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Anthropometry, body composition and iron status of lactating women living in Yaounde, Cameroon

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Abstract

The study was aimed at assessing the anthropometry, the body composition and iron status, of lactating women living in Yaounde, Cameroon. Seventy-six (76) lactating mothers were recruited at the University Teaching Hospital Vaccination Centre, Yaoundé. Anthropometric measurements including body mass index (BMI) and skinfold thickness were done on these mothers. Total body water (TBW), intracellular water (ICW), extracellular water (ECW) and fat mass (FM) of these mothers were estimated by monofrequency bioelectrical impedance analysis (BIA). The hemoglobin level was determined by assessing the iron status of the mothers. The results obtained showed that the mean value of mothers BMI irrespective of their age was within the overweight limit. The TBW and FM of mothers varied from 21.7 Kg to 43.7 Kg and 12.2 Kg to 46.2 Kg respectively. The LM of these mothers varied from 41.4 Kg to 62.8 Kg. According to the hemoglobin level, 23.6 % of lactating mothers were anemic while 76.4 % were normal. No significant effect of breastfeeding was found on the body composition of lactating women. Most of the lactating mothers were overweighed and obese. The hemoglobin level of lactating mothers did not significantly vary with breastfeeding practices.

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Introduction

Body composition is a good health and nutritional status indicator. The body composition of lactating women depends on their key nutrients status. The maternal food intake and the volume of breast milk that mothers should produce could be affected by environmental factors (G.A. Ettyang *et al.,* 2005). The literature on the effects of breastfeeding on maternal anthropometry is controversial. General trend in most population seems to be to lose weight and body fat during the first 6 months after delivery (Vinoy *et al.,* 2000); however some studies have found no association between postpartum time and anthropometric measures (Chou *et al.,* 1999).

Although several techniques exist for the measurement of body composition, few are appropriate in the field setting. Commonly used field techniques include bioelectrical impedance analysis (BIA) and anthropometry (Rudolph, 1997; Kushner & Schoeller, 1986). Values of body weight adjusted for height, referred to a body mass index (BMI; in kg/m^2), in excess of 25 and 30 are considered to indicate overweight and obesity respectively (WHO, 1998). Water is the major chemical component of the body. Total body water is frequently measure to evaluate body composition. The body fat and muscle could be estimate by BIA (Lukaski *et al.,* 1985).

Iron deficiency anemia is considered to be among the major nutritional deficiencies in developing countries. Because of the increased iron requirement during pregnancy, lactation and growth; infants, pregnant and lactating mothers are recognized to be the most vulnerable groups (ACC/SCN, 4th Report, 2000). In Cameroon, 68 % of children under five suffer from iron deficiency while 45 % of women are anemic. (EDS, 2004).

There is little information on the body composition of Cameroonian lactating women. The aim of this study was to evaluate the body composition and the iron status of some Cameroonian lactating mothers in relation to the type of breastfeeding.

Materials and methods

Subjects

Seventy-six (76) lactating mothers were recruited from the University Teaching Hospital Centre, Yaounde Cameroon: (1) the mothers were living in the urban area and aged between 14 and 40 years.

The study was approved by the ethics committee of Cameroon. Written informed consent was obtained from each woman before the start of the study.

Anthropometric measures

Measurements were made by trained personnel using standard procedures (Lohman & al, 1988). Wearing minimal clothes, Mothers were weighed to nearest 0.01 kg with an electronic scale (Seca, Hamburg, Germany). Height was measured to the nearest millimeter with a portable gauge (Seca, Hamburg, Germany). The Body Mass Index (BMI) was calculated as weight (kilograms)/height (meters)^2.

Bioelectrical Impedance Analysis

BIA was performed on the right side of the body, using a body composition analyzer (Bodystat®, QuadScan 4000, British Isles) with a tetrapolar electrode placement. The electrodes were placed on the hand, wrist, foot, and ankle of each subject according to the standard placement for adults as stated in the manufacturer's guidelines. All metal objects were removed from the subjects before the measurements were made. The subjects were supine on a nonconductive surface with their arms and their thighs apart; the measurements were performed after the subjects had remained in the supine position for at least 15 min. All BIA measurements were performed by the same person. The values used in the calculations were the mean of duplicate measurements. Only the impedance (Z) or resistance (R) data at 5, 50, and 100 kHz were used in the calculations of the present study. The impedance index was calculated as height^2/R (cm^2/Ω) or height^2/Z, depending on the explanatory variable used in the equation tested (Rudolph, 1997; Kushner & Schoeller, 1986).

When the subject is connected to the apparatus

current is able to pass through cell membranes at high frequencies but not at low frequencies, thus enabling the prediction of extracellular water (ECW) and TBW independently at 5 and 100 kHz, respectively. Differences in TBW distribution over the intra and extracellular space are reflected by impedance ratios of 5-100 kHz frequencies. The height$^2/R_5$ is assumed to reflect the ECW volume, and the height$^2/R_{100}$ is assumed to reflect the TBW volume (Rudolph, 1997; Kushner & Schoeller, 1986).

Biochemical analysis

Whole blood from lactating women was collected in a tube (5mL). The blood was dissolved in a Drabkins solution. A Miniphotometer MPA was used to determine Hemoglobin (Hb) concentration. The lactating mothers were categorized as having iron deficiency anemia when found with an Hb of < 12 g/dL (Ettyang, 2003).

Statistical analysis

Statistical analyses were performed using SPSS 10.1 software (SPSS Inc., U.S.A.). Results were expressed as mean ± SD. Mean, standard deviations and median were calculated. Independent sample Student's t test was used as appropriate**.**

Results

Socio economic status and breastfeeding practice

Results showed that 60.5 % of women irrespectively of age or socio economic status practised exclusively breastfeeding whereas 30.3 % and 9.2 % fed their babies using mixed and artificial breastfeeding respectively.

Table 1. General characteristics of Lactating Women.

	Mean ± SD	Minimum	Maximum
Age (Year)	26.6±5.7	14	40
BMI (kg/m²)	26.8±3.7	20.5	38.2
Fat Mass (Kg)	23.7±8.7	12.2	46.2
Lean Mass (Kg)	47.4±4.8	41.4	62.8
Total Body Water (Kg)	33.2±3.8	21.7	43.7
Hb (g/dL)	12.9±1.3	10.1	15.8

n = 76.

The study population was composed of rich class (6.5 % of women), middle class (65.2 %) and poor class (28.3 %).

Similarly, on the basis of age distribution, the study population was divided into 3 categories: (1) The adolescent mothers whose ages were equal to or below 19 years represented 17.1 % of the population with a mean age value of 17.3; (2) the adult mothers whose age were found between 20 and 30 years represented 51.3 % of the population with a mean age value of 24.2; (3) the older adult mothers whose ages were equal to or below 30 years represented 31.6 % of the study population with a mean age value of 33.4.

Table 2. Characteristics of mothers depending on Age.

Range	Number	Age (Year)	BMI (kg/m²)	Fat Mass (Kg)	Lean Mass (Kg)	Total Body Water (Kg)
≤ 19	13	17.3±2.9	24.6±2.6	18.3±6.5	47.6± 5.6	29.7±7.7
[20 – 30]	39	24.2±2.6	26.3±4.0	21.6±7.8	46.5±4.6	33.4±3.1
≥ 30	24	33.4±3.8	28.2±3.0	28.5±9.4	49.2±4.9	35.1±3.4

On the other hand, women from poor and middle classes had greater preference for exclusive breastfeeding (92.3 % and 63.3 % respectively). All the mothers from the rich class (100 %) practised mixed breastfeeding.

Anthropometry and body composition

The mean value of mothers BMI irrespective of their

age or type of breastfeeding practices was within the overweight limit. However, when separately analysed, 26.1 % of mothers recorded normal Body Mass Index against 19.6 % and 52.7 % whose BMI fell in the obese and overweight categories respectively.

Table 3. Characteristics of mothers depending on the type of breastfeeding.

Type of breastfeeding	Number Of mothers	BMI (kg/m²)	Fat Mass (Kg)	Lean Mass (Kg)	Total Body Water (Kg)	Hb (g/dL)
Exclusive	46	27.0±4.1	24.2±9.9	47.3±4.8	33.1±3.9	12.9±1.5
Mixed	23	26.3±3.1	22.1±5.9	47.3±4.9	33.3±3.7	13.1±1.3
Artificial	7	26.4±0.2	25.5±0.4	48.3±7.3	33.6±4.7	12.8±1.3

The mean BMI, mean Fat mass, mean lean mass, and mean total body water did not significantly vary among different breastfeeding practices.

With the exception of lean mass, results also showed that the mean values of BMI, FM and TBW increased with age as seen in table 2.

Iron status of mothers

The WHO identifies Hb level below 12 g/dL as being anemic. Most mothers registered normal level of hemoglobin (76.4 %) against 23.6 % of those with hemoglobin level lower than 12 g/dL. However averagely, the mean hemoglobin level of mothers did not significantly vary with breastfeeding practices.

Table 4. Hemoglobin concentration of lactating women.

Concentration Interval (g/dL)	[10-11]	]11-12[	[12;14]	]14;16]
Number of women	8	10	32	26
Percentage (%)	10.5	13.1	42.2	34.2

Discussion

The higher preference for exclusive breastfeeding by mothers (60.5 %) may be due to the sensitization campaign during prenatal period on the benefits mother's milk provides children in terms of protection against infectious diseases (Picaud, 2008). This is in accordance with the WHO's recommendations requesting mothers to exclusively breastfeed their children for at least six months. In addition, traditionally exclusive breastfeeding is a common practice in Africa although the energy demands of intensive lactation interact with changes in diet quality and physical activity (Claudia R. Valeggia & Petter T. Ellison, 2003).

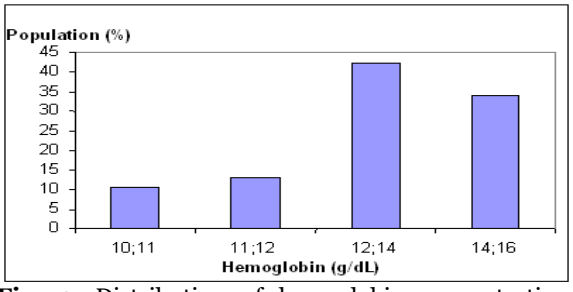

Fig. 1. Distribution of hemoglobin concentration among lactating women.

Noticeably, exclusive breastfeeding was mostly practised by women from middle and poor classes compared to the rich class (100 % of them mix breastfed their children). This may be explained by the fact that rich women have means to buy artificial milk. Only seven mothers (9.2 %) practised artificial breastfeeding. Artificial breastfeeding is not common in Africa and it is not part of our tradition. This option is chosen only when the mother fails to produce milk or when she is HIV positive.

The mean value of Body Mass Index (BMI), Fat Mass (FM), Lean Mass (LM) and Total Body Water (TBW) revealed that the body composition of lactating mothers who participated in the study did not vary significantly with respect to breastfeeding practices (table 3). Our finding confirmed the result of Janney *et al* who showed that there was no correlation between breastfeeding and the body composition of lactating mothers. However the conclusion of our finding cannot be authoritative given the fact that this present study was not a longitudinal one which usually takes in account important parameters such

as duration of lactation, mothers who smoke and those with low birth weighed children. These are key factors that strongly affect the maternal nutrition and lactation (Kramer, 2007). For example, they pointed out that mothers who breastfed for 6-11 months had lower measurement of body fat than those with shorter or larger duration.

On the contrary, with the exception of LM the mean values of BMI, FM and TBW increased with age group as one moved from the adolescent mothers to old adult mothers (table 3). This result is in accordance with the finding of Valeggia *et al* who concluded that the pattern of change in post partum body composition varied with maternal age. However the hemoglobin level of lactating mothers did not significantly vary with breastfeeding practices or mother's age group distribution through the haemoglobin level of adolescent mothers was very closed to that of the adult mothers. This may be due to the fact that the iron requirement of adolescent females is similar to that of non menopauses adult women (Dubost & Schneider, 2000). However these two groups are the most susceptible to iron deficiency as a result of menstruation and other physiological factors. The individual iron requirement is the most determining factor of iron absorption: The more it is needed, the more it is absorbed by the body. Therefore the lack of significant variation of haemoglobin levels of lactating mothers irrespective of their breastfeeding practices may just be attributed to the fact that these women may have quite similar diet.

It should also be noted that the effect of lactation on maternal body composition has been a controversial issue while some studies demonstrated that breastfeeding affect maternal weight others did not find any correlation between the two parameters (Nancy, 1998).

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