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Toxic Effects of Chronic Consumption of Ogogoro (Local Gin): A Biochemical and Haematological Study in Some Male Consumers in Ajegunle Nigeria

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Abstract

The aim of this study was to assess the toxic effects of chronic consumption of ogogoro (local gin) on some biochemical and haematological parameters. Six ml of fasting blood sample was collected via venipuncture technique from seventy five apparently healthy volunteers grouped into three with twenty five per group. Group one consisted of the non consumers of ogogoro (control group). Group two consisted of consumers o?f 5cl of ogogoro (local gin) as a single dose/day for ?6months (experimental group one). G roup three consisted of consumers of ?50cl of ogogoro (local gin) in divided dose/day for ?6months (experimental group two).The following biochemical and haematological parameters: alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, total bilirubin, urea, creatinine, uric acid, Creactive protein, fasting blood sugar, haemoglobin, erythrocytes sedimentation rate, white blood cells and red blood cells were measured quantitatively.

Index terms— toxic effects, chronic consumption, ogogoro, biochemical study, haematological study, male, nigeria.

Abstract-The aim of this study was to assess the toxic effects of chronic consumption of ogogoro (local gin) on some biochemical and haematological parameters. Six ml of fasting blood sample was collected via venipuncture technique from seventy five apparently healthy volunteers grouped into three with twenty five per group. Group one consisted of the non consumers of ogogoro (control group). Group two consisted of consumers of ?5cl of ogogoro (local gin) as a single dose/day for ?6 months (experimental group one). Group three consisted of consumers of ?50cl of ogogoro (local gin) in divided dose/day for ?6months (experimental group two).The following biochemical and haematological parameters: alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, total bilirubin, urea, creatinine, uric acid, C-reactive protein, fasting blood sugar, haemoglobin, erythrocytes sedimentation rate, white blood cells and red blood cells were measured quantitatively. The results of chronic consumers of ?5cl of ogogoro (local gin) showed no statistical significant differences (p ?0.05) in the mean values of all the measured biochemical and haematological parameters (experimental group one) as compared to that of the control group. However, 20%,12%,12%,16%, 12%, 8%, 8%, 8%, 16% and 8% of these consumers had elevated concentrations of alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, total bilirubin, urea, creatinine, uric acid, Creactive protein, fasting blood sugar and erythrocytes sedimentation rate above the respective existing maximum reference ranges while 8%, 12% and 8% had decreased concentrations of haemoglobin, white blood cells and red blood cells below the respective existing minimum reference ranges. The results of chronic consumers of ?50cl of ogogoro (ogogoro) showed statistical significant (p?0.05) elevations in the mean values of alanine aminotransferase, aspartate aminotransferase, total bilirubin, uric acid, C-reactive protein and fasting blood sugar (experimental group two) as compared to that of the control group while that of urea, creatinine and erythrocytes sedimentation rate showed no statistical significant differences as compared to that of the control group. The percentage of consumers in this group with concentrations above the existing maximum reference ranges for the measured biochemical and haematological parameters: alanine aminotransferase, aspartate

1 I. Introduction

he local gin otherwise referred to as "ogogoro" is an alcoholic drink that is very common in West Africa (1) particularly in Nigeria where it is nicknamed as akpeteshie, push me I push you, sapele water, wuru, kaikai, kparaga, ufofob, baba-erin, eyinbogo, robirobi etc (2).

This local gin (ogogoro) is distilled from the juice of raphia palm tree via local fermentation that involves the incision of the trunk of the tree with the juice collected in a gourd placed by the trunk of the tree after 1-2 days followed by its extraction and boiling of the sap thus forming steam which is condensed and subsequently collected for consumption (1).

The production of this local gin which has ethanol as the active ingredient within the range of 30-60% is mainly carried out by amateur brewers, which however makes it presumably dangerous to human health thus causing intoxication and neurotoxicity when consumed in large quantity (3).

In 2002, it was reported by some researchers that alcohol consumption was responsible for 41% of fatal road accident as well as systemic pro-inflammatory changes via intestinal routes as a result of the alteration of intestinal microbiota composition which in turn initiate the increase release of lipopolysacchaide (dysbiosis) as well as degradation of the intestinal mucosal barrier integrity (4) hence leading to its elevation in the portal vein, liver and systemic circulation. This situation in turn influences the liver immune cells to release reactive oxygen species (ROS), chemokines, leukokrienes and T cytokines which trigger tissue inflammation that may contribute to organ pathology (5).

Despite its presumable danger to human health which has attracted public health interest as reported by (6) this local gin (ogogoro) still plays a vital role in various religious and social ceremonies in Nigeria. It is in view of this, coupled with its indiscriminate and excessive rate of consumption among the populace including men, women and adolescent both male and female that this present study which is aimed at assessing its toxic effects on some biochemical and haematological parameters in humans was initiated.

2 II. Materials and Methods

Seventy five apparently healthy male volunteers between the ages of 30-40 years were recruited for this study. These volunteers were grouped into three as shown: Group one consisted of twenty five volunteers with no evidence of ogogoro (local gin) consumption before and during the course of this study (control group). Group two consisted of twenty five volunteers addicted to chronic consumption of ?5cl of ogogoro (local gin) as single dose/day for a period of ?6months (experimental group one). Group three consisted of twenty five volunteers addicted to chronic consumption of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two). As at the time of conducting this research work all the recruited volunteers were free from any ailment(s) and besides they were not addicted to cigarette smoking, drugs and coffee abuse which rules out the possibility of any effects of their lifestyle variables on the obtained results. Other physical data such as age, quantity of ogogoro (local gin) drunk per day and the duration of consumption were also obtained from these recruited volunteers whose consents and approval were sought and got before their blood specimens were collected for this research work. All the data obtained from the recruited volunteers were through open questions.

6ml fasting blood specimen was collected via venipuncture technique from each of the recruited subjects with 3ml dispensed into plain (non anticoagulated) bottles, 1ml dispensed into sodium fluoride/potassium oxalate anticoagulated bottles and mixed gently while the remaining 2ml dispensed into ethylene diamine tetraacetic acid (EDTA) anticoagulated bottles and mixed gently as well. The blood specimens in the plain (non anticoagulated) bottles were allowed to clot, retracted carefully and spun alongside the blood specimens in the sodium fluoride/potassium oxalate anticoagulated bottles using a Gulfex Medical and Scientific Macro Centrifuge, Model 800D England.

The sera obtained from the spun clotted blood specimens in the plain (non anticoagulated) bottles were used for the quantitative measurement of the following biochemical parameters with the specified methods using S23A13192 model spectrophotometer: alanine aminotransferase (ALT), colorimetric method as described in the manual of 11 th February, 2009 revised edition of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom (7,8) aspartate aminotransferase (AST), colorimetric method as described in the manual of 5 th January, 2007 revised edition of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom (9,10), alkaline phosphatase (ALP), colorimetric endpoint method as described in the manual of September, 2001 revised edition of Teco Diagnostics, 1268 N. Lakeview Avenue, Anaheim, CA 92807 1-800-222-9880 (11), total bilirubin, Jendrassik and Grof method as described in the manual of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom (12), urea, urease berthlot's method as described in the manual of 7 th January, 2011 revised edition of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT 294QY, United Kingdom (13-16), creatinine, Jaffe reaction method previously described by Jaffe in 1886 and revised on the 15 th September, 2010 by Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom (17,18), uric acid, enzymatic colorimetric method as described in the manual of 20 th October, 2009 revised edition of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom (19,20), Creactive protein, Latex turbidimetry method as described by Spin-react Diagnostic manual Spain (21,24) while the plasma obtained from the spun blood specimen in the sodium fluoride/ptassium oxalate anticoagulated bottles was used for the quantitative measurement of fasting

blood sugar using glucose oxidase/peroxidase.method as described in the manual of Randox Laboratories Limited, 55, Diamond Road, Crumlin, County Antrim, BT 294QY, United Kingdom (25). The blood samples in the ethylene diamine tetraacetic acid (EDTA) anticoagulated bottles were used for the quantitative measurement of the following haematological parameters using the specified methods: haemoglobin, cyan methaemoglobin method as described by (**??**6), erythrocyte sedimentation rate (ESR), westergren method as described by (27), total white blood cells (WBC's) count and red blood cells (RBC's) count, improved neubauer chamber counting method as described by (28).

Statistical analysis: The results obtained were expressed as mean and standard deviation, while the differences between the control and experimental groups were assessed using the student's 't' tests with the results considered statistically significant at p?0.05.

3 III. Results and Discussion

In this study comparison was made between the mean values of the serum/plasma biochemical Table 4 shows the comparison between the mean values of the serum/ plasma biochemical parameters in the chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) and that of the non consumers of ogogoro (local gin) referred to as the control group while Tables 5 shows the comparison between the mean values of blood haematological parameters in chronic consumers of ?50cl of ogogoro (local gin) in divided dose /day for a period of ?6months (experimental group two) and that of the non consumers of ogogoro (local gin) referred to as the control group. The percentage of non consumers of ogogoro (local gin) referred to as the control group and chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) with abnormal values compared with the existing reference range of the measured biochemical and haematological parameters are as shown in Table **??**.

As shown in Tables 1 and 2 respectively the mean values of all the measured biochemical and haematological parameters in the chronic consumers of ?5cl of ogogoro (local gin) as a single dose/day for a period of ?6months (experimental group one) are not statistically different significantly (p ?0.05) as compared with that of the non consumers of ogogoro (control group). However, the results revealed 20%, 12%, 12%, 16%, 12%, 8%, 8%, 8%, 16% and 8% of these chronic consumers as having values higher than the existing maximum reference ranges of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total bilirubin, urea, creatinine, uric acid, C-reactive protein (CRP), fasting blood sugar (FBS) and erythrocytes sedimentation rate (ESR) respectively as compared with the control group whose alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total bilirubin, urea, creatinine, uric acid, C-reactive protein (CRP), fasting blood sugar (FBS) and erythrocytes sedimentation rate (ESR) were within the existing reference ranges as shown in Table 3. Besides, 8%, 12% and 8% of these chronic consumers had lesser values below the existing minimum reference ranges of haemoglobin, white blood cells (WBC's) and red blood cells (RBC's) respectively as compared with the control group whose haemoglobin, white blood cells (WBC's) and red blood cells (RBC's) were within the existing reference ranges as shown in Table 3.. The mean values of the serum liver enzymes: alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) were significantly higher statistically (p?0.05) in the chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) as compared with that of the control group as shown in Table 4. These findings as established in this study and in agreement with the research work of (**??**) are presumed to be affiliated with damage to the liver which may be as a result of the bioaccumulation of some toxic chemicals in ogogoro (local gin) which probably would have led to the leakage of these enzymes from its intracellular compartment with their resultant elevation in the serum. However, 80%, 60% and 52% of these chronic consumers had higher values of alanine aminotransferase, aspartate aminotransferase and alkaline phosphatase than their respective existing maximum reference ranges as compared with the control group whose alanine aminotransferase, aspartate aminotransferase and alkaline phosphatase were within the existing reference ranges as shown in Table **??**.

The mean value of total bilirubin was significantly higher statistically (p ?0.05) in the chronic consumers of ?50c l ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) as compared with that of the control group as shown in Table 4.. The mechanism responsible for this elevation is not understood. However, 56%, of these chronic consumers had higher values of total bilirubin than the existing maximum reference range as compared with the control group whose total bilirubin were within the reference range as shown in Table **??**.

The mean values of urea and creatinine in the chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two)

showed no statistically significant differences (p?0.05) as compared with that of the control group as shown in Table 4. However, 12% and 8% of these chronic consumers had higher values of urea and creatinine than the existing maximum reference ranges respectively as compared with that of the control group whose urea and creatinine were within the existing reference ranges as shown in Table **??**. From these findings it is presumed that chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a Year 2018 The mean value of uric acid in the chronic consumers of ?50cl of ogogoro (local gin) in div ided dose/day for a period of ?6months showed statistical significant elevation (p?0.05) as compared with that of the control group (Table 4). Despite the fact that the mechanism as related to this elevation is not clearly understood, it is presumed that consumption of

?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months may influence uric acid synthesis. This presumption is however in agreement with the research work of (29) who reported an elevation in serum uric acid level as a result of chronic and excessive consumption of alcohol. However, 60% of these chronic consumers showed higher values of uric acid than the existing maximum reference range as compared with that of the control group whose uric acid were within the existing reference range as shown in Table **??**. From this finding it is presumed that chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months may be at risk of gout if the consumption rate is not regulated.

The mean value of the serum C-reactive protein was significantly elevated statistically (p?0.05) in the chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) as compared with that of the control group as shown in Table 4.. This finding as established in this study is presumed to be due to the systemic response of the chronic consumers to toxic chemicals in the ogogoro (local gin) which may have caused damage to some organs particularly the liver thus leading to disease condition and subsequently inflammation with the resultant release of interleukin 6 as well as other cytokines by the liver which in turn trigger the synthesis of C-reactive protein (CRP).

However 60% of these chronic consumers had elevated values of C-reactive protein (CRP) than the existing maximum reference range as compared with that of the control group whose C-reactive protein (CRP) were within the existing reference range as shown in Table **??**. From this finding it is presumed that chronic consumers of ?5 0cl ogogoro (local gin) in divided dose/day for a period of ?6months may be at risk of organs inflammation.

This research work went further to unveiled the statistically significant elevation (p?0.05) of the mean value of fasting blood sugar in the chronic consumers of ?50cl of ogogoro (local gin)/day in divided dose for a period of ?6months (experimental group two) as compared with that of the control group as shown in Table 4. This finding as established in this study is presumed to be caused by the decreased secretion of insulin which may be as a result of the adverse effects of the toxic chemicals in ogogoro (local gin) on the pancrease thus leading to its impairment and regulation of the body sugar level. The study further revealed that 72% of the chronic consumers of ?50cl of ogogoro (local gin)/day in divided dose for a period of ?6months had elevated values of fasting blood sugar (FBS) than the existing maximum reference range as compared with the control group whose fasting blood sugar were within the existing reference range as shown in Table **??**. This finding as established in this study shows that chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months may be at risk of hyperglycaemia.

The haematological results showed that the mean value of haemoglobin (Hb) in the chronic consumers of ?50cl of ogogoro (local gin)/day in divided dose for a period of ?6months (experimental group two) was significantly lower (p ?0.05) statistically as compared with that of the mean value of the control group as shown in Table **??**. This finding as established in this study may be attributed to the toxic effects of excessive consumption of the ogogoro (local gin) on haematopoietic system. The result of this study further revealed that 64% of these chronic consumers had lower value of haemoglobin below the existing minimum reference range as compared with that of the control group whose haemoglobin value were within the existing reference range as shown in Table **??**.This finding as established in this study shows that chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months may be at risk of anaemia as a result of reduced red blood cells production.

The mean value of erythrocyte sedimentation rate (ESR) in the chronic consumers of ?50cl ogogoro (local gin) in divided dose for a period of ?6months (experimental group two) showed no statistically significant difference (p?0.05) as compared with that of the control group as shown in Table **??**. However 24% of these chronic consumers had elevated value of erythrocyte sedimentation rate (ESR) than the existing maximum reference range as compared with that of the control group whose erythrocytes sedimentation rate (ESR) value were within the existing reference range as shown in Table **??**. This finding which showed insignificant percentage of the chronic consumers of ?50cl ogogoro (local gin) in divided dose/day for a period of ?6months as having elevated erythrocytes sedimentation rate (ESR) is not clearly understood.

This study went further to reveal a statistically significant decrease (p?0.05) in the mean value of total white blood cells (WBC's) in the chronic consumers of ?50cl/day of ogogoro (local gin)/day in divided dose for a period of ?6months (experimental group two) as compared with that of the mean values of the control group as shown in Table **??**. This finding as established in this study shows that chronic consumption of ?50cl/day of ogogoro (local gin)/day in divided dose for a period of ?6months has toxic effects on white blood cells (WBC's). This presumably may be as a result of its Year 2018 K ability to suppress white blood cells (WBC's) production. Further finding as related to the white blood cells revealed that 60% of these chronic consumers had lower value of white blood cells (WBC's) below the existing minimum reference range as compared to that of the control group whose white blood cells (WBC's) value were within the existing reference range as shown in Table **??**.

The mean value of red blood cells (RBC's) in the chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months (experimental group two) revealed a statistically significant decrease (p?0.05) as compared with that of the control group as shown in Table **??**. This finding however, is suggestive that chronic and excessive consumption of ogogoro (local gin) may have toxic effects on the red blood cells metabolism. However 64% of these chronic consumers had lower value below the existing minimum reference range as compared with that of the control group whose red blood cells (RBC's) value were within the existing reference range as shown in Table **??**.

4 IV. Conclusion

In conclusion chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ?6months may be at the risks of developing some medical problems such as liver disease, gout, organs inflammation, hyperglyceamia, anaemia etc while chronic consumers of ?5cl of ogogoro (local gin) as a single dose/day for a period of ?6months may not be at the risk of developing such problems. Number of subjects is in parenthesis while values are in percentage *=Percentage elevation than the existing maximum reference range for the measured biochemical and haematological parameters in the chronic consumers **=Percentage decrease below the existing minimum reference range for the measured haematological parameters in the chronic consumers Recommendations [1] [2]

Figure 1:

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[Note: Kparameters in the]

Figure 2:

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[2] Toxic Effects of Chronic Consumption of Ogogoro (Local Gin): A Biochemical and Haematological Study in Some Male Consumers in Ajegunle Nigeria

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i. Chronic consumption of ?50cl of ogogoro (local gin) in divided dose/ day for a period of ?6months s hould be discouraged. ii. Chronic consumers of ?50cl of ogogoro (local gin) in divided dose/day for a period of ? 6 months should check their health status regularly in order to prevent
further health complications iii. Chronic consumers of ?5cl of ogogoro (local gin) as a single dose/day for a period of ? 6months are also advised to take precaution by checking their health status regularly.

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Figure 3: :

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Parameters measured	Control (n=25)	Chronic consumers (n=25)	Remark
ALT(U/I)	9.00 ± 0.85	9.04 ± 0.86	NS
AST(U/I)	8.20 ± 0.67	8.18 ± 0.65	NS
ALP (IU/L)	20.50 ± 1.84	20.56 ±1.85	NS
Total Bil (µmol/l)	14.22 ± 0.54	14.56 ± 0.58	NS
Urea(mmol/L)	8.50 ± 1.02	8.54 ± 1.03	NS
Creatinine (µmol/l)	58.20 ± 2.10	58.50 ± 2.12	NS
Uric acid(µmol/l)	250.00 ± 3.75	250.10 ± 3.79	NS
CRP (mg/L)	2.70 ± 0.22	2.71 ± 0.23	NS
FBS (mmol/L)	4.00± 0.43	4.03 ± 0.45	NS

Keys:
N Represents The Number Of Subjects
Ns Represents Not Significant
Alt Represents Alanine Aminotransferase
Ast Represents Aspartate Aminotransferase
Alp Represents Alkaline Phosphatase
Total Bil Represents Total Bilirubin
Crp Represents C-Reactive Proteins
Fbs Represents Fasting Blood Sugar

Figure 4: Table 1 :

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Parameters measured	Chronic consumers (n=25)	Remark
Hb (%)	12.0 ± 0.27	12.2 ± 0.28	NS
ESR (mm/hour)	4.0 ± 1.02	3.8 ± 1.03	NS
Total WBC (cmm)	10, 000 ± 3.75	10,200 ± 3.80	NS
RBC (cmm)	5,500 ± 1.70	5,700 ± 1.72	NS

Keys: Ns Represents Not Statistically Significant Control (n=25)

N Represents the Number of Subjects
Hb Represents Haemoglobin
Esr Represents Erythrocytes Sedimentation Rate,
Wbc Represents White Blood Cell
Rbc Represents Red Blood Cell

[Note: K]

Figure 5: Table 2 :

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Figure 6: Table 3 :

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Figure 7: Table 4 :

.1 Parameters measured

Control (n=25) Chronic consumers (n=25) Remark ALT(U/I)

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