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Ingestão dietética e padrão alimentar das mulheres em estado de gravidez e amamentação de povos indígenas da Colômbia. Problemática que requer atenção urgente

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Abstract

Objective. This work sought to analyze the eating pattern and risk of deficiency in the usual intake of energy and nutrients of gestating and lactating women from some indigenous peoples. **Methods.** Cross-sectional descriptive study, with information from the dietary intake component taken from the National Study on the Food and Nutritional Situation of

Indigenous Peoples in Colombia, conducted between 2013 and 2019, including 1,028 indigenous gestating (319) and lactating (709) women, from the north and south regions of the country. **Results.** The study found a proportion > 90% (standard deviation = 0.04) of gestating and lactating women with calorie consumption percentage below that recommended

($p = 0.038$). Nearly 70% of the gestating and lactating women had not consumed dairy products the day prior to the survey, and 50% did not consume fruits and vegetables. With respect to micronutrients, the work found, in the gestating and lactating women, high prevalence of the risk of deficiency in vitamin C intake (50.3% and 80.2%), folates (80.4% and 95.1%), zinc (87.6% and 96.3%), iron (88.9% and 68.6%), and calcium (87.5% and 98.5%). **Conclusion.** Consumption of foods and

nutrients in indigenous gestating and lactating women is deficient in key nutrients to maintain their state of health and provide the nutrients necessary for their infants; their eating pattern is classified as unhealthy.

-----**Keywords:** Colombia, diet, nutrition and feeding, lactation, indigenous women, nutrition of the pregnant woman, indigenous people.

Resumen

Objetivo: Analizar el patrón alimentario y el riesgo de deficiencia en la ingesta usual de energía y nutrientes de las mujeres gestantes y lactantes de algunos pueblos indígenas. **Métodos:** Estudio descriptivo transversal, con información del componente de ingesta dietética tomada del Estudio nacional de la situación alimentaria y nutricional de los pueblos indígenas de Colombia, realizado entre 2013 y 2019, que incluyó 1028 mujeres indígenas gestantes (319) y lactantes (709), de las regiones norte y sur del país. **Resultados:** Se encontró una proporción superior al 90 % (Desviación estándar = 0,04) de gestantes y lactantes con consumo inferior al recomendado de calorías ($p = 0,038$). Alrededor del 70 % de las gestantes y lactantes no consumió lácteos el día anterior

a la encuesta, y 50 % no consumió frutas y verduras. Con respecto a los micronutrientes, se encontraron, en las gestantes y lactantes, altas prevalencias del riesgo de deficiencia en la ingesta de vitamina C (50,3 y 80,2 %), folatos (80,4 y 95,1 %), zinc (87,6 y 96,3 %), hierro (88,9 y 68,6 %) y calcio (87,5 y 98,5 %). **Conclusión:** El consumo de alimentos y nutrientes en las mujeres indígenas gestantes y lactantes es deficiente en nutrientes claves para mantener su estado de salud y proporcionar los nutrientes necesarios a su bebé, y su patrón alimentario se clasifica como no saludable.

-----**Palabras clave:** Colombia, dieta, nutrición y alimentación, lactancia, mujeres indígenas, nutrición de la mujer embarazada, pueblos indígenas

Resumo

Objetivo: Analisar o padrão alimentar e o risco de deficiência na ingestão usual de energia e nutrientes das mulheres gestantes e lactantes de alguns povos indígenas. **Metodologia:** Estudo descritivo transversal, com informação do componente de ingesta dietética tirada do Estudo nacional da situação alimentar e nutricional dos povos indígenas da Colômbia, realizado entre 2013 e 2019, que incluiu 1028 mulheres indígenas gestantes (319) e lactantes (709) das regiões norte e sul do país. **Resultados:** Encontrou-se uma proporção superior a 90% (Desvio-padrão = 0,04) de gestantes e lactantes com consumo inferior ao recomendado em calorías ($p = 0,038$). Ao redor de 70% das gestantes e lactantes não consumiu

lácteos no dia prévio à enquete, e 50% não consumiu frutas e verduras. No que se refere aos micronutrientes, acharam-se nas gestantes e lactantes altas prevalências de risco de deficiência na ingestão de vitamina C (50,3 e 80,2 %), folatos (80,4 e 95,1 %), zinco (87,6 e 96,3 %), ferro (88,9 e 68,6 %) e cálcio (87,5 e 98,5 %). **Conclusão:** O consumo de alimentos e nutrientes nas mulheres indígenas gestantes e lactantes é deficiente em nutrientes-chave para manter seu estado de saúde e proporcionar os nutrientes necessários para o bebê; seu padrão alimentar classifica-se como não saudável.

-----**Palavras-chave:** Colômbia, dieta, nutrição e alimentação, amamentação, mulheres indígenas, nutrição da mulher grávida, povos indígenas.

Introduction

Inequalities between indigenous communities and the population without ethnic affiliation are marked in the global and national settings, in economic, political, and morbidity-mortality terms [1]. According with the United Nations Permanent Forum on Indigenous Issues, data existing on this population is limited, but that available reflects the big inequalities in this group, which are more marked in women with respect to men [2].

To respond to these needs, since 2013, the Colombian Institute of Family Welfare (ICBF), in alliance with other institutions, has led the National Study of the Food and Nutritional Situation of Indigenous Peoples from Colombia (ENSANI, for the term in Spanish) [3], conducted from a territorial, intercultural, and relational perspective to guide public policies and the government decisions of each people. The ENSANI emerged as response to that established in the 2010-2014 National Development Plan “Prosperity for All” [4], CONPES do-

cument 113 of 2008 [5], the imperatives of the document “General Framework for Public Policy Guidelines and Technical Guidelines for Differentiated Care ICBF in matters of family, childhood, and adolescence of ethnic groups” [6], and by State commitments with respect to the human right to food of indigenous people, especially of those at risk of physical and cultural disappearance, and who require urgent interventions to protect their integrity. In said study, participation by the indigenous community was permanent, both during the design phases, as in the implementation and socialization of the results. In each indigenous community, the components of characterization, anthropometry, food consumption, biochemical indicators, conceptions and feeding practices, and nutritional health care were evaluated.

Colombian indigenous communities are diverse regarding their culture, cosmovision, sociopolitical organization, and self-government (traditional authorities, councils, captains, etc.). According to Colombia’s 2018 National Population and Housing Census, there are 105 indigenous peoples, with 1,905,617 individuals, representing 4.4% of the country’s population total, which are distributed similarly between men (50.1%) and women (49.9%), mostly constituted by young individuals and adults (64%), followed by children (33.8%), and in lower proportion by the elderly (5.8%) [7]. Regarding women, the Individual Service Provision Registry evidences that the principal diagnoses in 2019 were pregnancy, childbirth, and puerperium [cited in 8], situations that can have complications due to low health care, short intergenic periods, non-institutionalized childbirth, adolescent pregnancy, and due to gestating and lactating at the same time.

Deficiency in the usual intake of energy and nutrients of the entire population, especially in indigenous women in gestation and lactation stage, is an aspect of transcendental importance due to the metabolic adaptations manifested in the short term in the mother’s health (anemia, malnutrition, cardiovascular diseases, maternal mortality), and in the newborn (delayed fetal development, low birth weight, premature birth, congenital defects, etc.), while in the mid- and long term, these determine the health and disease processes of future generations [9].

Evaluating the dietary intake in indigenous women during gestation and lactation contributes to identifying gaps in the consumption of foods and nutrients from which the human right to food can be sustained, and propose, according with the context of indigenous communities, health and nutrition care strategies adjusted to it, to mitigate the circle of maternal and child malnutrition. Due to the foregoing, the objective of this study was to analyze the eating pattern and risk of deficiency in the usual intake of energy and nutrients of pregnant and lactating women from some indigenous people.

Methodology

A cross-sectional descriptive study was conducted, from the secondary information of the component of calorie and nutrient intake by the ENSANI of Colombia, carried out between 2013 and 2019 [3]. The ENSANI, for the population group of pregnant and lactating women, elaborated a census sampling, which included all the women in these physiological periods who were found at the time of the evaluation in the indigenous people.

Data were collected from 1,028 women, de which, through self-report, 319 manifested being in gestation period and 709 in lactation period.

This study included the 24 indigenous peoples in which had been socialized the ENSANI results. The location de las participating women from the peoples was classified into two regions, according to their geographic location: the north-western region included the Amorúa, Betoeye, Ette Enaka, Hitnu, Maibén Makaguan, Masiware, Sáliba, Sikuaní, Tsiripu, Uwa, Wamonae, Waüpijiwi, Yamalero, Yaruro, and Wayuú peoples located in the departments of Casanare, Arauca, Cesar, La Guajira, and Magdalena; in the south region, the Coreguaje, Jiw, Kichuwa, Kofán, Makaguaje, Murui, Quillasinga, Siona, and Yanacona peoples, located in the departments of Caquetá, Guaviare, Meta, and Putumayo.

Evaluation of dietary intake

The ENSANI evaluated the consumption of foods of the different indigenous peoples in unified manner, using un dietary intake evaluation system from the adjusted Multi-step 24-hour (R24h) reminder [10] set. This information was collected by students and professionals in nutrition and dietetics, trained and standardized on the technique.

To quantify the foods ingested, food models and geometric figures were used, along with a photo album with real-size homemade measuring utensils, which have been validated [11], adjusted [12] and used in different population studies [13-15]. Non-coded products and the community foods were weighed and standardized. In addition, the consumption of liquor, supplements and nutritional supplements was inquired and quantified, to avoid underestimating or overestimating the prevalence of deficiency or excess of nutrients.

The R24h were applied on non-consecutive days and distributed during the seven days of the week. All the women in this study were applied a first R24h, and to 57.6% (167 pregnant and 425 lactating) was applied a second R24h, necessary procedure to adjust the intra- and inter-individual variability of the intake [16].

To verify the quality of the information, the forms were reviewed in the field by previously trained dietitian nutritionists. Subsequently, they were entered into the Dietary intake evaluation program (EVINDI) v5.0 [17]

of the School of Nutrition and Dietetics at Universidad de Antioquia, which measures the foods and nutrients consumed, from different food composition tables [18-25] and information obtained from labels, supplements, complements, and preparations standardized in different investigations. When a new food was reported, of which no nutritional information was available, it was replaced according with its characteristics by another similar food.

Estimation of energy and nutrients

Nutrient data from the first and second R24h generated in the EVINDI v5.0 were processed in the Personal Computer Software for Intake Distribution Estimation, (PC-SIDE®) v1, by the Iowa State University [26], which estimates the distribution of the usual intake and establishes the proportion of the population at risk of deficiency or excess in nutrient consumption, using as cut-off point the Estimated Average Requirement, which is established in the RIEN for the Colombian population [27].

To calculate the energy requirement, the Physical Activity Level [27] was established, based on the usual, occupational, and discretionary activities reported by each woman. According to the RIEN, these are classified into: light, moderate and strong.

To analyze nutrients, the mean and standard deviation (SD) adjusted in the PC-SIDE® v1 were obtained; the percentage of women who consumed calories, protein, fat, and carbohydrates below or above the Acceptable Macronutrient Distribution Range [27], which is the recommended percentage of the contribution of each macronutrient to the total energy intake; the low risk of deficiency in the usual intake of dietary fiber, and the prevalence of risk of deficiency in the usual intake of protein, vitamin A, vitamin C, folates, zinc, iron, and calcium.

Determination of the eating pattern

Foods from the first R24h were classified into six groups, according with the consumption and with that recommended in the GABAS [28]: 1. Cereals, roots, tubers, and plantains; 2. Fruits and vegetables; 3. Dairy products (whole milk, dairy products, low-fat milk and dairy products); 4. Protein sources (lean meats, high-fat products, eggs, legumes, nuts and seeds); 5. Fats (polyunsaturated, monounsaturated, saturated), and 6. Sugars (simple, sweets, and desserts).

With these food groups, the consumption ratio index (CRI) was calculated, which is the quotient between the calories consumed and those recommended for each woman, according to the physiological state (gestating or lactating) and the trimester of gestation or semester of lactation, and it was calculated among pregnant and lactating women who consumed any food from the groups mentioned. When the value of CRI is < 1 , it means consumption is lower than the recommended; if it is $= 1$, the person is consuming 100% of that recommended, and when it is $>$

1, consumption is above that recommended. This analysis, considered a healthy eating pattern the compliance with the energy recommendations for each food group.

Statistical analysis

For the descriptive analysis of the sociodemographic aspects and the CRI, absolute and relative distributions were used; the median as summary measure and the SD of the median as dispersion measure.

The criteria of normality and homoscedasticity were established with the Kolmogorov-Smirnov and Levine tests, from which the non-parametric Wilcoxon signed rank test was defined, to compare the difference between the calorie consumption by food groups with the respective recommendation in the GABAS and the difference between physiological states and regions.

In addition, the Effect Size of Range Biserial Correlation and Krippendorff's alpha were calculated [29,30].

Data analysis was performed with the Jamovi program 1.6.23 and all tests considered statistically significant a value of $p < 0.05$.

Ethical considerations

This research adhered to the international ethical principles of the Declaration of Helsinki [31] and the guidelines established in Resolution 8430 of 1993 by the Colombian Ministry of Health [32], according to which it was classified as minimum risk.

In addition, due to being a project from secondary sources, Legislation 1581 of 2012 [33] was considered, which safeguards the principles of security and confidentiality of personal data, as well as the use, management, collection, and treatment of the information.

The study from which this project is derived was approved according to minute 8-2012 by the Research Ethics Committee of Colombia's National Health Institute.

Results

The study included 1,028 indigenous women in gestation (319) and lactation (709) periods, ranging in age between 14 and 50 years, with predominance of the age range from 19 to 30 years in both groups; 74% of the women was in the second and third trimesters of gestation, and 64% was in the second semester or more of lactation, 90% resided in the rural zone, and 57% resided in the north region of the country.

According to some lifestyle characteristics, a higher proportion of lactating women engaged in moderate physical activity (65.2%), with respect to those who were pregnant (55.8%). Supplement consumption in this population was low, at 11.3% in lactating women and 8.5% in gestating women. A third of the group consumed native foods the day prior to the survey and 4.5%

Table 1. Sociodemographic and food consumption characteristics of women during gestation and lactation periods from some indigenous peoples of Colombia

Variable		Total n = 1,028 % (n)	Gestating n = 319 % (n)	Lactating n = 709 % (n)	
Age group	14 to 18 years	19.7 (203)	25.1 (80)	17.3 (123)	
	19 to 30 years	56.0 (576)	55.2 (176)	56.4 (400)	
	31 to 50 years	24.2 (249)	19.7 (63)	26.2 (186)	
Trimester or semester	First trimester or semester	33.1 (340)	26.0 (83)	36.2 (257)	
	Second trimester or semester or more	57.5 (591)	43.6 (139)	63.8 (452)	
	Third trimester	9.4 (97)	30.4 (97)	-	
Area of residence	Urban	10.8 (111)	9.7 (31)	11.3 (80)	
	Rural	89.2 (917)	90.3 (288)	88.7 (629)	
Region	North	56.7 (583)	59.9 (191)	55.3 (392)	
	South	43.3 (445)	40.1 (128)	44.7 (317)	
Departments per region	North	Arauca	26.5 (272)	24.5 (78)	27.4 (194)
		Casanare	5.6 (58)	7.2 (23)	4.9 (35)
		Cesar	2.5 (26)	4.4 (14)	1.7 (12)
		La Guajira	13.8 (142)	15.4 (49)	13.1 (93)
	South	Magdalena	8.3 (85)	8.5 (27)	8.2 (58)
		Caquetá	9.1 (94)	9.7 (31)	8.9 (63)
		Cauca	0.1 (1)	0.3 (1)	0.0 (0)
		Meta	14.1 (145)	10.0 (32)	15.9 (113)
Putumayo	19.9 (205)	20.1 (64)	19.9 (141)		
Physical activity	Light	30.0 (308)	39.2 (125)	25.8 (183)	
	Moderate	62.3 (640)	55.8 (178)	65.2 (462)	
	Strong	7.8 (80)	5.0 (16)	9.0 (64)	
Consumption the previous day	Supplements and complements	10.4 (107)	8.5 (27)	11.3 (80)	
	Alcoholic beverages	4.5 (46)	3.4 (11)	5.0 (35)	
	Native foods	37.0 (380)	38.9 (124)	36.2 (256)	
Food safety	The food reported is usual	80.9 (830)	79.0 (252)	81.8 (578)	
	Satisfied with the amount of foods usually consumed	80.4 (825)	81.8 (261)	79.8 (564)	
	In the last month went to bed hungry someday due to lack of food	50.5 (518)	47.0 (150)	52.1 (368)	

Source: [34-40]. Statistical analyses performed by the authors.

consumed alcoholic beverages; 81% reported that food intake was usual and were satisfied with the amount consumed; however, half of them mentioned having gone to bed hungry due to lack of food in the last month prior to the survey (Table 1).

A proportion > 90% (SD = 0.04) of gestating and lactating women was found with consumption percentage below that recommended of calories and fats, with

statistically significant differences according to the physiological state for calories ($p = 0.038$). Prevalence of risk of deficiency in the usual protein intake was 29.2% (SD = 0.04) for gestating women and 34.1% (SD = 0.03) for those lactating. Carbohydrate consumption had contrary behavior, given that > 80% (SD = 0.06) of both groups had consumption above that reference value. Regarding micronutrients, statistically significant diffe-

Table 2. Distribution and adequacy of energy intake, percentage of individuals with consumption percentage lower and higher than the Acceptable Macronutrient Distribution Range (%AMDR) and prevalence of the risk of deficiency in the usual intake of proteins, vitamins, and minerals of women during gestation and lactation periods from some indigenous peoples of Colombia

Physiological state	Gestating (n = 319)				Lactating (n = 709)				
	<%RV* % (sd)	>%RV* % (sd)	Prevalence of deficiency† % (sd)	Adjusted mean (sd)	<%RV* % (sd)	>%RV* % (sd)	Prevalence of deficiency† % (sd)	Adjusted mean (sd)	p value‡
Calories (kcal)	90.4 (0.04)	3.1 (0.02)	1406 (552)	94.0 (0.02)	1.9 (0.01)	1309 (587)	0.038		
Proteins (g)	21.7 (0.07)	1.7 (0.03)	38.7 (16.0)	16.9 (0.08)	0.6 (0.01)	36.2 (14.6)	0.121		
Fats (g)	95.5 (0.04)	0.02 (0.00)	24.8 (14.5)	94.5 (0.03)	0.1 (0.002)	24.1 (15.2)	0.504		
Carbohydrates (g)	0.4 (0.01)	82.3 (0.06)	254.2 (101.4)	0.2 (0.004)	81.5 (0.06)	231.6 (110.3)	0.759		
Dietary fiber (g)			17.2 (9.8)			15.2 (9.5)	0.070		
Vitamin A (RE)			332 (322)			282 (280)	-		
Vitamin C (mg)			85 (66)			63 (59)	<0.001		
Folates (ugDFE)			366 (363)			205 (126)	<0.001		
Zinc (mg)			5.42 (3.53)			4.62 (2.46)	<0.001		
Calcium (mg)			447 (646)			259 (178)	<0.001		
Iron (mg)			17.0 (16.6)			9.3 (7.1)	<0.001		
Region	North (n = 583)				Sur (n = 445)				
Calories (kcal)	95.0 (0.02)	1.3 (0.01)	1296 (511)	90.7 (0.02)	4.0 (0.02)	1393 (657)	0.007		
Proteins (g)	15.3 (0.14)	0.0 (0.00)	35.1 (14.5)	14.5 (0.07)	2.4 (0.03)	39.4 (14.5)	<0.001		
Fats (g)	96.7 (0.03)	0.0 (0.00)	22.8 (13.6)	92.0 (0.04)	0.3 (0.004)	26.4 (16.4)	<0.001		
Carbohydrates (g)	0.2 (0.003)	86.3 (0.06)	233.4 (95.6)	0.3 (0.01)	77.0 (0.07)	244.8 (125.1)	<0.001		
Dietary fiber (g)			17.4 (11.7)			13.7 (6.4)	<0.001		
Vitamin A (RE)			296 (264)			298 (317)	-		
Vitamin C (mg)			73 (56)			75.7 (0.03)	0.002		
Folates (ugDFE)			265 (239)			249 (181)	0.119		
Zinc (mg)			4.85 (2.83)			4.92 (2.84)	0.802		
Calcium (mg)			342 (445)			282 (184)	<0.001		
Iron (mg)			11.2 (10.6)			12.7 (13.1)	0.005		

Abbreviations: sd: Standard deviation, kcal: kilocalories, g: grams, RE: retinol equivalents, mg: milligrams, ugDFE: micrograms of dietary folate equivalents.

* Corresponds to the percentage of women who consumed calories below (<) or above (>) the reference value (RV), that is, <90% and >110%. For macronutrients, corresponds to percentage of women who consumed below or above the Acceptable Macronutrient Distribution Range, %AMDR), which is the percentage recommended of the contribution of each macronutrient to the total energy intake; for proteins it is <10% and >20%AMDR; fats <25% and >35%AMDR; carbohydrates <50% and >65%AMDR.

† For all the nutrients, the prevalence of the risk of deficiency was established in the usual intake and for dietary fiber the low risk of deficiency in the usual intake.

‡ The p value was calculated with the difference of proportions test.

§ Not possible to calculate values due to data variability

Source: [34-40]. Statistical analyses performed by the authors.

rences ($p < 0.001$) were found, according to the physiological state, in the prevalence of risk of deficiency in the usual intake of vitamin C, folates, zinc, iron, and calcium, with higher risk in the group of women in the lactation period, except for iron, whose prevalence of risk of deficiency was higher in women in gestation period. In both groups, > 50% of the women had risk of deficiency of critical nutrients for their physiological state.

Given the geographic characteristics of Colombia, intake comparison was made by north and south regions. It was found that over 90% of the women had consumption percentage below the reference value in calories and fats, with statistically significant differences according to region ($p = 0.007$ and < 0.001 , respectively).

For proteins, the prevalence of risk of deficiency was 37.5% (SD = 0.03) for the north region and 24.3% (SD = 0.04) in the south ($p < 0.001$). In women residing in the north, 86.3% (SD = 0.06) had carbohydrate intake above the reference value, and in the south region, 77.0% (SD = 0.07) ($p < 0.0001$).

With respect to micronutrients, there were statistically significant differences in consumption of vitamin C, iron, and calcium ($p = 0.002$, 0.005 and < 0.001 , respectively); the other micronutrients showed no statistically significant differences per region. Prevalence of risk of deficiency in the usual intake was higher in the south region for vitamin C, folates, zinc, and calcium, and lower for iron (Table 2).

When calculating the CRI between the food groups consumed and the GABAS recommendations, in the case of pregnant women, statistically significant differences were found for the six food groups ($p < 0.001$). Intake was lower than recommended for fruits and vegetables (CRR = 0.07; MAD = 0.05), protein sources (CRR = 0.26; MAD = 0.12), dairy (CRR = 0.30; MAD = 0.19), fats (CRR = 0.46; MAD = 0.29) and sugars (CRR = 0.55; MAD = 0.30); the cereal group was the only one with a median CRI greater than one (1.08; MAD = 0.47). In the case of lactating women, statistically sig-

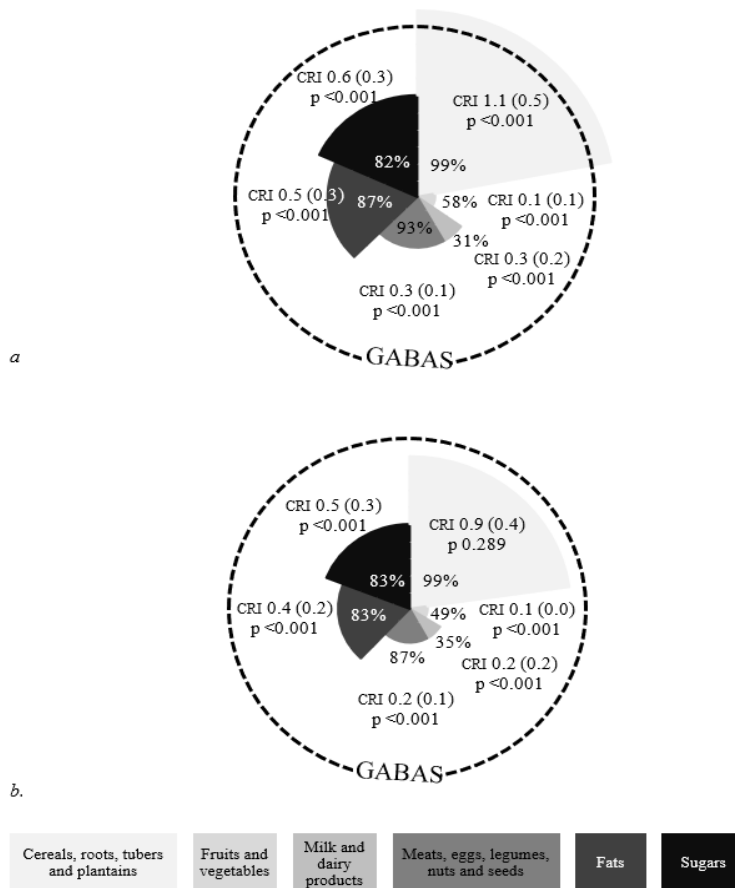


Figure 1. Physiological state. **a.** gestating (n = 319); **b.** lactating (n = 709). Abbreviations: CRI: Consumption ratio index; GABAS: Food-based Dietary Guides. When the value of CRI is < 1, it means consumption is lower than that recommended; when it is = 1, the person is consuming 100% of that recommended; and when it is > 1, consumption is above that recommended.

Source: [34-40]. Statistical analyses performed by the authors.

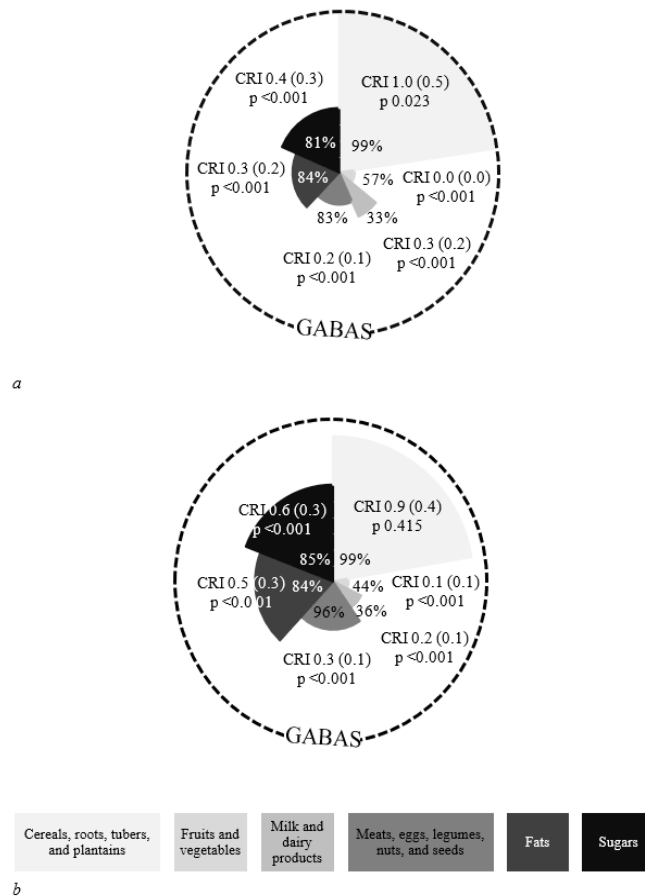


Figure 2. Region. **a.** North (n = 583); **b.** south (n = 445). Abbreviations: CRI: Consumption ratio index, GABAS: Food-based Dietary Guides. When the value of CRI is < 1, it means consumption is lower than that recommended; when it is = 1, the person is consuming 100% of that recommended; and when it is > 1, consumption is above that recommended.

Source: [34-40]. Statistical analyses performed by the authors.

nificant differences ($p < 0.001$) were reported between consumption and GABAS for five food groups (fruits and vegetables, dairy, protein sources, fats and sugars); cereal consumption was very close to that recommended in the GABAS (CRI = 0.89; MAD = 0.41). About 70% of the pregnant and lactating women did not consume dairy products the day before the survey, and 50% did not consume fruits and vegetables (see Figure 1). The greatest magnitude of the effect between what was consumed and what was recommended was in the dairy group in pregnant women (-0.996) and protein sources in infants (0.993). There was no concordance strength according to Krippendorff's alpha in any of the groups compared (see Table 3).

In the south region, the CRI median in the cereal group was 0.88 (MAD = 0.40), without statistically significant differences ($p = 0.415$) between that consumed and that recommended in the GABAS; with statistically significant differences ($p < 0.023$) in the north region (CRI 1.01; MAD = 0.45). In the other food groups, the

re were statistically significant differences. Overall, for both groups of women, according to the region, consumption of all the food groups was lower than the GABAS recommendations. Likewise, nearly 70% of the women during gestation and lactation periods did not consume dairy products the day prior to the survey, and 50% did not consume fruits and vegetables (Figure 2). The greatest magnitude of the effect between that consumed and recommended was seen in the group of protein sources in the north region (-0.987) and protein sources, fruits and vegetables in the south (-0.997). There was no strength of agreement according to Krippendorff's alpha in none of the groups compared (Table 3).

Discussion

The eating pattern identified in the pregnant and lactating women from the study was characterized by consumption lower than recommended in the GABAS about

Table 3. Comparison among the food groups consumed and those recommended in the Food-based Dietary Guides of women during pregnancy and breastfeeding period from some indigenous peoples of Colombia.

Physiological state	Gestating (n = 319)					Lactating (n = 709)				
	Groups	Consumption % (n)	CRI* Me (MAD)	Wilcoxon p (TE)	KA	Consumption % (n)	CRI* Me (MAD)	Wilcoxon p (TE)	KA	
	Cereals	98.7 (315)	1.08 (0.47)	<0.001 (0.239)	-0.0952	98.7 (700)	0.89 (0.41)	0.289 (-0.046)	-0.3331	
	Fruits and vegetables	58.0 (185)	0.07 (0.05)	<0.001 (-0.962)	-0.2309	48.8 (346)	0.05 (0.04)	<0.001 (-0.980)	-0.3576	
	Dairy products	31.0 (99)	0.30 (0.19)	<0.001 (-0.996)	-0.2822	35.4 (251)	0.24 (0.16)	<0.001 (-0.970)	-0.4338	
	Protein sources	92.8 (296)	0.26 (0.12)	<0.001 (-0.986)	-0.1282	86.7 (615)	0.24 (0.11)	<0.001 (0.993)	-0.3413	
	Fats	86.5 (276)	0.46 (0.29)	<0.001 (-0.749)	-0.1894	83.2 (590)	0.38 (0.21)	<0.001 (-0.811)	-0.2600	
	Sugars	81.8 (261)	0.55 (0.30)	<0.001 (-0.780)	-0.1719	82.9 (588)	0.48 (0.29)	<0.001 (0.744)	-0.3471	
Region			North (n = 583)				Sur (n = 445)			
	Groups	Consumption % (n)	CRI Me (MAD)	Wilcoxon p (TE)	A	Consumption % (n)	CRI Me (MAD)	Wilcoxon p (TE)	KA	
	Cereals	98.5 (574)	1.01 (0.45)	0.023 (0.109)	-0.1757	99.1 (441)	0.88 (0.40)	0.415 (-0.045)	-0.2108	
	Fruits and vegetables	57.3 (334)	0.04 (0.03)	<0.001 (-0.960)	-0.2296	44.3 (197)	0.08 (0.06)	<0.001 (-0.997)	-0.2973	
	Dairy products	32.6 (190)	0.31 (0.20)	<0.001 (-0.970)	-0.3127	36.0 (160)	0.16 (0.11)	<0.001 (-0.985)	-0.3205	
	Protein sources	82.8 (483)	0.21 (0.11)	<0.001 (-0.987)	-0.2380	96.2 (428)	0.28 (0.12)	<0.001 (-0.997)	-0.2693	
	Fats	84.4 (492)	0.34 (0.18)	<0.001 (-0.847)	-0.1714	84.0 (374)	0.49 (0.29)	<0.001 (-0.726)	-0.1861	
	Sugars	81.1 (473)	0.44 (0.28)	<0.001 (-0.803)	-0.2552	84.5 (376)	0.59 (0.30)	<0.001 (-0.687)	-0.2867	

Abbreviations: CRI: Consumption ratio index, Me: Median, MAD: Median Absolute Deviation, TE: Effect Size of Range Biserrial Correlation, KA: Krippendorff alpha

* When the value of CRI is < 1, it means consumption is lower than the recommended, when it is = 1, the person is consuming 100% of that recommended, and when it is > 1, consumption is above that recommended.

Source: [34-40]. Statistical analyses performed by the authors.

fruits, vegetables, dairy products, protein sources, fats, and sugars, which contributed to the high prevalence of risk of deficiency in the usual intake of calories, fats, proteins, vitamins, and minerals. The risk of micronutrient deficiency exceeded 80% for vitamin A, folates, zinc, iron, and calcium in pregnant women, and vitamin C, folates, zinc, and calcium in those lactating. The majority of the women reported that intake was usual and 50% manifested having gone to bed hungry due to lack of food, showing that the low consumption of calories and nutrients is permanent.

Food consumption has social, economic, cultural, and biological conditions. In the first place, indigenous women from some of the peoples evaluated in the ENSANI do not increase calorie consumption during pregnancy [34-40]. In Western society, it is estimated that during gestation, an increase is required of 70,000 kcal to guarantee the formation of the new fetal structures and the fat reserve to respond to the delivery and lactation [34-40]. In our study, deficiency in calorie consumption was marked, different from a research in Ecuador, where only one in every four women had risk of deficiency in energy intake [41].

Likewise, the risk of micronutrient deficiency found in the women of our study has been evidenced in studies in other communities, like that conducted by Ferranti *et al.*, [42] which evaluated the overall quality of the diet and the micronutrient intake during gestation entre las Amerindian women, finding suboptimal dietary patterns and some gestation-specific levels of micronutrients, like vitamin D, folate, and iron; these were not achieved solely with the dietary intake. A study carried out in the tribal lands of the Navajo nation, in southwestern United States (biggest indigenous reserve in the country), in a group of 242 pregnant Navajo women, found a high proportion with inadequate intake of calcium (62%), folate (75%), and iron (83%) [43].

Besides the increased requirement of energy and nutrients provoked by gestation and lactation, in indigenous women the caloric expenditure is higher because, according to the community where they live, they must respond to high-demand occupational and discretionary activities, like household chores; sale of medicinal products, coal, foods and crafts; agricultural tasks, like preparation of seeds for cultivation [34]; harvest of savanna tubers and wild fruits [38], and breeding and caring for animals [36]. This further limits the availability of energy and nutrients to respond to the high demands of gestation and lactation.

Risk factors in indigenous women during reproductive age are multiple, among them, short intergenic periods; gestating and lactating at the same time; low or no attendance to the prenatal control program, which is a common denominator in the Tsiripu and Yamalero peoples [38,40]. A qualitative study identified that some

communities reject supplements of micronutrients, considering them medications, because they do not like their smell and prefer to throw them away than take them [44]; similar situation to that reported in our study. In one of the indigenous communities, the omission in supplement consumption was even expressed, as a measure to control the accelerated growth of the fetus and, thus, avoid complications during childbirth [34].

Nationally, important progress has taken place in relation to the health of indigenous communities; however, the sexual and reproductive health, in general, and indigenous maternity, particularly, require greater attention [45]. Pregnancy at an early age, among other factors, has been considered by some studies as a factor that leads to risks to the health of the mother-child binomial [46,47].

Other studies conducted in Colombian indigenous communities, different from those by ENSANI, like the research with women from the Zenú people, located in the departments of Córdoba and Sucre in the north of the country, reported that care for the woman starts as soon as her pregnancy is identified, with practices like drinking lots of liquid, consuming soups, fruits, vegetables and foods at adequate hours, considering it healthy and necessary for the child's formation [48]. In the Wayúu community, located in the north region, pregnant indigenous women mentioned that "food serves for the formation of the offspring" [48, p. 98], and those attending the prenatal control indicated that the doctors always recommended that they should eat meat and cereals for the good formation of the child [44]. Studies, like those previously described, account for the knowledge the pregnant women have about the benefits of proper nutrition; nevertheless, access to the sufficient amount of foods is limited, which is why they consume what is available.

The foregoing presents sufficient reasons for the defense of the food safety of indigenous women to become an issue of urgent attention, given that the current condition of vulnerability perpetuates the intergenerational circle of malnutrition due to deficits in the intake of calories and nutrients, which is dependent on the maternal nutrition before, during, and after gestation [49], and is sensitive to certain phases of intrauterine development, which are considered "*critical windows of development*" because the woman's unfavorable nutritional conditions have deleterious and irreversible effects on the structure and function of fetal tissues and organs [50,51].

Efforts by the State to intervene aspects related with the food and nutritional safety of indigenous communities have not had the impact expected, given that strategies are proposed from technical knowledge, but in many cases the reality and beliefs of the communities are unknown. It is necessary to design and execute contextualized, particularized programs consistent with the food and nutritional reality of indigenous women in

their life cycle, to break the intergenerational cycle of malnutrition in this group.

Feeding patterns should be promoted that include their own native foods and preparations, which, in adequate amount and variety, contribute to cover the requirement of calories, and macro and micronutrients, especially in gestating and lactating women. Further, it is important to sensitize the communities with respect to the risks represented by the consumption of ultra-processed foods, like sweet and salty packaged products, sausages, sugary and alcoholic drinks, which modify their food culture, incorporating foods of low nutritional density and high energy density. The risk of deficiency in the usual intake of energy and nutrients identified in this population demands implementing programs that promote the production and consumption of native foods, supplementation, complementation, and fortification consistent with the physiological and nutritional state of the women during the different stages of the reproductive cycle [34-39].

As a strength of this study, the quality of the database is recognized, which was constructed from a dietary intake evaluation system, standardized in its training, collection, and analysis processes, which enabled integrating food consumption data from nearly 30 Colombian indigenous communities, evaluated during a 10-year period. As limitation, we highlight not having access to other variables different from the dietary intake, like nutritional state and sociodemographic variables, as this is agreed with the indigenous communities participating in the ENSANI.

The eating pattern found has serious implications by contributing to the risk of macro and micronutrient deficiencies during a fundamental stage for the development of the human being, such as the first one-thousand days of life, considered windows of opportunities for child development. A deficient intake of calories and nutrients by the woman increases the risk of low birth weight in the neonate and of metabolic alterations, like the phenotype saver that predisposes the child to the risk of chronic diseases in the future. In addition, the nutritional depletion that can occur in the woman must be considered, which contributes to the development of deficiency diseases, like anemia, osteoporosis, and vitamin and mineral deficiency that affect not only the immune system, but also the metabolic balance in the woman, with serious repercussions for future pregnancy, if any [52,53].

The problems identified in this study demand urgent intervention, by revealing a pattern of deficient, limited, and deficient consumption percentage that affects the woman's health, the growth and development during the first one-thousand days of life of the indigenous infant

population and the human potential of their communities, with serious effects on health in the short, mid, and long term. These results are of great relevance for Colombia and they should be taken as input to formulate policies that promote the food and nutritional safety of the maternal and child group and the human right to food.

Conclusions

Our study evidenced that indigenous women in gestation and lactation periods have unhealthy eating pattern, characterized by lower intake than that recommended of fruits and vegetables, foods protein sources, and dairy products, added to the low consumption of recommended supplements.

The prevalence of the risk of deficiency is high for critical nutrients in the physiological states of the women, placing at risk their health and that of the child.

With respect to region of residence, the risk of deficiency in protein consumption was higher in the north region, and of micronutrients, in the south region.

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Declaration of conflicts of interests

The authors declare having no conflicts of interests in the development of this project.

Declaration of responsibility

The responsibility for that expressed in the article is that of the researchers and of the institution to which they belong.

Declaration of contributions by authors

All the authors were part of: 1) substantial contribution to the conception or design of the article or acquisition, analysis or interpretation of the data; 2) participation in the design of the research work or in the critical review of its intellectual content; 3) approval of the final version of the manuscript submitted, and 4) capacity to answer questions related with the precision or integrity of any part of the work.

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