

# Characterization of Oral Health Conditions and Somatic Growth of Wayuu Children and Adolescents in the Department of La Guajira, Colombia: A Cross-Sectional Study

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## Abstract

**introduction:** *The Wayuu ethnic group is mainly distributed in La Guajira, Colombia. Multiple factors, including ethnicity, determine head and face shape and related indices. They also affect oral and general health, as well as measures such as weight, height, and head circumference. This study describes oral health, somatic growth, and nutritional status of Wayuu children and adolescents in La Guajira.* **Materials and methods:** *Prospective cross-sectional study with 538 participants aged 2–17 years from Riohacha and Nazareth. Random and systematic errors were calculated; descriptive and Pearson correlation analyses were performed using SPSS 20.0.* **Results:** *The predominant facial*

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*index corresponded to euryprosopic and leptoprosopic types; the cranial index was leptoprosopic. Additionally, 44% presented with at least one decayed tooth, and 39% showed gingival inflammation. Furthermore, 63.6% were underweight for their age..*  
**Conclusion:** Oral health, somatic, and craniofacial growth were described, exploring correlations of craniofacial growth profiles.

**Keywords:** Child, Growth and development, cross-sectional study, indigenous, Oral Health.

### **Caracterización de las condiciones de salud oral y crecimiento somático de niños y adolescentes Wayuu del departamento de la Guajira, Colombia: un estudio transversal**

#### **Resumen**

**Introducción:** El grupo étnico Wayuu se distribuye principalmente en La Guajira; múltiples factores, incluyendo la etnia, determinan la forma de la cabeza y la cara, así como los índices que describen estas estructuras. También influyen en la salud oral, general y variables como peso, talla y perímetro cefálico. Este estudio describe la salud oral, crecimiento somático y estado nutricional de niños y adolescentes Wayuu. **Materiales y métodos:** Estudio transversal prospectivo con 538 participantes Wayuu, de 2 a 17 años, residentes en Riohacha y Nazareth. Se calcularon errores aleatorios y sistemáticos y se realizó análisis descriptivo y correlación de Pearson mediante SPSS 20.0. **Resultados:** El índice facial predominante correspondió a euriprosopo y leptoprosopo, índice craneal fue leptoprosopo. El 44% presentó al menos un diente con caries y el 39% inflamación gingival. El 63,6% presentó bajo peso para la edad. **Conclusión:** Se describen las condiciones de salud oral, crecimiento somático y craneofacial, explorando correlaciones de perfiles de crecimiento craneofacial infantil y adolescente.

**Palabras clave:** Niño, Crecimiento y desarrollo, estudio transversal, indígenas, Salud Oral.

### **Caracterização das Condições de Saúde Bucal e do Crescimento Somático de Crianças e Adolescentes Wayuu do Departamento de La Guajira, Colômbia: Um Estudo Transversal**

#### **Resumo**

**Introdução:** O grupo étnico Wayuu está distribuído principalmente no departamento de La Guajira. Diversos fatores, incluindo a etnia, determinam a forma da cabeça e do rosto, bem como os índices que descrevem essas estruturas. Esses fatores também influenciam a saúde bucal, a saúde geral e variáveis como peso, estatura

*e perímetro cefálico. Este estudo descreve as condições de saúde bucal, crescimento somático e estado nutricional de crianças e adolescentes Wayuu. **Materiais e métodos:** Estudo transversal prospectivo com 538 participantes Wayuu, de 2 a 17 anos, residentes em Riohacha e Nazareth. Foram calculados erros aleatórios e sistemáticos, e realizou-se análise descritiva e correlação de Pearson utilizando o software SPSS 20.0. **Resultados:** O índice facial predominante correspondeu a euriprosopo e leptoprosopo; o índice cranial foi leptoprosopo. 44% apresentaram pelo menos um dente com cárie e 39% inflamação gengival. 63,6% apresentaram baixo peso para a idade. **Conclusão:** Descrevem-se as condições de saúde bucal, crescimento somático e craniofacial, explorando correlações dos perfis de crescimento craniofacial infantil e adolescente.*

**Palavras-chave:** Criança, Crescimento e desenvolvimento, estudo transversal, indígenas, Saúde bucal

## Introduction

The Wayuu indigenous people are located on the Guajira Peninsula, in Colombian territory and in the state of Zulia in the Bolivarian Republic of Venezuela. In total, there are 380,460 individuals who self-identify as Wayuu indigenous people, representing 20% of the national indigenous population, 48% of the population of La Guajira, and 8% of the population of the state of Zulia in the Republic of Venezuela [1].

This region of the country reflects a critical situation where child deaths from malnutrition reach a critical level of 31.61%, which affects somatic growth and where oral health is not given particular importance within the context of general health.

Oral health is considered a public health issue, and La Guajira is no stranger to this situation, as reflected in the results obtained in the IV National Oral Health Study (ENS-AB), which describes that 33.27% of children aged 1, 3, and 5 have a history of dental caries [2].

It should be noted that oral health for the Wayuu community is still related to the spiritual and naturalistic world, associating diseases of the oral cavity with evils caused by spirits that

enter the body, or as actions of nature; This demonstrates their deep-rooted connection to their traditions, as pointed out in the study conducted by Polanco et al., who found that only 30% and 26% of the population analysed used toothbrushes and toothpaste, while the use of herbs such as malambo or other medicinal plants for oral hygiene reached 24% [3].

On the other hand, the guidelines provided by the World Health Organisation (WHO) on growth references indicate that, in early childhood and adolescence, one of the main objectives of health strategies is to monitor somatic growth, which in turn is an indicator of child health [4,5]. In this case, the Wayuu population will be analysed, where previous studies have identified that 64.5% of children in the Wayuu indigenous population are underweight and malnourished [6].

Due to the limited knowledge about the true state of oral health among Wayuu children and adolescents, as well as the growth patterns determined by ethnicity and nutritional conditions, it is vitally important to understand the oral health, growth and development conditions of children in the Wayuu community in the department of La Guajira, Colombia, in order to implement various strategies that promote oral health and good practices.

## Materials and methods

### Study Design

A cross-sectional observational study was conducted. Recruitment and data collection took place between October and November 2024 in the municipalities of Riohacha and Nazaret – Municipality of Uribia Guajira Alta, department of La Guajira, Colombia, selecting ethno-educational institutions with a high concentration of Wayuu children [4,5].

### Study Population and Selection Criteria

**Population and Sample:** The universe consisted of all students enrolled in the ethno-educational institutions targeted by the intervention. For the selection of the sample, stratified probability sampling by age group was used, ensuring proportional representation of developmental stages (early childhood, school age, and adolescence). This resulted in a final sample of 538 participants who met the inclusion criteria.

The following inclusion criteria were considered:

- Be the child of an indigenous Wayuu mother or father, or self-identify as a member of the Wayuu ethnic group.
- Be between the ages of 2 and 17 at the time of data collection.
- Not have severe craniofacial abnormalities that could interfere with facial anthropometric measurements.
- Be formally enrolled and attending the selected educational institutions during 2021.
- Have voluntarily agreed to participate in the study, formalised by the signature of the informed consent form by parents or legal guardians and, simultaneously, the informed assent of children and adolescents, respecting their autonomy and willingness to participate in accordance with current ethical standards [4,5].

### Data Collection Procedures

Data collection was carried out in the selected educational institutions, following coordination with school authorities and Wayuu communities. Extraoral and intraoral clinical evaluations were performed following standardised protocols [7,8].

### General Anthropometric Measurements

- Weight in kilograms (kg) using a calibrated scale.
- Height in centimetres (cm) using a portable height gauge.
- Body Mass Index (BMI) calculated using the formula:  $\text{weight [kg]} / \text{height [m}^2\text{]}$  [4,5].

### Craniofacial Anthropometric Measurements

- Head circumference: measured with a non-stretchable tape measure around the maximum circumference of the head [7].
- Bimaxillary width: distance between the most lateral points of the zygomatic arches [7].
- Facial height: upper facial height (nasion to subnasal), lower facial height (subnasal to gnathion) and total facial height (nasion to gnathion) [7].
- Facial index:  $(\text{Facial height} / \text{Bimaxillary width}) \times 100$  [7].
- Cranial index:  $(\text{Maximum width of the skull} / \text{Maximum length of the skull}) \times 100$  [7].

Two examiners received extensive training to ensure the accuracy of measurements, which were recorded with an accuracy of 0.1 cm following WHO guidelines [7,8].

### Oral Health Assessment

- **Silness & Loe Index:** presence and thickness of bacterial plaque [9].
- **ICDAS criteria:** detection and severity of caries [10].
- **Oral cavity lesions:** mouth ulcers, candidiasis, abscesses [11].

- **Gingival inflammation:** signs of oedema and erythema [12].

## Data Quality and Reliability Control

Reliability was assessed using a random sub-sample of 15 participants, taking two measurements with a one-week interval between them. The Kappa coefficient was 0.81, indicating high inter- and intra-observer agreement [7,8].

To minimise selection bias, all students present on the days of the event who met the inclusion criteria were included. Measurement bias was controlled by prior standardisation of examiners (dentists and nutritionists) according to international criteria (WHO and growth indicators) and the use of calibrated instruments.

## Statistical Analysis

The data were analysed using SPSS 20.0. Continuous variables were described using mean, median, mode, and standard deviation. Normality was assessed using Shapiro-Wilk. Pearson or Spearman correlation tests were used depending on the distribution, considering  $p < 0.05$  as significant [4,5].

## Results

A total of 538 Wayuu children and adolescents, aged between 2 and 17, participated in the study. Of the total, 62.9% were male and

37.1% were female. The distribution by nationality is shown in Table 1, highlighting that the majority were Colombian (92.0%) and a minority were Venezuelan (7.9%). The geographical distribution by place of residence is presented in Table 2.

## Oral Health Status

Analysis of oral hygiene using the Silness & Løe index showed that 69.5% of participants had poor hygiene, 19.1% had fair hygiene, and only 11.3% had good hygiene (Table 3).

**Table 3. Distribution of the Silness & Løe index**

State of oral hygiene	Number of participants	Percentage (%)
Regular hygiene	103	19,14
Poor hygiene	374	69,52
Good hygiene	61	11,34
Total	538	100

Source: Own elaboration.

The prevalence of dental caries was 39.8% in tooth 16, 37.5% in tooth 46, and 34.6% in tooth 26, with the initial stage of caries (ICDAS 2) being the most frequent, accounting for 37.7% of cases (Table 4). Gingival inflammation was the most prevalent oral lesion (50%), followed by mesiodens (4.2%) and abscesses (1.8%) (Table 5).

**Table 1. Distribution of participants by nationality and age group**

Nationality	2–5 years (%)	6–9 years (%)	10–13 years (%)	14–17 years (%)	Total (%)
Colombians	97,22	87,64	92,74	92,18	92,01
Venezuelans	2,78	12,36	7,26	7,82	7,99

Source: Prepared internally.

**Table 2. Distribution by place of residence and age group**

Lugar	2–5 years (%)	6–9 years (%)	10–13 years (%)	14–17 years (%)	Total (%)
Riohacha	13,89	17,98	23,5	23,46	21,93
Nazareth	86,11	82,02	53,85	57,54	61,9
Lina	0	0	22,65	18,99	16,17

Source: Own elaboration.

**Table 4. Frequency of dental caries according to ICDAS**

Condition	Frequency	Percentage (%)
Sano	150	26,5
ICDAS 2	214	37,7
ICDAS 3	59	10,4
ICDAS 4	47	8,3
ICDAS 5	7	1,2
ICDAS 6	8	1,4

Source: Own elaboration.

**Table 5. Presence of oral lesions**

Type of injury	Number of participants	Percentage (%)
No injuries	211	20,6
Gingival inflammation	269	50
Mesiodens	23	4,2
Abscesses	10	1,8
Melanin pigmentation	9	1,6

Source: Own elaboration.

## Distribution of Facial and Cephalic Types

The predominant facial type was euriprosopic (broad face) at 76.6%, followed by mesoprosopic (18.7%) and leptoprosopic (1.8%). The euriprosopic type predominated in men, while the mesoprosopic type predominated in women. The cephalic index showed a predominance of brachycephalic in 436 participants, indicating skulls that were wider than they were long (Tables 6 and 7).

**Table 6. Mean and standard deviation of cephalic and facial indices**

Variable	Media	Standard deviation
Age range	12	0,902
Gender	-	-
Cephalic index	79,98	7,13
Facial index	114	11,01

Source: Own elaboration.

**Table 7. Correlations between variables**

Variable	Age range	Gender	Cephalic index	Facial index
Age range	1	-0,007	0,003	-0,127**
Gender	-0,007	1	-0,133**	0,094*
Cephalic index	0,003	-0,133**	1	0,066
Facial index	-0,127**	0,094*	0,066	1

Source: Own elaboration.

## Head Circumference Analysis

Analysis of head circumference revealed that 81% of children had a euriprosopic skull type, with more evident increases in boys and a slower growth rate in older children.

In terms of nutritional status, 63.6% of participants were underweight, while 32.7% were of normal weight. Only 2.7% were overweight and 0.9% were obese. Children under 5 years of age were the group most affected by underweight (94.4%), followed by those aged 6 to 9 years (92.1%). Between 2 and 5 years of age, 52% were at risk of acute malnutrition and 48% were at moderate risk. Among children aged 5 to 17, 45% were at risk of thinness and 55% were thin.

## Correlations between BMI, weight, height, age, and gender

A significant positive correlation was found between BMI and weight, indicating that children with low BMI have lower weight. Height was inversely related to weight and BMI, although without statistical significance. Facial index was negatively correlated with BMI and weight, suggesting that children with wider faces tend to have lower BMI and weight.

BMI correlated positively with age ( $r = 0.364$ ;  $p < 0.001$ ) and negatively with gender ( $r = -0.141$ ;  $p < 0.001$ ), highlighting differences between males and females in nutritional development.

**Table 8. Mean, standard deviation, and correlations of anthropometric and craniofacial variables**

Variable	Media	Standard deviation	Correlation with age	Correlation with gender	Correlation with cephalic index	Correlation with facial index
Age range	12	0,902	1	-0,007	0,003	-0,127**
Gender	-	-	-0,007	1	-0,133**	0,094*
Cephalic index	79,98	7,13	0,003	-0,133**	1	0,066
Facial index	114	11,01	-0,127**	0,094*	0,066	1

\* p < 0,05; \*\* p < 0,01 Source: Own elaboration.

## Craniofacial Development and Nutrition

Craniofacial development was observed to increase with age and BMI, especially in terms of bicigomatic width, facial height, and antero-posterior length, reflecting a typical growth pattern during childhood and adolescence. Males showed slightly greater increases in cephalic dimensions, while differences in facial height and head circumference were less pronounced.

## Discussion

The eligibility criteria for institutions and research participants allowed for the collection of a representative sample of the Wayuu indigenous population. Various factors influence variability in growth and anatomy, both at the general somatic level and at the craniofacial level. Among these, ethnicity stands out as one of the most relevant (13,14, 15).

The distribution of the sample considered a low percentage of the population of other nationalities, reflecting the migratory dynamics of the region. Despite geographical barriers, the two populations analysed in this study are not completely separate. Over time, they have shared an ethnic flow that has favoured the coexistence of common morphological characteristics and traits, both somatic and craniofacial. This ethnic interrelation contributes to the similarities observed in growth patterns, facial biotype and nutritional characteristics, elements that are reflected in the results of this study.

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With regard to oral health, there are few studies documenting the prevalence of dental caries in the Wayuu community. Morón et al. (2004) reported a 43% prevalence of caries in children aged 6 to 17, while Polanco et al. (2011) found a 16% prevalence in children aged 5 to 7 (3, 17). In our study, the prevalence of caries in children and adolescents aged 2 to 17 years was 39.8%, reflecting a persistent problem in the oral health of this population.

On the other hand, Deschler et al. (18) state that patients with head and neck cancer are increasingly younger, mainly males, which motivated us to evaluate the distribution of oral and maxillofacial pathologies in this age group. Although reports on oral pathologies in the Wayuu community are limited, the study by Polanco et al. (2011) highlighted that the most common oral diseases were caries, oral ulcers, inflammatory processes, and pain (3). In our study, gingival inflammation was the most frequent condition,

followed by the presence of mesiodens and abscesses, although in a lower percentage. It is important to note the high prevalence of melanin pigmentation in the oral mucosa, a feature that could be associated with the ethnic characteristics of the Wayuu population.

With regard to craniofacial growth, there is little literature available on the analysis of the indices studied in this indigenous population. The results of this study show that the predominant facial type is euriprosopic, which coincides with the findings observed in other indigenous groups, such as the Ticunas of the Amazon region, Cauca and Valle (19,20). The dominant cephalic type is brachycephalic, associated with a euriprosoidal face, which reinforces the morphological similarities between the indigenous peoples of Colombia.

The findings obtained in this research suggest that the oral health and growth and development of children and adolescents in La Guajira are in a vulnerable situation, exacerbated by barriers to accessing health services. The lack of an adequate intercultural health model, limitations in the implementation of preventive oral health measures, and adverse social determinants (such as poverty, food insecurity, and lack of infrastructure) negatively affect the quality of life of the Wayuu population. Corruption, unemployment, and a shortage of educational and health services contribute to this fragility, reflecting a crisis that must be addressed urgently to ensure the well-being of this community.

## Conclusions

This study provided a detailed description of the oral health status and somatic and craniofacial growth of the Wayuu population, and offers new insights into the growth profiles of children and adolescents. These data constitute a significant contribution to biological and physical anthropology, and will serve as diagnostic support criteria for health professionals.

There is an urgent need to improve the living conditions and quality of life of the Wayuu indigenous population by providing access to food security and better nutrition, which would ensure adequate growth and development. It is also essential to strengthen local health systems to improve oral health indicators, based on an approach that considers the social determinants of health, health promotion and primary health care.

It is recommended to continue exploring new statistical methodologies that allow for the study of craniofacial and general growth in this population, in order to establish more accurate diagnostic and risk criteria for monitoring their development.

## Ethical Considerations

This research was conducted in accordance with the ethical principles of the Declaration of Helsinki and national bioethical standards. In accordance with Resolution 8430 of 1993 of the Colombian Ministry of Health, this study is classified as minimal risk research, given that non-invasive observation and physical examination techniques (dental and anthropometric assessment) were used that did not compromise the physical or psychological integrity of the participants. The project was endorsed by the Ethics Committee of the Institución Universitaria Colegios de Colombia Unicoc, as recorded in Minutes No. 25 of 19 August 2019. All participants had the informed consent signed by their parents or legal guardians and the respective informed assent of the minors, guaranteeing the confidentiality of the information and the voluntary nature of the participation.

## Conflict of Interest

The authors declare that they have no conflicts of interest.

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The authors also declare that they used an artificial intelligence tool (ChatGPT, OpenAI's GPT-5 model) exclusively to improve the writing, coherence, and style of the manuscript, without this implying any involvement in the analysis, interpretation, or generation of scientific results.

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