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# Assessment of consumption of kolanut (*Cola nitida*) on hepato-renal and reproductive hormones biomarkers among chronic consumers in Aritallin Bayelsa State Nigeria

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## Abstract

Kolanut is a caffeine containing nut. This study was aimed at assessment of consumption of kolanut (*Colanitida*) on hepato-renal and reproductive hormones biomarkers among chronic consumers in Aritallin, Bayelsa State, Nigeria. Five millilitres blood specimen was withdrawn for biochemical investigations from each of the sixty apparently healthy volunteers with thirty being chronic consumers (≥ 5) years of kolanut (*Cola nitida*) while the other thirty being non kolanut consumers. The results revealed significant elevation ($p<0.05$) of alanine aminotransferase (21.41 ± 2.83) U/I, aspartate aminotransferase (18.75 ± 2.07) U/I, alkaline phosphatise (32.60 ± 2.18) U/I, creatinine (137.22 ± 9.78) µmol-[1] and urea (15.92 ± 2.82) mmol-[1] in the chronic consumers as compared to the non consumers alanine aminotransferase (10.50 ± 1.40) U/I, aspartate aminotransferase (9.60 ± 1.22) U/I, alkaline phosphatise (18.67 ± 1.78) U/I, creatinine (66.30 ± 1.86) µmol-[1] and urea (5.22 ± 1.31) mmol-[1] . However, there was no significant differences ($p>0.05$) between the chronic consumers and non consumers of kolanut (*Colanitida*) in the measured reproductive hormones. In conclusion, chronic consumption (≥5 years) of kolanut (*Cola nitida*) may influence hepato-renal disorders.

**Keywords:** Kolanut; Hepato-renal; Reproductive hormones; Chronic consumers; Aritallin

## 1. Introduction

Kolanut is a bitter flavoured caffeine containing nut that belongs to the genus *Cola* and species *Cola acuminate* and *Cola nitida* [1]. This nut is used by most Africans as a masticatory stimulant. Besides, it is also used in social, religious, ritual and ceremonial functions [2] as well as coffee berry and tea leaf in ancient times [3].

The caffeine content of this nut influences its use as food source as well as alternative .medicine in some cultures globally [4]. Preliminary studies of phytochemicals have shown that this nut contains ingredients (such as caffeine, theophyline and polyphenols) [5].

Kolanut has beenreported by some researchers to cause smooth muscles relaxation [6] while the caffeine content has beenreported to combat fatigue by stimulating central nervous system, heart and muscles [7]. Besides, this nut is also known to stimulate gastric acid production, aid digestion as well as improve the taste of food [8].

The consumption rate of this nut in recent times has been reported to be on the increase in the

Eastern region of Nigeria which was attributed to the local belief that it remedies catarrh, cough, cold and diabetes [9] and also improves gastrointestinal health by the regularity and quality of bowel movements [10]. Since kolanut (*Cola*

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*nitida*) can affect the central nervous system, when consumed in large quantity there is the tendency to induce nervousness, tremors and anxiousness [11]. Also, it may trigger stomach upset due to its ability to produce heat in the body and increased production of stomach acids [12].

However, some of the side effects of caffeine which is the primary ingredient of kolanut are

- Slight elevation of Type 2 diabetes bloodglucose level as a result of its ability to lower insulin sensitivity [13].
- Reducing a woman's chances of conception by about 27%as a result of the caffeine ability to reduce the fallopiantubes muscle activity, thus hindering the carrying of eggs from the ovaries to the womb [13].
- Insomnia: The disruption of sleep by blockage of the adenosine receptor which increases during the day and induces sleep as well as the suppression of meltonin which affects the sleep-wake cycle [14].

Despite these established adverse effects on chronic consumption of kolanut, the rate of its consumption is still on the rise particularly among students as well as residents in this study area. It is therefore necessary to embark on this study which is aimed at assessment of consumption of kolanut (*Colanitida*) on hepato-renal and reproductive hormones biomarkers among chronic consumers in Aritallin, Bayelsa State, Nigeria taking into consideration the paucity of literature in this regard.

## 2. Material and methods

### 2.1. Study area

Aritalin town in Bayelsa State was where this research was done.

### 2.2. Ethical approval

Ethical approval was obtained from Niger Delta University Ethical Committee, Bayelsa State, Nigeria. The study was conductedin accordance with the Principles of Helsinki declaration of 1975 as revised in 2008 after obtaining oral informed consent from all the volunteers.

### 2.3. Volunteer group

Sixty volunteers who appeared to be in good health were randomly divided into two (2) groups as illustrated.

### 2.4. Control group

Thirty (30) apparently healthy non-kolanut (*Cola nitida*) consumers of 30-55 years made up this group.

### 2.5. Experimental group

This group was made up of thirty (30) ostensibly healthy volunteers who have consumed kolanut (*Cola nitida*) for an extended period ≥5 years and are between the ages of 30-55.

All of the recruited volunteers were healthy and free from drugs or smoking of cigarettes at the time this research was being done.

### 2.6. Sample collection

Each of the recruited volunteers had five milliliters of blood extracted from them using a syringe and dispensed into a lithium heparin anticoagulated bottle, respectively. After this, each specimen was spun for 10 minutes at 1,500 revolutions per minute using a Gulfex Medical and Scientific macro centrifuge model 800 D England.

### 2.7. Measurement of biochemical parameters

All the reagents used for these measurements were purchased commercially and the standard operational procedures (SOP) of the manufacturers were meticulously followed.

### 2.8. Measurement of alanine aminotransferase (colorimetric method)

Thecolorimetric method described by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom as modified by [15] was adopted.

### 2.9. Measurement of aspartate aminotransferase (colorimetric method)

This was determined using the colorimetric method described by Randox Laboratories Limited as modified by [15].

### 2.10. Measurement of creatinine (Jaffe reaction method)

This was determined using Jaffe reaction method describedby Randox Laboratories Limited, as modified by [15].

### 2.11. Measurement of urea (Urease Berthelot method)

This was determined using Urease berthelot method described by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom,as modified by [15].

### 2.12. Measurement of luteinizing hormone (Enzyme Immunosorbent Assay method)

This was determined using Enzyme Immunosorbent Assay (ELISA) method described by Diagnostic Automation Inc. California, United States of America as modified by [16].

### 2.13. Measurement of follicle stimulating hormone (Enzyme Immunosorbent Assay method)

This was determined using Enzyme Immunosorbent Assay (ELISA) method described by Diagnostic Automation Inc. California, United States of America as modified by [16].

### 2.14. Measurement of prolactin(Enzyme Immunosorbent Assay method)

This was determined using Enzyme Immunosorbent Assay (ELISA) method described by Diagnostic Automation Inc. California, United States of America as modified by [16].

### 2.15. Measurement of testosterone (Enzyme Immunosorbent Assay method)

This was determined using Enzyme Immunosorbent Assay (ELISA) method described by Diagnostic Automation Inc. California, United States of America as modified by [16].

### 2.16. Statistical analysis

The differences between the subjects (control and experimental) were evaluated using the student's " t" test, and the results expressed as mean and standard deviation.. The findings were deemed statistically significant at $p < 0.05$.

## 3. Results

The results of hepatic enzyme biomarkers measured in the control group as compared with that of the experimental group are shown in Table1 below

**Table 1** Mean ± S.D. ofhepatic enzyme biomarkers of the control group as compared with that of the experimental group

| Parameters | Control group (n=30) | Experimental group ( n=30) | p-value | Remarks |
|---|---|---|---|---|
| ALT (U/I) | 10.50 ± 1.40 | 21.41 ± 2.83 | 0.01 | s |
| AST (U/I) | 9.60 ± 1.22 | 18.75 ± 2.07 | 0.02 | s |
| ALP (U/I) | 18.67 ± 1.78 | 32.60 ± 2.18 | 0.02 | s |

KEYS: ALT = alanine aminotransferase, AST = aspartate aminotransferase, ALP = alkaline phosphatise, n = number of volunteers.

The results showed that the mean values of plasma alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatise (ALP) in the experimental group were significantly higher ($p < 0.05$) statistically as compared with that of the control group.

**Table 2** Mean ± S.D. ofrenal biomarkers of the control group as compared with that of the experimental group

| Parameters | Control group (n=30) | Experimental group ( n=30) | p-value | Remarks |
|---|---|---|---|---|
| Creatinine (µmol-1) | 66.30±1.86 | 137.22±9.78 | 0.03 | s |
| Urea (mmol-1) | 5.22±1.31 | 15.92±2.82 | 0.04 | s |

KEYS: n = number of subjects

The results showed that the mean values of creatinine and urea in the experimental group were significantly higher ($p < 0.05$) statistically as compared with that of the control group.

**Table 3** Mean ± S.D. of reproductive hormones of control group as compared with that of the experimental group

| Parameters | Control group (n=30) | Experimental group ( n=30) | p-value | Remarks |
|---|---|---|---|---|
| LH(mIU/ml) | 2.43±0.17 | 2.45±0.18 | 0.89 | NS |
| FSH(mIU/mL) | 2.64±0.79 | 2. 69±0.82 | 0.92 | NS |
| Prolactin (ng/mL) | 3.24±0.30 | 3.27±0. 52 | 0.87 | NS |
| Testo(ng/mL) | 6.11±0.43 | 6.15±0.52 | 0.97 | NS |

KEYS: LH = luteinizing hormone, FSH = follicle stimulating hormone, Testo = testosterone, n = number of subjects

The results showed that the mean values of luteinizing hormone, follicle stimulating hormone, prolactin and testosterone in the experimental group were not significantly different ($p > 0.05$) statistically as compared with that of the control group.

## 4. Discussion

In this study, the mean values of plasma hepatic enzyme, renal, and reproductive hormones biomarkers were compared in the chronic consumers of kolanut (*Cola nitida*) experimental group with that of the non-kolanut (*Cola nitida*) consumers (control group).

According to the study's findings, chronic kolanut (*Cola nitida*) eaters hadmean plasma alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatise(ALP ) values that were significantly higher ($p< 0.05$)in comparison to the non-kolanut (*Colanitida*) consumers (control group) as demonstrated in Table1. This significant increase, which was found in this study, and in agreement with the past work of [17] may be due to liver injury brought on by caffeine, anactive component of kolanut (*Cola nitida*), which is thought to have led to the leakage and subsequent release of these liver enzymes from the liver to the plasma.

As indicated in Table 2, the study's findings revealed that the mean values of plasma creatinine and urea in the extended kolanut (*Cola nitida*) consumers (experimental group) were significantly elevated ($p<0.05$) compared to that of the non-kolanut (*Cola nitida*) consumers (control group). This study's conclusive finding which is in agreement with the past work of [17] suggests that long-term kolanut (*Colanitida*) consumption may be harmful to the kidneys.

The results of this study demonstrated that the mean values of luteinizing hormone, follicle stimulating hormone, prolactin and testosterone were not significantly different($p > 0.05$) in the chronic kolanut (*Cola nitida*) consumers (experimental group) as shown in Table 3, when comparedto the non-kolanut (*Cola nitida*) consumers (control group),. This finding is contrary to the previous work of [13].

## 5. Conclusion

Chronic consumption of kolanut (*Cola nitida*) may elevate liver enzymes (such as alanine aminotransferase,aspartate aminotransferase and alkaline phosphatase) and renal biomarkers (such as creatinine and urea) , while reproductive hormones (such as luteinizing hormone, follicle stimulating hormone, prolactin and testosterone) are not adversely altered.

*Recommendations*

- Kolanut (*Colanitida*) consumption for a lengthy period of time (five years or more) should be well-informed as well as discouraged.
- Kolanut (*Colanitida*) consumers should occasionally undergo hepato-renal biochemical tests in a reputable and authorized medical laboratory facility.

## Compliance with ethical standards

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*Disclosure of conflict of interest*

No conflict of interest

*Statement of ethical approval*

The procedures that were used for this research work were in compliance with the Principles of Helsinki declaration of 1975 as revised in 2008. Dr Emmanuel Tonbra Egoro was responsible for the concept and experimental design of this research while also he was jointly responsible with the other authors for the statistical analysis, interpretation of results, revision and final approval for submission.

*Statement of informed consent*

Oral informed consent was obtained from all individual participants included in the study.

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