

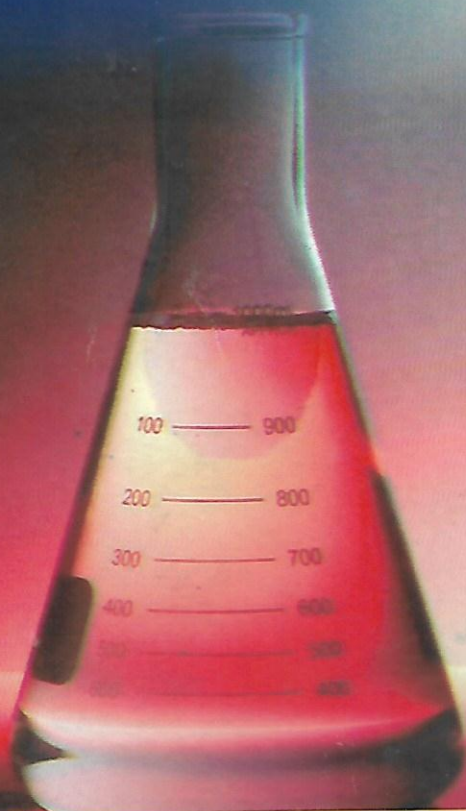
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## Article title

# COMBINED EFFECTS OF ORAL CONTRACEPTIVE, ALCOHOL AND CIGARETTE SMOKE ON SERUM LEVELS OF ZINC AND SELENIUM IN WOMEN

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Running Title: Abnormal zinc and selenium levels in women using oral contraceptive.

## ABSTRACT

This study was carried out to determine the effect of combined oral contraceptive (OC) on serum zinc, selenium and copper levels in women using COC, consuming alcohol and exposed to cigarette smoke, and to identify if differences in degree of exposure to these agents are capable of modulating effects of COC on antioxidant elements thereby increasing their risks of developing oxidative stress-induced diseases as well as hepatic diseases commonly associated with alcohol consumption. Venous blood samples were taken from the studied population for estimating trace elements and indices of hepatic function. The studied population was divided into smokers\binge drinkers and passive smokers\social drinkers groups. ALT, AST, ALP & copper were not significantly different in exposed group compared with control ( $p > 0.05$ ). Both GGT and total bilirubin were significantly increased while zinc and selenium were decreased ( $p < 0.05$ ). In addition, among the combined oral contraceptive users, both binge drinkers\smokers and social drinkers\passive smokers groups had a more depleted Zn and Se level compared with non-drinkers\non-smokers group and controls. These results suggest that women on COC consuming alcohol and smoking cigarette may be more susceptible to oxidative stress-induced diseases because of enhanced depletion of antioxidant elements, zinc and selenium.

## INTRODUCTION

Oral contraceptives are medications administered by mouth for birth control purposes and are of two main types i.e. the combined oral contraceptive pill and progestogen only pill. Their use was first approved in 1960 in the United States of America (Aiko, 2004; Taylor et al., 2006). According to United Nations (UN) Population Division, 2006, some of the factors which determine its choice as a birth control method include age, education and marital status. The levels of a number of biomolecules have been reported to be influenced by prolonged use of oral contraceptive e.g. Trussell et al. (2007) revealed high doses of estrogen and

progestin caused a low level of brain serotonin level by enhancing the level of enzyme that reduces serotonin, low level of serotonin has been linked to depression. Alteration in the levels of coagulation factors has also been reported, thereby affecting coagulation and the risk of deep venous thrombosis (Famodu, 1997; Famodu & Osadebe, 1998). Oral contraceptive use has in some cases been linked to obesity and hypercholesterolemia (Obisesan et al., 2002).

De Groote et al., (2009) revealed that oral contraceptives (OCs) with estrogens as well as progestin may affect oxidative stress (OS) status in human subjects. Results of a number



of studies have shown that there were significant differences in the levels of zinc and some other antioxidants in oral contraceptive exposed compared with non-users, even with all these side effects, some beneficial effects have also been identified e.g. its use for the treatment of acne and its ability to reduce risk of ovarian and endometrial cancer (Bast et al., 2007; Arowaju et al, 2009). This study is therefore designed to investigate if exposure to cigarette smoke and alcohol consumption will aggravate the trace element alterations associated with use of COC especially as recent epidemiologic studies have revealed an increase in mortality rate from cardiovascular diseases in people with higher serum copper levels. Either cigarette smoke or alcohol consumption can independently induce free radical generation.

## METHODS

### Subjects

Thirty females who had been exposed to combined oral contraceptive were randomly selected from Ibadan metropolis, Nigeria and another thirty non-contraceptive users served as the control group while twenty served as combined oral contraceptive users not exposed to either alcohol or cigarette smoke. Apparently, healthy subjects were used for the study. The duration of exposure to combined oral contraceptive was between 5 and 13 years. The mean ages of exposed and control groups are 31.55 and 31.90 years respectively. A well structured questionnaire was administered by a well trained person on all the women individually; subject's age, sex and information about lifestyle, drug history, and existing pathological conditions were obtained from each participant. Women with lifestyle choices, drug history and pathological conditions that may affect the result were excluded. All procedures were in conformity with the ethical standards of our institution on human experimentation and with the Helsinki Declaration of 1975, revised in 1983.

### Blood collection and biochemical analyses

Ten milliliter (10ml) of blood was collected from the ante-cubital vein of each member of the combined oral contraceptive and control groups. The blood was collected into non-anticoagulant containing bottles and centrifuged at 3000 r.p.m. for ten minutes to obtain serum. The sera obtained were immediately stored at -20°C until the time required for analysis. Activities of liver enzymes; alanine and aspartate amino transferases (ALT & AST), gamma-glutamyl transpeptidase and alkaline phosphatases (ALP); as well as concentrations of total bilirubin and zinc, copper and selenium were determined in the serum of these subjects. ALT & AST activities were estimated using the method of Bergmeyer et al., (1979); ALP by McComb & Bowen (1972) and bilirubin by modified Jendrassik-Grof method (Koch & Dumas, 1982). Hitachi 902 Automated machines (Roche Diagnostic, Germany) was used for the estimation of all other biochemical analytes except Zn, Cu and Se.

For atomic absorption measurements of Zn, Cu and Se, Buck Scientific 205 Atomic absorption Spectrophotometer (Buck Scientific, East Norwalk, Connecticut, USA) was used. Reagents were of high-purity analytical grade (Merck, Darmstadt, BDH, Chemicals Ltd). The water used for the preparation of reagents and working standard was deionized, doubly distilled and re-deionized shortly before use (Millipore Co., Bedford, MA), with specific resistance of > 3 MΩ. Working standard was prepared from the Spectrosol stock standard 1g/L (Buck Scientific). Samples and standards were diluted with a 2mM/L of aqueous solution of Triton X-100 (BDH Chemicals, Ltd). The operating characteristics of atomic absorption spectrometry for the analyzed elements are shown below Table 1.

### Statistics

The level of significance between the combined oral contraceptive users and non-



users was determined using SPSS package. Student's *t* test and analysis of variance were used to test the differences between mean values of COC users and controls. Analysis of Variance was employed to ascertain level of differences among different sub-groups; namely binge drinkers\smokers, social drinkers\passive smokers and control. Values of  $P < 0.05$  were considered significant.

## RESULTS

The results in **Table 2** are the mean  $\pm$  SEM of ALT, AST, ALP, GGT, zinc, copper, selenium, bilirubin total, and bilirubin conjugated as well as the age of the subjects. ALT, AST, ALP; enzymes employed to assess hepatic damage showed non-significant difference between the exposed group and the control group ( $p > 0.05$ ). The indicator used to assess exposure to other xenobiotics e.g. alcohol, GGT was significantly higher in COC group compared with control subjects ( $p < 0.05$ ). Significant differences were observed for zinc, selenium and total bilirubin ( $p < 0.05$ ), zinc and selenium were significantly decreased while total bilirubin was significantly increased. Conjugated bilirubin, on the other hand was not statistically different between the two groups ( $p > 0.05$ ). **Table 3** shows the results of inter-group comparison of liver enzymes; ALT, AST and GGT were significantly lower in social drinkers\passive smokers group compared with binge drinkers\smokers group ( $p < 0.05$ ). **Table 4** on the other hand shows significant decrease in the levels of zinc, copper and selenium in the smokers group compared with passive smokers.

## DISCUSSION

Looking at the results presented in **Table 2**, one can say that the results of most studies carried out on women using COC that showed that COC causes a significant decrease in the level of serum zinc compared with controls (Mc Bean et al., 1977; Crews et al., 1980; Mc Master et al., 1992; Akhter et al., 2005) is in agreement with the result of this study, in which a significant decrease ( $p < 0.05$ ) in the serum zinc level was also observed, a pointer

that some of the other xenobiotics (alcohol and cigarette) which these subjects were exposed to did not modulate COC effects on zinc metabolism. This modulation was expected because Zhang et al. (2009); Frimpong & Louis (1989) and Clywik et al. (2008) have indicated that alcohol consumption produced higher level of serum Zn while smoking caused no significant change in Zn level. Even without this modulation, the implications of a significant decrease in Zn level in these subjects are diverse; zinc deficiency has been linked to increase in oxidative stress, abnormalities in protein synthesis and in gene expression at both structural and enzymatic levels as well as impaired immune response (Perez-Torres et al., 2009).

Cigarette smoke causes generation of excessive amount of free radical beyond the capability of the endogenous anti-oxidant system. Apart from this, cigarette smoke also contains other hazardous chemicals such as carbon monoxide, nicotine, tar, benzene, radon and cadmium. The presence of cadmium in the cigarette smoke may be responsible for the significant decrease in the level of selenium in the cigarette smokers group compared with passive smokers and controls. Selenium binds with cadmium in a way suggesting the formation of a 1:1 Cd-Se-protein complex, rendering cadmium less toxic, to facilitate its elimination from the body. Smoking decreases appetite and nutrient absorption in the intestine as well as increases utilization of nutrients such as Zn and Se (Gibson, 1990). Pizent et al. (2003) has also suggested that exposure to cadmium through smoking may contribute to a decrease in serum zinc level.

There was no significant ( $p > 0.05$ ) difference in the serum level of copper of combined oral contraceptive users- smoking cigarette and consuming alcohol- compared with the controls. This is contrary to the report of the study of Werbach, (1997); Wynn, (1975) & Berg et al., (1998) who have associated OC use with increased absorption of calcium and copper and with increased blood levels of



copper and vitamin A. The modulating effect of these subjects lifestyle choices e.g. alcohol consumption & cigarette smoking which have been reported to cause lowering effect on serum copper level, may be responsible for the non-significant difference, especially as Vir et al. (1981) have reported that smoking caused a significant lowering effect on serum copper values. Moreover, Clywik et al. (2008) have pointed out that excessive alcohol intake causes a number of metabolic changes and disturbs homeostasis of macro- and microelements in the body. Zhang et al., (2009) have also indicated that both alcohol and smoking caused a lower serum copper in alcohol exposed individuals compared with their non- alcoholic counterparts whereas Schuhmacher et al. (1994) from the data obtained from their study concluded that consumption of alcohol significantly reduced the levels of zinc and copper in serum. Copper level though in non-smoking/non-alcohol consuming group was significantly higher than in control subjects.

Furthermore, data emanating from past studies have been inconsistent concerning the effects of oral contraceptive on liver cells. At least, nine case-control studies conducted in developed countries have identified an association between oral contraceptives and a type of liver disease; hepatocellular carcinoma. Some other most recent population-based data from both developed and developing countries, though have failed to confirm such an association (authors unlisted). The non-significant difference observed for both ALT & AST shows that the combined effects of these agents may cause hepatocellular damage.

The significant increase ( $p < 0.05$ ) in GGT activity, occurring concurrently with non-significant difference in the activities of ALT & AST suggests that increase in GGT activity might have been resulted from exposure to alcohol. Even with its relatively low sensitivity and specificity, GGT has been recommended as a marker for alcohol use disorders (Balldin

et al., 2010). This study is a further confirmation that GGT rather than ALT & AST is a better indicator of alcohol intake. Although the significant increase in the level of GGT might also have been as a result of exposure to cigarette smoke as these subjects were equally exposed to different degrees of cigarette smoke. Wannamethee & Shaper (2010) observed that although cigarette smoking was significantly associated with increased levels of gamma-glutamyl transferase (GGT) and alkaline phosphatase, cigarette smoking does not directly cause liver injury.

Cigarette smoke has also been identified to compound the effects of alcohol in causing liver cell injury in heavy drinkers; smoking affects the liver through inflammatory pathways, thereby aggravating the pathogenic effects of alcohol on the liver, but such effects seem to be absent in this category of subjects as revealed by the results of both hepatotoxic indicators. However, the results of our study is in agreement with that of Adams et al., (Adams et al., 2008) who also identified that ALT was not associated with alcohol consumption in males whereas GGT was significantly associated with alcohol.

Although it is known that the mature adult liver has large reserves of hepatic secretory capability, yet unconjugated hyperbilirubinemia is common in sickle-cell anemia, thalassemia and spherocytosis (Crook, 2006). The significant difference in the levels of unconjugated hyperbilirubinemia in the oral contraceptive group compared with controls might have been as a result of interaction among the different xenobiotics oral contraceptive users were exposed, although the non-significant ( $p < 0.05$ ) difference in the activity of AST rules out drug-induced hemolysis as a cause of unconjugated hyperbilirubinemia. Reduction in bilirubin uptake by the hepatocytes seems to be another possible cause of this presentation - unconjugated hyperbilirubinemia.



By sub-dividing the combined oral contraceptive users consuming alcohol and smoking cigarette into binge drinkers\smokers and social drinkers\passive smokers groups, the results in **Tables 3 & 4** once again show the harmful effects of these lifestyle choices (smoking and alcohol consumption), on human subjects. Alanine aminotransferase which was found not be significantly different when the two groups were considered together was significantly increased in binge drinkers/smoker group compared to other groups. Moreover, zinc and selenium were more significantly decreased in binge drinkers/smoker group compared with other groups.

## CONCLUSION

One of the most important side effects of oral contraceptive exposure is intravascular thrombosis which has being reported to be mediated by elevation of serum copper level. The non-significant effect observed for copper level in this study shows that this side effect may not be pronounced in the category of subjects recruited for this study. However, care should be exercised in perceiving this as a protective effect since other lifestyle choices of these subjects e.g. smoking and alcohol consumption have been reported to induce oxidative stress leading to depletion in antioxidant levels and therefore increasing the risks for oxidative stress-induced diseases. This increasing risk for oxidative stress-induced diseases was further portrayed by depletion in both zinc and selenium levels. Since cigarette smoke increases the utilization of nutrients and interacted with alcohol to cause a more depleted selenium level than the controls, therefore increase in nutrient requirement values may be considered for this category of subjects.

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**Table 1: The Operating Characteristics of AAS for Zinc, Copper, Selenium, Manganese, Iron, Cobalt, Chromium, Molybdenum and Magnesium**

Slit Width	0.7nm(Cu & Zn); 0.2nm (Se)
Wave lengths	Copper (324nm); selenium (196nm), zinc (213nm).
Burner height	Low
Gas mixture	Air – acetylene
Acetylene	12 psi
Air pressure	50 psi
Temperature	2300 °C
Analytical mode	Concentration
Measurement mode	Peak area
Linear range (mg/L)	5.00 (Cu); 2.50 (Zn); 25.00 (Se)
Sensitivity (mg/L)	2 (Cu); 0.5(Zn); 15 (Se)
Detection limit (mg/L)	0.005 (Cu); 0.005 (Zn); 0.5 (Se)
Atomizing air flow	83 $\mu$ l / second
Lamp current	18mA
Scale expansion	3
Noise suppression	2

**Table 2: Summarized Mean  $\pm$ SEM of age and some biochemical parameters of oral contraceptive users and control subjects.**

Biochemical parameter ( unit)	Oral Contraceptive users	Controls	P value
Alanine aminotransferase (IUL)	33.35 $\pm$ 2.43	32.85 $\pm$ 2.55	p>0.05
Aspartate aminotransferase (IUL)	26.80 $\pm$ 1.73	25.75 $\pm$ 1.79	p>0.05
Alkaline phosphatase (IUL)	40.41 $\pm$ 1.65	43.02 $\pm$ 2.07	P>0.05
Gama-glutamyl transferase (IUL)	39.20 $\pm$ 3.31	22.40 $\pm$ 1.28	P<0.05
Copper ( $\mu$ g/dl)	109.45 $\pm$ 6.41	127.60 $\pm$ 7.51	p>0.05
Zinc ( $\mu$ g/dl)	70.95 $\pm$ 3.55	94.75 $\pm$ 6.07	P<0.05
Selenium ( $\mu$ g/dl)	77.96 $\pm$ 3.30	102.44 $\pm$ 5.27	P<0.05
Bilirubin-total ( $\mu$ mol/L)	16.50 $\pm$ 1.13	11.65 $\pm$ 1.06	P<0.05
Bilirubin-conjugated ( $\mu$ mol/L)	7.20 $\pm$ 1.05	6.30 $\pm$ 0.92	p>0.05
Age (years)	31.55 $\pm$ 1.21	31.90 $\pm$ 1.36	p>0.05

\*significant difference at p&lt;0.05



**Table 3: Summarized Mean  $\pm$ SEM of liver enzymes of different categories of oral contraceptive users and control subjects.**

	Binge drinkers\smokers	Social drinkers\passive smokers	Non-drinkers\non- smokers	Controls
ALT (IU/L)*	40.50 $\pm$ 2.27	26.20 $\pm$ 2.89	30.82 $\pm$ 0.53	32.85 $\pm$ 2.55
AST (IU/L)	28.60 $\pm$ 2.90	25.00 $\pm$ 1.87	27.53 $\pm$ 0.35	25.75 $\pm$ 1.79
ALP (IU/L)	46.14 $\pm$ 2.65	35.40 $\pm$ 1.94	41.75 $\pm$ 1.92	43.02 $\pm$ 2.07
GGT (IU/L)*	51.30 $\pm$ 3.18	27.10 $\pm$ 1.93	23.74 $\pm$ 1.66	22.40 $\pm$ 1.28

SEM – standard error of mean; ALT-alanine amino transferase; AST-aspartate amino transferase; ALP- alkaline phosphatase; GGT-  $\gamma$ -glutamyl transferase. \*- significant difference at  $p < 0.05$ .

**Table 4: Summarized Mean  $\pm$ SEM of age, bilirubin and trace elements of different categories of oral contraceptive users and control subjects.**

	Binge drinkers\smokers	Passive smokers\social drinkers	Non- alcohol\non smoking	Controls
Age	31.40 $\pm$ 1.56	31.70 $\pm$ 1.93	30.56 $\pm$ 1.65	31.90 $\pm$ 1.36
Copper ( $\mu$ g/dl)	102.50 $\pm$ 8.18	116.40 $\pm$ 9.80	150.10 $\pm$ 3.78	127.60 $\pm$ 7.51
Zinc ( $\mu$ g/dl)*	67.40 $\pm$ 5.65	74.50 $\pm$ 4.29	81.04 $\pm$ 1.68	94.75 $\pm$ 6.07
Selenium ( $\mu$ g/dl)*	72.88 $\pm$ 4.73	83.05 $\pm$ 3.88	91.20 $\pm$ 3.56	102.44 $\pm$ 5.27
Bilirubin-total* ( $\mu$ mol/L)	16.90 $\pm$ 1.71	16.10 $\pm$ 1.56	15.89 $\pm$ 0.48	11.65 $\pm$ 1.06
Bilirubin- conjugated ( $\mu$ mol/L)	7.50 $\pm$ 1.07	6.90 $\pm$ 1.88	6.00 $\pm$ 0.87	6.30 $\pm$ 0.92

SEM-standard error of mean. \*- significant difference at  $p < 0.05$ .



## **A STUDY ON THE EFFICACY OF HIV PREVENTION COUNSELING OF CLIENTS IN ANAMBRA STATE**

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### **ABSTRACT**

The study focused on the efficacy of HIV-prevention counseling of clients in Anambra State. Three research questions and three null hypotheses guided the study. A sample of 207 nurses selected from Tertiary, Secondary and Primary levels of Health Care Institutions were used for the study. The instrument for data collection was checklist titled CHCS. Statistical weighted mean was used to answer the research questions, and Analysis of Variance (ANOVA) was adopted in testing the null hypotheses at 0.05 level of significance. The result showed that the HIV-prevention counselors in Comprehensive Health Centres (Primary Level) adhere mostly to the elements of HIV-prevention counseling and also possess the best counseling skills, while the counselors in Voluntary Agency Hospitals (Secondary Level) are best in ensuring high quality HIV-prevention counseling. Significant differences existed in the mean scores of the counseling strategies and quality HIV-prevention counseling between the providers in tertiary, secondary and primary levels of Health Care delivery. Recommendations were given based on the findings.

### **INTRODUCTION**

Counseling is the helping relationship that includes someone seeking help, and someone willing to give help who is capable or trained to help in a setting that permits help to be given and received (Cormier & Hackney, 1987). It is a specialized service of guidance, and basically an enabling process designed to help an individual come to terms with his/her life and grow to greater maturity through learning to take responsibility and make decisions for himself/herself (Basavanthapa, 2004).

Vedanayagam (1988) cited by Basavanthapa (2004) asserts that counseling is an accepting, trusting and safe relationship in which clients learn to discuss freely what upsets them, to define their goals, to acquire essential social skills and to develop the courage and self-confidence to implement desired new behaviour. Thus counseling implies a learning oriented process carried

out in a social environment in which the professionally competent counselor attempts to assist the counselee using appropriate procedures to become a happy and productive member of the society by formulating realistic and purposeful goals for total growth.

HIV-prevention counseling seeks to reduce HIV acquisition and transmission through information. In HIV-prevention counseling, clients should receive information regarding HIV transmission, prevention and the meaning of HIV test results. It must be noted that provision of information is different from informed consent.

*All clients who are recommended for and who request HIV testing should even if the test request is declined, receive information regarding the HIV and how it can be prevented, plus the importance of obtaining test results and explicit procedures for doing so.*



Kelly & St. Lawrence (1987) indicated additional useful information that should be given to clients in settings where HIV testing are offered as descriptions or demonstrations of how to use condoms correctly, information regarding risk-free and safer sex options, information regarding other sexually transmitted and blood borne diseases, descriptions regarding the effectiveness of using clean needles, syringes, cotton wool, water and other drug paraphernalia, information regarding drug treatment, and information regarding the possible effects of HIV vaccines on test results for persons participating in HIV vaccine trials. Kelly & St. Lawrence (1987) further explained that in HIV-prevention counseling, information should be provided in a manner appropriate to the client's culture, language, sex, sexual orientation, age and developmental level.

Parker (2002) asserts that risk behaviours place an individual at risk of infection rather than associations with particular group. Therefore in HIV-prevention counseling, clients should receive help to identify the specific behaviours that put them at risk of acquiring or transmitting HIV, and commit to steps to reduce this risk. Parker (2002) also added that HIV-prevention counseling should focus on the client's own unique circumstances and risks, and should help the client set and reach an explicit behaviour change goal to reduce the chance of acquiring or transmitting HIV.

According to Centre for Disease Control (CDC) HIV CTR (1999), all HIV counseling, testing and referral (CTR) providers should ensure efficient HIV-prevention counseling of clients by subjecting themselves and their services to training and quality assurance, HIV-prevention capacity building activities

and evaluation of major programme activities, interventions and services. CTR providers should conduct routine periodic assessments for quality assurance to ensure that the counseling being provided includes the recommended essential counseling elements namely training and Continuing Education for counselors and supervisors, supervisor observations and immediate feedback to counselors, periodic evaluation of physical space, client flow and time concerns, periodic counselor or client satisfaction evaluations and periodic case conferences.

Kamalan (2005) warned that the emergence of HIV infection is a serious public health problem all over the world. According to him, HIV has infected millions of women, men and children in developed as well as developing countries. WHO cited by Kamalan (2005) had predicted that by the turn of the last century, 30 to 40 million people would be infected with HIV. Also, the global AIDS policy estimated the figure of HIV infected people to be 110 million (Kamalan, 2005).

According to Rose (1996), clinical experience suggests that the "emerging epidemic" of HIV presents a unique challenge to women especially mothers. This rising trend of HIV certainly poses challenge to the effectiveness of the counseling strategies adopted by Health Care providers in HIV-prevention counseling.

### STATEMENT OF PROBLEM

The problem of the study is the efficacy of HIV-prevention counseling methods for clients.

### RESEARCH QUESTIONS

- To what extent do the HIV-prevention counselors adhere to the elements of effective HIV-prevention counseling of clients?
- What skills do the HIV-prevention counselors possess in ensuring effective HIV-prevention counseling of clients?



- What measures do the HIV-prevention counselors adopt effective HIV-prevention counseling of clients?
- What measures do the HIV-prevention counselors adopt to ensure high quality HIV-prevention counseling?

## HYPOTHESES

- There is no significant difference in the mean scores of the HIV-prevention counseling strategies adopted in the Tertiary, Secondary and Primary Care Health Institutions.
- Significant difference does not exist in the mean scores of the skills of the HIV-prevention counselors in Tertiary, Secondary and Primary Health Care Institutions.
- Significant difference does not exist in the mean scores in ensuring high quality counseling among the HIV-prevention counselors in Tertiary, Secondary and Primary Health Care Institutions.

## METHOD

The study was a survey. Judgmental sampling technique was adopted in selecting Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi which is the only Teaching (Tertiary) Hospital in Anambra State. Simple random sampling was used to select 4 General Hospitals, 2 Voluntary Agency Hospitals and 2 Comprehensive Health Centres out of the 24 General Hospitals, 7 Voluntary Agency Hospitals and 10 Comprehensive Health Centres in Anambra State. This was to give all the government and voluntary agency hospitals equal chance of being selected for the study (Nworgu, 1991). The General Hospitals selected were General Hospital Awka, General Hospital Onitsha, General Hospital Ekwulobia and General Hospital Enugwu-Ukwu. The Voluntary Agency Hospital selected were St. Charles Borromeo Hospital Onitsha and Akwudo Diocesan Hospital Nnewi, while the CHC Dunukofia and CHC Nnewi were the Health centres selected.

A sample size of 23 nurses who participated in HIV-prevention counseling were selected from each of the selected Health institutions. Total number of nurses selected for the study was 207.

The instrument used for data collection in the study was checklist titled Client-Centred HIV-Prevention Counseling Scale (CHCS) which is made up of three subsections namely elements of HIV-prevention counseling, skills for effective counseling/counselor characteristics, and quality assurance measures in HIV-prevention counseling.

The instrument was designed by the researchers in 4 point scale ranging from 1 to 4 with poor having 1 point, fair 2 points, good 3 points and very good 4 points.

The instrument was face validated by three experts in preventive medicine, HIV-prevention counseling supervision as well as Measurement and Evaluation. These experts were given copies of the draft instrument, research questions and hypotheses for content validation.

The instrument was also subjected to reliability test by collecting data through interview of 10 nurses who participated in HIV-prevention counseling in a State Hospital in Enugu State. The aggregate scores were calculated, and then *cronbach alpha* was employed to determine the internal consistency of the items. The result showed reliability co-efficient score of 0.8.

The researchers used direct approach method in the data collection so as to interact with the respondents and also to facilitate the work. Trained research assistants were also employed for the data collection. Mean scores and standard deviations were used to answer the research questions, while Analysis of Variance (ANOVA) was employed in testing the null hypotheses at 0.05 level of significance.



**Results:** The results of the study are presented in the table below:

**Table 1: Mean scores of the extent of adherence to the Element of HIV -prevention counseling by HIV counselors.**

Variable	Health Institution	N	X	SD
Elements of HIV -Prevention Counseling	Teaching Hospitals (Tertiary Hospital)	23	2.7826	0.36129
	General Hospital	92	2.7826	0.45596
	Voluntary Agency Hospital	46	2.9766	0.39553
	Comprehensive Health Centres	46	3.0318	0.34991

Table 1. shows that HIV-Prevention counselors in Comprehensive Health Centres have the highest mean score of 3.0318 with a standard deviation of 0.34991 with regard to adherence to the elements of HIV-Prevention counseling. Next in the rating is the mean

score of 2.9766 by the HIV-Prevention Counselors in Voluntary Agency Hospitals while the counselors in Teaching and General Hospitals have the least mean scores of 2.7826 respectively.

**Table 2: Mean score of the skills of the HIV -Prevention counselors towards ensuring effective counseling of clients.**

Variable	Health Institution	N	X	SD
Skills for Effective HIV -Prevention Counseling	Teaching Hospital	23	2.9684	0.39112
	General Hospital	92	3.0287	0.50246
	Voluntary Agency Hospital	46	3.0277	0.37255
	Comprehensive Health Centre	46	3.1008	0.38770

In table 2 above, the HIV-Prevention Counselors in Comprehensive Health Centres had the highest mean score of 3.1008 with a standard deviation of 0.38770 in skills for effective HIV-Prevention Counseling. The second in the order are the HIV-Prevention Counselors in General Hospitals with mean score of 3.0287 and

standard deviation of 0.50246. The third in the ranking are the HIV-Prevention Counselors in Voluntary Agency Hospital whose mean score is 3.0277, while the HIV-Prevention Counselors in Teaching Hospitals have the least mean score of 2.9684 with a standard deviation of 0.3911.

**Table 3: Mean scores for ensuring high quality HIV -prevention counseling by the HIV -Prevention counselors.**

Variable	Health Institution	N	X	SD
Ensuring High Quality HIV-Prevention Counseling	Teaching Hospital	23	2.4928	0.52938
	General Hospital	92	2.7745	0.50555
	Voluntary Agency Hospital	46	3.0217	0.46628
	Comprehensive Health Centre	46	2.5670	0.46667

Above table 3 shows that the HIV-Prevention counselors in Voluntary Agency Hospitals have the highest mean score of 3.0217 with a standard deviation of 0.46628 in ensuring high quality HIV-Prevention counseling. Next in the ranking are the HIV-Prevention counselors in General Hospitals with a mean

score of 2.7745 and standard deviation of 0.50555. The third in the rating are the counselors in Comprehensive Health Centres with mean score of 2.5670 and standard deviation of 0.46667. The HIV-Prevention counselors in Teaching Hospitals have the least mean score of 2.4928 with a standard deviation of 0.52938.



**Table 4. Analysis of Variance (ANOVA) to compare the means of HIV -Prevention counseling strategies of Teaching Hospital, General Hospital, Voluntary Agency Hospitals and Comprehensive Health Centres.**

Source	Sum of Squares (SS)	Df	X	f-cal	f-crit	probability
Between groups	2.579	3	0.860	5.083	0.002	P<0.05
Within groups	34.340	203	0.169			
Total	36.919	206				

Table 4 above shows that significant difference exists in the HIV-Prevention strategies of tertiary (Teaching) Hospitals, General Hospital, Voluntary Agency Hospitals and Comprehensive Health Centres. The obtained F-ratio value (5.083) is more than the critical value (0.002) at 0.05 level of significance. So the null hypothesis which states that there is no significant difference in

the mean scores of the HIV-Prevention counseling strategies adopted in tertiary, secondary and primary health institutions is rejected. Scheffee test of multiple comparison (Akuezilo & Agu, 2002) was used to determine the order of significant difference across the four categories of Health Institutions.

**Table 5: Scheffee test of multiple comparison of mean scores in the strategies (elements) of HIV-Prevention Counseling across the Health Institutions.**

(I) Hospital	(J) Hospital	Mean Difference (I-J)	Std Error	F-crit (sig)
Tertiary (Teaching) Hospital	General Hospital	0.00000	0.09588	1.000
	Voluntary Agency Hospital	-0.19398	0.10503	0.397
	Comprehensive Health Centres	-0.24916	0.10503	0.112
General Hospitals (Secondary Health Institutions)	Tertiary Hospital	0.00000	0.09588	1.000
	Voluntary Agency Hospital	-0.19398	0.07427	0.058
	Comprehensive Health Centres	-0.24916*	0.07427	0.006
Voluntary Agency Hospitals (Secondary Health Institution)	Tertiary Hospital	0.19398	0.10503	0.397
	General Hospital	0.19398	0.07427	0.058
	Comprehensive Health Centres	-0.5518	0.08576	1.000
Comprehensive Health Centres (Primary Health Institution)	Tertiary Hospital	0.24916	0.10503	0.112
	General Hospital	0.24916*	0.07427	0.006
	Voluntary Agency Hospital	0.05518	0.08576	1.000

KEY: \* = The mean difference is significant at 0.05 level.

Above table 5 shows that significant difference exists in the counseling strategies between the HIV-Prevention Counselors in General Hospitals and those in

Comprehensive Health Centres. The mean difference of 0.24916 is in favour of the counselor in Comprehensive Health Centres.



**Table 6: Analysis of Variance (ANOVA) to compare the means skills for effective counseling between Teaching Hospitals, General Hospitals, Voluntary Agency Hospitals and Comprehensive Health Centres:-**

Source	Sum of squares (ss)	df	X	f-cal	f-crit	Probability
Between Group	0.306	3	102	0.526	0.665	P>0.05
Within Group	39.349	203	194			
Total	39.655	206				

Table 6 above shows that significant difference does not exist in the skills for effective counseling between the HIV-preventive counselors in Teaching Hospitals, General Hospitals, Voluntary Agency Hospitals and Comprehensive Health Centres. The obtained F-ratio value (0.526)

is less than the critical value (F-crit) of 0.665 at 0.05 level of significance. Therefore, the null hypothesis which states that significant difference does exist in the mean scores of the skills of the HIV-prevention counselors in Tertiary, Secondary and Primary Health Institutions is accepted.

**Table 7: Analysis of Variance (ANOVA) to compare the mean scores for ensuring High Quality HIV-Prevention counseling between Teaching Hospitals, General Hospitals, Voluntary Agency Hospitals and Comprehensive Health Centres.**

Source	Sum of squares (ss)	df	X	f-cal	f-crit	probability
Between Groups	6.513	3	2.171	8.993	0.000	P<0.05
Within Groups	49.007	203	241			
Total	55.520	206				

In table 7, significant difference exists between the HIV-prevention counselors in Teaching Hospitals, General Hospitals, Voluntary Agency Hospitals and Comprehensive Health Centres in ensuring high quality HIV-prevention counseling. The calculated f-ratio value of 8.993 is more than the critical value (f-crit) of 0.000 at 0.05 level of significance. Therefore, the null hypothesis

which states that significant difference does not exist in the mean scores of ensuring high quality counseling among the HIV-prevention counselors in the Tertiary, Secondary and Primary Health Institution is rejected. Scheffee test of multiple comparison (Akuezulo & Agu 2002) was used to determine the order of significant difference across the four types of Health Institutions.



**Table 8: Scheffee: Test of Multiple Comparison of the Means Across the Health Institutions for Ensuring High Quality HIV-Prevention Counseling.**

(I) Hospital	(J) Hospital	Mean Difference (IJ)	Standard Error	f-crit (Sig).
Tertiary (/Teaching) Hospital	General Hospital	-0.28170	0.11454	0.089
	Voluntary Agency Hospital	-0.52899*	0.12548	0.000
	Comprehensive Health Centres	-0.07428	0.12548	1.000
General Hospitals (Secondary Health Institution)	Tertiary Hospital	0.28170	0.11454	0.089
	Voluntary Agency Hospital	-0.24728*	0.08873	0.035
	Comprehensive Health Centres	0.20743	0.08873	0.122
Voluntary Agency Hospital (Secondary Health Institution)	Tertiary Hospital	0.5289	0.12548	0.000
	General Hospital	0.24728*	0.08873	0.035
	Comprehensive Health Centres	0.45471	0.10245	0.000
Comprehensive Health Centre (Primary Health Institution)	Tertiary Hospital	0.07428	0.12548	1.000
	General Hospital	-0.20743	0.08873	0.122
	Voluntary Agency Hospital	-0.45471*	0.10245	0.000

KEY:\* = The mean difference is significant at 0.05 level.

In table 8, significant differences exist between the HIV-prevention counselors in the three level of healthcare delivery with regard to ensuring high quality counseling. The mean difference of 0.52899 between Teaching Hospital and Voluntary Agency Hospitals is in favour of the counselors in Voluntary Agency Hospitals. The mean difference of 0.24728 between General Hospitals and Voluntary Agency Hospitals is in favour of Voluntary Agency Hospitals. Also the mean difference of 0.45471 between Voluntary Agency Hospitals and Comprehensive Health Centres is in favour of Voluntary Agency Hospitals.

## DISCUSSION

Table 1 shows that HIV-Prevention Counselors in Comprehensive Health Centres (CHC) adhere mostly to the elements of HIV-prevention counseling. This finding shows that the provider in the CHC conduct

more periodic assessment as recommended by CDC HIV CTR (1999).

Findings from the study indicate that the counselors in CHC possess the best skills in HIV-prevention counseling. This will go a long way in reducing risky behaviours among their clients. Kelly & St. Lawrence (1987) stated that HIV-prevention counseling seeks to reduce HIV acquisition and transmission.

Table 3 shows that the counselors in Voluntary Agency Hospitals are best in ensuring high quality HIV prevention counseling. This finding shows that the counselors in Voluntary Agency Hospitals comply to the requirements/recommendations of CDC HIV CTR (1999) that all CTR providers should conduct routine periodic assessments for quality assurance to ensure that the counseling being provided includes the recommended essential counseling elements.



The significant difference observed in the counseling strategies of counselors in the three levels of Health Care (table 4) is evidence of differences in the styles adopted by the three levels of health care providers in planning and implementing CDC recommended HIV-Prevention counseling.

Table 6 indicates no significant difference in the skills possessed by the HIV-prevention counselors in the three levels of health care institutions, but the mean score of 3.1008 for skills (table 2) scored by the providers in Comprehensive Health Centres comparatively places them superior to other levels of health care providers.

The result of the study indicates significant differences among the providers of the three levels of healthcare in ensuring high quality HIV-Prevention Counseling (tables 7 & 8). These findings calls for development of a common curriculum for training of all the providers of HIV-Prevention counseling, monitoring by supervisors and uniform periodic evaluation of major programme activities, interventions and services for quality assurance and quality improvement.

## CONCLUSIONS

The findings of the study indicate the HIV-Prevention Counselors in the different levels of Health care delivery are skillful, and they adopt different strategies in ensuring quality counseling.

## RECOMMENDATIONS

Training and quality assurance, HIV-Prevention capacity building activities and period evaluation of major services should be intensified to ensure efficient HIV-Prevention counseling of clients.

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## **EVALUATION OF CHARACTERISTICS OF ASSISTIVE TECHNOLOGY DEVICES THAT MAY ENHANCE USAGE AND SATISFACTION WITH USE**

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### **INTRODUCTION**

Assistive Technology Device (ATD) refers to any item, piece of equipment or product system, whether acquired commercially or off the shelf, modified or customized that is used to increase, maintain or improve the functional capabilities of individuals with disabilities.<sup>1</sup> They are prescribed to reduce the symptoms associated with any skeletal pathology, provide support, provide better positioning, improve biomechanical function<sup>2</sup> and minimize deformity, stress and pain.<sup>3</sup> Assistive Technology Device promotes greater independence by enabling people to perform tasks that they were formerly unable to accomplish.<sup>4</sup>

Despite significant advances in Assistive Technology Devices and legal mandates, these intervention often remain under-utilized.<sup>5</sup> Studies have shown that the rate of abandonment of Assistive Technology Device range from 8% to 75%.<sup>6-9</sup> To understand and ultimately reduce the non-usage and discontinuance of Assistive Technology Devices and increase its optimal use, there is a need to measure the outcomes of the Assistive Technology Devices and the services being provided.<sup>10</sup>

The discontinuance of ATD usage even when still indicated for the individual has been reported in some developed countries like the US and Canada.<sup>1</sup> This suggests a need to look at certain ATDs characteristics that may influence users' satisfaction and continual use of the ATDs since it has been reported that the most important perspective on how Assistive Technology Devices affects quality of life is that of the device user.<sup>11</sup> This study therefore is aimed at describing certain profile of ATDs' users and also determined users' perception of certain characteristics that may influence satisfaction with use.

### **METHODOLOGY**

The study was a survey of individuals receiving physiotherapy treatment and for whom Assistive Technology Devices have been prescribed in some selected Federal and State Hospitals in South-Eastern Nigeria. These hospitals were Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, National Orthopaedic Hospital Enugu, Enugu State, University of Nigeria Teaching Hospital Enugu, Enugu State, Parklane Hospital Enugu, Enugu State and Federal Medical Centre Owerri, Imo State.



A two-part questionnaire was used to collect data for this study. Part A comprised questions which sought information about users, prescribers of ATDs and conditions necessitating prescriptions of ATDs. Part B comprised questions on various ATDs' characteristics which may influence satisfaction with use. Copies of the questionnaire were administered on the participants at the physiotherapy departments of the selected hospitals. Obtained data was analysed using descriptive statistics of frequency count, percentages, mean and standard deviation.

## RESULT

A total of sixty qualified participants volunteered for this study. The average age of the participants was  $40.466 \pm 23.47$  years and 63.3% of the participants were male. Majority of the participants had their ATDs prescribed by physiotherapist (60%) (Table 1) and crutches (28.3%) and canes (23.3%) were the most-prescribed ATDs (Table 2).

A great number (33.4%) of study participants were afflicted by conditions characterized by muscle paralysis (post-polio syndrome, paraplegia and paraparesis), while about 17% of them had the ATDs prescribed due to a diagnosis of osteoarthritis (Table 3). More than 70% of participants rated their ATDs as either good or excellent in terms of appropriateness to physical disability, effectiveness, compatibility, dependability, durability and portability. The ATDs were rated poorly in terms of consumer reparability by 55% of participants while about 40% rated them poor in terms of social acceptability (Table 4).

A good number of the participants (70% and above) also found their ATDs easy to assemble, maintain, use and operate while more than half found it difficult affording the ATDs. Use of ATDs in diverse settings was also found difficult by about 40% of respondents. Overall, over three-quarters of study participants reported their ATDs as satisfactory. (Table 5)

**TABLE 1: Frequency Distribution Table Showing Different Prescribers of Participants ATDs**

PRESCRIBER	FREQUENCY	PERCENTAGE
Physiotherapist	36	60%
Doctors	15	25%
Family/friends	2	3.3%
Self	5	8.3%
Others	2	3.3%

**TABLE 2: Frequency Distribution Table of Number of Participants using Particular ATDs**

Assistive device	Frequency	Percentage
Cane	14	23.3%
Manual Wheelchair	8	13.3%
Crutches	17	28.3%
Zimmers Frames	4	6.7%
Lumbar Corset	4	6.7%
Shoe Raise	2	3.3%
Knee Brace	3	5.0%
Callipers	6	10.0%
Walkers	1	1.7%
Minerva Jacket	1	1.7%



**Table 3: Frequency Distribution of Various Conditions Necessitating ATDs Prescription and Use**

CONDITIONS	FREQUENCY	PERCENTAGE
Osteoarthritis	10	16.7%
Low back pain	3	5%
Cerebrovascular accident	7	11.7%
Post polio syndrome	7	11.7%
Paraplegia	6	10%
Paraparesis	7	11.7%
Amputation	2	3.3%
Foot drop	1	1.7%
Fracture	1	1.7%
Lumbar spondylosis	1	1.7%
Patellar dislocation	1	1.7%
Post osteotomy	9	15.0%
Avascular necrosis	2	3.3%

**TABLE 4: Frequency Distribution of Participants Rating of ATDs Characteristics in Terms of Quality**

PROPERTY	POOR	GOOD	EXCELLENT	NO RESP
Effectiveness	6 (10%)	44 (73.3%)	10 (16.7%)	-
Dependability	9 (15%)	45 (75.5%)	6 (10%)	-
Compatibility	17 (28.3%)	38 (63.3%)	5 (8.3%)	-
Flexibility	4 (6.7%)	21 (35%)	7 (11.7%)	28 (46.7%)
Physical security	1 (1.7%)	31 (51.7%)	17 (28.3%)	11 (18.3%)
Durability	7 (11.7%)	38 (63.3%)	13 (21.7%)	2 (3.3%)
Portability	7 (11.7%)	42 (70%)	11 (18.3%)	-
Securability	5 (8.3%)	36 (60%)	6 (10%)	13 (21.7%)
Personal acceptability	19 (31.7%)	27 (45%)	13 (21.7%)	1 (1.7%)
Social acceptability	23 (38.3%)	33 (55%)	4 (6.7%)	-
Consumer reparability	33 (55%)	20 (33.3%)	6 (10%)	1 (1.7%)
Supplier reparability	8 (13.3%)	40 (66.7%)	9 (15%)	3 (5%)
Appropriateness PA	6 (10%)	40 (66.7%)	9 (15%)	5 (8.3%)
Appropriateness VA	6 (10%)	13 (21.7%)	10 (16.7%)	31 (51.7%)
Physical comfort	7 (11.7%)	42 (70.0%)	9 (15%)	2 (3.3%)
Adequate staff support	5 (8.3%)	42 (70%)	12 (20%)	1 (1.7%)

Appropriateness PA=Appropriateness to physical ability

Appropriateness VA=Appropriateness to visual ability

**TABLE 5: Frequency Distribution of Participants Rating of the Ease of ATDs Characteristics**

PROPERTY	VERY EASY	EASY	DIFFICULT	NO RESP.
Ease of maintenance	11 (18.3%)	33 (55%)	12 (20%)	4 (6.7%)
Ease of assembly	12 (20%)	38 (63.3%)	6 (10%)	2 (3.3%)
Ease of use	18 (30%)	31 (51%)	9 (15%)	4 (6.7%)
Operability	15 (25%)	35 (58.3%)	6 (10%)	4 (6.7%)
Affordability	17 (28.3%)	9 (15%)	32 (53.3%)	2 (3.3%)
Ability in DS	17 (28.3%)	17 (28.3%)	23 (38.3%)	3 (5%)
Overall satisfaction	10 (16.7%)	36 (60%)	10 (16.7%)	4 (6.7%)

NO RESP=No response

Ability in DS=Ability in Diverse Setting



## DISCUSSION

Sixty participants comprising 63.3% males were involved in this study. About half of study participants have conditions characterized by some form of muscular paresis or paralysis. The high use of Assistive Technology Device by males could be because they are more prone and involved in high risk activities like palm-wine tapping and reckless driving. They are thus likely to have a higher predisposition to painful and debilitating injuries, necessitating the use of ATDs. The predominance of conditions characterized by gross muscle weakness among the study participants might also be responsible for while canes, crutches and manual wheelchairs are the most commonly used. Reimer-Reiss and Wacker<sup>1</sup> also found mobility devices to be the most-frequently used ATDs in their study of college students.

Majority of the Assistive Technology Devices were prescribed by physiotherapists and this was to be expected. Aside the fact that participants were recruited from physiotherapy clinics, the fact that a good number of individuals requiring the use of ATDs presented with disease conditions (osteoarthritis, paraplegia, post-osteotomy and post-polio syndrome) that affects mobility and functional ability and therefore physiotherapy intervention are also to be considered. The scope of training for the physiotherapist requires that he understands the indication and be able to assess the need for ATDs prescription, take appropriate measurements for it, be able to apply the ATDs on the patients and also teach its proper usage.

An appreciable number of the participants were satisfied with the Assistive Technology Devices they are using and some of the qualities of the Assistive Technology Devices that the individuals are satisfied with includes effectiveness, durability, operability and dependability (reliability), which had been documented as some of the characteristics

associated with the increased use of ATDs.<sup>12,13,14</sup> More than sixty percent of the participants also scored their ATDs high in terms of personal acceptability, compatibility, portability and appropriateness to physical ability and as well as not interfering with their physical ability. ATDs were rated poorly by about 40% of participants in terms of social acceptability. It seems our local society is yet to grasp the necessity for the use of ATDs for enhancement of functional ability and some people may rather prefer having the individual restricted to their homes than performing societal roles and functions with the aid of ATDs. This view can be very limiting and restrictive for the individual for whom ATDs had been prescribed. Fortunately in this study however, it seemed not to be strong enough to interfere with personal acceptance of the ATDs. ATDs were also rated low by many in terms of consumer reparability. There is a dearth of technicians skilled in ATDs repair in our environment, users may thus have to wait a long time or travel far distances to effect a repair and this may be quite frustrating. 53.3% of the participants found the cost of Assistive Technology Devices rather prohibitive, Reimer-Reiss and Wacker<sup>1</sup> reported some college students as having difficulty getting an assistive technology device due to its high cost. The situation might have been further worsened in our environment due to the poor development of the ATDs industry here and the ever-increasing cost of foreign exchange. About 40% of the participants had great difficulty using their Assistive Technology Device in various settings which could be attributed to the fact that most public building and transport system were constructed without considering individuals using ATDs.

Conclusively, ATDs were rated fairly well in terms of characteristics which might influence satisfaction with use and also in terms of ease of use. There may however be a need for government to subsidize the cost and also put machinery in motion to enhance the development of a local industry.



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## ANTIOXIDANT STATUS AND MINERAL LEVELS IN DIABETIC PATIENTS IN NNEWI

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### ABSTRACT

The study was designed to determine the serum levels of antioxidants, mineral levels, antioxidant enzymes and total antioxidant status in diabetic patients, and the control subjects. The plasma levels of antioxidants (albumin, uric acid, total antioxidant status) minerals (magnesium, zinc, selenium and copper) and antioxidant enzyme (superoxide dismutase, glutathione peroxidase and catalase) were estimated in diabetic and control subjects. In the diabetic patients, the mean fasting blood glucose (FBG)(9.374 ±1.166) mmol/L is significantly higher ( $P<0.005$ ) when compared with the controls (4.818±0.815) mmol/L. Antioxidants uric acid (6.506±1.522) mg/dl, zinc 112.234±18.125) µg/dl and selenium levels (18.0530±2.166) µg/dl were significantly higher ( $P<0.005$ ) when compared with the control subjects (5.468±1.600) mg/dl, (90.923±14.519) µg/dl and (17.080±2.157) µg/dl respectively. Conversely, magnesium level (306.870±56.803) µg/dl was significantly lower ( $P<0.005$ ) when compared with the control subjects (342.085±67.409) µg/dl. Age of subjects correlated negatively with their serum selenium levels ( $r=-0.311$ ). This study demonstrated the presence of oxidative stress in the diabetic patients as an expression of increased free radical production and diminished antioxidant defense. Appropriate supplementation of antioxidants and minerals in these patients will strengthen their immune system and reduce the adverse consequences of oxidative stress. Routine assessment is recommended.

### INTRODUCTION

Antioxidants neutralize the cell-damaging effects of free radicals<sup>1</sup>, which are atoms with an unpaired number of electrons that can be formed when oxygen interacts with certain molecules<sup>2</sup>. Antioxidant compounds include vitamins A, C and E, transition metals selenium, magnesium, zinc and copper. Other antioxidants are uric acid, glutathione, albumin, etc<sup>3, 4</sup>. Antioxidants abound in nature; they deactivate free radicals that result from exposure to UV light, gamma radiation, environmental pollutants, xenobiotics and cigarette smoking. Free radical oxidation may damage cell membrane and cell contents such as DNA, protein, lipid and carbohydrates resulting in loss of membrane function, inactivation of enzymes and chemical alteration of the DNA, predisposing the body to degenerative diseases<sup>4</sup>. Antioxidant compounds must be

replenished since they are used up in neutralizing free radicals. The antioxidant defense system also includes superoxide dismutase, glutathione peroxidase, glutathione reductase and Catalase<sup>5</sup>. Free radicals are molecules that have been chemically damaged by removing a single electron. When free radicals are produced in excess, the natural antioxidant defense system weakens resulting in oxidative stress that leads to oxidative injury and disease.

Major risk factors, like dyslipidemia and smoking habit have been assessed in conditions such as diabetes mellitus, hypertension and in patients with myocardial infarction<sup>6</sup>. Evidence is accumulating that most of the degenerative diseases have their origin in deleterious effect of free radicals<sup>7</sup>. Humans are endowed with antioxidant defenses and deficiencies of these micronutrients may increase susceptibility to these diseases and



associated complication<sup>7</sup>. The body's defenses against oxidative stress are less effective with aging<sup>8</sup>. There is indication that free radicals may be involved in the development of cancer, cardiovascular disease, Alzheimer's disease, immune dysfunction, cataracts and macular degeneration<sup>2,9,10,11</sup>. Consumption of antioxidants is thought to provide protection against oxidative damage and contribute positive health benefits. Diabetes mellitus is one of the diseases common in our society and constitute a major cause of disability or death. Current evidence has shown that free radicals may be implicated in its etiology<sup>12</sup>.

The objectives of this study are to determine the total antioxidant status, the level of secondary antioxidants uric acid and albumin in serum of both patients and control; to determine the level of some antioxidant minerals, and the activities of the antioxidant enzymes in both patients and control.

#### **PATIENTS AND METHODS.**

A total of 100 subjects aged 40-50 years, made up of 50 diabetic patients and 50 aged and sex matched. Healthy controls were recruited for the study. Informed consent was obtained from each subject before collecting blood samples while ethical approval was obtained through NAU/NAUTH Ethics Committee, before commencement of the study. The study was carried out in the Department of Chemical Pathology in collaboration with some experts in Public Health Medicine in Department of Community Medicine and PHC in the College of Medicine Nnamdi Azikiwe University (NAU) Nnewi Campus. Only patients whose plasma fasting blood glucose level was  $\geq 7.0\text{mmol/L}$  were included in the study as diabetic patients while patients with values below this were not included in the study. Apparently healthy individuals served as control subjects.

The design was a cross sectional descriptive study. A convenience sampling technique was used to select the subjects that met the

inclusion criteria, agreed to take part in the study and whose informed consent was obtained. Questionnaire was used as interview guide for data collection.

Plasma glucose was determined after enzymatic oxidation in the presence of Glucose Oxidase (GOD).<sup>13</sup> The measurement of serum albumin was based on its quantitative binding to the indicator 3,3',5,5'-tetrabromo-m-cresol (bromocresol green (BCG)).<sup>14</sup> while measurement of uric acid concentration was based on the principle that uric acid is converted by Uricase to allantoin and hydrogen peroxide.<sup>15</sup>

The Superoxide Dismutase (SOD) activity was determined based on the ability of SOD to inhibit the auto-oxidation of adrenaline. Superoxide generated by the Xanthine oxidase reaction is known to cause the oxidation of adrenaline to adrenochrome.<sup>16</sup> Glutathione peroxidase activity was determined by the method of Ozdemir et al, 2005 and the principle was based on the oxidation of NADPH to NADP.<sup>17</sup> Total antioxidants assay is based on the measurement of the scavenging ability of antioxidant test substances towards the stable radical<sup>18</sup>.

For trace elements: magnesium, zinc, selenium and copper equipment were designed to measure the concentration of elemental metals in solution. It provides integrated measurement in absorbance or emission intensity as well as sample concentration in comparison to standard solution and the readings taken within 0.5 to 10 seconds<sup>19</sup>. Six ml venous blood was collected with minimal venous stasis from each patient into a heparinized tube.

The sample was centrifuged, separated, aliquoted and immediately placed in a freezer until analysis. Quality control sera were run along test in each batch of analysis and this was compared with the reference range of the control material. Then the Standard Deviation



(SD) and coefficient of variation was calculated.

The results were expressed as mean  $\pm$  SD. Comparisons were made using Student's *t* test and  $P < 0.05$  was regarded as significant. Pearson Correlation Analysis was used to establish possible correlation between antioxidants, trace minerals and antioxidant enzymes.

## RESULT

Table 1 shows that there were statistically significant higher mean values of FBG ( $p=0.000$ ), uric acid ( $p=0.001$ ), zinc ( $p=0.000$ ), selenium ( $p=0.027$ ) and SOD ( $p=0.001$ ) in the diabetics when compared to the controls. Conversely, there are markedly lower mean values of magnesium ( $p=0.000$ ) and glutathione peroxidase ( $p=0.002$ ) in the diabetics when compared to the control. The rest of the mean values showed no significant differences between the diabetics and control.

Table 2 shows statistically significant positive correlations between the FBG of the diabetics and selenium ( $p=0.014$ ), SOD ( $P=0.012$ ) and total antioxidants ( $p=0.001$ ) in their blood. On the other hand, the age of the diabetic subjects is significantly negatively correlated with their blood selenium levels ( $p=0.02$ ).

Furthermore, while the FBG of control subjects show significant positive correlations with both the selenium level ( $p=0.001$ ) and catalase ( $0.000$ ), the same significant relationship is maintained between their age and these variables ( $p=0.027$ ,  $p=0.044$  respectively). However, a significant negative correlation exists between the age of control subjects and their blood magnesium levels ( $p=0.000$ ).

## DISCUSSION

The mean uric acid was significantly higher in diabetic subjects than control. Also, uric acid has been described as a powerful scavenging antioxidant in another study which also reported an increase and a positive

correlation between hyper-uricemia and oxidative stress<sup>20</sup>. This high uric acid level might be due to rapid cell turnover and muscle wasting as a consequence of oxidative damage to polyunsaturated fatty acid<sup>20</sup>. Moreover, since uric acid binds ions of copper and iron, this may cause increased concentration of copper and thus preventing availability or utilization by tissues.<sup>20</sup>

Superoxide dismutase was significantly higher in diabetics than control, and it is known that reactive oxygen species aggravate disease progression. To counteract their harmful effects, the body produces various antioxidant enzymes. The primary catalytic extracellular defense that protects cells and tissues against lipid peroxidation is glutathione peroxidase and was among the strongest univariate predictor of the risk of cardiovascular event.<sup>21</sup> Glutathione peroxidase was significantly decreased in diabetic subjects and this is consistent with literature and a clear indication of oxidative stress in diabetes.<sup>22,23</sup> A Japanese author in 1993 has however demonstrated a proportional decrease in the antioxidant enzyme activity with declining glycemic control adequacy<sup>24</sup>. Such contradictory findings could be explained as a consequence of insufficient standardization of clinical or analytical procedures utilized in the study.

Trace minerals zinc and selenium were significantly higher in diabetic subjects than in control even though magnesium was significantly lower in diabetics. Magnesium plays an important role in carbohydrate metabolism in that it may influence the release of activity of insulin which helps to control blood glucose levels.<sup>25</sup> Low blood levels of magnesium (Hypomagnesaemia) are frequently seen in individuals with type 2 diabetes<sup>25</sup>. The kidneys possibly lose their ability to retain magnesium during period of severe hyperglycemia. The increased loss of magnesium in urine may then result in lower blood level of magnesium.



In this study, significantly higher level of zinc in diabetic subjects than in control even though previous studies indicated that marginal zinc deficiency is more prevalent among diabetic adults compared to the normal adult population<sup>26, 27</sup>. (Lee et al., 2005; Yoon & Lee, 2007.) The unusual finding in our study can however be explained by the fact that trace minerals are usually linked directly or indirectly with several metalloenzymes having antioxidant activity. Despite the apparently high level of zinc in the diabetics, very little is available for tissue utilization. Zinc plays a key role in the cellular anti-oxidative defense and so if there is insufficient zinc, oxidative stress may damage the cell irreversibly thereby exacerbating some of the complications of diabetes. Hyperzincuria is as a result of hyperglycemia than any specific effect of endogenous or exogenous insulin on the renal tubules.<sup>28</sup> This suggests hyperglycemia as the basis for the hyperzincuria which interferes with the active transport of zinc back into the renal tubule and resulting in the hyperzincuria found in diabetes<sup>26</sup>. If hyperglycemia is the primary etiology, replacement with oral zinc supplementation should provide sufficient treatment. Zinc is a necessary factor in the variety of antioxidant enzymes, particularly superoxide radical ( $O_2^-$ ), alkoxyl ( $RO^\bullet$ ), Peroxyl radicals ( $ROO^\bullet$ ) hydrogen peroxide ( $H_2O_2$ ) and lipid peroxides ( $LOOH$ ). Alteration of zinc metabolism such that adequate zinc is unavailable for these enzymes might be expected to contribute to tissue damage observed in diabetes.<sup>29</sup>

From the study, significant increase of selenium in diabetic subject corresponds with the findings of Papp et al in 2000<sup>30</sup>. Another study also found that increased selenium is as a result of hyperglycemia which interferes with the biological functions including protection against oxidative stress.<sup>31</sup>

In conclusion, this study supports the fact that oxidative stress may culminate into deficiency of antioxidant and some micronutrients in diabetes with consequent tissue damage.

It also revealed the importance of determining the antioxidant status for early intervention and better management of this disease even as it also suggests lifestyle modification as a preventive measure to reduce the burden of the disease.

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**Table 1: Mean Levels of Antioxidants, Fasting Blood Glucose, Trace Minerals, in Control, and Diabetic Subjects.**

Parameters	Control (N=50) Mean±SD	Diabetics (N=50) Mean±SD	p-value
FBG(mmol/L)	4.818±0.815	9.374±1.166	*0.000
Uric acid (mg/dl)	5.468±1.600	6.506±1.522	*0.001
Albumin (g/dl)	4.474±0.649	4.394±0.617	0.526
Magnesium (µg /dl)	342.085±67.409	306.870±56.803	*0.004
Zinc (µg /dl)	90.923±14.519	112.234±18.125	*0.000
Selenium (µg/dl)	17.080±2.157	18.053±2.166	*0.027
Copper ( µg /dl)	195.129±2.157	204.500±34.300	0.152
Superoxide dismutase (µg /mg protein)	0.791±0.281	0.998±0.335	*0.001
Glutathione peroxidase (units/ml)	307.346±107.538	247.200±81.041	*0.002
Catalase (k unit/ml)	263.006±36.222	265.700±55.249	0.777
Total antioxidant status (%)	11.287±1.580	11.214±3.205	0.885

\*Statistically significant

**Table 2: Correlation of Fasting Blood Glucose Level and Age with the Antioxidants, Trace Minerals, Antioxidant Enzymes in Diabetic and Control Subjects.**

Variables	Diabetics				Control			
	FBG		Age		FBG		Age	
	R	p-value	R	p-value	R	p-value	R	p-value
Uric acid	-0.098	0.498	0.127	0.380	-0.016	0.912	-0.033	0.820
Albumin	-0.216	0.133	-0.074	0.58	-0.153	0.290	-0.163	0.259
Magnesium	0.254	0.075	0.058	0.61	-0.300	0.034*	-0.641	0.000*
Zinc	0.074	0.609	0.131	0.364	-0.099	0.493	-0.052	0.720
Selenium	0.344	0.014*	-0.311	0.02*	0.441	0.001*	0.312	0.027*
Copper	-0.254	0.075	-0.119	0.412	-0.191	0.184	-0.012	0.935
SOD	0.351	0.012*	-0.036	0.805	-0.073	0.613	-0.073	0.615
GP	0.098	0.449	-0.124	0.390	-0.023	0.876	-0.019	0.895
Catalase	-0.254	0.075	-0.202	0.16	0.528	0.000*	0.286	0.044*
TA	0.443	0.001*	0.254	0.075	0.127	0.378	0.537	0.000*

\*= significant correlation

Keys: FBG= Fasting Blood Glucose; SOD= Superoxide Dismutase; T.A= Total antioxidants



## **THE INCIDENCE OF JAUNDICE AND ACUTE PANCREATITIS IN HIV POSITIVE PATIENTS ON ANTI-RETROVIRAL THERAPY IN NNAMDI AZIKIWE UNIVERSITY TEACHING HOSPITAL, NNEWI**

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### **ABSTRACT**

A prospective study to find out the prevalence of jaundice and acute pancreatitis was carried out in Nnamdi Azikiwe University Teaching Hospital Nnewi. The study period was from March 2009 to May 2009. Prior to the study, baseline determinations of serum alpha amylase and bilirubin levels were obtained. A total of 75 HIV seropositive patients were studied. 50 (66.7%) of these subjects had been on the first-line HAART drugs (such as Nevirapine, Didanosine and Tenofovir) for more than two years. None were on second line drugs. 25 out of the 75 HIV positive patients (33.3%) were not on anti-retroviral therapy at all (pre HAART). 25 HIV-seronegative individuals were used as controls in this study. 50 (66.7%) of the 75 were females while 25 (33.3%) were males. Only 5 (6.7%) were aged above 50. HIV screening was carried out for all the subjects studied using Determine Stat Pak and Unigold in accordance with the current national serial algorithm. Serum alpha-amylase assay was carried out for the 75 HIV patients using fully automated VITROS 350 analyser. 3 subjects (4%) had acute pancreatitis. Also, serum total and conjugated bilirubin assay were performed manually using Van den Bergh diazo reaction and only 1 patient (1.33%) had elevated plasma bilirubin level (jaundice). The CD4 counts of these subjects were evaluated using cyflow SL-3 Flowcytometer and 39 patients (52%) had their CD4 count greater than 200 while 36 patients (48%) had their CD4 count less than 200.

### **INTRODUCTION**

It has been reported that acute pancreatitis occurs more frequently in HIV infected patients than in the general population<sup>1</sup>. Combination antiretroviral therapy (ART) was introduced over a decade ago and has led to great reduction in morbidity and mortality amongst people living with HIV/AIDS<sup>2</sup>. With the HIV burden in sub-Saharan Africa and the observed benefits of antiretrovirals<sup>3</sup>, it is obvious that HAART has come to stay in this region. As with most drugs, side-effects are to be expected. Finzi *et al*<sup>4</sup> reported that HIV positive subjects on antiretroviral therapy usually develop acute pancreatitis and jaundice more often than positive subjects not on ARTs. The incidence of jaundice and acute pancreatitis in these

subjects in our environment is the subject of this study.

### **MATERIALS AND METHODS**

#### **Subjects**

A total of 75 HIV Positive Subjects within the age bracket of 18-65 years were recruited for the study. Of these, 50 were receiving highly active antiretroviral drugs (HAART) such as tenofovir, didanosine, nevirapine, indinavir, atazanavir and ritonavir during the study period. All recruited subjects had been on antiretroviral treatment for two years and above. 25 of the HIV positive subjects were not on antiretroviral drugs while 25 apparently healthy HIV negative individuals, drawn from staff and students of Nnamdi Azikiwe University Nnewi campus, were used as



controls in this study. 36% of the study population were male while 64% were female. Ethical approval was obtained from the Ethical Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi before commencement of the study. Informed consent was also obtained from the subjects. Direct personal interview was used to obtain information from the study population.

## METHODS

5ml of blood sample was collected into plain vacutainer tubes from the antecubital vein of the subjects. The samples were first tested to determine their HIV status using Determine, Stat Pak and Unigold test Kits in line with the national serial algorithm. Procedure was according to the manufacturers' instruction.

The alpha amylase assay was performed using fully automated Vitros analyser (VITROS 350) based on the principle of

reflectance photometry while the total bilirubin assays were performed manually using the Van den Bergh reaction. CD4 counts were evaluated using CYFLOW SL-3 flowcytometer.

## STATISTICAL METHOD

Statistical analysis was performed using Chi-square method of statistical analysis.

## RESULTS

A total of 75 HIV positive subjects were studied. 50 of these (66.7%) were in the HAART era while the remaining 25 patients (33.9%) were in the pre HAART era. 25 HIV negative individuals were used as controls. 50 HIV positive subjects in the HAART era were tested for acute pancreatitis, 3 (6%) presented with acute pancreatitis while none of the subjects in the pre HAART era presented with acute pancreatitis. None in the control group had pancreatitis as well. This is shown in Fig. 1

	No of subjects with acute pancreatitis	No of subjects without pancreatitis	Total
HAART era	3	47	50
Pre HAART era	0	25	25
Total	3	72	75

Fig 1: Incidence of Pancreatitis in Antiretroviral Medication

The table shows that more people in the HAART era had acute pancreatitis, though statistical analysis using Chi-square method of data analysis revealed that the antiretroviral agents were not responsible for the pancreatitis observed. ( $P < 0.05$ ).

Of the 50 HIV-infected patients in the HAART era tested for jaundice, none had elevated plasma bilirubin level. Only 1 patient (4%) had elevated plasma bilirubin level out of the 25 HIV patients in the pre HAART era. No subject in the control group had elevated plasma bilirubin level. This is shown in fig 2.

	No of jaundiced subjects	Non-jaundiced subjects	Total
HAART era	0	50	50
Pre HAART	1	24	25
Total	1	74	75

Fig 2: Incidence of jaundice in Anti-retroviral therapy

## DISCUSSION

A prospective study in which 75 HIV positive subjects were studied, evaluated the incidence of jaundice and acute pancreatitis in HIV positive subjects on anti-retroviral therapy. An incidence of 1.33% had elevated

plasma bilirubin while 4% had acute pancreatitis. Increased incidence of jaundice in antiretroviral therapy has been reported. Krammer and Horl<sup>5</sup> reported 10.40% elevation in plasma bilirubin in the HIV positive subjects they studied, though they



reported that 7.69% of these were jaundiced due to anti-retroviral therapy. In some studies where the specific anti-retroviral drugs causing elevated plasma bilirubin were evaluated, approximately 14% of the HIV patients had elevated plasma bilirubin level due to indinavir therapy<sup>6,7</sup>, while 33-41% had elevated bilirubin due to atazanir<sup>8,9</sup>. On the other hand, quite a number of studies have observed higher rates of pancreatitis than those observed in the general population<sup>10,11,12,1</sup>. A study by Dutta et al<sup>13</sup>, found an incidence of 14%. Gan et al<sup>1</sup> attributed 46% of the cases to medication-induced while 26% was idiopathic. Reisler<sup>14</sup> reported a 0.85 per 100 person years in the period of 1996-2006.

The prevalence of one or more risk factors or co-morbidities in the study area may have accounted for the differences in the results obtained. For instance alcohol consumption is linked to pancreatitis<sup>15,16</sup> and prevalence of alcohol ingestion is more in urban HIV clinics. Also, pancreatitis linked to gallstones is common in older HIV positive populations<sup>17</sup>. In the same vein, the prevalence of alcoholic liver disease, opportunistic infections, neoplasias in certain areas of study may account for the differences in the incidence of jaundice observed. Our findings may be linked to the dose-dependent effects of didanosine, tenofovir and nevirapine. This is however unlikely presently, because there is better dosage effect management unlike before, when these drugs were administered without effective recourse to dosage effect relationship especially in developing countries. This may have accounted for the side effects of acute pancreatitis observed in earlier studies<sup>18,13</sup>.

The incidence of jaundice and acute pancreatitis in HIV infected subjects, was the focus of this study and we conclude that the anti-retroviral agents were not responsible for the jaundice and acute pancreatitis observed in this tertiary institution. However, more work needs to be done to assess the effect of the risk factors mentioned above.

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## ANTHROPOMETRIC CHARACTERISTICS OF LACTATING AND NON-LACTATING WOMEN IN A NIGERIAN OUT-PATIENT CLINIC

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### ABSTRACT

**Objective:** The present study was aimed at comparing the anthropometric characteristics of postpartum lactating women and non-pregnant non-lactating women.

**Materials and Methods:** Data was obtained from lactating and non-lactating women attending Institute of Child Health (ICH), University of Nigeria Teaching Hospital (UNTH), Enugu. Weight, height, Body Mass Index (BMI), waist circumference, hip circumference, waist to hip ratio and percentage body fat were determined. Independent t-test was used to analyse the differences between the groups. Level of significance was set at  $P < 0.05$ .

**Results:** The participants' age ranged from 18-32 years. There was no significant difference ( $P > 0.05$ ) in the Body Mass Index, waist circumference and hip circumference of lactating and non-lactating women. There was a significant difference in waist to hip ratio ( $P = 0.020$ ) and postpartum duration ( $P = 0.000$ ) of lactating and non-lactating women.

**Conclusion:** There is no significant difference in the BMI, waist circumference and hip circumference and percent body fat of lactating and non-lactating women. A significant difference exists between the waist-hip ratio of lactating and non-lactating women.

**KEYWORDS:** Anthropometric, Lactating, Non-Lactating, Out-Patient Clinic, Postpartum.

### INTRODUCTION

Lactation has been defined as the period after child birth during which milk is secreted from the breast (Steadman, 2000), which reaches its full functional capacity during this period (Geddes, 2007). The average Nigerian adult will always believe that a breast feeding woman will naturally have more nutrients to enable her meet the challenges and needs of lactation. This implies that the woman may be anthropometrically or nutritionally disadvantaged when compared to her non-lactating contemporaries. During lactation dynamic changes occur in the body

composition as the body reverts to its pre partum state (Wong et al, 1989). Questions of relevance have always arisen when body composition techniques that are validated in normal adults are applied to post partum lactating women because of changes in fat distribution and metabolism that occur during lactation (Wong et al, 1989).

Anthropometry is fast becoming a household name on the lips of many human scientists and clinicians interested in physical activity or nutrition. In essence, anthropometric measurements are fast emerging as important



indicators of physical status of individuals and populations which in turn highlights their nutritional status and history of their economic development (Singh, 2002). It is frequently used as a valuable instrument to determine health and disease, to define nutritional status, to assess growth and development and to determine differences in body proportion between populations (WHO,1995). Failure to return to pre-pregnancy weight after childbirth is of great concern to women particularly those who gain weight excessively during pregnancy. Many women associate these anthropometric changes to one or more of their pregnancies (Ohlin & Rossner, 1990).

In the last two decades the energetic impact of lactation have continually been assessed by measuring the anthropometric changes or differences in breastfeeding women (Valeggia & Ellison,2003). Even though literature on the anthropometric characteristics of lactating women has remained controversial, there is no known visible literature among Nigerian women addressing this gap. Hence, the need to assess the anthropometric characteristics of lactating women with a view to comparing with their non-lactating counterparts.

## **MATERIALS AND METHODS**

### **Research Design.**

A case-control design was used.

### **Method of data Collection**

Ethical approval was obtained from the Ethical Committee University of Nigeria Teaching Hospital, Ituku – Ozalla, Enugu. The study was carried out at the Institute of Child Health (ICH) of the University of Nigeria Teaching Hospital Enugu (UNTH, Old site).

An informed consent was obtained from a convenience sample of lactating and non-lactating mothers. Weight in kilogrammes was measured without shoes by using digital scale and was recorded. Height in metres was measured with the subjects in a standing position against a wall without shoes and the shoulders in a normal anatomical position. BMI was calculated as weight in kilograms divided by the height in meter squared. Waist circumference was measured at the point halfway between the lower border of the ribs and the iliac crest in a horizontal plane (Dalton et al,2003), and hip circumference was measured at the widest level over the greater trochanters. The waist to hip ratio was calculated as the waist circumference divided by the hip circumference. Percentage body fat was calculated according to the method described by Lean et al (1996).

## **METHOD OF DATA ANALYSIS**

The SPSS (version 15) software was used for statistical analysis. The independent t-test was used to compare the anthropometric characteristics of lactating and non-lactating women. Level of significance was set at  $P < 0.05$ .

## **RESULTS**

### **Participants**

A total of 60 (30 lactating and 30 non-lactating) women aged between 18-32 years participated in this study. All the lactating women were married while 23 out of the non-lactating women were married. The highest educational attainment of majority of the participants was primary education (Table 1). The anthropometric characteristics of the participants are shown in (Table 2). There was a significant difference in the waist-hip ratio ( $P=0.020$ ) and post-partum duration ( $P=0.000$ ) of lactating and non-lactating women.



**Table 1: Marital and Educational Characteristics of the Participants**

Variable	Non-lactating n(%)	Lactating n(%)
Marital Status		
Single	7(23.3)	0(0)
Married	23(76.7)	30(100)
Highest Educational status:		
Primary	20(66.7)	18(60.0)
Secondary	7(23.3)	8(26.7)
Tertiary	3(10.0)	4(13.3)

Keys: n= number of respondents; %=Percentage.

**Table 2: Comparison of Characteristics of lactating and non-lactating women**

Parameters	Non-lactating X±SD	Lactating Mean±SD	P value
Age (years)	25.33±3.86	25.00±4.00	0.860
Body Mass Index(kg/m <sup>2</sup> )	24.79 ±4.05	24.09 ±2.62	0.430
Waist circumference(cm)	80.77±7.52	83.63±6.63	0.120
Hip circumference (cm)	98.87±7.91	98.50±7.27	0.850
Waist to hip ratio	0.82±0.04	0.85±0.06	0.020*
Percentage body fat	31.57±3.68	32.75±3.31	0.200
Parity	4.10±1.71	4.11±1.66	0.120
Last Postpartum duration (months)	19.12±3.41	3.40±1.11	0.000*

\* = t-test is significant at P<0.05; SD=Standard Deviation

## DISCUSSION

Anthropometric measurements are useful criteria for assessing nutritional status as well as extrapolation of health risks. BMI is increasingly being used as a measure of nutritional adequacy and is considered to be a better indicator of chronic energy deficiency (Readdy et al, 1992). The BMI values of the participants in this study fall within the limits of the normal range for BMI values in normal adults, that is 18.5-24.9 as described by WHO (1995). The waist circumference, hip circumference and also percentage body fat equally had no significant difference among

the lactating and non-lactating women. However, there was a significant difference in the waist to hip ratio of lactating and non-lactating women. There is a general conception that pregnancy and lactation place extra demands on the woman's general body systems and thus there should be a great difference between the anthropometric characteristics of lactating and non-lactating women. It has been noted that lactating mothers will lose their body weight post partum if they do not compensate with additional food intake (Sarkar & Taylor, 2005). Also, exclusive breast feeding helps in



postpartum weight reduction (Marie et al, 1989). Hora and Roberts (2000) argued that the tendency of developing obesity at the postpartum period only arises in women who are already obese during pregnancy.

The only anthropometric index with a significant difference was the waist to hip ratio of lactating and non-lactating women. It is possible that this is due to the process of involution that is still taking place in the lactating women. This could also be accounted for by the fact that after child birth the abdominal muscles may become flabby resulting from abdominal stretch. Emphasis should be laid on the importance and practice of post partum exercises to reverse this trend during the lactating period. The results of this study should be interpreted with caution as comparing these findings with normal range values in normal healthy subjects may affect the validity of the findings. It has been noted that the alterations that occur during normal human pregnancy can affect the biological meaning of anthropometric measurements (Scholl et al, 1990).

## CONCLUSION

There is no significant difference in the BMI, waist circumference and hip circumference and percent body fat of lactating and non-lactating women. A significant difference exists between the waist-hip ratio of lactating and non-lactating women. The results of this study should be interpreted with caution as they do not imply causal inferences. There may be a need to conduct prospective studies on anthropometric changes in lactating women. There is also a need to carry out population based studies on the anthropometric characteristics of lactating women as hospital patients may not be used to extrapolate or generalize to the entire population.

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## PREVALENCE OF ANAEMIA AMONG CHILDREN ATTENDING A TERTIARY HEALTH FACILITY IN NORTHEASTERN NIGERIA

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### SUMMARY

Anaemia is a public health problem, particularly in Maiduguri and its environ. 120 children referred to the Haematology Department, University of Maiduguri Teaching Hospital for routine investigations were enrolled randomly and prospectively into the study. Subjects from ages 0-14 years comprising of 73 males and 47 females were investigated. Using standard methods, Haemoglobin concentration (Hb), packed cell volume (PCV), total red blood cell count (RBC), peripheral films for red cell morphology and red cell indices were carried out. Anaemia was defined according to the WHO cut-off value of Hb <11.0 g/dl. Of the 120 subjects studied, 68 were anaemic, a prevalence of 56.7% out of which, 41 (60.3%) were males while only 27 (39.7%) were females. Of the 68 anaemic subjects, 50 (73.5%) were of the pre-school age group. The majority of these subjects, 83.8%, were mildly anaemic, 11.8% were moderately anaemic while only 4.4% had severe anaemia. Out of the 68 anaemic children, 19 (27.9%) showed pure features of iron deficiency anaemia, 34 (50%) showed features suggestive of haemolytic anaemia (probably malaria-induced anaemia), while only 2 (2.9%) had pure features of megaloblastic anaemia. Thirteen (19.1%) had dimorphic blood picture. The contribution of iron deficiency to childhood anaemia is therefore underscored.

### INTRODUCTION

Anaemia is one of the most far-reaching pandemics that affect mostly developing countries. For example, about 3.5 billion people are affected by anaemia in developing countries.<sup>1</sup>

Childhood anaemia poses a major public health concern because it leads to an increased risk of child mortality as well as the negative effects of iron deficiency anaemia on cognitive and physical development of the child.<sup>2</sup> Anaemia is now recognized as an important cause of morbidity and mortality in African children admitted to hospitals.<sup>3</sup>

The World Health Organization has suggested a level of haemoglobin below which anaemia is said to be present. These levels are <11g/dl in children aged 6-59 months; <11.5g/dl in children aged 5-11 years and <12g/dl in older children, aged 12-14.<sup>4</sup>

Therefore, mild anemia was defined as haemoglobin concentration <11.0 g/dl, moderate anemia as <7.0 g/dl and severe anaemia as a haemoglobin concentration of <5g/dl or packed cell volume of <0.15.<sup>5,6</sup>

The etiology of childhood anaemia is multifactorial. However, the most common cause of



childhood anaemia all over the world is iron deficiency,<sup>7, 8</sup> although, a smaller portion is due to deficiencies of other micronutrients such as folate, Vit. A and B<sub>12</sub>.<sup>9</sup> For example, recent data from Côte d' Ivoire demonstrated that 40-50% of children and adult women were anaemic and iron deficiency anaemia accounted for about 50% of the anaemia in school children and women, while 80% in preschool children, aged 2-5 years old.<sup>10</sup> It has also been documented that in developing countries, infectious diseases such as malaria, helminth infection, HIV and tuberculosis cause anaemia in children.<sup>11, 12</sup> For instance, *Plasmodium falciparum* malaria-related anaemia contributes significantly to maternal and childhood mortality. Helminth, hookworm infection and schistosomiasis in particular cause blood loss and thus contribute to the etiology of anaemia.<sup>13</sup>

In 2003, the United Nations' General Assembly set a goal at its special session on children, to reduce the prevalence of anaemia by one-third by 2010.<sup>7</sup> Although, estimates of the prevalence of anaemia vary widely, accurate data are often lacking,<sup>7</sup> particularly in the local community.

In Northeastern Nigeria, there is virtually little or no work done to obtain an accurate data on the prevalence of childhood anaemia. Therefore, the knowledge of prevalence rates provides information on the degree of anaemia that will enhance the management of childhood anaemia, thus contributing to the actualization of the Millennium Development Goals (MDGs) on child health.

## SUBJECTS AND METHODS

The subjects for this study comprised of 120 patients who were referred to the haematology laboratory for routine investigations from paediatric wards and clinics of University of Maiduguri Teaching Hospital (UMTH), Nigeria. UMTH is a tertiary health care centre located in Borno State, Nigeria and serves as a reference centre for

the six States of Northeastern Nigeria as well as neighbouring African Countries (Chad, Niger and Cameroon). These patients were recruited from December, 2010 to February, 2011. Samples were collected randomly and processed accordingly.

Ethical approval was sought and obtained from the Hospital's Ethics and Research Committee. Some demographic characteristics such as age and gender were extracted from the patients' laboratory request form. Two milliliters (2ml) of venous blood was collected aseptically by venepuncture using a disposable syringe and needle, into ethylene diamine tetracetic acid (EDTA) at a concentration of 1.5mg/ml of blood. The sample collected was thoroughly mixed with the anticoagulant (EDTA) by repeated gentle inversion of the container and used for the estimation of Packed Cell Volume (PCV), Haemoglobin Concentration (Hb), Red Blood Cell Count (RBC) and red blood cell morphology.

PCV was determined by microhaematocrit method using glass capillary tube of specified length bore size and wall thickness two-third filled with whole blood, sealed at one end and centrifuged at a constant speed of 12,000g for 5 minutes using a microhaematocrit centrifuge. The proportion of red cells to the whole column (packed cell volume) was measured using a Hewkley Microhaematocrit Reader. Haemoglobin concentration was determined by the cyanmethaemoglobin method as described by Barbara and Bates<sup>14</sup> and as recommended by the International Committee for Standardization in Haematology (ICSH)<sup>15</sup> and WHO.<sup>4</sup> Haemoglobin standard graph and conversion table were prepared by a method modified from the method described by Lewis et al.<sup>16</sup> The optical density of mixture sample and diluents (Drabkin's solution) after at least 10 minutes for complete conversion was read using 6100 Spectrophotometer, JENWAY at a wavelength of 540nm and converted to Hb using the standard (calibration) table prepared



earlier. Also, total red cell count (RBC) was counted by making a 1 in 200 dilution of well mixed whole blood with an isotonic diluted (Formal Citrate) to avoid lysis of the red cells. The red cells were counted microscopically using an improved Neubauer ruled counting chamber (haemocytometre) and the number of RBCs per litre of blood calculated. Absolute values (Red cell indices) such as the mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC), were calculated from the results of the accurate red cell count, haemoglobin concentration and PCV, by standard methods as reported by Baker *et al.*<sup>17</sup> for classification of anaemia and a drop of well mixed whole blood was spread on a clean grease free glass slide, stained with a Romanowsky stain (Leishman's stain) and examined under the microscope with the oil immersion objective as described by Cheesbrough<sup>18</sup> were used for morphological classification of anaemia. Data were entered and analysis was done using SPSS version 15.0

## RESULTS

Of the one hundred and twenty (120) paediatric patients studied, 68 (56.7%) were anaemic using the WHO cut-off value of haemoglobin concentration of less than 11.0g/dl.

Table 1 shows some demographic characteristics of anaemic paediatric patients. 50 (73.5%) preschool-age children were anaemic against 18 (26.5%) of the school-age children in the study. It also reveals that 41 (60.3%) of male paediatric patients studied were anaemic while 27 (39.7%) of the female patients were anaemic. The ratio of anaemic males to females in this study is 1.5:1.

Table 2 illustrates the distribution of paediatric patient with anaemia according to severity. The majority of the patients, 83.8% were mildly anaemic, 11.8% were moderately anaemic while 4.4% were severely anaemic.

It is revealed in Table 3 that according to morphological classification based on Red Cell Indices, of the 68 anaemic paediatric patients, 21 (30.9%) had normocytic-normochromic anaemia, 23 (33.8%) had microcytic normochromic anaemia, 2 (2.9%) had macrocytic normochromic anaemia, 18 (26.5%) had microcytic hypochromic anaemia while 4 (5.9%) had macrocytic hypochromic anaemia. Whereas in Table 4, 34 (50.0%) showed features of normocytic normochromic anaemia, 2 (2.9%) showed features of macrocytic normochromic anaemia, 19 (27.9%) showed features of microcytic hypochromic anaemia, while 13 (19.1%) showed dimorphic blood picture.

## DISCUSSION

In this study, the prevalence of anaemia among paediatric patients attending UMTH, Maiduguri is 56.7%. This falls within the WHO definition of =40% for classifying a country into the level of severe public health significance.<sup>4</sup>

Of the 120 patients in this study, 73 were of the preschool age. Fifty out of seventy-three preschool age children were anaemic resulting to 68.5%. This is similar to report from another part of the sub-Saharan region of Africa<sup>19</sup> and from South-Western Nigeria.<sup>20</sup>

Although most of the studies on the severity of anaemia were carried out among the pre-school age group, the prevalence of severe anaemia in this study is 2.5%. This is lower than those reported in other centers in Nigeria,<sup>21-23</sup> but compares favourably with the report of Jiya *et al*, who noted a prevalence of 2.7%.<sup>24</sup>

A nationwide survey involving 12 States in Nigeria in 2001 only assessed the children population for iron deficiency of which 22.3% of the children under five years of age were found to be iron deficient.<sup>25</sup> Similar prevalence rates of 19.8 and 32.4% have also been reported in Western Kenya and Kazakhstan, respectively.<sup>26, 27</sup> In this study, microcytic hypochromic morphology was considered consistent with iron deficiency, and both the red cell indices as well as peripheral blood film



shows prevalence of 26.5% and 27.9% respectively. This signifies that iron deficiency is not only a public health problem but a common feature of developing countries.

Malaria has been reported as one of the major causes of childhood anaemia in the tropics.<sup>28</sup> Prevalence as high as 61.2% and 51.5% have been documented in Azare and Abakaliki respectively.<sup>21, 23</sup> Malaria has also been associated with haemolytic anaemia.<sup>29-31</sup> Evidences have supported the nature of the normocytic normochromic anaemia with haemolytic evidence of malarial anaemia.<sup>32</sup> In this study normocytic normochromic anaemia accounted for 30.9% and 50.0% from red cell indices and peripheral blood film respectively. This again, is in consonance with the established fact that malaria is one of the major causes of childhood anaemia.

In conclusion, childhood anaemia still remains a major public health problem. This underscores the morbidity burden in Nigerian children especially those of the preschool age. Malaria and iron deficiency are major contributing factors. A greater percentage of patients had mild anaemia because they presented with asymptomatic anaemia. The high prevalence may not be unconnected with socio-economic status of patients and the endemicity of Malaria infection in this part of the world.

It is therefore recommended that asymptomatic anaemia should be given attention in all tiers of health care delivery in Nigeria even when anaemia is not the presenting complaints. Also, more intensive and sustained efforts should be made in the prevention and treatment of malaria infection in our community; there is the need to provide iron supplements to preschool and school age children as this will reduce the negative effects of iron deficiency anaemia on cognitive and physical development of the child.

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**Table 1. Some Demographic Characteristics of the Anaemic Paediatric Patients Studied**

Characteristics	Total No of pts.	No anaemic (%)
<b>Age</b>		
< 6 months	23	9 (39.1)
6 months – 4.99 yrs	50	41 (82.0)
5.00 yrs – 11.99 yrs	39	15 (38.5)
12.00 yrs – 14.00 yrs	8	3 (37.5)
<b>Total</b>	<b>120</b>	<b>68 (56.7)</b>
<b>Gender</b>		
Male	73	41 (56.2)
Female	47	27 (57.4)
<b>Total</b>	<b>120</b>	<b>68 (56.7)</b>

**Table 2. Distribution of Anaemic Paediatric Patients According to Severity**

Severity	Hb Conc. (g/dl)	Frequency (%)	% of all patients
Mild	7.1 – 11.0	57 (83.8)	47.5
Moderate	5.1 – 7.0	8 (11.8)	6.7
Severe	≤ 5.0	3 (4.4)	2.5
<b>Total</b>		<b>68 (100)</b>	<b>56.7</b>



**Table 3. Distribution of Anaemic Paediatric Patients According to Morphological Classification Based on Red Cell Indices**

<b>Morphological Classification</b>	<b>No of pts. (%)</b>	<b>% of all patients</b>
Normocytic-normochromic	21 (30.9)	17.5
Microcytic-normochromic	23 (33.8)	19.2
Macrocytic-normochromic	2 (2.9)	1.7
Microcytic-hypochromic	18 (26.5)	15.0
Macrocytic-hypochromic	4 (5.9)	3.3
<b>Total</b>	<b>68 (100)</b>	<b>56.7</b>

**Table 4. Distribution of Anaemic Paediatric Patients According to Morphological Classification Based on Blood Film Appearance**

<b>Morphological Classification</b>	<b>No of pts. (%)</b>	<b>% of all patients</b>
Normocytic-normochromic	34 (50.0)	28.3
Macrocytic-normochromic	2 (2.9)	1.7
Microcytic-hypochromic	19 (27.9)	15.8
Dimorphic blood picture	13 (19.1)	10.8
<b>Total</b>	<b>68 (100)</b>	<b>56.7</b>



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