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EFFECTS OF VITAMIN A SUPPLEMENTATION IN HIV-INFECTED PATIENTS: A REVIEW
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EFFECTS OF VITAMIN A SUPPLEMENTATION IN HIV-INFECTED PATIENTS: A REVIEW

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ABSTRACT

***Background*: Vitamin A deficiency is associated with a higher Human Immunodeficiency Virus (HIV) viral load. Currently Anti-Retroviral Therapy (ART) is the main strategy that is used in suppressing viral load. Vitamin A has received significant attention as a therapeutic agent for the treatment of numerous immune compromised conditions. This is attributed to its ability to boost the immunity due to its antioxidant characteristics.**

***Objective:* To establish if vitamin A supplementation could be used as a therapeutic micronutrient in the management of HIV.**

***Study selection:* Based on defined key words a search was carried out on PUBMED to retrieve all publications on Vitamin A supplementation and HIV. 26 studies that met the search criteria were retrieved for data synthesis.**

***Data synthesis:* Six unique studies that met the study criteria were included. The publications were analysed to establish whether Vitamin A supplementation was effective in the management of HIV.**

***Results*: The articles reviewed indicated that Vitamin A supplementation leads to improved immunity. It was also noted that vitamin A deficiency resulted in an increase in HIV viral load among the HIV patients.**

***Conclusion:* Vitamin A supplementation is an affordable and effective way to retard HIV progression by suppressing the viral load and fighting opportunistic infections. Considering the high prevalence of detectable HIV viral load at this time and era of ART medication, Vitamin A supplementation should be given a significant consideration as a potential intervention strategy for suppressing HIV viral load along with the ART medication.**

INTRODUCTION

The initial onset of HIV was first documented in 1981, when the first cases of a typical skin lesions and an aggressive disease of Kaposi's sarcoma appeared in homosexual men [1]. In a period of twenty years, HIV became a global epidemic; approximately 20 million people died, and an additional 36 million people were living with the virus with a large majority of those infected living in non-industrialized countries with inadequate financial support to handle the pandemic [2]. Sub-Saharan Africa carries a disproportionate burden of HIV, accounting for more than 70% of the global burden of infection. The success in HIV treatment and prevention in sub-Saharan Africa has the potential to impact on the global burden of HIV [3]. Notwithstanding substantial progress in scaling up antiretroviral therapy (ART), sub-Saharan Africa accounted for 74% of the 1.5 million HIV related deaths in 2013 [3]. However, treatment cost, delivery and effectiveness may account for the large differences seen in HIV-related mortalities throughout the world.

There are different approaches used to treat HIV. Currently the treatment of HIV is by use of antiretroviral therapy (ART) which aims at reducing the viral load to undetectable level. In Kenya, ART treatment is currently at 74% with a viral suppression of 68% of all people living with HIV [4]. Other interventions in the management of HIV include Fortified Blended Flours (FBF), Ready to Use Supplementary Foods (RUSF) and Ready to Use Therapeutic Foods (RUTF) [5]. However, these nutrition supplements aid in weight gain but not necessarily suppressing viral load [6]. Regardless of all these interventions, HIV prevalence is still rising in Kenya with increased hidden hunger among the HIV patients and a high percentage of HIV patients with unsuppressed viral load. If left untreated, HIV infection is a known precursor to increase morbidity and mortality rate and therefore, it confers a risk of mortality fourteen (14) times higher than that of HIV free persons of the same sex and age group [7]. It is on this basis, there is more need to study other alternatives including Vitamin A supplementation as an effective way to suppress viral load among HIV positive individuals. Notably, Vitamin A, a fat-soluble vitamin, has recently received significant attention as a therapeutic agent for the treatment of several immune compromised conditions, but has not been directly linked with suppression of viral load among HIV positive individuals. Therefore, the objective of this rapid review was to establish if Vitamin A supplementation could be used as a therapeutic agent in the management of HIV.

MATERIALS AND METHODS

Published materials which covered vitamin A supplementation were obtained on PUBMED from 1st – 28th February 2021. Articles were reviewed to establish whether there is any significant association between Vitamin A supplementation and Health of HIV patients. Literature search was done using the following key words; 'Vitamin A and HIV', 'Vitamin A and CD4 count', 'Vitamin A and HIV viral load' and 'Vitamin A supplementation'.

*Study selection***:** From the search criteria, 26 articles were retrieved and screened using the study selection criteria to ensure they were relevant to the study. However, 20 Articles were rejected since they did not discuss Vitamin A in relation to treatment of HIV, or statistical analysis used were not suitable, or the study was not done on humans, or the study was done in a Vitamin A-replete population, or the article was a review of other publications. Consequently, only six (6) publications emanating from

four countries met the article selection criteria and were synthesized to provide this reviews findings.

RESULTS

Table 1 shows key information obtained from the studies that were reviewed. This included the country where the study was done, the study group, the study design, the results and the reference. From the studies reviewed, 2 were conducted on HIV positive women, 1 on children below 6 months, 2 on children above 6 and 1 on Anti-Retroviral Therapy (ART) naïve patients. It was noted that Vitamin A supplementation led to enhanced immunity and thus reducing the morbidity and mortality rate among HIV positive patients [8–11]. It was also noted that Vitamin A deficiency resulted to high levels of HIV viral load [12] . In contrast to this observation, one study revealed no significant relationship between Vitamin A supplementation and occurrence of early infant mortality and morbidity. However, this study focused on secondary person as the supplementation was done on HIV positive women during postpartum period, to determine occurrence of early infant mortality and morbidity, secondary diarrhea, fever and acute respiratory infection-related symptoms among their breastfed infants [13].

Table 1

Studies done associating vitamin A supplementation and HIV

Country	Study group	Sample size	Study design	Conclusion	Reference
Sub-Saharan Africa Countries	HIV-positive women who breastfed their infants	838	cross-sectional observational study	No statistically significant association between vitamin A supplementation provided to HIV-positive women in the postpartum period and occurrence of early infant mortality and morbidity among their breastfed infants.	[13]
Miami	Newly diagnosed HIV-infected participants	52	Cross-sectional study	Lower intake of vitamin A were associated with higher HIV viral load	[12]
Tanzania	HIV-infected pregnant women	1078	randomized controlled trial	Promotes health by protecting development of symptomatic malaria in HIV+ patients	[8]
Tanzania	Children below 6 months born of HIV – infected women	1078	double-blind factorial design	Higher vitamin A concentrations in plasma are protective against mortality in children born to HIV-infected women	[9]
Uganda	Children above 6 months	181	randomized, clinical trial	Vitamin A supplementation decreases mortality rate in HIV-infected children	[10]

Tanzania	Children 6 – 5 years		randomized, clinical trial	Vitamin A supplements, reduce mortality of HIV-infected children	[11]

DISCUSSION

HIV progression is determined by viral load concentration and its ability to replicate [13]. HIV can be suppressed by combination of ART consisting of 3 or more ARV drugs. However, ART does not cure HIV infection but suppresses viral replication within a person's body and allows an individual's immune system to strengthen and regain the capacity to fight off infections [14,15]. Vitamin A, a fat-soluble compound is involved in several physiological pathways connected to several disease etiology. Just like antiretroviral drugs, retinoic acid a form of vitamin A, plays an important function in the development and function of the innate immune system. This innate immune cells consist of macrophages and neutrophils, in which they respond to pathogen invasion through phagocytosis and activation of natural killer T-cells which perform immune regulatory functions through cytotoxic activity [16,17]. Studies have as well shown that immune system need frequent supply of vitamin A, to ensure adequate vitamin A concentration which is important for its functioning [18,19].

Vitamin A is also associated with enhancement of both innate and adaptive immune responses and its metabolites are key regulators of epithelial cell differentiation and growth therefore critical in promoting epithelial tissue integrity hence helping to reduce cases of diarrhea among the HIV Positive patients [20]. Studies have as well demonstrated that vitamin A is essential for proper development and differentiation of colonic $CD169_+$ macrophages which is important for immunity against HIV [19,21]. In contrast to these observations, a study by Gebremedhin 2020, showed no statistical significance between Vitamin A supplementation and infant mortality [13]. However, this study assessed the impact of vitamin A supplementation on infants born of HIV-infected mothers who were given vitamin A supplement during postpartum period. The concentration of vitamin A in breast milk depended on the mother storage ability. In addition, Vitamin A supplementation during the postpartum period is not a guarantee of high levels of vitamin A in the breast milk. Probably this resulted to the difference with other studies which included direct supplementation to the study participants. However, studies should be carried out to determine Vitamin A concentration in the breast milk of HIV-positive mothers supplemented with vitamin A during postpartum period to back up this study.

CONCLUSION

Vitamin A supplementation is a safe and effective way to manage or treat HIV and also reduce morbidity and mortality related to HIV. Given that Viral load suppression among HIV positive patients is still below the World Health Organization (WHO) target, Vitamin A supplementation should be given significant consideration as a potential strategy for suppressing the viral load of HIV positive patients thus reducing HIV- related cases of morbidity and mortality.

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