

## Evaluation of Mineral Status in Patients with Vesico-Vaginal Fistula in Jos, Northern Nigeria

Ileogben S A<sup>1</sup> and Uraku A J<sup>2\*</sup>

<sup>1</sup>South - East Fistula Centre, Abakaliki, Ebonyi State, Nigeria

<sup>2</sup>Department of Biochemistry, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria

**\*Corresponding Author:** Uraku A J, Department of Biochemistry, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.

**Received:** July 27, 2016; **Published:** September 23, 2016

### Abstract

**Background:** Vesico-Vaginal Fistula (VVF) is an abnormal communication between the vaginal and the urinary bladder resulting in continuous and involuntarily leakage of urine per vaginam. This disorder occurs mainly in Sub-Sahara Africa and Asia with major of the cases resulting from early girl child marriage. The mineral status in Patients with Vesico-Vaginal Fistula in Jos, Northern Nigeria was investigated.

**Material and Methods:** The levels of Zn, Cu, Fe, Pb and Mn were determined using Atomic Absorption Spectrophotometer (AAS). A total of 97 participants made up of 67 VVF patients and 30 controls undergoing treatments at Evangel Hospital, Jos were involved in the study.

**Results:** Among the studied population, the mean values of the minerals were similar for both the VVF clients and the control group except for Zn where there was a significant difference ( $P < 0.05$ ) between both groups. There were significantly higher ( $P < 0.05$ ) levels of Zn, Cu, Pb, Fe and Mn in the VVF patients between the ages of  $< 20$ ,  $20 - 24$ ,  $30 - 34$ ,  $45 - 49$  and  $> 50$  years compared to control. Also, there were significant increase ( $P < 0.05$ ) in the levels of all the minerals in the VVF clients when compared to control at all classes while that of parity showed significant increase ( $P < 0.05$ ) in the levels of analyzed minerals in the VVF clients when compared to control at para  $\geq 5$  and para  $1 - 4$ . In all, the levels of Zn, Cu, Fe and Pb in both patients were higher than the reference values reported in literature. The higher level of Pb in fistula patients may suggest contamination which may possibly be through water or food.

**Conclusions:** The study also suggests the need for determination of reference values of mineral status among African population.

**Keywords:** *Obstetric Fistula; Diseases; Early marriage; Prolong labour; Maternal mortality; Stigmatization; Minerals; Nutrition; Nigeria*

### Introduction

Obstetric Fistula (OF) refers to Vesico - Vaginal Fistula (VVF) and Recto-Vaginal Fistula (RVF) that follows labour and delivery as found commonly in developing countries like Nigeria [1]. Vesico-Vaginal Fistula (VVF) is reluctant seepage of urine through the vaginal from atypical contact between the vaginal and the bladder [2,3]. The entity of obstetric fistula is etiologically different from fistulas that may follow radiotherapy, gynaecological surgery, infections like lymphogranuloma venerum, malignancies; these are the common causes of fistula in the developed countries [3].

OF may occur worldwide but the burden is probably greater in Sub-Saharan Africa and Asia [4]. According to Babayemi and Olorunpomi [5] Nigeria has the highest incidences of VVF cases globally with an estimated 400,000 to 800,000 with 20,000 new cases yearly. This situation is really discouraging known the elevated rate of maternal mortality in Nigeria emanating from the incidence of VVF and RVF. Thus, most cases of VVF in Nigeria result from early girl child marriage and early marriage in most cases leads to misfortune on the

side of the girl. In Africa and Asia, these conditions have been found more commonly among women less than 30 years. The true burden of Fistula may remain difficult to determine due to underreporting because of the associated stigmatization and occasional ostracization [4].

Poor socioeconomic development has been reported by some to be the basic underlying factor responsible for the high prevalence of OF in developing countries [6]. The situation is further compounded by the deficient or absent of adequate obstetric care services especially in the rural parts of the country, activities of unskilled birth attendants, unequal distribution of amenities like good roads, water, schools and health facilities [7].

In situations where the facilities are available they may not be accessible or affordable or acceptable to the communities and where they are accessible, ignorance and poverty may be barriers to their effective utilization. Several women with obstetric fistula in Nigeria are living in shame and isolation often abandoned by their husbands and excluded by families and communities. They usually live in abject poverty, shunned or blamed by society and unable to earn money, many fall deeper into poverty, despair and some unable to cope with the pain and suffering of the scourge resort to suicide.

The public encumber consequences of VVF are incontinence and childlessness which may result to marital breakdown and eventually divorce, and social excommunication. Barren women are prone to divorced by their husbands. Excommunication may be the hardest consequence to bear psychologically for women with VVF. This is indicated by a lack of support not only from society but also from their families. These put together make fistula clients a decidedly susceptible group in the society with little fiscal power and little communal class [8].

Nutrition provides a link between health and disease and some foods contain natural constituents like vitamins and trace elements which have positive nutritional and health roles in man while others contain natural toxicants that have negative effects on nutrition. The absence of an obvious clinical disease state does not imply that nutritional deficiency or an excessive state for a particular micronutrient may not exist which may also compromise bodily function. Regrettably in certain parts of the world like Nigeria, baseline serum levels for micronutrients have not been established and references are mainly of Caucasian values which may not be representative of our values because of differences in diet.

Among people of low socioeconomic class like VVF patients, the expected prevalent form of malnutrition is the deficiency type. Malnutrition resulting from nutrient deficiency could range from deficiency of one nutrient to general deficiency of several nutrients. Inadequate food intake and low intake of certain nutrients are responsible for majority of malnutrition. Several factors contribute to malnutrition in the society; these include cultural food habits, ignorance, family size, poverty, genetics, disease and improper food handling and preparation. Majority of people in the developing countries live in the rural communities and most fall within the low income and poverty groups as represented by the patients with Vesico - Vaginal Fistula in this study. They resort to cheap low quality food items that may supply minimal nutrients.

Micronutrients like zinc, copper, iron, etc are required by the body in small amounts and they play leading roles in the functions of enzymes, hormones and other substances that help to regulate growth, development and the functioning of the immune and reproductive systems [9]. Adequate intake is essential during girl child development and other periods of rapid growth, pregnancy and lactation [10]. The lack of these essential micronutrients may affect the development of the bones, for instance, individual lacking zinc may develop osteoporosis or slow bone growth [11] which can result in short stature and ultimately prolonged obstructed labour and VVF.

Some reference values for minerals have been reported among Causacian population [12] and reference values for Nigerian population are lacking. In view of the role of nutrition in the reduction of maternal mortality and morbidity this study seeks to evaluate the micronutrient levels in this group of women who are discriminated against and to compare their levels with a control of normal women of similar social class.

## Methodology

**Study Area and Population:** This study was conducted using patients with Vesico-Vaginal Fistula in Evangel Hospital, Jos. The hospital is one of the Centres for VVF surgery in Northern Nigeria. The study was a total population study involving all the patients in the centre between January - March, 2006 who consented to be part of the study. The controls were non pregnant but parous women of similar social status who were willing to participate in the study.

**Ethical Approval:** Ethical approval was obtained from the Ethical Committee of Ebonyi State University Teaching Hospital, Abakaliki and an informed consent was also obtained from all the participants in the study. Those who failed to give their consent were excluded from the study. Demographic characteristics, like age at marriage, height and social class etc were also obtained from the participants.

**Sample Collection and Preparation:** About 10 ml of blood was collected from each participant, using a syringe and transferred into a sample bottle without an anticoagulant. The blood samples were transferred into centrifuging tubes and were centrifuged at 3000 rpm for 15 minutes. The serum was collected and the clotted blood residue was discarded. The serum samples were left frozen at - 20°C until needed and then refrigerated using a cold chain. The collected serum was then sent to the laboratory for vitamin A and E analysis using spectrophotometric method.

**Sample Collection and Preparation:** About 10 ml of blood was collected from each participant, using a syringe and transferred into a sample bottle without an anticoagulant. The blood samples were transferred into centrifuging tubes and were centrifuged at 3000 revolutions for 15 minutes. The supernatant which was serum was collected and the clotted blood residue was discarded.

The serum samples were left frozen at - 20°C until needed and then refrigerated using a cold chain. The collected samples were then sent to the laboratory where the samples were centrifuged, ashed, digested diluted and analyzed for Zinc, Lead, Copper, Manganese, Cobalt, and Iron using the Buck Scientific Atomic Absorption Emission Spectrophotometer.

**Ashing/Digestion:** The volume of each sample in the sample bottle was measured with a micro cylinder and recorded. The sample was then transferred into a beaker and evaporated to dryness with a hot plate. The dry deposits were taken into a furnace and was ashed at a temperature of about 400°C - 500°C for about one hour. The resultant ash was allowed to cool in a beaker and about 3 ml of aqua-regia (concentration of HCl and HNO<sub>3</sub> in a ratio of 3 : 1). The mixture was taken back to the hot plate for heating after the addition of the aqua-regia. The heating was to digest the mixture until the reaction mixtures were almost dry.

**Determination of trace elements:** About 20 ml of deionized water was added to what was left of the mixture after digestion. It was stirred with a stirrer and filtered with filter paper. The filtrate were analysed for the micronutrients Zinc, Copper, Iron, Lead, and Manganese using the atomic absorption spectrophotometer. The metals in each sample was compared against a standard to know the concentration of the metal in the blood if any and then the value was converted to mg/l of blood.

**Statistical analysis:** The data was analyzed by ANOVA and results expressed as means ± standard deviation and percentage.

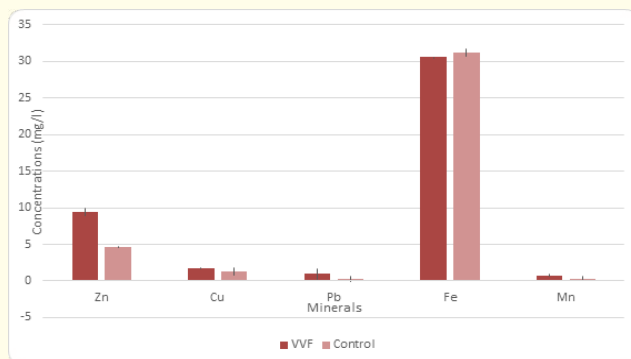
## Results

Minerals	Values in Women (mg/l)
Zinc	0.78444 - 1.17666 (12-18 µmol/l)
Copper	0.79375-1.54559 (12.5- 24.34 µmol/l)
Lead	<0.250712 (< 1.21 µmol/l)
Iron	0.4468 -1.7872 (8-32 µmol/l)
Manganese	0.49446 - 1.31856 (9-24 µmol/l)

**Table 1:** The reference values for some trace elements according to Carl et al. [12]

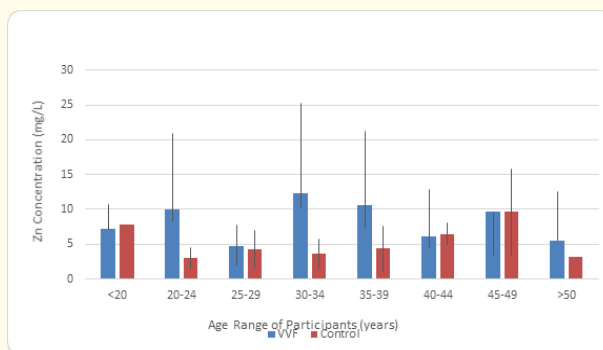
**Results of trace element levels in VVF patients and non VVF patients**

The results of mineral status levels in VVF patients and control are presented in figures, 1, 2, 3, 4, and 5 below.

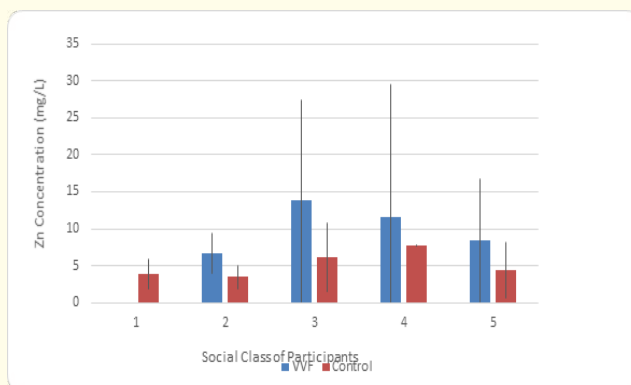


**Figure 1:** Mean serum levels of Zn, Cu, Pb, Fe and Mn (mg/l) in VVF Patients and control.

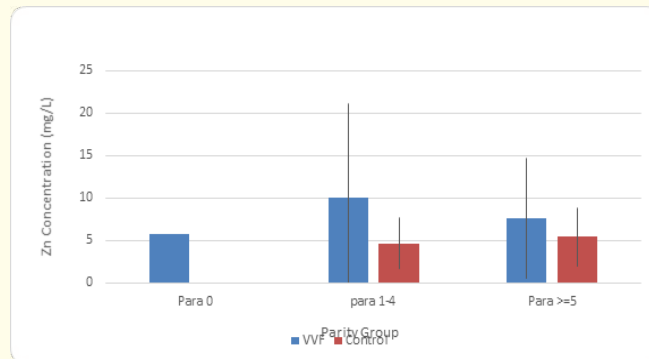
The results showed that there was no significant difference ( $P > 0.05$ ) in the levels of Cu, Pb, Fe and Mn except at only Zn in the VVF clients when compared to control



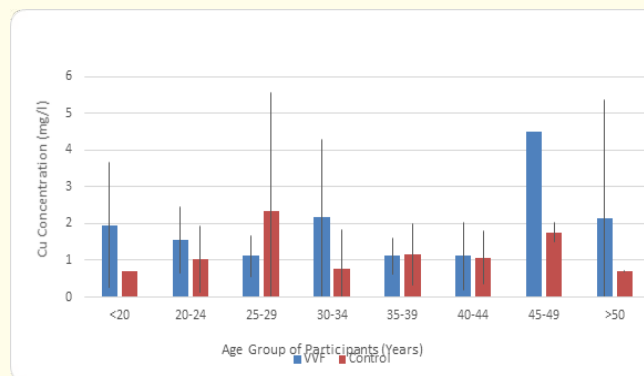
**Figure 2a:** Mean serum levels of zinc (mg/l) in VVF Patients and control vis-a-vis Age. The results showed that there was a significantly higher ( $P < 0.05$ ) levels of Zn in the VVF patients between the ages of 20 - 24, 30 - 39, 35 - 39 and > 50 years compared to control except at age < 20. There was no significant difference ( $P > 0.05$ ) between the ages of 25 - 29, 40 - 44 and 45 - 49 years compared to control.



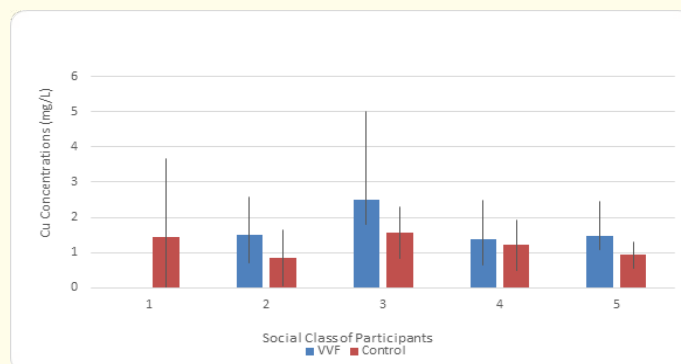
**Figure 2b:** Mean serum levels of Zn (mg/l) in VVF Patients and control. The results showed that there was significant increase ( $P < 0.05$ ) in the levels of Zn in the VVF clients when compared to control at class 2, 3, 4 and 5.



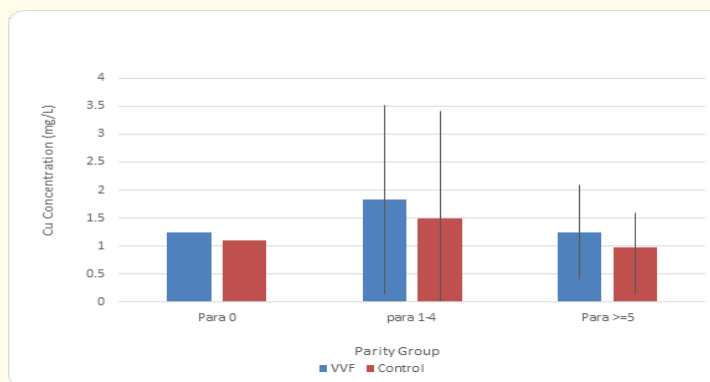
**Figure 2c:** Mean serum levels of Zinc (mg/l) in VVF Patients and control. The result showed that there was significant increase ( $P < 0.05$ ) in the levels of Zn in the VVF clients when compared to control at para  $\geq 5$  and para 1 - 4.



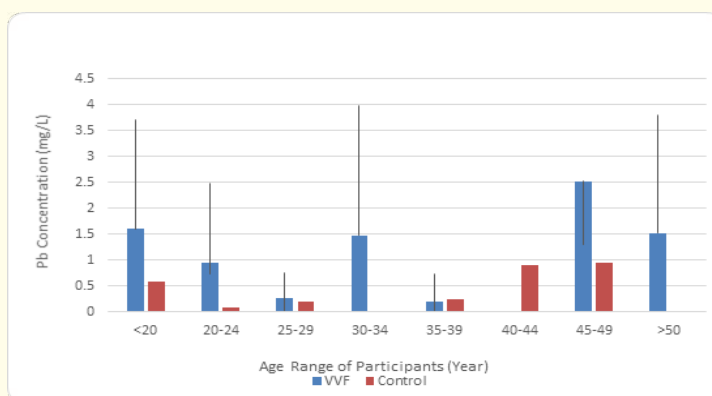
**Figure 2d:** Mean serum levels of Cu (mg/l) in VVF Patients and control. The results showed that there was a significantly higher ( $P < 0.05$ ) levels of Cu in the VVF patients between the ages of  $< 20$ , 20 - 24, 30 - 34, 45 - 49 and  $> 50$  years compared to control except at age of 25 - 29. There was no significant difference ( $P > 0.05$ ) between the ages of 35 - 39 and 40 - 44 years compared to control.



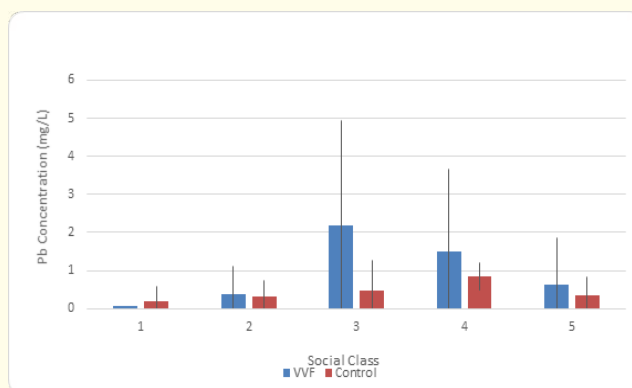
**Figure 2e:** Mean serum levels of copper (mg/l) in VVF Patients and control. The results showed that there was significant increase ( $P < 0.05$ ) in the levels of Cu in the VVF clients when compared to control at all classes.



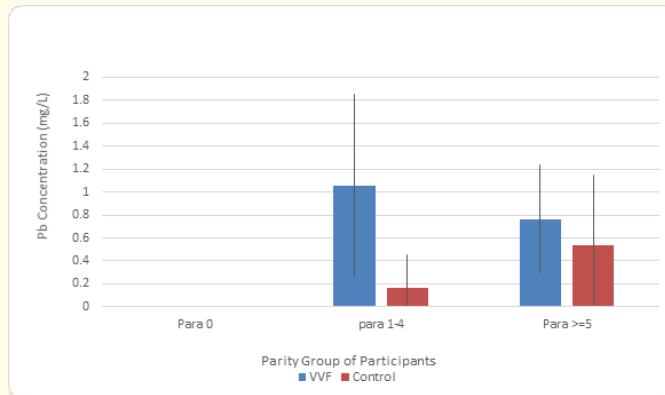
**Figure 2f:** Mean serum levels of Copper (mg/l) in VVF Patients and control. The result showed that there was significant increase ( $P < 0.05$ ) in the levels of Zn in the VVF clients when compared to control at para  $\geq 5$  and para 1 - 4.



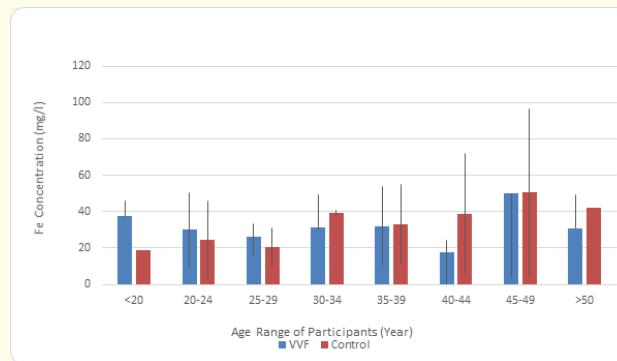
**Figure 3a:** Mean serum levels of Lead (mg/l) in VVF Patients and control. The results showed that there was a significantly higher ( $P < 0.05$ ) levels of Pb in the VVF patients between the ages of 20 - 24, 30 - 39, 35 - 39 and > 50 years compared to control except at age < 20. There was no significant difference ( $P < 0.05$ ) between the ages of 25 - 29, 40 - 44 and 45 - 49 years compared to control.



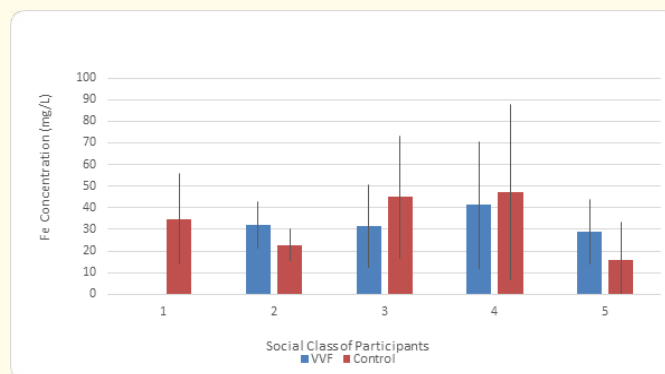
**Figure 3b:** Mean serum levels of lead (mg/l) in VVF Patients and control. The results showed that there was significant increase ( $P < 0.05$ ) in the levels of Pb in the VVF clients when compared to control at class 2, 3, 4 and 5.



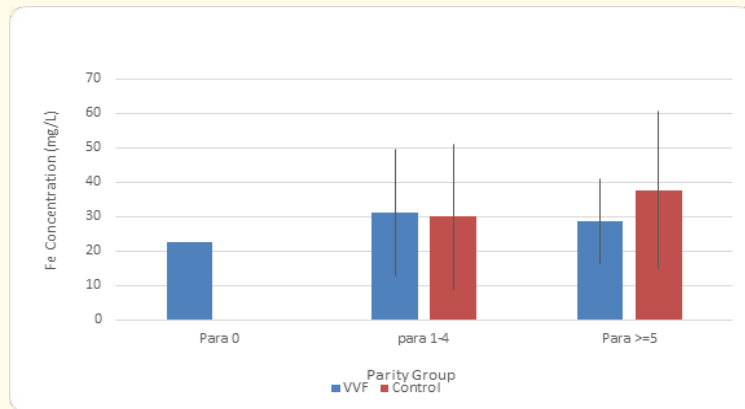
**Figure 3c:** Mean serum levels of Lead (mg/l) in VVF Patients and control. The result showed that there was significant increase ( $P < 0.05$ ) in the levels of Pb in the VVF clients when compared to control at para >=5 and para 1 - 4.



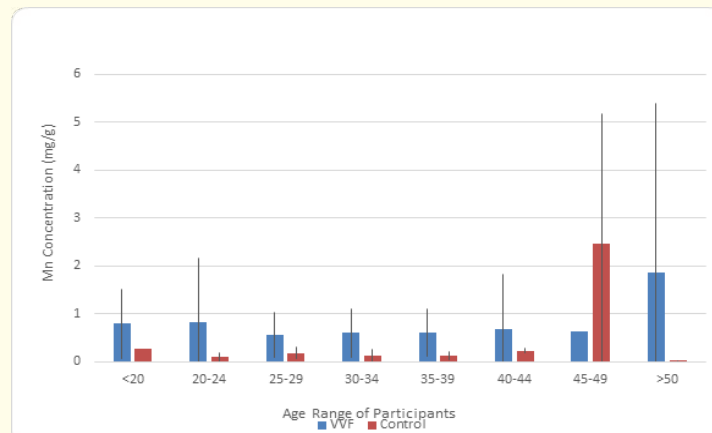
**Figure 4a:** Mean serum levels of Fe (mg/l) in VVF Patients and control. The results showed that there was a significantly higher ( $P < 0.05$ ) levels of Fe in the VVF patients between the ages of 20 - 24, 30 - 39, 35 - 39 and > 50 years compared to control except at age < 20. There was no significant difference ( $P < 0.05$ ) between the ages of 25 - 29, 40 - 44 and 45 - 49 years compared to control.



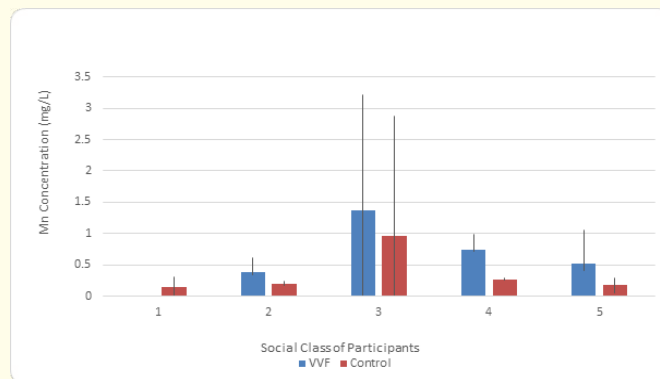
**Figure 4b:** Mean serum levels of Iron (mg/l) in VVF Patients and control. The results showed that there was significant increase ( $P < 0.05$ ) in the levels of Fe in the VVF clients when compared to control at class 2, 3, 4 and 5.



**Figure 4c:** Mean serum levels of iron (mg/l) in VVF Patients and control. The result showed that there was significant increase ( $P < 0.05$ ) in the levels of Fe in the VVF clients when compared to control at para  $\geq 5$  and para 1 - 4.

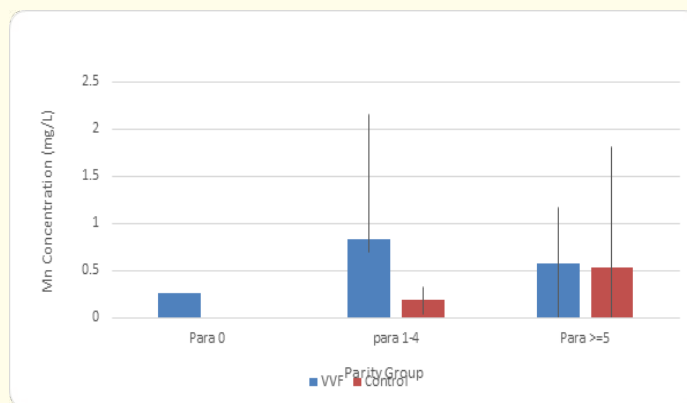


**Figure 5a:** Mean serum levels of Mn (mg/l) in VVF Patients and control. The results showed that there was a significantly higher ( $P < 0.05$ ) levels of Mn in the VVF patients between the ages of 20 - 24, 30 - 39, 35 - 39 and  $> 50$  years compared to control except at age  $< 20$ . There was no significant difference ( $P < 0.05$ ) between the ages of 25 - 29, 40 - 44 and 45 - 49 years compared to control.



**Figure 5b:** Mean serum levels of Manganese (mg/l) in VVF Patients and control. The results showed that there was significant increase ( $P < 0.05$ ) in the levels of Zn in the VVF clients when compared to control at class 2, 3, 4 and 5.





**Figure 5c:** Mean serum levels of Mn (mg/l) in VVF Patients and control. The result showed that there was significant increase ( $P < 0.05$ ) in the levels of Zn in the VVF clients when compared to control at para  $\geq 5$  and para 1 - 4.

## Discussion

The mean age of 16 years for marriage for the VVF clients was significantly lower than the mean age of 23 years reported among the control. Also, the VVF clients were significantly shorter with a mean height of 1.45m compared with the control with a mean height of 1.65m. These twin factors of short stature and marrying at a relatively young age may have predisposed these patients to prolonged obstructed labour.

There is non availability of adequate obstetric care in rural parts of Nigeria and where these are available, the various cultural and financial barriers limit patient's access to health care, with the ultimate result been late presentation to the hospital, prolonged obstructed labour and fistula formation.

This study highlights the unacceptably high fetal wastage as all the clients with Obstetric Fistula in this study lost their babies in the index pregnancy. Also, the point that multiparous women can develop prolonged obstructed labour and develop obstetric fistula after several normal vaginal deliveries. Though a vast majority of the patients developed the complication in their first pregnancy, about a quarter of the patients studied developed the problem after having four normal vaginal deliveries. The reason for developing prolonged obstructed labour after four normal vaginal deliveries may be because of increasing fetal weight with successive pregnancies and increasing lumbar lordosis with successive pregnancies which may reduce the pelvic parameters especially the pelvic inlet.

The mean serum levels for copper were slightly higher among the VVF patients than the control (1.68 mg/l vs 1.3 mg/l) the difference was not statistically significant. When compared with the reported normal values for copper in the literature it would appear that close to 50% of the VVF patients had normal level of copper as compared with 43% of the control, though the observed difference was not of statistical proportion. Age and parity did not appear to affect the level of copper in both groups. The finding of similar copper levels in both groups studied is understandable in the light of the fact that copper is a mineral that occurs naturally in many foods including vegetables, nuts, seeds and grains which are all very common in northern Nigeria.

The mean level of zinc was significantly higher in the VVF patients than in the control and the observed difference was statistically significant. Considering the place of zinc in growth generally and with the shorter stature reported among the patients, it was expected the patients would have a lower level of zinc when compared with the control. Surprisingly this was not the case, and the probable explanation for this curious finding may be in the smallness of the sample size for the control and this unexpected finding calls for a larger study using a larger sample size for the control. About 9% of the Clients with obstetric fistula had normal levels of zinc and 91% had higher levels of zinc. Among the control, 13% had normal level while 87% had elevated zinc levels. There appeared to be no deficiency of zinc in either the clients or the control in this study. This again calls for a larger study to establish normal levels of zinc among Nigerian population.

The mean level of lead was significantly three times higher among the clients with obstetric Fistula than among the control group. Lead is also a toxic essential trace element and this elevated mean level when compared with the control may suggest water and food contamination. While about a quarter of the control had lead levels above the normal recommended level of 0.250712 mg/l, close to 40% of the VVF patients had levels of lead beyond the normal acceptable level. Evidently because both groups are of similar social class it is not entirely surprising to find also a significant level of control also exhibiting elevated levels of lead and manganese, because access to good clean water and hygienic food is a function of finance which may be limited in people of low socioeconomic class and vulnerable people like Obstetric Fistula clients.

The mean value for iron was similar for both the clients and the control. This finding is similar as they are of similar social class. Interestingly the level of serum iron reported in this study is significantly higher in both the clients and the control than that quoted in the literature which was among the Caucasian population. This finding cannot be explained and calls for the determination of serum levels of micronutrients among Nigerian population in order to establish baseline values.

The mean level of manganese among the patients was curiously double the mean level among the control. This finding is interesting against the background that it is one of the three toxic essential trace elements which means that it is not only necessary for humans to survive, but it is also toxic when too high concentrations are present in the human body. The higher level reported among the patients than the control may actually reflect a degree of contamination among the patients because of the economic and social deprivation they are made to undergo. Water and food contamination with manganese may be the reason for this double mean value as manganese exists naturally in the environment as solids in the soils, small particles in water. Manganese particles in the air are present in dust particles and these usually settle down to the earth within a few days and can consequently easily contaminate food and water of any vulnerable population in the community like obstetric fistula clients. When compared with the reported range of normal values of manganese, among the clients with obstetric fistula, almost half had normal values while a quarter had low values and about a 15% had elevated values. The control had over 90% with low levels of serum manganese which is in keeping with the above view point that higher levels are found among vulnerable groups in the population.

Conclusively, the mean level of zinc in the VVF client was curiously double the value in the control group. The mean level of lead in the VVF clients was thrice the value of the control group. Furthermore, the levels of iron in both study population was higher than the reference values reported for serum iron in the literature. These higher levels of lead, iron and manganese in fistula patients may suggest contamination which may possibly be through water or food. The higher mean value of zinc in fistula clients is an unexpected finding that calls for another study using a larger sample size. The study also suggests the need for determination of reference values of micronutrient mineral status among African population.

### **Conflict of Interest**

There is no conflict of interest

### **Financial Interest**

There is no financial support from any source

### **Acknowledgements**

Authors are grateful to Medical Director of Evangel Hospital, Jos and their entire staff.

### **Bibliography**

1. Imoukhede M O., *et al.* "Conceptual knowledge of vesico-vagina fistula among parents, teachers and counsellors of senior secondary students in Warri South local government area of Delta State, Nigeria". *International Journal of Medicine and Biomedical Research* 4.1 (2015): 35-40.

2. Hsiung J and Savbäck S. "Long-time Suffering from Psychosocial Consequences - A Problem for Women with Vaginal Fistula in Moshi, Tanzania". Gothenburg University (2011).
3. Uprety DK, *et al.* "Vesicovaginal Fistula at Tertiary Care Center in Eastern Nepal". *Journal of Nepal Medical Association* 47.171 (2008): 120-122.
4. Narcisi L. "The Fistula Crisis in Sub-Saharan Africa: An Ongoing Struggle in Education and Awareness, Urologic Nursing". 30.6 (2010): 341-346.
5. Babayemi A W and Olorunpomi O T. "Model for the Prediction of the Reported Cases of Vesico Vaginal Fistula in Kebbi State". *International Journal Of Mathematics And Statistics Invention (IJMSI)* 2.12 (2014): 18-27.
6. Odu B K and Cleland J. "Women vulnerability to Vesico Vaginal Fistula and contributing influences in Northern Nigeria". *European Journal of Psychological Research* 1.2 (2014): 26-34.
7. Aboh J U, *et al.* "Clinical Features Of Patients Diagnosed With Vesico Vaginal Fistula (Vvf) In South East Nigeria". *Nature and Science* 11.12 (2013): 110-115.
8. Mohamed E Y, *et al.* "Contributing factors of vesico-vaginal fistula (VVF) among fistula patients in Dr.Abbo's National Fistula & Uro-gynecology Centre - Khartoum 2008". *Sudanese Journal of Public Health* 4.2 (2009): 259-264.
9. UNICEF. "The State of the World's Children Micronutrients". UNICEF Weekly Report, New York (1998): 47-72.
10. Okaka J C., *et al.* "Food and Human Nutrition an Integrated Approach". OCJ. Academic Publishers, Enugu. Nigeria. (2006) 135 - 368.
11. Golub M S., *et al.* "Adolescent Growth and Maturation in Zinc Deprived Rhesus monkeys". *The American Journal of Clinical Nutrition* 64 (1996): 274 - 82.
12. Carl A.B., *et al.* Tietz Textbook of Clinical Chemistry and Molecular Health Federation's Proposal for Nutrient Reference Values. (2006) :2251-2302.

**Volume 3 Issue 4 September 2016**

**© All rights reserved by Ileogben S A and Uraku A J.**