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Original Article

Bitter kola and kola nut use and their effect on treatment outcome on People Living with HIV at a Military Hospital in Benue state Nigeria

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Abstract

Introduction *Bitter Kola (Garcinia Kola) and kola nut, contains substances attributed to numerous effects on humans including anti-inflammatory, anti-allergic properties, anti-infective and caffeinism. This study explores Bitter kola and kola nut use and its impact on treatment outcome on People Living with HIV (PLWHIV).*

Methods: *The study was conducted at a Military Hospital in Nigeria. An analytical cross-sectional study was done using questionnaire among 700 HIV-positive clients selected using simple random sampling. Data were collected by researcher and three trained assistants. Chi-square test and binary logistic regression were used for identifying associations and predictors, respectively. The level of significance was set at $p < 0.05$.*

Results: *Findings show that 260 (63.6%) and 179 (25.6%) have ever and currently used Bitter kola/Kola nut, respectively. Also, 14 (7.8%) used Bitter kola/Kola nut alone while 165 (92.2%) used it in addition to other substances, especially with alcohol 123 (68.7%). Bitter kola use was associated with age ($p = 0.037$), gender ($p < 0.001$), occupation ($p = 0.001$), and number of children ($p < 0.011$). Identified predictors were being a female (AOR 0.79; 95% CI 0.08-0.92) and earning <18,000 Naira (AOR 2.91; 95% CI 2.03-21.54). There was no association of Bitter kola/kola nut use with CD4 count and viral load suppression.*

Conclusion: *Though Kola nut and Bitter kola use was high as in the general population we have not found any effect on treatment outcome among PLWHIV. This calls for more research to ascertain if there are other possible beneficial effects on PLWHIV.*

Keywords: *Kola nut/Bitter kola use, HIV clients, treatment outcome, Nigeria*

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Introduction

Bitter Kola (Garcinia Kola), a popular nut consumed in virtually all parts of West Africa contains substances that are attributed to its numerous effects on humans. It contains carbohydrates, protein, water and crude fibers as nutritional components [1]. Also Tannin, oxalate, phytate, Trypsin inhibitor and phytochemicals referred to as anti-nutrient contents have protective or disease preventive properties. These phytochemicals are phenol, saponin, alkaloid, Flavonoid, and Glycoside [2].

Bitter Kola contains a high level of cardiac glycosides and kolaviron which are known to have anti-inflammatory [2,3] and anti-allergic properties [4]. Kolaviron blocks the signaling pathway in lipopolysaccharides induced inflammatory gene expression in macrophages and decreases secretion of Interleukin-6 (IL-6) [3].

has antioxidant properties by scavenging free radicals [5] inhibits stress response proteins and has metal chelating properties [6]. It is also known to have hepatoprotective properties [7,8] and reduces liver enzyme makers [9].Other effects of bitter cola extracts include antibacterial [10,11] and anti-parasitic properties [12] reduction of plasma glucose [13,14] inhibition of cancer cell proliferation [6]. reduction of plasma cholesterol [15] and may delay neurodegenerative disorders associated with disturbed cholinergic neurotransmitter system [16]. These mentioned properties of bitter kola are suggestive that it may be of value to PLWHIV who may require agents that may helpprevent the emergence of opportunistic infections and reducing pill burden. But on the other hand, bitter kola reduces the bioavailability of some drugs when administered concomitantly possibly by induction of liver

enzymes [17] and this may have implication on Anti-Retrovital Therapy (ART).

Kola nut has an important place in virtually all parts of Nigeria and West- Africa where it is consumed commonly for social, religious, and medicinal reasons like in the treatment of whooping cough and other obstructive airway diseases [18]. It contains a high quantity of caffeine1 which causes increased alertness [19] and is said to have antioxidant properties [20] Caffeine (kola nut) administered concomitantly with Halofantrine reduces its absorption and plasma maximum concentration (Cmax) [21,22]. This may have implications on other drug's plasma concentrations as well.

Chronic Bitter kola/kola nut consumption is also associated with increased plasma concentration of low-density lipoproteins (LDL), uric acid, triglycerides, and total cholesterol [23]. Daily consumption of caffeine >500mg daily is associated with caffeinism (anxiety, restlessness, irritability, agitation, muscle tremor, insomnia, headache, diuresis, sensory disturbances, tachycardia, arrhythmia, and nausea) [24]. High Kola nut consumption may, therefore, have implications on the general well-being of PLWHIV who are on treatment. On the other hand, kola nut is said to increase the programmed cell death (apoptosis) of breast cancer cells [25]. This may be of value in preventing AIDS-defining cancers among HIV patients such as Kaposi sarcoma.

There is also a dearth of literature on Bitter kola/Kola nut use among HIV-positive patients in Nigeria. Presently, there is a gap in our understanding of why some of the clients fail on their ART even when they claim to have good drug adherence to their medication. Exploring psychoactive substance use like Kola nut among PLWHIV and their effect on treatment outcome is expected to throw more light on these issues.

Methods

Study design and setting

An analytical cross-sectional study was done at the Centre for Infectious Diseases Control (CIDC), 161 Nigerian Air Force Hospital, Makurdi of Benue state, Nigeria. The Centre provides comprehensive HIV care services for over seven thousand (7,000) clients. These include military personnel, their relatives, and other civilian clients from Benue state and other bordering states.

Study participants

HIV-positive clients ≥ 18 years who have accessed care for ≥12 months preceding the study at the center or transferred in with a record of being on treatment for ≥ 12 months and who gave consent were studied. The sample size was determined using the single population proportion formula [n=Z2pq/d2] taking 50% as the prevalence of Bitter kola/Kola nut use [26]. A total of 410 clients were needed, however, 700 clients were studied.

A simple random sampling method was adopted. On each day, each client was given a card bearing a number, from 1 to the maximum attendance number usually about 120. Then random numbers were used to select 15 clients from the daily pull. Each selected client was checked to confirm if he/she meets the inclusion criteria and if nor was replaced.

Data collection tools and procedures

Data were collected using a pretested, semi-structured, interviewer administered questionnaire. It has five (5) sections. The first section was on clients specific ID. The second section captured the participant's socio-demographic variables; while the section three (3) captured the participants' HIV infection related data. Section four (4) was the alcohol, smoking and substance use (Bitter kola and kola nut) screening section; while the 5th section captured the client CD4 and Viral load results. The questionnaires were coded from numbers 001 to 700. Each selected clients client's unique ID in the facility was matched to a questionnaire code by the principal investigator and recorded in a codebook. This was to ensure the linking of the questionnaire with the treatment record. Data was collected by researchers and three trained research assistants. They were trained for 6 hours on the contents of the questionnaire and procedures on data collection.

Data analysis

Data analysis was done using IBM Statistical package for social sciences (SPSS) version 23.0. The tool elicits ever used, current use (in the last 3 months), and the frequency of Bitter kola/Kola nut use. The CD4 increase was categorized as a good increase which is an increase of CD4 of at least 50cells/ ml per year from the baseline CD4 when the client was commenced on ART or a poor CD4 increase if the increase per annum was less than 50cells/ml, or if CD4 started dropping to baseline CD4 after the initial increase or less than 50% of pick ever attained since the commencement of ART. Also, good suppression is viral load of less than 1000 copies/ml after six months of commencement.

of ART, while poor suppression was viral load greater than or equal to 1000 copies after six months on Highly Active Anti-Retroviral Therapy (HAART). A Chi-square test was applied to ascertain if there was any significant association between Bitter kola/Kola nut use with characteristics and treatment outcome (CD4 count and Viral load) of clients. The level of significance was set at $p < 0.05$. Logistic regression was used for further analysis to identify predictors at the chi-square test p-value of 0.2 and below.

Ethical Considerations

Ethical clearance was obtained from the Health Research and Ethics Committee of the University of Nigeria Teaching Hospital (UNTH). Permission was obtained from the Commander and management of the institution to embark on the study. Written informed consent was obtained from all those interviewed after the purpose of the study was explained to them. Information obtained from clients were kept confidential. The client's freedom to withdraw from the study at any point in time in spite of the consent was also respected.

Results:

Table 1 shows that the mean age of the clients was 39.3 (±10.1) years. Majority 618 (88.3%) were aged 30 to 60 years, females 441 (63.0%), Tivs 688 (98.3%), had tertiary education 304 (43.5%), married and living with their spouse 326 (46.6%) and Christians 693 (99.0%). Also higher proportion earn 18100 – 50000 naira 314 (44.9%) followed by <18,000 naira 302 (43.1%). Equally, they majorly engage in trading 255 (36.5%) followed by farming 201 (28.7%). Most have 1-3 children 317 (45.5%) followed by those with ≥4 children 354 (36.3%).

Table 1: Sociodemographic Socio-demographic characteristics of respondents

Variables	Frequency (n=700)	Percent %)
Age Groups (years)		
<30	65	9.3
30-60	618	88.3
>60	17	2.4
Mean ± SD (years)	39.3 ± 10.1	
Gender		
Male	259	37.0
Female	441	63.0
Education		
Tertiary Education	304	43.5
Secondary Education	232	33.1
Primary Education	164	23.4
Marital Status		
Married and Living With Spouse	326	46.6
Widowed/Divorced	140	20.0
Married not Living with Spouse	133	19.0
Single	101	14.4
Religion		
Christianity	693	99.0
Others (Islam, traditional religion)	7	1.0
Income (₦)		
< 18000	302	43.1
18100 – 50000	314	44.9
>50,000	84	12.0
Tribe		
Tiv	688	98.3
Others*	12	1.7
Occupation		
Business	255	36.5
Farming	201	28.7
Public Servant	173	24.7
Student/applicants	71	10.1
No of children		
None	129	18.4
1-3	317	45.3
≥ 4	254	36.3

*Others includes all non-Tiv participants

Table 2 shows 260 (63.6%) have used Bitter kola/Kola nut before and 179 (25.6%) of the participants currently used Bitter kola/Kola nut in the past 3 months. A higher proportion of the clients 150 (83.8%) used Bitter kola/ Kola nut mildly and 29 (16.2%) used moderately. Also, 89 (49.7%) used it one once/twice and 6 (3.4%) daily in the past 3 months. Concisely, 14 (7.8%) used Bitter kola/Kola nut alone while 165 (92.2%) used in addition to other substances. The substances used together with Bitter kola/Kola nut were alcohol 123 (68.7%), tobacco 82 (45.8%), cannabis 6 (3.4%), and others 12 (6.8%).

Table 2 : Use of Bitter kola/Kola nut

Variables	Frequency (n=700)	Percent (%)
Ever Used Bitter kola/Kola nut		
Yes	260	37.1
No	440	62.9
Currently used Bitter kola/Kola nut in past 3 months		
No	521	74.4
Yes	179	25.6
Level of Bitter kola/Kola nut use in 3 months* (n=179)		
Mild	150	83.8
Moderate	29	16.2
Frequency of usage in past 3 months (n=179)		
once/twice	89	49.7
Monthly	51	28.5
Weekly	33	18.4
Daily	6	3.4
Use of Bitter kola/Kola nut (n= 179)		
Bitter kola/Kola nut alone	14	7.8
Bitter kola/Kola nut and other substance	165	92.2
Use of Bitter kola/Kola nut and other substance (n =179)$		
Bitter kola/Kola nut and alcohol	123	68.7
Bitter kola/Kola nut and t obacco	82	45.8
Bitter kola/Kola nut and cannabis	6	3.4
Bitter kola/Kola nut and others#	12	6.8

#Others includes cocaine, sedatives, inhalants, opioids, hallucinogens
$ - mutually exclusive/multi choice

Table 3 shows that there were statistically significant associations between current use of Bitter kola/Kola nut with gender ($p < 0.001$), educational level ($p= 0.040$), and number of children ($p = 0.003$). There were no statistically significant associations between current use of Bitter kola/Kola nut with age group ($p = 0.053$), marital status ($p = 0.119$), religion ($p= 0.685$), tribe $p = 0.514$), (occupation ($p= 0.075$) and income ($p= 0.057$). Females were about 80% more (AOR 0.83; 95% CI 0.06-0.97) likely to never use Bitter kola/Kola nut than males.

Table 3: Socio-demographic characteristics influencing current use of Bitter kola/Kola nut

Current use of Bitter kola/Kola nut				
Variables	**Yes**	**No**	**χ^2 (p value)**	**AOR[#] (95% CI[$])**
	Freq[*](%)	**Freq*(%)**		
Age cat				
18-25	12(18.5)	53(81.5)		3.62 (0.23-14.55)
26-60	159(25.7)	459(74.3)	5.86(0.053)	1.77 (0.09-8.63)
>60	8(47.1)	9(52.9)		1
Sex				
Female	86(33.2)	173(66.8)	12.59 (<0.001)	0.83 (0.06-0.97)[*]
Male	93(21.1)	348(78.9)		1
Education				
Primary	30(18.3)	134(81.7)		1.68 (0.46-10.35)
Secondary	61(26.3)	171(73.7)	6.45(0.040)	1.39 (0.67 -5.31)
Tertiary	88(28.9)	216(71.1)		1
Marital Status				
Married (With Spouse)	74(22.7)	252(77.3)		2.27 (0.62-7.47)
Married (not with Spouse)	35(34.7)	66(65.3)	5.85 (0.119)	4.41 (0.78-11.55)
Single	35 (26.3)	98(73.7)		3.69 (0.82-16.08)
Widowed/Separated/ Divorced	35(25.0)	105(75.0)		1
Religion				
Christianity	178(25.7)	515(74.3)	0.47(0.685)	NA
Others	1(14.3)	6(85.7)		
Tribe				
Tiv	175(25.4)	513(74.6)	0.39 (0.514)	NA
Others	4(33.3)	8(66.7)		
Occupation				
Farming	38(18.9)	163(81.1)		1.52 (0.72-3.45)
Business	71(27.8)	184(72.2)	6.91 (0.075)	1.34 (0.67-4.53)
Civil/Public Servant	48(27.7)	125(72.3)		1.67 (0.12-12.44)
Student/none	22(31.0)	49(69.0)		1
Income				
< 18000	67(22.2)	235(77.8)		3.67(0.03-11.74)
18100 – 50000	94(29.9)	220(70.1)	5.72 (0.057)	2.36 (0.93-12.32)
>50,000	18(21.4)	66(78.6)		1
No of Children				
None	48(37.2)	81(62.8)	11.45(0.003)	2.44(0.16-10.66)
1-3	75(23.7)	242(76.3)		3.10 (0.77-9.25)
≥ 4	56(22.0)	198(78.0)		1

NB: Freq[*] – Frequency, AOR[#] – Adjusted Odd Ratio, CI[$] –Confidence Interval, Level of significance + p value < 0.05

Table 4 shows that there was no statistically significant association with the CD4 count increase of those that currently use Bitter kola/Kola nut (p = 1.000) and severity of use (p = 0.453). Also, there was no statistically significant association in the viral load suppression of those that current use (p=0.682) and severity of use (p = 0.873) of Bitter kola/Kola nut among the clients.

Table 4: : Bitter kola/Kola nut use influence on HIV related factors among clients

CD4 COUNT				
Variables	**Good n (%)**	**Poor n (%)**	**BIVARIATE χ2(p value)**	**MULTIVARIATE AOR (95% CI)**
Current use of Bitter kola/Kola				
Yes	214(92.6)	17(7.4)	0.00(1.000)	NA
No	378(92.6)	30(7.4)		
Level of Bitter kola/Kola use				
Mild	472(93.1)	35(6.9)	0.74(0.453)	NA
Moderate	120(90.9)	12(9.1)		
Severe	-	-		
VIRAL LOAD				
	Good n(%)	**Poor n(%)**		
Current use of Bitter kola/Kola				
Yes	229 (90.2)	25 (9.8)	0.22(0.682)	NA
No	395 (91.2)	38 (8.8)		
Level of Bitter kola/Kola use				
Mild	490(90.9)	49(9.1)	0.02(0.873)	NA
Moderate	134(90.5)	14(9.5)		
Severe	-	-		

NB: AOR[#] – Adjusted Odd Ratio, CI[$] – Confidence Interval, Level of significance + p value < 0.05

Discussion

The prevalence of bitter kola and kola nut in this study was high with over one-fourth (1/4) of the clients using one form of Kola or the other. Generally bitter cola and kola nut are socializing agents/ingredients in the country and is shared in many traditional social events. This high prevalence of kola nut and bitter cola in our society has been shown in various studies conducted among the Nigerian population 27,28]. Bitter cola is also used locally as a treatment for cough and catarrh. On the other hand, the prevalence of kola nut and bitter cola noted in this study was less than the prevalence of Kola nut use among PLWHIV at Usmanu Danfodiyo University Teaching Hospital Sokoto state, Nigeria [26]. This is expected since kola nut use is commoner among Hausas and other tribes in the northern part of Nigeria where kola nut is consumed as a socializing agent unlike in Benue where alcohol is regarded as a more socializing agent than kola nut..

Males have a higher tendency than females to use kola nut and bitter cola. This higher prevalence of use just like other psychoactive substances among males than female counterparts is in agreement with various studies locally in Jos [29] and Abuja [30]. This is also in agreement with other studies carried out among other populations in Nigeria [28,31].

Therefore, gender is a strong predictive factor to psychoactive substance use among PLWHIV who are accessing care at 161 NAF hospital Makurdi similar to what is obtainable in the general population.

Bitter kola (Garcinia) and kola nut (Cola nitida and Cola acuminate) are commonly used substances by the respondents but there was no significant difference in the CD4 count or viral load of clients who use them and those who do not use them. A probable explanation for the finding may be the low quantity and frequency of kola nut use as reported in this work where higher proportion of the clients (over 80%) used bitter kola/kola only mildly. The level of consumption may be below threshold to have clinical significance including impact on treatment outcome.

However, Bitter Kola contains a high level kolaviron which are known to have anti-inflammatory effect [2,3], decreases secretion of Interleukin-6 (IL-6) [3]. has antioxidant properties by scavenging free radicals [5] and have hepatoprotective properties [7,8] These mentioned properties of bitter kola are suggestive that it may be of value to PLWHIV who may require agents that may help prevent the emergence of opportunistic infections and reducing pill burden. On the other hand, it is said to increase the programmed cell death (apoptosis) of breast cancer cells [25]. This may be of value in preventing AIDS-defining cancers among HIV patients such as Kaposi sarcoma. One study demonstrated that baicalin, a flavonoid isolated from Scutellaria baicalensis (Lamiaceae), inhibits HIV-1 infection and replication. Baicalein and other flavonoids such as robustaflavone and hinokiflavone have been shown to inhibit HIV-1 and reverse transcriptase.[32https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6454915/ - ref22]. High Biterkola/Kola nut consumption may, therefore, have implications on the general well-being of PLWHIV who are on treatment.

Although there were not much studies regarding their effect on viral load or CD4 count of clients on HAART, some studies have indicated that they may influence the plasma concentration of some medication medications [33,34] For instance kola nut taken concomitantly with Halofantrine reduces its absorption and plasma maximum concentration (Cmax) [21,22]. possibly by induction of liver enzymes [17]. This is likely to have implication on other drugs' plasma concentrations as well including ART which is not the case in this study.Therefore, it may be necessary that further studies be done to see other potential effects of either bitter kola or cola nut on the treatment outcome of clients on HAART apart from CD4 count and viral load assay.

Conclusion

The use of kola nut and Bitter kola use was high as in in the general population. Socio- demographic characteristics influences use. It has no effect on treatment outcomes. More research is necessary to see if there are possible beneficial effects on such patients .

Conflict of interest

The authors have declared that they have no conflict of interest, financial or non-financial.

Authors contributions

GE and EA conceptualized and designed the work. GE wrote the literature review. EA did data analysis. Both EA and GE wrote the whole work, reviewed it and agreed on its publication.

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