longitudinal, Prospective, Case-Controlled Study. *Journal of Pharmaceutical Research International*. 2021;33(47A):78-84.
56. Emmanuel G, Martin O, Peter OS, Obeagu EI, Daniel K. Factors Influencing Early Neonatal Adverse Outcomes among Women with HIV with Post Dated Pregnancies Delivering at Kampala International University Teaching Hospital, Uganda. *Asian Journal of Pregnancy and Childbirth*. 2023;6(1):203-11.
<http://research.sdpublishers.net/id/eprint/2819/>.
57. Igwe MC, Obeagu EI, Ogbuabor AO, Eze GC, Ikpenwa JN, Eze-Stephen PE. Socio-Demographic Variables of People Living with HIV/AIDS Initiated on ART in 2014 at Tertiary Health Institution in Enugu State. *Asian Journal of Research in Infectious Diseases*. 2022;10(4):1-7.
58. Vincent CC, Obeagu EI, Agu IS, Ukeagu NC, Onyekachi-Chigbu AC. Adherence to Antiretroviral Therapy among HIV/AIDS in Federal Medical Centre, Owerri. *Journal of Pharmaceutical Research International*. 2021;33(57A):360-8.
59. Igwe MC, Obeagu EI, Ogbuabor AO. Analysis of the Factors and Predictors of Adherence to Healthcare of People Living with HIV/AIDS in Tertiary Health Institutions in Enugu State. *Madonna University journal of Medicine and Health Sciences*. 2022;2(3):42-57.
<https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/75>.
60. Madekwe CC, Madekwe CC, Obeagu EI. Inequality of monitoring in Human Immunodeficiency Virus, Tuberculosis and Malaria: A Review. *Madonna University journal of Medicine and Health Sciences* ISSN: 2814-3035. 2022;2(3):6-15.
<https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/69>
61. Echendu GE, Vincent CC, Ibebuikwe J, Asodike M, Naze N, Chinedu EP, Ohale B, Obeagu EI. Weights Of Infants Born to HIV Infected Mothers: A Prospective Cohort Study in Federal Medical Centre, Owerri, Imo State. *European Journal of Pharmaceutical and Medical Research*, 2023; 10(8): 564-568
62. Nwosu DC, Nwanjo HU, Okolie NJ, Ikeh K, Ajero CM, Dike J, Ojiegbe GC, Oze GO, Obeagu EI, Nnatunanya I, Azuonwu O. Biochemical Alterations in Adult HIV Patients on Antiretroviral Therapy. *World*

- Journal of Pharmacy and Pharmaceutical Sciences, 2015; 4(3): 153-160.
[links/5a4fd0500f7e9bbc10526b38/BIOCHEMICAL-ALTERATIONS-IN-ADULT-HIV-PATIENTS-ON-ANTIRETROVIRAL-THERAPY.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310).
63. Obeagu EI, Obeagu GU. Effect of CD4 Counts on Coagulation Parameters among HIV Positive Patients in Federal Medical Centre, Owerri, Nigeria. *Int. J. Curr. Res. Biosci. Plant Biol.* 2015;2(4):45-9.
64. Obeagu EI, Nwosu DC. Adverse drug reactions in HIV/AIDS patients on highly active antiretro viral therapy: a review of prevalence. *Int. J. Curr. Res. Chem. Pharm. Sci.* 2019;6(12):45-8. DOI: [10.22192/ijcrps.2019.06.12.004](https://doi.org/10.22192/ijcrps.2019.06.12.004)
[links/650aba1582f01628f0335795/Adverse-drug-reactions-in-HIV-AIDS-patients-on-highly-active-antiretro-viral-therapy-a-review-of-prevalence.pdf](https://doi.org/10.22192/ijcrps.2019.06.12.004).
65. Obeagu EI, Scott GY, Amekpor F, Obeagu GU. Implications of CD4/CD8 ratios in Human Immunodeficiency Virus infections. *Int. J. Curr. Res. Med. Sci.* 2023;9(2):6-13. DOI: [10.22192/ijcrms.2023.09.02.002](https://doi.org/10.22192/ijcrms.2023.09.02.002)
[links/645a4a462edb8e5f094ad37c/Implications-of-CD4-CD8-ratios-in-Human-Immunodeficiency-Virus-infections.pdf](https://doi.org/10.22192/ijcrms.2023.09.02.002).
66. Obeagu EI, Ochei KC, Okeke EI, Anode AC. Assessment of the level of haemoglobin and erythropoietin in persons living with HIV in Umuahia. *Int. J. Curr. Res. Med. Sci.* 2016;2(4):29-33.
[links/5711c47508aeebe07c02496b/Assessment-of-the-level-of-haemoglobin-and-erythropoietin-in-persons-living-with-HIV-in-Umuahia.pdf](https://doi.org/10.59298/IAAJB/2023/1.2.23310).
67. Vogenberg FR, Barash CI, Pursel M. Personalized medicine: part 1: evolution and development into theranostics. *Pharmacy and Therapeutics.* 2010;35(10):560.
68. Apostolopoulos V, Borkoles E, Polman R, Stojanovska L. Physical and immunological aspects of exercise in chronic diseases. *Immunotherapy.* 2014;6(10):1145-57.
69. Yang J. Using nutrigenomics to guide personalized nutrition supplementation for bolstering immune system. *Health Information Science and Systems.* 2023;11(1):4.
70. Altice FL, Kamarulzaman A, Soriano VV, Schechter M, Friedland GH. Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *The Lancet.* 2010;376(9738):367-87.
71. Kopelovich SL, Monroe-DeVita M, Buck BE, Brenner C, Moser L, Jarskog LF, Harker S, Chwastiak LA. Community mental health care delivery during the COVID-19 pandemic: practical strategies for improving care for people with serious mental illness. *Community mental health journal.* 2021; 57:405-15.

CITE AS: Emmanuel Ifeanyi Obeagu, Getrude Uzoma Obeagu, Esther Ugo Alum and Okechukwu Paul-Chima Ugwu (2023). Advancements in Immune Augmentation Strategies for HIV Patients. IAA Journal of Biological Sciences 11(1):1-11. <https://doi.org/10.59298/IAAJB/2023/1.2.23310>