

# Zinc Composition in Breast Milk of Lactating Mothers in Urban and Sub-urban Areas in Rivers State

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## **Article Information**

### Editor(s):

(1) Dr. Asmaa Fathi Moustafa Hamouda, Jazan University, Saudi Arabia.

### Reviewers:

(1) Umakanth Siromani, India.

(2) Jannatbi Iti, Rajiv Gandhi University of Health Sciences, India.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/76773>

**Original Research Article**

**Received 05 September 2021**

**Accepted 10 November 2021**

**Published 17 November 2021**

## **ABSTRACT**

Breast milk includes complex proteins, lipids, carbohydrates, and other components that are physiologically active. The composition varies both throughout the lactation period and over a single meal. Zinc is an essential micronutrient of proper development and growth. The aim of this study is to compare breast milk zinc composition between breastfeeding mothers in urban and sub-urban areas in Rivers State. The study was conducted among 59 postpartum subjects between 0 and 10 days of child delivery in each group. Sampling was done through a simple random sampling method. Human breast milk was collected using a manual breast pump and analyzed using Atomic Absorption Spectrophotometer (AAS) for the analysis of zinc concentration. Result revealed that there was a significant difference in zinc level between both groups ( $p < 0.05$ ). This work has shown that zinc composition in breast milk of postpartum women vary based on urban and sub-urban settlements.

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*Keywords: Breast milk; zinc; urban; sub-urban.*

## 1. INTRODUCTION

Breast milk, commonly known as mother's milk, is the milk produced by the mammary gland in a human female's breast to nourish her baby. Breast milk is a newborn's main source of nourishment until they are ready to consume and digest solid foods; older babies and toddlers may continue to be nursed, but solid foods should be given in combination beginning at six months of age. Breast milk includes complex proteins, lipids, carbohydrates, and other components that are physiologically active. The composition varies both throughout the lactation period and over a single meal [1]. Zinc is an essential micronutrient of proper development and growth. Even beyond infancy, breastfeeding has health advantages for both the mother and the kid [2]. These advantages include appropriate heat generation and adipose tissue development [3], improved intellect, a 73% lower incidence of newborn mortality syndrome [4], and a lower risk of middle ear infections [5] resistance to colds and flu [6] a somewhat lower risk of childhood leukaemia. Reduced risk of diabetes in infancy as well as asthma and eczema [7] are benefits of breastfeeding. Dental troubles have also been indicated [7]. Reduced risk of obesity later in life [8] and psychiatric problems, especially in adopted children have been indicated. Furthermore, as compared to feeding a baby powdered formula, breast milk is linked with lower insulin levels and greater leptin levels [9]. Current status of knowledge provides that there is a link between the environment and breast milk composition. It is generally believed via research provision that environment interacts positively or negatively on the components of life existing in it. By implication, environment has a role to play in healthy breast milk, mother and child. This suggests the role of the environment in patient's health as stated by Florence Nightingale in her Environmental theory. The content of human milk has also been found to be influenced by race, environment and lifestyle. However, there are limited studies on this subject in this part of Nigeria. This study is focused on assessing the concentration of zinc in subjects in urban and sub-urban areas in Rivers state with the view of comparing zinc composition in subjects living in different settlements.

## 2. MATERIAL AND METHOD

### 2.1 Study Area

The research study was conducted in urban and sub-urban settlements in Rivers State. Rivers State is located in the south-south geopolitical zone of Nigeria. It is composed of urban, sub-urban and rural communities. This study focused on urban and sub-urban areas. In the urban, Primary Healthcare Centre Orogbum and Primary Healthcare Centre Elelewon were used and in sub-urban, Model Health Centre Akpajo and Primary Healthcare Centre Nchia were used.

### 2.2 Study Population

The cross-sectional study was conducted between January 2021 to April 2021 among 118 postpartum subjects between 0 and 10 days of child delivery.

#### 2.2.1 Inclusion criteria

The following are the inclusion criteria

- Subjects registered with the health centres
- Subjects between 0 and 10 days of childbirth
- Subjects between the ages of 18 and 45
- Subjects must reside within the two settlements

#### 2.2.2 Exclusion criteria

The following are the exclusion criteria:

- Subjects with impaired breast milk production
- Subjects with other background illnesses

### 2.3 Sampling Method

All subjects who met the eligibility requirements and provided their written consent were recruited for the study. Port Harcourt is a metropolis and subjects recruited from this area were categorized as "urban group" while subjects recruited from Eleme area were categorized as "suburban group". In a simple random sampling method, subjects were recruited. Subjects were asked to choose from a container having a numbering system of "0" and "1" and all subjects

who picked “1” were selected and those who picked “0” were not selected [10,11].

### 2.4 Specimen Collection

In this study, the manual breast pump technique or method was used in collecting breast milk from postpartum women. In the collection room, the subjects were asked to partly undress in a manner that the breast was revealed and then the pump was applied to drain breast milk. After collection, the milk was transferred into an appropriate container for storage or immediate laboratory analysis [12].

### 2.5 Sample Analysis

Zinc was analyzed using Atomic Absorption Spectrophotometer. The standard zinc ion level was aspirated to calibrate the apparatus and to produce the test ion's standard graph. Before continued usage, the suction system was periodically cleansed with de-ionized water. The sample solution was aspirated and zinc ion concentrations extrapolated from the graph. Concentration was measured in mg/l or ppm.

### 2.6 Statistical Analysis

The gathered data were recorded on Microsoft Excel table and analyzed using SPSS 21.0. Descriptive statistics such as mean and standard deviations have been done to identify the central trend and spread measure of each variable. T-test was also performed to check if the mean of the groups are substantially different (urban group and sub-urban group). The statistical significance was determined at  $p < 0.05$ .

## 3. RESULTS

Table1 shows the demographic parameters of urban and sub-urban groups. The mean±SD age of urban group was 35±5.0 years and the mean±SD age of the sub-urban group was 28±3.0 years. The mean±SD weight of the urban group was 80±10Kg while the mean±SD weight of the sub-urban group was 74±4.0Kg. The mean±SD postpartum days of the urban group was 6±2days while the mean±SD postpartum days of the sub-urban group was 5±2days.

In urban group, Zinc level was 0.35±0.2mg/l and 0.14±0.1mg/l in sub-urban group (T-value = 2.1; P-value <0.05). This means that there was a significant difference in zinc levels between the urban group and sub-urban group.

**Table 1. Demographic parameters**

	Urban group	Sub-urban group
Age (yrs)	35±5.0	28±3.0
Weight (Kg)	80±10.0	74±4.0
Postpartum days	6±2	5±2

**Table 2. Comparing zinc levels in urban and sub-urban areas**

Heavy urban metal	Sub-urban	P-value	Remark
Zinc (mg/l)	0.35±0.2	0.14±0.1	0.04 ss

## 4. DISCUSSION

In this study, two groups were considered within a postpartum period of 10days; the urban group had 59 participants and sub-urban group also had 59 participants of postpartum women with mean age of 35±5.0yrs and 28±3.0yrs respectively. Their breast milk samples were assayed to determine the variation or changes in zinc composition between the two groups. Like every other metal, zinc is found in the environment but unlike other metals, zinc is an essential trace element that is useful for various biochemical processes in the body especially in enzyme activities because it functions as a catalyst. In this study, zinc was present in breast milk of breast-feeding mothers in urban group (0.35±0.2mg/l) and suburban group (0.14±0 mg/l) with the urban group presenting higher level of zinc in the breast milk. There is a high need of zinc during pregnancy for fetal development and during early breast milk production. Studies have shown that prolactin stimulates the secretion of zinc in breast milk and the level of this hormone decreases as lactation time increases, this is the rationale why early breast milk production (the first one month) is rich in zinc [13].

Conversely, reports from other studies revealed a higher level of zinc in breast milk compared to the findings in the study. Findings from Serap and his team showed that zinc was 2.89±23.23mg/l [14]. This value is way higher than the value in the both groups considered in this study. Masayo and his colleagues also reported zinc level of 0.56±0.37mg/l in breast milk [15]. These studies reported higher zinc level in the milk of breastfeeding mothers compared to our finding. The reason behind this could be due to variation in zinc dietary intake.

This study revealed that breast milk of mothers in the urban area was richer in zinc than the breast milk of mothers in the sub-urban area and this difference was statistically significant. This could be as a result of changes in lifestyle between subjects in both areas and level of healthcare facility and education. Subjects in the urban area are more likely going to attend antenatal clinics as required than those in sub-urban areas and as such may be well educated on nutritional diet that could be of great benefit to them and their babies.

## 5. CONCLUSION

This study has showed that difference in settlement has significant impact in zinc composition in breast milk of lactating mothers living in urban and sub-urban areas in Rivers state. This difference has been attributed to differences in lifestyle in both environments.

## 6. LIMITATION

Subject recruitment was a key limitation of this study because not all subjects were willing to expose their breasts for sample collection.

## DISCLAIMER

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

## ETHICAL APPROVAL

Ethical clearance for this study was obtained from the Ethics Committee, Rivers State Hospital Management Board. Informed written consent was also obtained from the subjects before recruiting subjects into the study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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*The peer review history for this paper can be accessed here:  
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