



Dental and Craniofacial Conditions of the Tainos in Pre-Columbian Hispaniola

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DOI: [10.5281/zenodo.14802830](https://doi.org/10.5281/zenodo.14802830)

Submission Date: 31 Dec. 2024 | Published Date: 04 Feb. 2025

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Abstract

When Columbus arrived in the Dominican Republic, the Tainos were the inhabitants of the island of Hispaniola. Based on historical and bioanthropological data, the dental and craniofacial aspects of these natives will be analyzed, as well as the pathologies found in them and how they were possibly treated.

We will also see aspects of their physiognomy and artificial deformities that they made and the plants that the Tainos used to treat some oral diseases, able to perform extractions, and also used some plant leaves for dental purposes; Tooth pathologies such as periodontal disease, abscesses were found, and their caries rates were low compared to today, due to the low consumption of carbohydrates and sugars.

Keywords: *Indigenous, Taino, Dentofacial Health, Hispaniola, Pre-Columbian.*

INTRODUCTION

It is known to all that since ancient times, dental actions have been considered an inherent part of the medical act. Since primitive man, health services have also existed, although of course, not in a formal way like the specialty of maxillofacial surgery today. It has been practiced by countless people, working to restore oral and facial health through surgical means.

The events present in the indigenous inhabitants of America come from the first Spanish chronicles, written between the end of the 15th century and the beginning of the 16th century in the Caribbean region.

However, like most documentation relating to pre-Columbian cultures, these are accounts written after the arrival of Columbus: they, therefore, raise a series of complex exegetical problems, well known to those who work in this field; and in the case of the Tainos, the problems turn out to be even more serious: the documents are few, they are written without any indigenous contribution and they are only partly a reflection of direct observation, due to the rapid decline of this people.

Several published works discuss the dento-craniofacial aspects of research in Hispaniola [1,9,10,26]. These publications offer summaries of some anthropological and paleopathological studies carried out in this geographic region.

Of course, there are traces and archaeological clues: especially the bones, and skulls, these materials, which by themselves are difficult to interpret, so we can add the written testimonies.

Just two hundred years ago surgery, and more specifically the operative act, was a supreme resource. Only extreme urgency and desperation led to surgical operations. Since that time, surgery has grown disproportionately, in power and daring, in means and results, in frequency and also in safety. The influence of surgery has gone beyond bodies and is seen in the evolution of spirits.

THE INDIGENOUS PEOPLE OF HISPANIOLA

According to archaeological evidence, the history of Native American human settlement in the Greater Antilles dates back 8,000 to 5,000 years. Between 4,000 and 2,000 years ago, other waves of migration from the American continent reached this group of islands, probably from the Orinoco River basin and through the Lesser Antilles [1].

The Taino population dates back to 2600 BC [2] to 1800 BC according to prehistorians from Santo Domingo, such as Ortega, Guerrero, and Veloz Maggiolo [3]. These Indigenous people were in a developing Neolithic period and lived by hunting, gathering, and fishing. The first inhabitants of these Antilles were: the archaic [paleo-indians], later the Arawaks and the Ciboneyes whose cultures, a mixture of these, are before the different indigenous groups known as the Taínos - Ciguayos, or Macoríes, Ignieris and Tainos on the island of Santo Domingo.

Before European colonization, the Caribbean was a mosaic of archaeologically distinct communities connected by networks of interaction since the first human occupations in Cuba, Hispaniola [Santo Domingo], and Puerto Rico around 6,000 years ago. The pre-contact Caribbean is divided into three archaeological Ages that denote shifts in material cultural complexes.

The Lithic and Archaic Ages are defined by distinct stone-tool technologies, while the Ceramic Age, beginning 2,500–2,300 years ago, featured an agricultural economy and intensive pottery production [4].

Considering the Tainos position in the genetic analysis, it is clear that, despite being geographically close to the Central American groups, they have affinities with South American groups [5]. This is consistent with archaeological and linguistic evidence of origin in northeastern South America.

The Taínos lived in the Greater Antilles and of these, the one baptized by Columbus after he arrived in 1492 as Hispaniola -which would later be called Santo Domingo-, populated by this Taino ethnic group along with the Ciguayos in the northeastern part of the island.

The practice of medicine and, therefore, dentistry was magical-religious, as in all primitive peoples. When Columbus arrived the Indigenous people of this island were in a transitioning from a society of hunter-gatherers to one of sedentary farmers.

PHYSIOGNOMY

The face of the American Indian was wide, with developed cheekbones; low forehead depressed and tilted backward, which produces an acute angle and consequently mesocephalic, but with an intelligent appearance. As they have a straight jaw and are orthognathous, the nose is classified as typical Indo-American, wide and flattened, but with a high septum; with a wide mouth and thick lips, although the Taino had average proportions and was 1.70 meters tall [6].

Although it is known that pre-Columbian cultures considered teeth to be fundamental elements of personal adornment, regarding the dental appearance of the Taino people, they reported that they had very good teeth; the historian Fernández de Oviedo [7] refers in his Chronicles that they had very white and even teeth.

No severe prognathism was noted in either male or female skulls. The dental arch was elliptic or parabolic in both sexes and the mandible was medium to small [8].

Dusini et al. in archaeological studies show that orbits were square in shape in the male, and more rounded in the female; the zygomatic bone lateral protrusion was small in both sexes (cryptozygia); the profile of the nose was quite irregular, and the pyriform aperture showed the prenasal groove.

In 1881 Louis Alphonse Pinart quoted by Veloz, made the first known studies of the Samaná Bay area in Santo Domingo. He went on to calculate the height of the individual and then detailed his measurements and skull dimensions.

It is the first scientific information in the Antillean area on physical anthropology related to our aborigines [9]. For their historical and anthropological interest, we transcribe the results and conclusions reached by Pinart:

'The height of the individual according to the examination of the large bones must have been one meter eighty centimeters, the dimensions of the skull are the following:

Antero-posterior diameter	16.4 cm.
Transverse diameter	13 cm
Bizygomatic diameter	13 cm.
Bimastoid diameter	14.2 cm.
Total circumference	13.2 cm.
Total height	12.8 cm.

Face height	52.9 cm.
Frontal bone	15.6 cm.
Parietal bone	9 cm.
Occipital bone	12.8 cm.
Maximum front width	12.9 cm.

"The skull is therefore dolichocephalic; the face flat, long, very wide between the zygomatic arches; the forehead also very wide and spacious; very closed facial angle; the nasal bone prominent, the orbits regular and almost equal in diameter; the lower jaw somewhat strong; Very used (worn) teeth have a particular worn and conchoidal shape, very slight traces of prognathism, very pronounced muscle insertions, the sutures are complicated; sagittal suture, an imprint of the Inca bone; the occipital very prominent".

Although the cranial shape of the indigenous peoples was dolichocephalic, brachycephalic craniums have been found [10].

Considering Taino's position in the genetic analysis, it is clear that, despite being geographically close to the Central American groups, their affinities are with South American groups [11].

They included personal ornaments of the celebrating indigene who had crowns and belts of fish and stone bones, as well as necklaces and amulets. Among the charms they wore were the so-called earrings, nostrils -to put on certain garments called guanines-, lip ornaments, and combs.

The Indigenous people pierced their noses and ears, dyed their bodies, and smeared their faces with bija (Bixa Orellana), according to them to protect them from the sun, rain, and insects [12].

DENTOFACIAL HEALTH

There are no documentary or archaeological records about the surgical and medicinal activities of these Paleo-Indians. These indigenous people did not have medicines like we do today, but instead used plants for various types of problems. The medicines or remedies that the Spaniards found were few and extremely simple.

Regarding health, we have the impression of Bartolomé de las Casas [13]. Who wrote: *From all the things mentioned about these Islands, one can well deduce their health and temperance; the goodness, fertility, and health of these Indies can also spread.*

The Indigen people had the following characteristics: Regular height, good and beautiful shapes, straight and shiny hair, fine hands and small feet, large and expressive eyes, profiled nose, friendly and obedient and submissive, very agile and with noble feelings. Their build was so well formed and their forms so graceful, *"that they all seemed like children of princes"*, exclaims Fray Bartolomé de las Casas, attributing the purity of their feelings to their exterior forms.

In all primitive populations, there was a doctor; Behiques [14] -Shaman-, Buchitibu [15], and Búcios [16]. These are the different names that the indigenous *"doctor"* received. Who were obliged to keep a diet with the sick person, and if he died, the relatives made a concoction and gave it to the deceased, as if to extract the secrets of death from him. Questioned by them, he answered, that he had not strictly followed his diet and we beat him with sticks until his legs and arms were broken [17].

Spanish medicine was so ineffective in the first decades that the Indians, despite the existence of hospitals for both Spaniards and blacks and Indians, preferred to put themselves in the hands of their traditional behiques.

Coppa et al. [18] refer to the paleodemographic analysis and dental evidence of the three skeletal collections in a study. The analysis of non-metric dental traits has been taken into account to point out the biological and demic differences between the Dominican populations, finding that this group was homogeneous in appearance.

They found a high incidence of shovel-shaped central incisors, while a reduction in the appearance of this trait in the lateral incisor may point to the preceramic group. Unlike the one above, the Cueva Roja specimens show a greater frequency of the Carabelli cusp in the first and third molars and the Metaconuls in the first two molars. In addition, the absence of a hypocone and a single root. The second molars are more pronounced in the Cueva Roja group.

PATHOLOGIES AND DEFORMITIES

Pre-Columbian dentistry had two aspects: one related to the mouth and their treatment, and the other to dental mutilations that include filings and inlays, although these were not carried out by the Tainos.

Bones and skulls from the Museum of the History of Dominican Man showed shovel-shaped teeth typical of the Indigenous American population- showing a square crown, well developed and implanted in their bone bases, with great wear on their occlusal faces due to the diet used by the Tainos, position anomalies have been found.

The Taíno population was no stranger to conditions such as tartar, dental caries, and bone erosions of the jaws, probably due to dental abscesses, cysts; also, malocclusions, periodontopathy, and the absence of the third molar [19].

Studies have established that the high incidence of tooth decay and calculus accumulation exhibited by the ancient inhabitants of the Antilles was due to the consumption of two carbohydrate sources, maize (*Zea mays*) and manioc (*Manihot esculenta*), in addition to marine and terrestrial proteins. [20].

The presence of corn starch in dental calculus has been found to not indicate the frequency of its consumption. Since previous studies indicate that maize was most likely not consumed as a staple crop, a variety of other cariogenic (staple) crops have been identified as important contributors to diets at this study sites, including marunguey (*Zamia portoricensis*), sweet potato (*Ipomoea batatas*), cocoyam (*Colocasia esculenta*), arrowroot (*Xanthosoma sagittifolium*) and manioc or cassava (*Manihot esculenta*) [21, 22]. Once processed, these starchy plants can be highly cariogenic, particularly if consumed in soft, sticky form.

They took care of their mouths and used guano brushes to clean their teeth. They knew how to extract teeth and for toothaches, they used jabillo resin (*Hura Crepitans*) [23]. The star apple plant (*Chrysophyllum cainito*) according to Fernandez de Oviedo [24] this plant had:

"Una propiedad tienen las hojas deste árbol, muy singular, y es que aquella parte dellas que parece seca (e no lo es), sino leonada, es algo vellosa, e a quien con aquella parte se acostumbrare a estregar los dientes, se los limpiará, e páralos muy blanco".

[The leaves of this tree have a unique property, and that is that the part which appears dry (and it is not), but tawny, is somewhat hairy, and sometimes Anyone who gets used to scrubbing their teeth with that part will clean them and have them very white.]

In human remains there are traces of abscesses of dental origin and caries as the most frequent pathologies [25]; oscillating in a range of 12.5 to 6.5% [26]. Thus, it seems that the high caries rates observed in most assemblages in this study are most likely the result of large proportions of soft sticky starches in the diet, together with regular doses of natural sugars from fruits, sweet potato, squash, and perhaps maize [27].

There is no evidence that they used tools for tooth extractions., they did not know the use of metal, although it is known that in other places tooth extraction with fingers was normal; It is considered that they carried out the extraction or progressive destruction of the tooth, using the latex of the Maboia (*Camerania Latifolia*), which has a very low pH; The use of this substance destroyed the dental crown and, through passive eruption mechanisms, continued to destroy the root remains [28].

On this last aspect, Morbán Laucer [29] observed bone lesions with some destruction of the mandibular horizontal ramus similar to those caused by malignant neoplasms, as well as wear on the articular face of the mandibular condyle due to age and associated with chewing defects; He also found a large amount of tartar with great alveolar destruction that served as a dental splint.

There is no evidence that the Indians of Hispaniola practiced trepanation, but they must have known how to heal wounds, contain hemorrhages, and cure fractures. The wounds were sutured with hair [30].

Although they did not leave any type of treatment that allows us to ensure empirical surgical practice. Some researchers conjecture that: it is undeniable that dental extractions were performed since the medical-dental needs of the Taino population were carried out within the magical-religious framework [31].

Skulls and voluntary, bilateral, and symmetrical dental extractions, were found in the community of La Caleta -Santo Domingo-, which according to their hypothesis were ritual types with unknown purposes [32]. Moscoso Puello suggests that this space was likely to hold some object or stick for dances, other ceremonies, or defense.

There is no petroglyphic or pictorial evidence, in the faces the details are limited to the representation of the eyes and mouth in their simplest form: a stroke, a line, and in no case do the nose and ears appear. This is evidenced by the lack of facial deformities, although rock art and skulls with dentofacial deformities and trepanations have been found in Inca skulls in Peru.

We could formulate the hypothesis that the same thing was done on the island of Santo Domingo given their ethnic-cultural similarity. Although the Dominican Kasse Acta in an investigation carried out in 1954 and titled: *El Arte Dental en Nuestros Indígenas* [The Dental Art of Our Indigenous People], highlights that the Tainos, urged by pain, found themselves in the need to perform surgical procedures to extract diseased teeth, for which they used a special instrument elevator manner, similar to those used today, goes on to say:

"Although the way of applying said instrument is beyond our deductions, we must agree that the healers must have had a lot of skill in the extraction... we must not doubt how bloody and how elaborate an operation of this nature must have been in the medium and time that; It also says that: We believe, therefore, that the Tainos practiced extraction; but we repeat as long as the skulls examined were pre-Columbian".

Kasse Acta [33] himself considers that regarding the use of any leaf that had anesthetics effects, he believed that the Tainos stoically endured the avulsion without anesthesia; the opposite occurred in Costa Firme, since as is known they used the chewed coca leaf to numb their gums.

The so-called Cohoba Ceremony on the Hipaniola island was qualified for it –Shamans or Behiques– who came into contact with the Gods. The French chroniclers of the Carib Indians did not include cojobana (*Anadenanthera peregrina*) in their magical-religious rituals, but instead refer the use of tobacco

Although they used inhaled hallucinogenic powders by wooden inhalators which looked like a nose pipe. These powders were a mixture of cojobana seeds and crushed shells [34]. The active ingredient in cojoba is called *dimethyltryptamine* (C₁₂H₁₆N₂), an alkaloid that, after being inhaled, causes euphoria and hallucinations for almost an hour; as well as the daturas species such as Jimson weed (*Datura stramonium*) or the genus endemic bellflowers (*Cubanola domingensis*) island native, all parts of the plants of this genus are highly toxic due to their content of tropane alkaloids (scopolamine and hyoscyamine, among others). Although it was used for magical-religious purposes, it cannot be ruled out that they were used for anesthetic purposes.

Dominican natural medicinal knowledge uses many indigenous plant species and healing techniques. Many remedies have a Taíno association to them, and it is probable that this association is not coincidental but was handed down over the generations as seen in Cuba. Examples of natural medicine using indigenous products are numerous and include the use of calabaza leaves (*Cucurbita pepo*) for toothaches and swelling [35].

All this, says Kasse Acta [36], was because in the jaws it was found that the spaces where the alveoli were, were calcified and that the third molars were present, a sign that those spaces were artificially missing teeth. He asserted that they performed dental mutilations similar to the indigenous people of Venezuela, although they did not observe it in the skulls examined, but others do refer it to the Caribs if they performed it on the anterior teeth to make themselves more visible and diabolical. During the investigations of pre-Hispanic ossifications, not a single case of palatine torus or mandibular torus was found in the Dominican Republic

There is no petroglyphic or pictorial evidence of the details of the face; these are limited to the representation of the eyes and mouth in their simplest form: a dash or a line, and in no case do the nose and ears appear. Evidence of this is the absence of facial deformities.

They treated the wounds with a species of date palm called *Tamarindo* (*Tamarinda indica*) whose bark was ground and the resulting product was placed on the wounds, giving excellent results as a healing agent. As hemostatics they used grass leaves placed on top of the wound and avocado seeds; and to immobilize the fractures they made a kind of plaster with Breadfruit (*Artocarpus altilis*) resin, amacey (*Tetragastris balsamifera*) and other resins.

Bones and teeth are the parts of the body that survive the longest after the death of the individual. That is why in universal religious iconography, the face of death and ghosts is represented by a skull. The indigenous skulls were mostly

dolichocephalic and brachiocephalic have been found. The artificial deformation of the skull, a sign of beauty among the Tainos, Macoriges, and Ciguayos, was common among the Antillean Caribs who came sporadically to invade this island practiced cranial deformation [37], they obtained it with bandages and even only with pressure from the hands and knees [38], causing a cranial deformation of the oblique tabular type.

Studies carried out by Luna Calderón quoted by Veloz Magiollo [39] observed in ninety-eight bone remains in Cueva Roja [Red Cave] of Pedernales -west of the city of Santo Domingo- indicate that the highest number of deaths corresponds to the male sex and the pathologies are summarized in very common traumas, fractures, arthritis, osteodegenerative changes, anemia, and maxillofacial disorders. Previously had found and reviewed the pre-Columbian pathologies of lesions such as osteochondromas, chondromas, giant cell tumors, osteomas, myelomas, and the metastases of primary malignant tumors in bone tissue [40].

Fractures were studied in adult individuals, finding that 18% of the population suffered from some type of fracture; the majority of these fractures were located in the extremities. Among the disorders of metabolic origin, the *spongio-hyperstosis* is a childhood bone injury that affects the bones of the skull. The orbital cavities and manifests itself in the form of sieves or porosities, causing thickening of the diploe (this thickening is produced by the need for the bone marrow to expand by not being able to perform a normal function in the long bones), according to these studies, 25% of children's skulls had this disease [41].

The first mention of the practice of cranial transformation among the indigenous populations of Hispaniola is attributable to Christopher Columbus himself, who included it in a description of the physiognomy of the indigenous people he encountered on his first voyage.

Columbus [42] describes how mothers performed this operation on their newborns, nonchalantly stating that the Indigenous people practiced it because they liked the visible appearance, cited:

"These islanders, although not very tall, were of a regular height and had a flattened head because since they were children, their mothers would hold it very tightly between their hands or between two wooden planks as in a press, where did the bending of the head come from? Skull and growing thicker with this artifice the helmet became so hard that the Spaniards broke their backs into pieces more than once, wanting to unleash the blow of the chopping block on the heads of these unfortunates. This bad nonconformity of the head and forehead pleased them a lot, and if it is added to the fact that their noses were very open... this whole set of features contributed a lot to this wild and ferocious air observed in those towns.

A similar description was made by Oviedo in 1557, other references to the custom of molding the head come from Santo Domingo, also in Hispaniola. Eric Dingwall quotes Thamara [43], whose work was published in the mid-16th century, about 60 years after Columbus's previous mention:

In 1556, Thamara noted the practice of deforming the head in Santo Domingo. He states that some of the population have their foreheads artificially narrowed by lateral compression, and like other authors, he comments that under the constriction the eyes protrude from the forehead. Head (eyes pop out).

The peculiar head shape of these people as we see was produced by artificial means, which almost completely forced the forehead. This was caused by mothers, who were careful to keep the child's head pressed tightly between their hands, or two pieces of flat board, while the children were still newborns; the West Indian Indians used cotton bandages only [44]; from which, an old writer naively says, when the children grew up, their skulls became so hard and compressed that the Spaniards scrubbed them -bothered them.

The cranial metric values confirm the high incidence of artificial cranial deformation. As far as the platyopy indices are concerned, they seem to be closer to the La Pica series -Venezuelan Arawak- than to the Peruvians.

For some researchers like Spurzheim and others like Stahl and Broca, it was not a very common practice, Spurzheim comments [45]:

"...I have already seen ten Carib skulls; all were low and extended laterally, particularly in the temporal bones; However, they presented as marked diversities as ten skulls from any European nation could. I have also seen skulls of even shorter Europeans. This shape of the skull, therefore, is not merely the effect of artificial pressure. Furthermore, the upper surface of all Caribbean skulls is multi-vaulted and, except for one, has no modeling marks from the pressure of a smooth, level board. It even seems that the story of the Caribbean way of flattening the head refutes itself.

From our previous observations, it is evident that a great force would be necessary to compress the skull and brain; Now this cannot be applied from above, without being balanced by an equal force from below, from behind, or from the sides; and if pressure from above produces a given effect, counterpressure must produce a similar one...I have questioned several gentlemen who had been on the island of Saint Vincent, to obtain information about the attempts of the Caribs to deform themselves. The accounts were all in contradiction to each other, and I am still in a state of complete uncertainty..."

Near the heights of the Northern Cordillera of the Dominican Republic, in the section of "Tres Amarras" - today the city of Cabrera in the northeast of the Dominican Republic- and which, according to the historians of the discovery [46], was populated by the warlike tribe of the Ciguayos, a cave was discovered, with the name 'Cabeza del Muerto' which served as their cemetery. In this cave, the Ciguayo skull was found, and the iliac bones and the femur, the discoverer came to the following conclusion:

This head belonged to an individual under 20 years old, still missing his last molars. When he died, he had all his other teeth, because the missing ones had left their cells open. Note the double upper maxillary and lower alveolar prognathism, with a rather small facial angle of 75°. The most notable features are the occipito-frontal flattening, which gives this head a prismatic shape, and the great development of the parietal protuberances, projecting outwards. The nostrils are wide and open. This individual could, however, pass for a pretty boy among his people, because beauty is something arbitrary, depending on race...We said pretty boy is true because his iliacus indicates his sex. His femur is only 0.40 m. long: However, the femur, according to Orfila indices, represents 58% of the length of the skeleton, we can conclude that the Indian had, soft parts included, only 1 m, 56 in height, Size below average.

Regarding trepanation, Moscoso Puello [47] affirms that the Indians of the island practiced it, since in the Museo del Hombre Dominicano [Museum of Dominican Man] there are several specimens of skulls that show perforations made by trepanation, although these skulls have not yet been studied from the scientific point of view.

CONCLUSION

Due to their rapid annihilation, these peoples received little recognition for their achievements as American insular civilizations. It is even more appropriate to remember their extraordinary mastery of the marine element and the fact that they were among the greatest navigators and builders of oceanic vessels of pre-Columbian America.

Data on health and diseases is difficult to find due to the scarce archaeological evidence and the stories of the first conquerors.

Based on physical anthropology we can conclude that the craniofacial physiognomy of the Indigenous people was of the dolichocephalic type with slight maxillary biprotrusion and that they also practiced cranial deformation.

The Tainos, with an archaic health system, used native plants for analgesia, being able to perform extractions, and also used some plant leaves for dental purposes; Tooth pathologies such as periodontal disease, and abscesses were found, and their caries rates were low compared to today, due to the low consumption of carbohydrates and sugars.

The number of physical anthropological and paleopathological studies performed in the Dominican Republic is relatively small when compared to other geographic areas. But they make the international scientific community aware of the normal and pathological conditions affecting the pre-Columbian and historic populations of the Caribbean Island, the Hispaniola.

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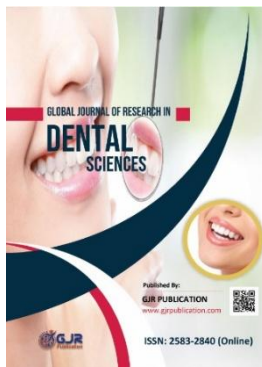
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CITATION

Núñez-Gil, Zoilo. (2025). Dental and Craniofacial Conditions of the Tainos in Pre-Columbian Hispaniola. In Global Journal of Research in Dental Sciences (Vol. 5, Number 1, pp. 45–53).

<https://doi.org/10.5281/zenodo.14802830>



Global Journal of Research in Dental Sciences

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