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STATUS OF SOME HAEMATOLOGICAL PARAMETERS AMONG CHRONIC CONSUMERS OF CALABASH CHALK IN AMASSOMA BAYELSA STATE NIGERIA

Kingsley Chukwuka Amaihunwa* Collins Ohwonigho Adjekuko[1] and Mokogwu Azukaego Thomas Hughs[2]

*& [2]Department of Medical Laboratory Science, Delta State University, Abraka, Delta State, Nigeria.
[1]Department of Medical Laboratory Science, University of Delta Agbor, Delta State, Nigeria.

***Corresponding Author: Kingsley Chukwuka Amaihunwa**
Department of Medical Laboratory Science, Delta State University, Abraka, Delta State, Nigeria.

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ABSTRACT
Calabash chalk is a geophagic material used for medicinal, spiritual and cultural practices. This study was aimed on status of some haematological parameters among chronic consumers of calabash chalk in Amassoma Bayelsa State Nigeria. Five milliliters of blood specimen were withdrawn from 20 calabash consumers for < 2 years (experimental groups one), between 2-5 years (experimental groups two), 6-10 years (experimental groups three) and non- consumers of calabash chalk (control group) respectively. These specimens were subsequently dispensed into ethylene diamine tetra acetic acid containers respectively and used for the measurement of packed cells volume (microhaematocrit method), haemoglobin (cyanmethaemoglobin method), total white blood cells count (improved neubauer chamber method), platelet (haemocytometer manual method), and erythrocytes sedimentation rate (westergren method). The data were analysed using SPSS version 20.0 and analysis of variance (ANOVA) was used for the statistical analysis, while the differences between the groups which were considered significant at a p-value lesser than 0.05 were assessed using student "t" test. The results revealed significant mean value decrease of packed cells volume ($p = 0.02$), haemoglobin ($p = 0.02$), total white blood cells count ($p = 0.03$), platelet count ($p = 0.03$) and mean value elevation of erythrocytes sedimentation rate ($p = 0.02$) in the calabash consumers for 6-10 years (experimental group three) when compared with that of the control group. However, these haematological parameters were not altered significantly ($p > 0.05$) among the < 2 years (experimental group one) and 2-5 years (experimental group two) calabash consumers as compared to the control group. In conclusion, this study has revealed that consumers of calabash chalk for a period of 6-10 years are at risk of anaemia, infection, blood clotting disorder and inflammation. It is therefore recommended that consumers of this chalk particularly for 6-10 years should endeavor to check their haematological parameters occasionally in a reputable and licensed medical laboratory facility

KEYWORD: Calabash chalk, chronic consumers, status, haematological parameters, Amassoma, Bayelsa State, Nigeria.

1. INTRODUCTION

Calabash chalk, also known as calabash clay is a type of geophagic material that has been used for various purposes, such as medicinal, spiritual and cultural practices. It is typically composed of various minerals, including kaolin, quartz and mica.[1] Its medicinal uses include the treatment of various ailments such as stomach problems, diarrhea and skin conditions. The consumption of this chalk is associated with various health risks such as lead poisoning due to its high levels of lead which can cause lead poisoning and other health problems, intestinal blockages.[2]

Calabash chalk is a complex substance with various uses and health implications. Thus understanding its definition, composition, uses, health implications and cultural significance can help individuals make informed decisions about its use. This chalk which contains many trace elements as well as some toxic heavy metals such as lead, arsenic and chromium[3] is consumed mostly by pregnant women as a remedy for morning sickness.[4]

This chalk which is known by different names in different languages and regions such as calabash stone in English, Lacraie or argile I French, Ligala in Congo-mabele, nzu in Igbo, Nigeria, efun in Yoruba, Nigeria, china lake in Hausa Nigeria, toru in Izon, Nigeria, ndom in Efik/Ibibio Nigeria, eko in Bini/Edo Nigeria, shile in Ghana, umcako in Zulu South Africa[5] has been reported to be responsible for (i) increase in body weight as well

as histomorphological changes in cerebral cortex of fetuses[6] (ii) histological changes in stomach and oesophagus which may eventually transform to other pathophysiological conditions[7] (iii) oedema as well as haemorrhages in the stomach mucosa which has thus led to safety concerns regarding its consumption.[8]

This chalk which is less prevalent in developed countries is commonly found in rural area in Nigeria[9] and has been reported to possess cation exchange capacity thus employed in anti-diarrheal medication as a constituent.[10] Irrespective of the various findings as regard the chronic and indiscriminate consumption of this chalk in this part of the globe, there is still a major gap in knowledge regarding the consumption of this chalk and it adverse effects as related to some haematological parameters. It is thus expedient to carry out this research which is aimed on status of some haematological parameters among chronic consumers of calabash chalk in Amassoma Bayelsa State Nigeria.

2. MATERIALS AND METHODS

2.1 Scope of the experiment

This study was embarked on in Amassoma town which is situated in Latitude 4^{o} $55^{/}$ $36.30^{/}$ North and Longitude 6^{o} $16^{/}$ $3.50^{/}$ East with an area of 1,696 km^2. This town has a total population of 352, 285 according to 2006 census.[11;12]

2.2 Ethical approval

Informed consent was obtained from all the participants who were adequately told the reasons why their blood specimens were needed for the study. Thereafter the study was carried out in strict compliance with the principle of Helsinki declaration of 1975 as revised in 2008.[13; 14]

2.3 Study population

The study population consisted of sixty apparently healthy participants that were grouped into three experimental groups made up of 20 participants/group excluding the control group as shown:

2.3.1 Control group

This group consisted of twenty apparently healthy participants within the age range of 24 to 37 years and are non-consumers of calabash.

2.3.2 Experimental group one

This group comprised twenty apparently healthy participants of age range 24 to 37 years who are consumers of calabash chalk for a period of < 2 years.

2.3.3 Experimental group two

This group comprised twenty apparently healthy participants who were within the age range of 24 to 37 years and have consumed calabash chalk for a period of 2-5 years.

2.3.4 Experimental group three

This group which comprised of twenty apparently healthy participants within the age range of 24 to 37 years had consumed calabash chalk for a period of 6-10 years.

2.4 Selection criteria

1.4.1 Criteria for inclusion

All participants deemed healthy for this study exhibited no health issues.

2.4.2 Criteria for exclusion

Participants with addictions to drugs, snuff, and cigarette smoking were not included in this study.

2.5 Sample collection and processing

Five millilitres of blood samples were collected via vein-puncture method from each participant in the control and experimental group respectively and dispensed into different ethylene diamine tetra acetic acid (EDTA) anti-coagulated bottles and mixed carefully to prevent clotting. These blood samples were subsequently used for the quantitative measurement of packed cells volume, haemoglobin, white blood cells, platelets, and erythrocytes sedimentation rate.

2.6 Measurement of haematological parameters

2.6.1 Packed cells volume

The microhaematocrit method as described by the International Council for Standardization in Haematology 1980 and modified by[15a] was utilized.

2.6.2 Haemoglobin

The automated Haematology Analyzer method as described by the Clinical and Laboratory Standards Institute, 2018 and modified by[15b] was used.

2.6.3 Total white blood cells count

The improved neubauer chamber method as described in Textbook of Medical Laboratory Technology by Baker et al (1995) and modified by[16] was adopted.

2.6.4 Platelet

The haemocytometer manual method as described in Textbook of Dacie and Lewis by[17] was adopted.

2.6.5 Erythrocytes sedimentation rate

The westergren method described by Westergren in 1921 and modified by[18] was used.

Statistical Analysis

SPSS version 20.0 was used for all the statistical analysis. The data were grouped into control, < 2 years, 2-5 years and 6-10 years. The Kolmogorv – Smirnov test was used to determine normality. ANOVA was used to measure differences between the means and standard deviation. Differences in means between groups were considered significant at $p < 0.05$.

3. RESULTS

The results of the measured haematological parameters, packed cells volume, haemoglobin, total white blood cells count, platelet count and erythrocytes sedimentation rate in consumers of calabash chalk for < 2 years, 2-5 years, 6-10 years (experimental groups) as compared to non-consumers (control group) are as shown in Table 1 below:

Table 1: Results of mean ± SD values of packed cell volume, haemoglobin, total white blood cell, platelet and erythrocytes sedimentation rate measured in the Calabash chalk consumers for < 2 years, 2-5 years and 6-10 years (experimental groups) compared with the non-consumers (control group).

Groups	PCV (%)	Hb (g/dl)	WBC (cmm)	Platelet (cmm)	ESR (mm/Hour)
Control (n=20)	41.00 ± 0.72	13.20 ± 0.13	10,200± 0.95	190,000±2.15	3.00 ± 0.21
< 2 years (n=20)	40.10 ± 0.68	13.00 ± 0.11	10,190± 0.92	189,800±2.00	3.20 ± 0.23
2-5 years (n=20)	40.00 ± 0.65	12.90 ± 0.10	10,175± 0.88	189,710±1.99	3.25 ± 0.26
6-10 years (n=20)	32.00±0.61**	10.48±0.08**	8,100± 0.65*	130,000±1.21*	9.20±0.87**
F-value	45.13	30.52	36.34	42.70	33.70
P-value	0.02	0.02	0.03	0.03	0.02

KEYS: *PCV=Packed cells volume, Hb = Haemoglobin, WBC=Total white blood cells, ESR=Erythrocytes sedimentation rate.*

Packed cells volume: The mean values of packed cells volume in the consumers of calabash chalk for a period of < 2 years (experimental group) compared to the non-consumers (control group) (40.10 ± 0.68 versus 41.00 ± 0.72) %, for a period of 2-5 years (experimental group) compared to the non-consumers (control group) (40.00 ± 0.65 versus 41.00 ± 0.72) % revealed no statistically significant alterations ($p > 0.05$)

**Significant mean value decrease was observed between the consumers of this chalk for a period of 6-10 years and each of < 2 years, 2-5 years and control ($p < 0.02$)

Haemoglobin: The mean values of haemoglobin in the consumers of calabash chalk for a period of < 2 years (experimental group) compared to the non- consumers (control group) (13.00 ± 0.11 ± versus 13.20 ± 0.13) g/dl, for a period of 2-5 years (experimental group) compared to the non-consumers (control group) (12.90 ± 0.10 ± versus 13.20 ± 0.13) g/dl revealed no statistically significant alterations ($p > 0.05$)

**Significant mean value decrease was observed between the consumers of this chalk for a period of 6-10 years and each of < 2 years, 2-5 years and control ($p < 0.02$).

Total white blood cells count: The mean values of total white blood cells count in the consumers of calabash chalk for a period of < 2 years (experimental group) compared to the non- consumers (control group) (10,190 ± 0.92 versus 10,200 ± 0.95) cmm, for a period of 2-5 years (experimental group) compared to the non-consumers (control group) (10,175 ± 0.88 versus 10,200 ± 0.95) cmm revealed no statistically significant alterations ($p > 0.05$)

*Significant mean value decrease was observed between the consumers of this chalk for a period of 6-10 years and each of < 2 years, 2-5 years and control ($p < 0.03$)

Platelet count: The mean values of platelet count in the consumers of calabash chalk for a period of < 2 years (experimental group) compared to the non- consumers (control group) (189,800±2.00 versus 190,000±2.15) cmm, for a period of 2-5 years (experimental group) compared to the non-consumers (control group) (189,710±1.99 versus 190,000±2.15) cmm revealed no statistically significant alterations ($p > 0.05$)

*Significant mean values decrease was observed between the consumers of this chalk for a period of 6-10 years and each of < 2 years, 2-5 years and control ($p < 0.03$)

Erythrocytes sedimentation rate: The mean values of erythrocytes sedimentation rate in the consumers of calabash chalk for a period of < 2 years (experimental group) compared to the non- consumers (control group) (3.20 ± 0.23 versus 3.00 ± 0.21) mm/hour, for a period of 2-5 years (experimental group) compared to the non-consumers (control group) (3.25 ± 0.26 versus 3.00 ± 0.21) mm/hour revealed no statistically significant alterations ($p > 0.05$)

**Significant mean value increase was observed between the consumers of this chalk for a period of 6-10 years and each of < 2 years, 2-5 years and control ($p < 0.02$)

4. DISCUSSION

Calabash chalk is well known for its consumption in this part of the globe. In this study, packed cells volume, haemoglobin, total white blood cells count, platelet count and erythrocytes sedimentation rate were measured in order to ascertain whether the chronic consumption of this chalk may influence changes in these haematological parameters.

As shown in the Table, there were no significant alterations ($p > 0.05$) in the mean values of packed cells volume in the calabash chalk consumers for a period of < 2 years and between 2-5 years as compared to that of the non-consumers (control group). This finding is indicative

that the consumption of this chalk for this period has no adverse effect on this haematological parameter. However, there was significant decrease ($p < 0.05$) in the mean values of this haematological parameter in the consumers of this chalk for a period of 6-10 years when compared with the control group. This significant decrease ($p < 0.05$) which is in agreement with the previous work of[19,20] is indicative of anaemia which may be attributed to the presence of kaolin which is one of the major composition of calabash chalk which reduces the bioavailability of iron for absorption.[21]

As shown in the Table, there were no significant alterations ($p>0.05$) in the mean values of haemoglobin in the calabash chalk consumers for a period of < 2 years and between 2-5 years as compared to that of the non-consumers (control group) which suggests that consumption of this chalk for these period has no deleterious effect on this haematological parameter. However, a significant decrease of this haematological parameter ($p<0.05$) was observed among consumers of this chalk for a period of 6-10 years (experimental group one) as compared to the control group as shown in Table 1. This finding which is suggestive of anaemia and in agreement with the previous work of[22] may be attributed to the chronic consumption of this chalk which contains chemical substances such as kaolin, lead etc.

As shown in the Table, there were no significant alterations ($p>0.05$) in the mean values of white blood cells in the calabash chalk consumers for a period of < 2 years and between 2-5 years as compared to that of the non-consumers (control group) which suggests that consumption of this chalk for these period has no deleterious effect on this haematological parameter.

The finding from this study as shown in Table 1 further revealed significant decrease of this haematological parameter ($p<0.05$) among the consumers of this chalk for a period of 6-10 years (experimental group) when compared to the non-consumers (control group). The finding which is contrary to the previous work of[23] and in agreement with the past work of[24] indicates depression of immune reactions which may be related to the excessive phagocytosis of foreign toxins found in calabash chalk. However the findings of this haematological parameter among calabash consumers are inconsistent as reported by researchers

As shown in the Table, there were no significant alterations ($p>0.05$) in the mean values of platelet in the calabash chalk consumers for a period of < 2 years and between 2-5 years as compared to that of the non-consumers (control group) which suggests that consumption of this chalk for this period has no deleterious effect on this haematological parameter.

However, as further revealed in the Table, the mean value of platelet among the consumers of this chalk for a period of 6-10 years (experimental group one) revealed significant decrease ($p<0.05$) as compared with that of the non-consumers (control group). This finding which is indicative of clotting disorder among this category of calabash chalk consumers is in agreement with the past work of.[25] However, this finding may be associated with the chronic consumption of this chalk which contain chemical substances such as lead, kaolin etc that could have altered the clotting factors process in these individuals.

The mean values of erythrocytes sedimentation rate among the calabash chalk consumers for a period of < 2 years as well as between 2-5 years when compared with that of the non-consumers (control group) revealed no statistical significant alterations ($p>0.05$).

As further revealed in this study the mean value of this parameter revealed significant elevation ($p<0.05$) among the consumers of this chalk for 6-10 years (experimental group three) when compared to the non-consumers (control group). This finding is as established in this study since there are scarcity of relevant literatures to compare it with.

CONCLUSION

Chronic consumption of calabash chalk for 6-10 years triggers anaemia, infection, clotting and inflammatory disorders.

Recommendations

(i) Awareness campaign and education about the adverse effects of chronic consumption of this chalk should be organized be the appropriate agency in this part of the country.
(ii) Consumers of this chalk particularly for a period of 6-10 years should go for these haematological parameters check-up occasionally.

Contribution to knowledge

This study would go a long way to unfold the major gap in knowledge regarding the adverse effect chronic consumption of this chalk has on humans.

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