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EFFECTS OF A SELECTED HERBAL BEVERAGE ON THE FULL HAEM OGRAM, INFLAMMATION AND SERUM ZINC STATUS OF HIV AND AIDS SUBJECTS IN NAIROBI, KENYA, 2010

[1*] Friederike Deborah Nagel
Post Graduate Student, Jomo Kenyatta University of Agriculture and Technology
***Corresponding email: friederike_deborah@yahoo.de**

[2]Prof. Charles F.L. Mbakaya
Rongo University College, School of Physical Sciences

[3]Dr. Yeri I. Kombe
Center for Public Health Research, (CPHR - KEMRI)

[4]Dr. Venny C. S. Nyambati (posthumously)
Jomo Kenyatta University of Agriculture and Technology (JKUAT)

Abstract

Purpose: The purpose of the study was to establish the effects of a selected herbal beverage on the full Haemogram, inflammation and serum zinc status of HIV and AIDS Subjects in Nairobi, Kenya.

Methodology: This was a randomized prospective controlled intervention study. The sample size was 100 patients who were recruited from the Association of People living With AIDS in Kenya (TAPWAK) that is based at Nairobi West. The study subjects were recruited upon consent and randomized into the two groups, one group received the herbal beverage and the other a placebo. The intervention was double blinded and unmasking was done during data analysis. Blood samples were taken from the subjects at baseline and periodically, to investigate effects on or changes in the above biomarkers. Means and medians of the biomarkers were compared between and within groups at baseline and at end line.

Results: Following the study findings it was possible to conclude that regarding the socio-economic status of the study subjects in both arms were comparable by marital status. Majority of subjects had children who depended on them. By education status, the subjects were comparable between the groups. Most of the subjects had attained some level of education, those on the intervention arm having a higher proportion of more educated persons. While about half the subjects had social support systems, financial support was lacking for close to 80% of the subjects in both arms. Women were a majority in both study arms, one reason could be that they are more willing to get help for issues affecting their health. The Erythrocyte Sedimentation Rate (ESR) count was not different at baseline in both groups but almost attained significant

difference at the 9th month of intervention, the intervention group having a much lower value (p = 0.074), suggesting that the mode of action of the herbal beverage was via reduction of inflammation. The same was the trend in the Mean Corpuscular Hemoglobin Concentration MCHC, the intervention arm having a lower value than the placebo group (p = 0.088). However, the other hematological parameters were neither different at baseline nor at the 9th month of intervention. The serum zinc values in the intervention and placebo arms were similar at baseline, 3rd, 6th and 9th months and lower than normal values at all time points, suggesting that the intervention had no benefits in repletion of serum zinc levels and / or no effect in improved absorption of serum zinc of the subjects, yet this trace element is critical in human immunity. The median platelet (PLT) count was much lower in the intervention arm than the placebo at the 9th month of intervention (p = 0.045) while they were not different at baseline (p = 0.332), again suggesting that the mode of action of the herbal beverage might be via PLT reduction. Overall, the benefits of the herbal beverage were only marginally better in the intervention arm than the placebo for most of the selected biomarkers assessed in this study.

Unique contribution to theory, practice and policy: The study recommended that despite interesting finding regarding the impact of the ESR count of patients of the intervention group which could suggest that consumption of the herbal beverage in combination with an effective medical based treatment of HIV/ Aids could be promising for improvement of inflammation regulation in the patients. Further studies on that would be of benefit.

Keywords: *Haemogram, placebo, chronic inflammation*

1.0 INTRODUCTION

The herbal beverage is a nutritious herbal beverage produced in China and freely available in the Kenyan market. Its actual ingredients are not disclosed only described as 100% herbal. There is no indication on the number of nutrients like zinc it provides. The producer allowed the study research to take place but did not want to be disclosed or the brand/ trademark to be disclosed. The producer required confidentiality regarding the intellectual property protection of the used product. It is however very interesting and of importance to investigate the effect of such a freely available product as it could be of benefit to HIV/ Aids subjects in Kenya and sub-Saharan Africa in general. Although modern drugs do help immuno-suppressed subjects regain good health, the cost of such drugs and their many side effects and challenges of drug resistance allude to the need for other safer and more affordable options of treatment, also in beneficial combination with modern drugs or to promote well-being for patients who suffer from side-effects.

Antiretroviral Therapy (ARV) or Highly Active Antiretroviral Therapy (HAART) slow down the progress of the disease and support the immune functions, but the relationship between viral suppression and immune recovery is very complex and involves multiple factors, which include nutritional status (Heever & Veldman, 2003). Often HIV/ Aids patients in sub Saharan Africa, especially in the rural areas, might not have the financial stability to ensure regular and

appropriate medical treatment of the disease. Income has to be spent wisely; often it might just be sufficient for the most pressing daily needs such as water and food.

A supportive beverage can be of benefit in many ways, improving health and reducing nutrient deficiencies, improved health and nutrition might result in improved economic and social status as improved health is key for being able to go to work. Nutritional deficiency, like zinc deficiency, is known to be associated with increased intracellular oxidative stress, faster viral replication and a higher viral load and with a reduction of the CD4 lymphocytes in HIV/AIDS subjects. This may contribute to increased morbidity, faster disease progression and higher HIV/ADS- related mortality (Dannhauser *et al*., 1999). Micronutrient therapy in conjunction with allopathic treatments can extend and improve the quality and quantity of life in HIV-infected individuals as well as those living with AIDS (Semba and Tang *et al.*, 1999).

1.2 Problem Statement

Human immunodeficiency virus (HIV) infections are a major health threat to populations throughout the world and it is the most aggressive pandemic of this century/ AIDS is a burden for individuals and societies, affecting social and physical well-being as well as economical and health care costs. Although medical progress in detecting the status early and in developing effective therapies improved the quantity and quality of life of people living with HIV/ AIDS it continues to be a life-threatening disease for which medical progress is always a step behind the progress of the disease. An important factor for HIV/ AIDS therapy is nutrition supplementation.

Micronutrient deficiencies are common in HIV/ AIDS patients, while zinc deficiency is the most prevalent. Main reasons for that are a poor dietary intake, malabsorption and increased demand of nutrients by the body and recently studies have shown that serum zinc levels are regulated not only by what is consumed, but by evolutionary considerations (Mbakaya *et al.*, 2008). High serum zinc is associated with cellular (innate) immunity while low serum zinc is associated with antibody (humoral) immunity (Mbakaya *et al*., 2008).

Zinc immuno-stimulating action mechanisms are complex, although thyme hormone stimulation, of which zinc is an essential co-factor, seems to be most important. Zinc is a key component for HIV replication and for inhibition of HIV replication (Williams *et al.*, 2006). Zinc supplementation, also parenterally, can be useful in immunodeficiency in AIDS (Ripa, Ripa 1995). Another important factor in HIV/ AIDS- management is monitoring the full hemogram of infected patients. Haematologic abnormalities are among the most common manifestations of advanced human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) (Erhabor *et al.*, 2005). A study carried out in Nigeria in 2005 showed that hematological parameters of HIV/AIDS infected Africans were different than in HIV/AIDS negative Africans, especially the mean Erythrocyte Sedimentation Rate was higher than in healthy Africans. This shows the need for routine monitoring of some hematological parameters of HIV/AIDS infected Africans before commencement of medication such as highly active antiretroviral therapy to ensure that mortality and morbidity are minimized and quality of life optimized (Erhabor *et al.*, 2005).

Acute/ chronic Inflammation as measured by the Erythrocyte Sedimentation Rate (ESR) influences the assessment of nutritional status (Thurnham *et al.*, 1999). For example, inflammation reduces plasma retinol concentrations and vitamin A deficiency is overestimated.

Conversely inflammation increases plasma ferritin concentrations and Fe deficiency is underestimated (Thurnham *et al.*, 1999). Any effect of inflammation on serum zinc levels of HIV/AIDS infected subjects will be established in this study.

Malnutrition in combination or as a result of HIV/AIDS has a dramatic influence on the immune function of the patients, which is the key factor of the disease. Therefore, efficient HIV/ AIDS treatment has to include nutrition supplementation, for both, HIV-infected patients and patients with AIDS.

Hypothesis

Null Hypothesis (Ho)

Supplementation with the herbal beverage will not result in any difference in the baseline and post intervention full Hemogram, Erythrocyte Sedimentation Rate and Serum Zinc levels between the placebo and study group.

Alternative Hypothesis

Supplementation with the herbal beverage will result in differences in the baseline and post intervention full Hemogram, Erythrocyte Sedimentation Rate and Serum Zinc levels between the placebo and study group.

1.3 Study Objectives

1. To establish the socio-economic status of the HIV/ AIDS subjects
2. To determine the full Haemogram of HIV/ AIDS subjects at baseline and nine months' post intervention in the placebo and study group
3. To determine the Serum Zinc levels of HIV/ AIDS subjects at baseline, three, six, and nine months' post intervention in the placebo and study group
4. To establish trends in the magnitude of chronic inflammation of HIV/ AIDS subjects at baseline and nine months' post intervention in the placebo and study group.

2.0 LITERATURE REVIEW

2.1 Empirical Literature

Currently, an estimated number of about 36.9 million people are living with HIV/AIDS worldwide, the vast majority in the developing world, where few interventions are available (UNAIDS, 2014).Studies have shown that hematologic abnormalities are among the most common manifestations of advanced human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) (Erhabor *et al.* 2005).Hematologic manifestations of HIV infection are common and more frequent with progression of disease. A study conducted in 2012 revealed a significant increase in the number of cases of anemia, and lymphopenia, with decreasing CD4 cell counts. Thrombocytopenia is also seen but does not show significant increase with disease progression. This study also highlighted the importance of simultaneously treating HIV patients for hematologic manifestations to reduce morbidity. (Pranitha S1, Kulkarni M. 2012) Monitoring hematologic parameters can be beneficial and effective for both, HIV/ Aids patients who already receive HAART treatment, and those who do not receive it.

A study conducted in Ghana in 2011 compared hematological and immunological markers among HAART Naïve HIV patients and those on HAART. The study showed that HAART has the capability of reducing the incidence of anemia and lymphopenia which are associated with disease progression and death in HIV infected patients. Total lymphocyte count, hemoglobin and weight could also serve as useful predictive tools in the management and monitoring of HIV infected patients in resource limited settings (Owiredu, Quaye, Amidu & Addai-Mensah, 2011)

3.0 Method

This study was conducted at The Association of People with AIDS in Kenya (TAPWAK) which is a non-governmental non-profit organization. TAPWAK is located in Niamey Lane, Off Muthaiti Avenue in Nairobi West in Nairobi province, Kenya. This was a randomized prospective controlled intervention study. The study subjects were randomized into the two groups of the study, one group received the selected herbal beverage and the other group which received a placebo. The two interventions above were double blinded. Unmasking was done during data analysis. The study population included a total number of 100 HIV/AIDS subjects selected by The Association of People Living with AIDS (TAPWAK) in Nairobi West, Kenya. At baseline, 3, 6 and 9 months of intervention, blood (3 ml) was obtained from the patients using a 5-ml syringe and a 2-inch needle.

Data entry and analysis was conducted. The SPSS/10.0 programs were used for analysis. Data on a continuous scale was checked for normality. If normally distributed, analysis was done by parametric tests (T-Tests and Anova). Unpaired tests on data that was not normally distributed was done using non-parametric tests (One way ANOVA and Mann-Whitney U-tests). Paired tests on continuous data that was not normally distributed (N<30) were done using non-parametric tests of the median using Wilcoxon Signed Ranks Test.

4.0 RESULTS AND DISCUSSIONS

4.1 Characteristics of subjects

At baseline, 100 subjects were sequentially recruited into the study from the Association of People Living With AIDS in Kenya (TAPWAK) at Nairobi West. The socio-demographic characteristics of the subjects on the intervention (Arm 1) and placebo (Arm 2) at baseline are provided as provided (Table 1). The mean age of subjects in Arm 1 was 37.6 (7.8) compared to 39.7 (10.3) in Arm 2 . The monthly income of subjects in Arm 1 of KSh 14,500 (14,594) was higher than that of Arm 2 subjects which was 8700 (4,011). The subjects on placebo had a median monthly income of Ksh 9000 (1500-15,000) compared to those on the intervention who had an income of Ksh 9000 (4,000-60,000). The median BMI of subjects on placebo changed from 24.0 (19.92-41.78) to 24.0(19.15-42.15) after intervention (p = 0.692) while that of subjects on intervention changed from 24.58(19.53-32.89) to 25.10 (19.47-33.76) after intervention (p = 0.003). The median age of the groups were not different (p = 0.509).

Table 1: Baseline socio-demographic and other characteristics of study subjects

Parameter	Frequency	Arm1(Interv.)	Arm2 (Placebo)
Sex			
Female	57.7		90.1
Male		19.2	9.1
Marital status			
Single		25.0	31.8
Married		35.0	22.7
Widowed		20.0	20.0
Divorced		20.0	9.1
Dependants			
With children		90.0	86.4
Children < 3		66.7	65.0
Education Status			
Primary		35.0	22.7
Secondary		25.0	50.0
College		20.0	0.0
University		5.0	0.0
Employment			
Self employed	20.0	22.7	
Employed	0.0	4.5	
Unemployed	30.0	31.8	
Occasional jobs	50.0	40.9	
Social Network			
Socially support		50.0	36.4
Financially supported		20.0	19.0

Women were a majority in both study arms probably because they are more willing to get help for issues affecting their health. Study subjects in both arms were comparable by marital status. Majority of subjects had children who depended on them. By education status, the subjects were comparable between the groups. Most of the subjects had attained some level of education, those on the intervention arm having a higher proportion of more educated persons. In both arms, hardly any subject was employed. While about half the subjects had social support systems, financial support was lacking for close to 80% of the subjects in both arms.

Table 2: Mean haemogram of subjects on intervention and placebo at baseline and nine months

Parameter	Time (Months)	Intervention (Arm 1) Mean (SD)	Placebo (Arm 2) Mean (SD)	*p-value*
Total lymphocytes	0			
Total lymphocytes	9	22115.62 (762.39)	2479.42(698.46)	0.199
ESR	0	48.63(34.16)	40.04(28.12)	0.347
ESR	9	38.81(24.61)	54.42(28.66)	0.074
WBC	0	4.77(1.61)	4.89(1.78)	0.807
WBC	9	4.49(1.28)	4.91(1.98)	0.365
RBC	0	4.29(0.64)	28.65(120.38)	0.328
RBC	9	4.35.(0.68)	3.99(1.04)	0.145
Hb	0	12.61(1.30)	12.95(1.44)	0.397
Hb	9	12.62(1.32)	12.35(2.89)	0.664
HCT	0	37.35(4.44)	38.23(3.56)	0.449
HCT	9	38.90(3.19)	38.20(3.63)	0.471
MCV	0	88.08(11.91)	89.01(10.38)	0.775
MCV	9	89.97(12.35)	93.59(13.03)	0.301
MCH	0	30.06(5.95)	29.94(4.64)	0.775
MCH	9	29.66(5.46)	31.58(5.46)	0.217
MCHC	0	34.07(5.194)	45.50(58.49)	0.350
MCHC	9	32.80(1.72)	33.60(1.58)	0.088

WBC $x10^9$/l); total lymphocytes($x10^9$ /l); ESR (mm/hr);

While total lymphocyte cell count was not different between HIV-seronegative and seropositive

Subjects at baseline, the difference attained significance with the former having higher values after nutritional intervention (p = 0.005). The ESR was not different at baseline in both groups but almost attained significant difference at the 9th month of intervention, the intervention group having a much lower value (p = 0.074). The same was the trend in the MCHC, the intervention arm having a lower value than the placebo group (p = 0.008). However, the other haematological parameters were neither different at baseline nor at the 9th month of intervention.

Table 3 : Parameter by study arm

Parameter by study arm	Intervention (Arm 1)	Placebo (Arm 2)	p-value
Serum zinc (baseline)	66.3 (13.7)	63.8 (19.1)	0.754
Serum zinc (3 months)	60.7 (12.3)	57.4 (14.6)	0.561
Serum zinc (6 months)	59. 1 (15.6)	54.9 (18.3)	0.916
Serum zinc (9 months)	58.5 (19.3)	53.5 (19.1)	0.918

serum zinc (µg/dl)The serum zinc values in the intervention and placebo arms were similar at baseline, 3rd, 6th and 9th months and lower than normal values at all time points (Table 3).

Table 4: Median haemogram of subjects on intervention and placebo at baseline and nine months

Parameter	**Time (Months)**	**Intervention (Arm 1) Median (Range)**	**Placebo (Arm 2) Median (Range)**	**p-value**
Total lymphocytes	0			
Total lymphocytes	9	2188.5(764.0-3989)	2359.5(1225.0-4010)	0.170
ESR	0	45.0(3.0-105)	31.0(3.0-102.0)	0.458
ESR	9	30.0(9.0-87.0)	42.0(10.0-102)	0.082
WBC	0	4.8(2.4-7.8)	4.7(2.2-9.4)	0.984
WBC	9	4.3(2.5-7.1)	4.8(1.1-11.2)	0.365
RBC	0	4.3(2.6-5.4)	4.4(3.41-5.94)	0.992
RBC	9	4.5(3.0-5.5)	4.1(1.0-5.8)	0.115
Hb	0	12.5(10.1-15.7)	13.2(8.6-15.4)	0.208
Hb	9	12.6(9.4-14.7)	12.3(8.0-15.7)	0.891
HCT	0	37.8(21.2-45.4)	39.0(28.5-43.7)	0.433
HCT	9	39.3(33.1-44.0)	37.1(32.5-42.6)	0.402
MCV	0	84.3(65.0-113.0)	85.7(66.0-107)	0.496
MCV	9	86.6(62.8-114.3)	93.8(64.0-115.9)	0.296
MCH	0	28.8(18.6-46.7)	28.7(20.5-39.0)	0.845
MCH	9	28.4(17.8-42.9)	31.6(20.0-41)	0.181
MCHC	0	33.3(28.0-58.0)	33.45(30.0-32.0)	0.421
MCHC	9	32.6(28.4-37.5)	33.6(31.3-38.2)	0.091
PLT	0	216.5(129.0-399)	260.0(87.0-468)	0.332
PLT	9	219.0(95-426)	264.0(142.0-458.0)	0.045

WBC ($x10^9$/l); total lymphocytes($x10^9$ /l);

The median PLT count was much lower in the intervention arm than the placebo at the 9th month of intervention (p = 0.045) while they were not different at baseline (p = 0.332). Similarly, the median ESR was nearly significantly lower in the intervention arm than the placebo at the 9th month (p = 0.082), yet the values were similar at baseline (p = 0.458). Other haematological parameters had medians that were similar at both time points.

Table 5: Median haemogram of subjects on placebo at baseline and nine months

Parameter	**Baseline Median (Range)**	**Nine Months Median (Range)**	***p-value***
Total lymphocytes		2359.5(1225.0-4010)	
ESR	31.0(3.0-102.0)	42.0(10.0-102)	0.115
WBC	4.7(2.2-9.4)	4.8(1.1-11.2)	0.920
RBC	4.4(3.41-5.94)	4.1(1.0-5.8)	0.089
Hb	13.2(8.6-15.4)	12.3(8.0-15.7)	0.353
HCT	39.0(28.5-43.7)	37.1(32.5-42.6)	1.000
MCV	85.7(66.0-107)	93.8(64.0-115.9)	0.162
MCH	28.7(20.5-39.0)	31.6(20.0-41)	0.330
MCHC	33.45(30.0-32.0)	33.6(31.3-38.2)	0.495
PLT	260.0(87.0-468)	264.0(142.0-458.0)	0.626

WBC ($x10^9$/l); total lymphocytes($x10^9$ /l); ESR (mm/hr);

Within the placebo arm, a marginal decline in the RBC count was noted between baseline and values at the nith month (p = 0.089), other values staying largely the same.

Table 6: Median haemogram of subjects on intervention at baseline and nine months

Parameter	Baseline Median (Range)	Nine Months Median (Range)	p-value
Total lymphocytes		2188.5(764.0-3989)	
ESR	45.0(3.0-105)	30.0(9.0-87.0)	0.049
WBC	4.8(2.4-7.8)	4.3(2.5-7.1)	0.466
RBC	4.3(2.6-5.4)	4.5(3.0-5.5)	0.668
Hb	12.5(10.1-15.7)	12.6(9.4-14.7)	0.796
HCT	37.8(21.2-45.4)	39.3(33.1-44.0)	0.346
MCV	84.3(65.0-113.0)	86.6(62.8-114.3)	0.830
MCH	28.8(18.6-46.7)	28.4(17.8-42.9)	0.587
MCHC	33.3(28.0-58.0)	32.6(28.4-37.5)	0.235
PLT	216.5(129.0-399)	219.0(95-426)	0.71

WBC ($x10^9$/l); total lymphocytes($x10^9$ /l); ESR (mm/hr); Within the intervention arm, a significant reduction was noted in the median ESR count (p = 0.049) as other median haematological parameters remained the same.

5.0 DISCUSSIONS

The mean age in years of subjects in the intervention arm was 37.6 (7.8) compared to 39.7 (10.3) in the placebo. The subjects on placebo had a median monthly income of Kshs 9000 (1500-15,000) compared to those on the intervention who had an income of Kshs 9000 (4,000-60,000), these being similar and suggesting that the subjects were not different economical. The median BMI of subjects on placebo changed from 24.0 (19.92-41.78) to 24.0(19.15-42.15) after intervention (p = 0.692) while that of subjects on intervention changed from 24.58(19.53-32.89) to 25.10 (19.47-33.76) after intervention (p = 0.003). In both arms, hardly any subject was employed. While about half the subjects had social support systems, financial support was lacking for close to 80% of the subjects in both arms. Thus, while the subjects were fairly comparable in their socio-demographic characteristics, suggesting that the randomization made the two groups fairly similar, it was worrying that over 80% of the subjects lacked financial support. This compounded their challenges of fighting HIV as they were not able to afford to feed themselves properly and take care of their financial needs and that of their dependents.

Women were a majority in both study arms probably because they are more willing to get help for issues affecting their health. Study subjects in both arms were comparable by marital status. Majority of subjects had children who depended on them. By education status, the subjects were comparable between the groups. Most of the subjects had attained some level of education, those on the intervention arm having a higher proportion of more educated persons.

The ESR was not different at baseline in both groups but almost attained significant difference at the 9th month of intervention, the intervention group having a much lower value (p = 0.074). The same was the trend in the MCHC, the intervention arm having a lower value than the placebo

group (p = 0.088). However, the other hematological parameters were neither different at baseline nor at the 9th month of intervention.

The serum zinc values in the intervention and placebo arms were similar at baseline, 3rd, 6th and 9th months and lower than normal values at all time points. This suggests that the intervention did not have any zinc and was thus not useful in restoring this trace element that is essential in human immunity nor did it improve its absorption from the diet.

The median PLT count was much lower in the intervention arm than the placebo at the 9th month of intervention (p = 0.045) while they were not different at baseline (p = 0.332). Similarly, the median ESR was nearly significantly lower in the intervention arm than the placebo at the 9th month (p = 0.082), yet the values were similar at baseline (p = 0.458). Other hematological parameters had medians that were similar at both time points. This suggests that the key beneficial effect of the herbal beverage was to lower inflammation since increased inflammation was associated with high ESR and increased morbidity.

Within the placebo arm, a marginal decline in the RBC count was noted between baseline and values at the ninth month (p = 0.089), other values staying largely the same.

Within the intervention arm, a significant reduction was noted in the median ESR count (p = 0.049) as other median hematological parameters remained the same, again suggestion that both the median and mean ESR values declined in the intervention arm as did inflammation. Apparently, this was the most notable benefit from the herbal beverage, possibly suggesting that the mechanism by which it worked was via decreased inflammation that may also have resulted in decreased morbidity.

5.1 CONCLUSIONS AND RECOMMENDATIONS

Conclusions were drawn based in the study objectives of the study and possible policy recommendations suggested. For objective 1, 2 and 4 women were a majority in both study arms probably because they are more willing to get help for issues affecting their health. While about half the subjects had social support systems, financial support was lacking for close to 80% of the subjects in both arms. From this study, more men should be encouraged to be proactive in seeking healthcare, especially for such terminal illness as HIV and AIDS.

The ESR was not different at baseline in both groups but almost attained significant difference at the 9th month of intervention, the intervention group having a much lower value (p = 0.074), suggesting that this biomarker was sensitive to the intervention. The same was the trend in the MCHC, the intervention arm having a lower value than the placebo group (p = 0.088). However, the other hematological parameters were neither different at baseline nor at the 9th month of intervention, indicating that the intervention was only marginally beneficial in restoring hematological parameters of the subjects.

Finally, objective 3 was to determine the Serum Zinc levels of HIV/ AIDS subjects at baseline, three, six, and nine months' post intervention in the placebo and study group. The serum zinc values in the intervention and placebo arms were similar at baseline, 3rd, 6th and 9th months and lower than normal values at all time points, suggesting that the intervention had no benefits in repletion of serum zinc levels of the subjects. The median PLT count was much lower in the

intervention arm than the placebo at the 9th month of intervention (p = 0.045) while they were not different at baseline (p = 0.332), again suggesting that the mode of action of the herbal beverage might be via PLT reduction. Similarly, the median ESR was nearly significantly lower in the intervention arm than the placebo at the 9th month (p = 0.082), yet the values were similar at baseline (p = 0.458) as other hematological parameters had medians that were similar at both time points.

Overall, the herbal beverage appears to have had only marginal benefits in improving the measured biomarkers of the study subjects, suggesting that its effective use in management of HIV and AIDS subjects may require reformulation or use of other combined therapies to maximize benefits.

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