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Kaolin Clay Consumption and Pregnancy: Prevalence, Hematological Consequences and Outcome of Labour in the Douala

Henri Essome[1,2], Jean Paul Engbang[1,2], Gaëlla Ndedi Penda[2], Mve Koh Valere[3,4], Merlin Boten[1], Pascal Foumane[4,5], Dieudonné Adiogo[2]

[1]Douala Laquintinie Hospital, Douala, Cameroon
[2]Faculty of Medicine and Pharmaceutical Sciences, The University of Douala, Douala, Cameroon
[3]Yaounde University Health Center, Yaoundé, Cameroon
[4]Faculty of Medicine and Biomedical Sciences, The University of Yaoundé I, Yaoundé, Cameroon
[5]Gynecological-Obstetric and Pediatric Hospital of Yaoundé, Yaoundé, Cameroon
Email: jean_pen@yahoo.ca

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Abstract

Objective: To determine the prevalence, haematological repercussions and prognosis of childbirth in the event of consumption of kaolin during pregnancy. **Materials and Methods:** It was a study over a period of 3 months at the Laquintinie Hospital Douala. It compared two groups of women, one of whom had consumed kaolin during pregnancy (exposed group) and the other had not consumed it (non-exposed group). **Results:** A total of 342 women were included in our study, 121 (35.4%) of whom had consumed kaolin during pregnancy. Women exposed to this consumption ($P < 0.05$) after univariate analysis were those of pregnant women from the Far North (OR = 3.37, CI: 1.29 - 8.79, P = 0.013), single (OR = 1.65, CI = 1.05 - 2.59, P = 0.029), those with primary education (OR = 2.25, CI = 1.06 - 4.79, P = 0.035) and those with HIV (OR = 2.75, IC = 1.02-7.43, P = 0.045). Consumption was more frequent in the first trimester of pregnancy (37%) and in the third quarter (34%), at a predominantly weekly rate (47.9%). The most frequently cited reasons were envy (82%), and nausea (45%). This consumption was associated with a risk of premature delivery (RR = 2.26, IC = 1.27 - 4.05, P = 0.001), yellowish amniotic fluid (RR = 4.66, IC = 1.81 - 11, P = 0.001), birth weight < 2500 g in newborns (RR = 1.72, IC = 3.36 - 9.56, P = 0.025), but increased the probability of delivery (RR = 1.94, IC = 0.96 - 3.90, P = 0.039). For the hematological aspect, the occurrence of anemia (RR = 1.55, IC = 0.97 - 2.31, P = 0.003) and a decrease in mean hemoglobin concentration (RR = 1.29, IC = 0.83 - 2.03, P = 0.041) were associated with kaolin in pregnancy. After multi-

variate logistic regression, the complications included premature delivery, yellowish colour of the amniotic fluid and decreased hemoglobin. **Conclusion:** The use of kaolin is a frequent feeding behavior in pregnancy, mainly motivated by envy, which nevertheless presents serious maternal and fetal complications.

Keywords

Kaolin, Pregnancy, Anemia, Prognosis, Childbirth, Douala

1. Introduction

Eating disorders are widespread throughout the world, represented by pathologies such as geophagia, bulimia and anorexia [1]. Geophagy is defined as the voluntary feeding of land between 10 - 50 g per day [2]. It represents the most widespread form of pica; the practice of ingesting non-edible materials [1]. It is one of the nutritional disorders frequently occurred in pregnant women [1]. The kaolin locally called "kalaba" is the material of predilection of the geophages. It is more or less sweet, white or pinkish clay frequently consumed in Africa, rarely in India and the USA [3]. It is believed to have antiparasitic, antidiarrheal, and especially antacid properties [4]. Nevertheless, because of its remarkable ion-exchange properties, its consumption would upset the absorption of ions, causing deficiencies, mainly iron responsible for long-term iron deficiency anemia [5]. Its consumption is also responsible for other pathologies such as poisoning with heavy metals, pesticides, intestinal occlusions and renal lithiasis [6]. Studies in Africa on geophagia and pregnancy show prevalence of 65%, 28% and 50% respectively in Kenya, Tanzania and Nigeria [6] [7]. A study carried out in Yaoundé gives a prevalence of consumption of kaolin in pregnancy in the percentage of 32.4% [8]. Because of the iron chelating properties of kaolin, its consumption makes it one of the etiologies encountered but little known of iron deficiency anemia [5]. Iron deficiency anemia is a condition affecting 20% of pregnant women in developed countries, 51% in developing countries [9]. A study carried out in Douala on the prevalence of anemia in pregnancy, evaluated it at 20.5% [10]. Nevertheless, the relationship between anemia and soil ingestion is not yet well established. It would be a vicious circle, where ingestion of soil would lead to anemia due to iron deficiency, which would increase the urge to consume soil [5]. As part of our contribution to the knowledge of geophagy and its consequences, we proposed to carry out this work, which aimed to investigate the hematological repercussions and the prognosis of childbirth in the case of geophagic practice among pregnant women in the maternity of Douala Laquintinie Hospital.

2. Methods

It was a study conducted at the Douala Laquintinie Hospital over a period of

about 3 months; from 21 February to 31 May 2017. All pregnant women were included, with the exception of those with increased risk factors for bleeding. Two groups were then constituted, one consuming kaolin and the other not have being consuming. Consumption information, socio-demographic data, medical and obstetric history, labor and blood count were collected. The study materials were an established standardized questionnaire and the result of a biological sampling (NFS) at the time of delivery. The statistical analyses were done by SPSS software version 20.0. The associated factors were investigated using the logistic regression method in univariate and multivariate analysis. The Odds Ratio (OR) and Relative Risk (RR) were used to measure the degree of association. The significance threshold was set at $P < 0.05$.

3. Results

During our study period, we identified 353 female workers in the laboratory, after searching for exclusion criteria. 342 were retained, including 121 kaolin users, a prevalence of 35.4% (N = 342) (Figure 1). For the population consuming kaolin, the most represented age group was [25 - 35] years with an average of 26 ± 4 years. The main reason for consumption was envy (82%) with a predominance in the first quarter (56.4%) weekly 47.9% (Table 1).

Sociodemographic data and antecedents: Sociodemographic variables and antecedents revealed that belonging to the Far North region (OR = 3.37, CI: 1.29 - 8.79, P = 0.013), single marital status (OR = 1.65, CI: 1.05 - 2.59, P = 0.029), primary education (OR = 2.25, CI: 1.06 - 4.79; P = 0.035) and HIV carriers (OR = 2.75, CI: 1.02 - 7.43, P = 0.045) predisposed to kaolin in pregnancy (Table 2).

Childbirth labor: After univariate analysis, labor-related variables associated with consumption of kaolin were: prematurity (RR = 2.26, IC: 1.27 - 4.05, P = 0.001), yellowish coloration (RR = 1.94, IC = 0.96 - 3.90, P = 0.001, P = 0.001) 0.039), birth weight <2500 g (RR = 1.72, IC: 3.36 - 9.56, P = 0.025).

The use of kaolin protects against complications such as: caesarean section (RR = 0.61, IC: 0.35 - 1.04, P = 0.016) and cephalo-pelvic disproportion (RR = 0.29, 10 - 0.86, P = 0.017) (Table 3).

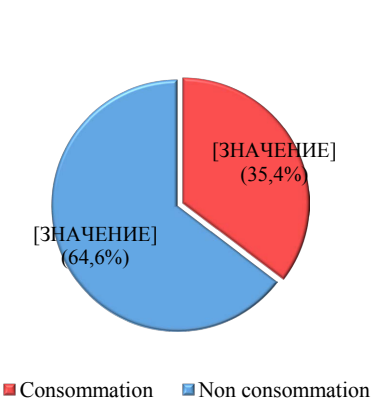

Figure 1. Prevalence of consumption of kaolin.

Table 1. Distribution by kaolin consumption variables.

Variables	Effective	Percentage
Term of the consumption		
Before pregnancy	5	4.1
1st trimester	**68**	**56.2**
2nd trimester	48	39.7
3rd trimester	64	52.9
Fréquency of the consumption		
Per day	47	38.8
Per week	**58**	**47.9**
Per month	11	9.1
Per trimester	5	4.1
Motivations of the consumption		
Nausea	54	44.6
Vomiting	3	2.5
Desire	**99**	**81.8**
Culture	1	0.8
No reason	1	0.8

Table 2. Summary of socio-demographic and history variables with a significant association with consumption of kaolin.

Variables	Exposed N = 121	Non-exposed N = 221	OR (IC 95%)	P value
	n (%)	n (%)		
Extreme North Region	12(9.9)	7(3.2)	3.37 (1.29 - 8.79)	**0.013**
Single	73 (60.3)	106 (48.0)	1.65 (1.05 - 2.59)	**0.029**
Primary	16 (13.2)	14 (6.3)	2.25 (1.06 - 4.79)	**0.035**
HIV[1] (Yes)	10 (8.3)	7 (3.2)	2.75 (1.02 - 7.43)	**0.045**

1. Human immunodeficiency virus.

Table 3. Summary of childbirth labor variables with a significant association with consumption of kaolin.

Variables	Exposed N = 121	Non-exposed N = 221	RR (IC 95%)	P value
	n (%)	n (%)		
GA[1] < 37WA[2]	31 (25.6)	25 (11.3)	2,.26 (1.27 - 4.05)	**0.001**
Yellowish Amniotic Fluid	16 (13.2)	7 (3.2)	4.66 (1.81 - 11.33)	**0.001**
Vaginal delivery	96 (79.3)	150 (67.9)	1.72 (3.36 - 9.56)	**0.025**
caesarean	24 (19.8)	71 (32.1)	0.61 (0.35 - 1.04)	0.016
CSD[3]	4 (3.3)	25 (11.1)	0.29 (0.10 - 0.86)	0.017
BW[4] < 2500	18 (14.9)	17 (7.7)	1.94 (0.96 - 3.90)	**0.039**

1. Gestational age; 2. Weeks of amenorrhea; 3. Cerebrospinal dystocia; 4. Birth weight; 5. Average corpuscular concentration in hemoglobin.

Blood count: Consumption of kaolin increases the risk of hypochromic anemia, which is objectified (Table 4) by a statistically significant association between kaolin intake and a decrease in hemoglobin to less than 10 (RR = 1.55, IC = 0.97 - 2.31, P = 0.003) and on the other hand a decrease in mean corpuscular hemoglobin concentration (RR = 1.29, IC = 0.83 - 2.03, P = 0.041).

After multivariate analysis using linear logistic regression, the factors independently associated with consumption of kaolin were: being from the extreme North region, single marital status, prematurity and anemia (Table 5).

Table 4. Breakdown by blood count.

Variables	Exposed N = 121	Non-exposed N = 221	RR (IC 95%)	P value
	n (%)	n (%)		
Hemoglobin (g/dl)				
<10.5	56 (46.3)	66 (29.9)	1.55 (0.97 - 2.31),	**0.003**
≥10.5	65 (53.7)	155 (70.1)	0.76 (0.48 - 1.21)	
MCH[1](pg)				
<24	15 (12.4)	21 (9.5)	1.31 (0.65 - 2.63)	0.406
24 - 37	193 (87.3)	102 (84.3)	0.96 (0.52 - 1.79)	0.437
≥37	4 (3.3)	7 (3.2)	1.05 (0.30 - 3.63)	0.945
MCHC[2] (g˚/dl)				
<32	76 (62.8)	135 (61.1)	1.03 (0.65 - 1.62)	0.754
32 - 36	32 (26.4)	63 (28.5)	0.93 (0.56 - 1.52)	0.684
≥36	13 (10.7)	23 (10.4)	1.04 (0.51 - 2.11)	0.923
Hematocrit (%)				
<34	61 (50.4)	86 (38.9)	1.29 (0.83 - 2.03)	**0.041**
≥34	60 (49.6)	135 (61.1)	0.81 (0.52 - 1.27)	
MGV[3] (fl)				
<80	18 (14.9)	28 (12.7)	1.18 (0.62 - 1.64)	0.568
80 - 100	86 (71.1)	155 (70.1)	1.01 (0.62 - 1.64)	0.856
≥100	17 (14.0)	38 (17.2)	0.82 (0.44 - 1.51)	0.450
White blood cells (C/mm³)				
<15,000	108 (89.3)	209 (94.6)	0.94 (0.41 - 2.13)	0.076
≥15,000	12 (10.7)	13 (10.7)	1.88 (0.83 - 4.25)	
Platelets (˚C/mm³)				
<150,000	19 (15.7)	56(25.3)	0.62 (0.35 - 1.11)	0.549
15,000 - 450,000	99 (81.8)	164 (74.2)	1.10 (0.64 - 1.92)	0.112
≥450,000	3 (2.5)	1(0.5)	5.62 (0.57 - 53.11)	0.138

1. Mean corpuscular hemoglobin (MCH); 2. Mean corpuscular hemoglobin concentration; 3. Mean globular volume.

Table 5. Multivariate logistic regression.

Variables	OR adjusted	IC. 95%		P value
		Inferior	Superior	
Extreme North	6.69	2.05	21.90	**0.002**
Signle	2.02	1.20	3.37	**0.008**
Primary	1.61	0.64	4.07	0.311
HIV[1]	1.95	0.64	5.97	0.242
Prématurité	2.57	1.08	6.13	**0.033**
Weight < 2500 grs	0.60	0.20	1.74	0.346
Yellowish Amniotic Fluid	4.59	1.65	12.78	**0.004**
Vaginal delivery	1.46	0.77	2.78	0.250
Hematocrit	1.01	0.55	1.83	0.986
Hemoglobin < 10.5	2.07	1.11	3.86	**0.021**

1. Human immunodeficiency virus.

4. Discussion

Our study found a 35.4% prevalence of consumption of kaolin in pregnancy (Figure 1). This consumption was spread over the whole pregnancy with a predominance in the first quarter (37%) and the third quarter (34%). It was more frequent during the week and envy was the main reason for this practice at 82% followed by relief of nausea (Table 2).

These data are in line with studies conducted in Yaoundé in 2015 and 2016, which stipulate that the consumption of kaolin has a prevalence of 32.4% and 40.5% respectively. The consumption pattern was 49.50% and 55%, respectively [8] [11].

Here, the labor of childbirth and the fate of the newborn were studied. 16.37% of the admitted pregnant women had a gestational age of less than 37weeks. Kaolin intake after univariate analysis was found to be a factor that multiplied the risk of premature birth by 2 (RR = 2.26, CI: 1.27 - 4.05, P = 0.001).

The color of the amniotic fluid was also influenced by the kaolin intake. An increase in the frequencies of amniotic fluid, yellowish colour and meconium, was observed when consumption of kaolin was observed. This practice had a deleterious effect on the color of the amniotic fluid (RR = 4.66, CI: 1.81 - 11.83, P = 0.001); with a four-fold increase in the risk of having a yellowish amniotic fluid at childbirth.

The birth weight of our series varied between 700 - 5600 grams and was negatively influenced by consumption. Women Consuming kaolin were 1.72 times more likely to have a newborn baby weighing less than 2500 grams (RR = 1.72, CI: 3.36 - 9.56, P = 0.025).

The geophagic practice had the advantage of reducing the risk of an indication of Caesarean section. There was an increase in delivery by low route in the case of kaolin intake (RR = 1.94, IC: 0.96 - 3.90, P = 0.039).

All these findings go in the same direction as the literature, which reports that geophagy exposes to the risks of premature birth, newborns with low birth weight. Data reported by Njiru in Kenya in 2011 and Foumane *et al.* in Yaoundé in 2016 indicate that consumption of kaolin was associated with newborns with weight under 2500 grams [11] [12]. This is due to a decrease in maternal-fetal blood flow due to maternal anemia. With a chronic fetal suffering partly explaining prematurity; the yellowish amniotic fluid, and the small birth weight (which itself favors the passage through the lower lobe) at the time of delivery.

On our population of 342 pregnant women, 123 had an Hb < 10.5 g/dL. After logistic analysis, we found that consumption of kaolin increased the risk of anemia (RR = 1.55, IC: 0.97 - 2.31, P = 0.003). The literature goes in the same direction, in that a study carried out in Madagascar in 2011 on the relationship between geophagy and anemia shows us a case of carotid anemia resulting from geophagy with a hemoglobin <9 g/dL [13]. Similarly, a cohort study carried out in 2009 in western Guyana on 109 female geophages and 75 non-geophages showed a hemoglobin <8.5 g/dL at the beginning of pregnancy, with a progressive decrease during pregnancy, requiring transfusion of the globular pellet [5]. This is explained by the iron chelating action of kaolin.

5. Conclusion

Consumption of kaolin is a common practice during pregnancy in Africa. The origin of extreme north, the celibacy and the prematurity are the independent factors associated with kaolin intake in this study.

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