Editorial

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Iodine deficiency in indigenous pregnant women in Colombia: an equity and public health concern

Javier Eslava-Schmalbach, M. D., M. Sc., Ph. D.[1]*; Laura Eslava-González, B. Sc.*[2]

Iodine deficiency, goiter, hypothyroidism and congenital hypothyroidism have existed as public health problems for many years, and attempted global and local solutions have consisted of interventions at a community and individual level. In Colombia, the frequency of endemic goiter has been historically high. In school children in Caldas, Rueda-Williamson reported a prevalence of 83.1% of endemic goiter in 1945 and of 33.9% in 1952 (1). Later, the same author reported that the implementation of salt iodization in the department of Caldas – one of the first places to introduce fortification on a experimental basis with the aim of preventing endemic goiter - a program created in 1963 by the National Institute of Nutrition, reduced the frequency of goiter in this population of school children by up to 1.8% in 1965 (2). However, by 1984, 21 years after the formal implementation of iodization in Colombia, the frequency of endemic goiter was reported at 52% in Chameza and 13% in Yopal, two municipalities in the department of Casanare, with high average TSH values in both populations (3). Later, the neonatal screening program for congenital hypothyroidism was implemented in 2000 (4). In 2015, the National Nutritional Situation Survey (ENSIN) showed an 16.6% iodine deficiency in children of indigenous ethnicity 1 to 4 years of age, more than twice the deficiency found for children of the same age with no ethnic claim, for which the reported prevalence of iodine deficiency was 7.5% (Table 1) (5). These figures suggest that this nutritional deficiency continues to be a public health problem in many regions of the country.

This issue of the *Colombian Journal of Obstetrics and Gynecology (Revista Colombiana de Obstetricia y Ginecología)* features the study conducted by Herrera-Murgueitio *et al.* in 2019 with the aim of identifying the prevalence of iodine deficiency in indigenous pregnant women in five departments of Colombia: Amazonas, Cauca, Córdoba, La Guajira and Meta. In a random sample of a universe of 5,925 pregnant women, the authors found a prevalence of iodine deficiency of 33.2%. In this same group of pregnant women, chronic malnutrition was 27.9% (min-max: 16.6-36.3), the median poverty line was 34.8% (min-max: 25.4-53.0), median extreme poverty was 11.1% (min-max: 9.1-26.7) and median illiteracy was 21.6% (min-max: 17.2-40.9). The prevalence of goiter was 34.4%.

It has been shown clearly that iodine deficiency has an impact on the health of pregnant women and, in particular, on that of their children, considering that it is a cause of abnormal neurological development of the fetus that may result in cognitve, psychomotor, and perceptual impairment , as well as infantile hearing loss (6-8). Studies in laboratory animals (Wistar rats) have shown evidence of molecular changes in the hippocampus of progeny born to mothers subjected to

1 Health Equity Group Leader, School of Medicine, Universidad Nacional de Colombia; Hospital Universitario Nacional de Colombia, Bogotá (Colombia).
2 Behavioral Neurosciences, Simon Fraser University, Burnaby (Canadá).

iodine deficiency during pregnancy. The cubs showed a reduction in factors that play a key role in synapsis reconstruction and regulation, cell differentiation, and memory consolidation and maintenance in the hippocampus. These changes resulted in poor performance in spatial memory tests such as the Morris water maze, showing permanent memory and learning changes in the cubs (6). The hippocampus has been described as especially important for consolidation of long-term memory and learning (7).

The permanent neurological effects that have been observed in children born to mothers who had iodine deficiency during pregnancy depend on the severity of the deficiency. It has been suggested that more severe deficiencies may result in more significant changes, including cretinism, a disease characterized by congenital hypothyroidism, mental retardation, deafness, speech difficulties and psychomotor deficits (8,9). It has also been suggested that more severe deficiencies during pregnancy lead to lower scores in intelligence quotient tests in children. Moderate or mild deficiencies may lead to perception and cognition deficits, an even the development of attention deficit and hyperactivity disorder (8). In contrast, the treatment of these deficiencies during the first trimester of pregnancy may improve neurological development and prevent permanent neurological consequences (8-10).

As highlighted by Herrera-Murgueitio *et al.*, this is the first approach to the exploration of iodine deficiency and the presence of goiter in indigenous pregnant women as a population in which significant inequities associated with maternal mortality have been described in Colombia. Two prior studies had shown that maternal mortality gaps were found in the departments with the highest poverty levels (11) or with the most profound basic unmet needs (12). The indigenous pregnant women described in the study live in some of those departments.

Likewise, the ENSIN-2015 survey reveals profound differences in social determinants of health as they relate to indigenous ethnicity, and reflects that iodine deficiency is a proxy for a structural problem that alienates these populations from potential developments that occur in urban areas or in big cities. This alienation, according to the level of iodine deficiency, places the pregnant women of the study in a similar situation as that in 1952, when experimental research in Colombia (2) managed to lower endemic goiter to similar levels as those found among indigenous pregnant women in the study by Herrera-Murgueitio *et al.* for 2019. Other authors show a very close relationship between maternal iodine deficiency and the deficiency in their children, given that they find themselves in the same environment, with the same structural deficiencies and food insecurity (13).

The ENSIN-2015 survey shone the light on the problems of housing, access to water systems, low education in mothers of children under 5 years, informal work, high food insecurity and global malnutrition among the indigenous population, when compared to the group with no ethnic claim (Table 1).

A previous study on social determinants of health associated with early death due to malnutrition in children under 5 years (14) proposes an explanatory model that includes the following: 1) socioeconomic and political conditions; 2) the environment with its environmental conditions, rurality, armed conflict, food availability, safe water and access to utilities; 3) parents and caregivers, which includes ethnicity, education, work and housing conditions; 4) individual-related aspects. Many of these variables are shown in Table 1 and reflect the level of vulnerability of the indigenous population in Colombia, not only for congenital hypothyroidism but also for premature malnutrition-related mortality.

On the other hand, an exploration conducted by the Institute for Health Metrics and Evaluation (IHME) shows Disability Adjusted Life Years (DALY) for Colombia in relation to iodine deficiency-related disorders. In this regard, although Colombia showed a drop in DALYs between 2005 and 2010, the values were again similar to those reported in 1990 (15). In other words, a 30-year regression.

Table 1.
Deficits in different social determinants of health assessed in the ENSIN-2015

Assessed determinant	Indigenous (%) (95% CI)	No ethnic claim (%) (95% CI)
Quantitative housing deficit	*10.9 (8.1-14.6)	6.5 (5.8-7.2)
Qualitative housing deficit	51.2 (43.7-58.6)	18.7 (17.4-20)
With public water supply systems	42.2 (34.5-50.3)	79.8 (78.3-81.2)
Mothers of children under 5 years of age, with completed secondary education and incomplete higher education	25 (18.8-32.5)	54.7 (52.5-56.8)
Employment informality	*81 (74.1-86.5)	43.6 (41.7-45.4)
Household in the lowest quartile of the wealth index	67.8 (61.7-73.3)	22.5 (20.9-24.2)
Household with food insecurity	76.9 (74.5-79.1)	52.3 (54.2-55.9)
Self-consumption	50.2 (43.9-56.5)	14.9 (13.9-16.0)
Coping strategies in the past 7 days due to food insecurity	71.3 (66.2-75.9)	49.9 (48.7-51.1)
Households with children under 18 years of age who sent a child to neighbors or relatives due to the lack of food	15 (12.0- 18.6)	7.7 (7.2-8.2)
Minimum acceptable food intake in children under 2 years of age	24.7 (18.6-32.1)	37.4 (34.6-40.3)
Iodine deficiency in children from 1 to 4	16.6 (12.3-21.9)	7.5 (6.4-8.7)
Global malnutrition in children from 0 to 4 years of age	7.2 (5.1-10.2)	3.0 (2.4-3.7)
Pregnant women out of the total, from 10 to 19 years of age	24.8 (16.1-36.2)	19.2 (16.2-22.5)

Source: Authors, from data taken from ENSIN-2015 (5).

* Variation coefficient 15 to 20%, acceptable accuracy, according to ENSIN-2015.

Apart from salt iodization and congenital hypothyroidism screening, Colombia launched a strategy for the prevention and control of micronutrient deficiencies (16), iodine included. However, according to the study by Herrera-Murgueitio et al., the strategy has not yet reached the regions inhabited by the indigenous population, or at least has not been sustainable, as was the case with the declaration for the elimination of iodine deficiency disorders in Colombia in 1998 (17).

The results found by Herrera-Murgueitio et al. could be extrapolated not only to the 5,925 indigenous pregnant women who are part of the study universe (at least 2,000 households in a situation of food and nutritional insecurity) but also to other marginalized populations in the inner cities or the rural areas which experience similar problems of food insecurity during gestation and in their daily lives, as they are subjected to the same impact of social determinants. Congenital hypothyroidism is a preventable, avoidable and by all means intolerable condition because of its potential consequences (18).

The salt iodization policy needs to be revisited and the impact on the people that benefit from it or who do not have access to it needs to be closely re-examined. Monitoring of urine iodine, iodine intake, or thyroglobulin levels (19), or other forms of evaluation (20) must be part of the regular prenatal care of pregnant women, developing children and the general population. Be as it may, outcomes will also be a reflection of the underlying social determinants of health.

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