

# Prevalence of Periodontal Disease in Young Adults with Down Syndrome

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## Abstract

The most prevalent stage in the development of periodontal diseases is the adolescence, but in the patients with Down syndrome there is a tendency to present a slight increase in it, this is due to a deficient oral hygiene. Reason why the objective of this research is to determine the prevalence of periodontal disease in young people with Down syndrome between the ages of 15 and 25 years at the Carabobo Bolivarian Workshop of Labor Education, located in Valencia, Carabobo State, Venezuela. Period from 2011 to 2012. Being a descriptive research, under a non-experimental design, whose sample is thirty (30) young people who presented Periodontal Disease (EP), where their parents and representatives were made known and explained about what an informed consent was, in order for them to sign the authorization to include their children in our study. For getting the data, the observation guide was used as observation technique and as an instrument of data collection the observation guide whose validity was of content through the judgment of experts. According to the results, it was possible to observe a high prevalence of periodontal disease that stands out more in the masculine gender than the female one. On the other hand, the abundant presence of Dental Biofilm, increase of material alba and slight presence of dental calculus in all the ages studied which lead to a poor oral hygiene. It can be concluded that young people with Down syndrome are generally vulnerable to show Periodontal Disease due to poor oral hygiene and bad habits of daily tooth brushing; they need help from parents and relatives to reduce the incidence of this disease.

**Keywords:** Periodontal Disease; Biofilm; Material Alba; Dental Calculus and Down syndrome

## Introduction

Nowadays, it has been observed that in Venezuela the population with the most tendency to get Periodontal Disease are young people with Down Syndrome, which is a genetic disorder caused by the presence of all or part of an extra 21<sup>st</sup> chromosome, who show different mental and physical characteristics as other young people, as for example: Small head, flatter faces, low muscle tone, congenitally missing teeth, macroglossia, fissured tongue, malocclusion, among others [1,2].

Likewise, it is observed that one of the etiologic and pathological forms of periodontal disease is the gingivitis, which is the inflammation of the gums, where the epithelium remains attached to the tooth, showing changes in the sulcular temperature, gingival exudates, reversibility of the disease. Consequently, when the gingivitis does not stop, it can develop other diseases due to the toxins produced by the accumulation of bacteria in the plaque which irritate the gums and remain there causing the loss of teeth, favoring the appearance of periodontal pockets and bone loss, thus developing periodontitis [3]. In addition to this, other authors recently make reference that obesity has been shown to increase oxidative stress in periodontal tissues and cause destruction their [4].

Following these ideas, it has been shown that these diseases have a high incidence in adolescents with Down syndrome, mainly caused by an improper brushing which leads to an incorrect oral hygiene that requires a joint work in team of oral health with parents.

That is why different investigations have been led to study the factors involved in the development of the periodontal disease in patients with Down syndrome. A high incidence of Trichomonas Tenax has been found, which is a widely known parasite found

in patients with periodontitis caused by a poor oral hygiene [5]. On the other hand, among the bacterial species manifested in greater quantities in patients with Down syndrome are found: The *Troponema denticola*, *Tannarella forsythia*, *Porphyromonas gingivalis* and *Aggregatibacter actinomycetenum* [6,7,8]. Due to this, the characteristics of the dental biofilm in patients with Down syndrome constitute an influential factor in the development of periodontal disease. Despite this, it has been shown that conventional non-surgical periodontal treatments can significantly decrease the presence of these bacterial groups [6].

In the same way, an affected immune response has been evidenced, which is given by the deficiency in the chemotaxis of neutrophils, as well as a reduction of prostaglandin E2 levels in the cervicular fluid of patients with Dawn syndrome [9]. In addition to this, a low NK lymphocyte cytotoxic activity has been observed as well as an increase in the expression of interferon receptors [10].

Similarly, another factor that influences these individuals is the kind of solid diet they eat, since they manifest difficulties in chewing solid foods, making it necessary to eat soft and high-carbohydrates foods, which once consumed should be properly removed from the mouth because it can lead to the formation of dental biofilm and calculus, likewise, some medicines these patients take can produce in them hyperplasia or gingival hypertrophy [11]. In this field of study, as the cases in references have been raised, it was observed at the Carabobo Bolivarian Workshop of Labor Education, a group of young people with Down syndrome, where, through an oral examination, the prevalence of periodontal disease could be determined.

Likewise, to control this disease, dentists recommend a proper brushing, at least three times a day, as well as the use of dental floss and mouthwash, helping to prevent possible diseases that may occur, such as acid salival pH, tooth cavities, gingivitis and bone loss, during periodontal disease is a chronic inflammatory disease of periodontium and its advanced form is characterized by periodontal ligament loss and destruction of surrounding alveolar bone. Similarly, another technique to prevent periodontal risks, is visiting the dentist every six months, because he is the expert in the field and can help to prevent, control, remove and stop the formation of dental biofilm and dental calculus in areas difficult to reach with the brush, through an exhaustive oral examination to know if the disease has progressed or advanced in any form.

It should be noticed that there are other new treatments such as the use of photodynamic antimicrobial therapies with high and low intensity laser, as adjuvant in surgical and non-surgical periodontal treatments, favoring the destruction of the bacterial wall and the DNA of the periodontal bacteria [12].

Periodontal disease has been the object of research, among them we find: A study in Maracaibo city, Zulia State, Venezuela, whose name is "Oral Health-Disease Conditions in Children and Adolescents with Down Syndrome", at Special Education School "El Zulia", with a sample of 35 patients between 3 or 20 years old. As an instrument was used the clinical examination to get the DMFT (CPOD) index which is designed to measure the degree of tooth decay in patients, it also used the dental biofilm index with the gingival index. Among the results, the researchers observed that dental biofilm index was of 2,6 (3,1) and gingival was 3,7. So the gingivitis was grade 2, with a higher value found in the group between 15-18 years old (14.2). Finally, this investigation was a descriptive one [13].

Similarly, in a study made at the University of Guatemala, we sought to determine the periodontal status of patients with initial diagnosis of periodontitis at 12, 15 or 18 months after the end of treatment in the Periodontics Unit of that College, through a clinical and radiographic re-evaluation, 2 years later. For this study, 22 patients were selected and evaluated for determining the depth of the gingival groove and bleeding. Therefore, the results showed there was a recovery in periodontal health with a decrease of widening of the periodontal ligament space [14].

Finally, this study was located in the area of Rehabilitation of the Stomatognathic System, because it involves a group of organs which participate in important functions such as chewing, swallowing and phonation, and it is framed in the line of Periodontic research since it is related to one of the oral diseases that affects young people with Down syndrome, such as gingivitis and periodontitis. Through this, the prevalence of periodontal disease will be diagnosed in young people with these characteristics and the variables were studied to decrease the development of gingival diseases in such special young people.

On the other hand, the population is defined as a finite or infinite set of elements with common characteristics, which was formed by a group of 30 young people with Down syndrome.

## Material and Method

This investigation, according to the methodological approach was taken as quantitative, which –according to Briones, collects and analyzes quantitative data bases on variables, studying the relationship among quantified variables [15]. Likewise, according to its content, it was taken as a descriptive model, which consists in knowing the prevailing situations, customs and attitudes through the exact description of the activities, objects, processes and people [16].

Similarly, this study was aimed to determine the prevalence of periodontal disease in young people with Down syndrome at the Carabobo Bolivarian Workshop of Labor Education, located in Valencia, Carabobo State, Venezuela, in the period 2011-2012.

In this sense, it was placed within a non-experimental design, where the phenomenon is observed (in this case, the presence of etiopathological factors of periodontal diseases) as it occurs in natural context for being analyzed later.

In other words, it refers to any investigation in which it is possible to manipulate variables or randomly assign subjects or conditions. In this way, such a design is considered of transversal or transaction type, because they collect data in a single moment, in a single time, whose purpose is to describe variables to analyze their incidence and intervention at a given moment and involving several groups or subgroups of people, objects or indicators [17]. For this experiment clinical exam of 30 students with Down Syndrome between the ages of 15 and 25 years of age of both genders (Female 43% and 57% Male) and the data obtained were registered in Ramjford Periodontal index.

In turn, the sample was probabilistic of intentional sampling because the elements are chosen based on criteria or judgments pre-established by the researcher [18]. Such a sample consisted in 30 young people with Down syndrome with ages between 15 and 25 years, who are located at the Carabobo Bolivarian Workshop of Labor Education, there they were diagnosed with the informed consent of their parents.

In relation to the technique, simple observation was used which is based (according to Arias) on visualizing or capturing through visual examination, in a systemic way, any event, phenomenon or situation that occurs in nature, depending on the pre-established research objectives [19]. In the same way, the data collection instrument is described as that resource which the researcher uses to approach the phenomena and extract the information from them [20]. This instrument was based on a dental observation guide, which consist of: personal data of young people, such as age, sex and a clinical examination by using diagnostic instruments (mirror, dental explorers, periodontal probe, cotton pliers) and the existence of periodontal disease was determined by the O'Leary index (dental biofilm), IHOS (material alba and dental calculus) and Russell's periodontal disease (inflammation, sack depth and tooth mobility).

Moreover, the validity is about content, which –according to Hernández- indicates the degree in which an instrument reflects a specific domain of what is being measured [21]. It was determined before the application of the data collection instrument, through the evaluation of three experts, one in Methodology, one in Pediatric Dentistry and one in Periodontics. They systematically analyzed the content, evaluating the connection with the sample that was measured, its representativeness in relation to it and its relevance to measure the variable under study. Finally, the data analysis technique used to reduce and systematize any kind of information recorded in data, answers or values corresponding to variables that are investigated according to a problem [22]. As indicated, the analysis of the data in this investigation is related to the descriptive statistic because in it, the collected data is represented or revealed for its respective analysis.

The presented study the following formulas were:

- **Formula to calculate the dental biofilm:**

$\Sigma PB$  (sum of dental biofilm): It is done as follows

$$\text{O'Leary} = \frac{\text{number of stained surfaces}}{\text{number of surfaces present}} \times 100$$

Then the value of each young person is added according to the grouped ages to obtain the total amount of dental biofilm.

- **O'Leary index** : It is obtained in the following way

$$\frac{\Sigma PB (\text{sum of the dental biofilm Index})}{\text{total young}}$$

- **Formula to calculate the IHOS:**

$\Sigma MA$  (sum of alba matter) y  $\Sigma C$  (sum of calculation): is obtained by evaluating 6 teeth as the UD 11,16, 26, 31, for the Vestibular surface, UD 36 and 46 for the lingual surface, then the following formula is applied:

$$\frac{\text{number of painted faces}}{\text{number of evaluated teeth}}$$

Therefore the value of each young person is added according to the age group to obtain the total sum of both matter and calculation.

- **Average Matter of Alba and Calculus:** It is done in the following way:

$$\text{Total IMA average} = \frac{\Sigma MA (\text{sum of alba matter})}{\text{total young}}$$

$$\text{Total IC average} = \frac{\Sigma C (\text{sum of the calculate index})}{\text{total young}}$$

- **Formula to calculate Russell's Periodontal Index:**

To establish the criterion (0, 1, 2, 6 and 8) it is calculated

Sum of the value of each tooth Total teeth present

**F:** Frequency of illness in young people.

**FR:** is the relative frequency and is calculated:

$$\begin{aligned} &\text{Total of young people of the sample} \rightarrow 100\% \\ &\text{Frequency of young people due to the disease} \rightarrow X \end{aligned}$$

- The IHOS general sample:
- The formula is applied: Total average IMA + total average IC

**F:** It is the frequency in young people with periodontal disease.

**FR:** It is the relative frequency and it is calculated by

$$\begin{aligned} &\text{Total of young people of the sample} \rightarrow 100\% \\ &\text{Frequency of young people due to the disease} \rightarrow X \end{aligned}$$

## Results

In the periodontal disease there are many factors to evaluate, in consequence said formulas were applied and analyzed according to the following index, according to the age group, oral hygiene index, Russell's periodontal index and periodontal disease frequency.

- **According to the age group:**

Age	Young people (total number)	$\Sigma$ PB	O'Leary index
15-17	10	830	83
18-20	7	589	84
21-23	8	604	75
24-25	5	441	88
<b>Average values</b>	30	2464	82

Source: Form of the O.P.S./O.M.S. Oral Health (2012)

**Table 1:** O'Leary index according to the age of young people with Down Syndrome at the Carabobo Bolivarian Workshop of Labor Education

According to the data shown in Table 1, of the 30-young people with Down syndrome, it is evident that there is a higher O'Leary index of 88 in ages between 24-25 years, then an index of 84 is shown at ages between 18-20 years and at the ages of 15-17 years an index of 83 on plate. Finally, the O'Leary index is found in a lower proportion of 75 at ages between 21-23. Therefore, it can be deduced that there is a greater accumulation of O'Leary index at ages between 23-25 years and a clear tendency of the studied sample towards inappropriate oral hygiene.

- **According to Oral hygiene index:**

Age	Young people (total)	$\Sigma$ MA	Average MA	$\Sigma$ C	Average C	IHOS
15-17	10	23,6	2,3	15,4	1,5	3,8
18-20	7	15	2,1	11,9	1,7	3,8
21-23	8	22,1	2,7	15,9	1,9	4,6
24-25	5	13,5	2,7	8,6	1,7	4,4
<b>Average values</b>	30	74,2	2,4	51,8	1,7	4,1

Source: Form of the O.P.S./O.M.S. Oral Health applied by Delgado María (2012)

**Table 2:** Oral hygiene index simplified by age in young people with Down syndrome at Carabobo Bolivarian Workshop of Labor Education

In relation to the data observed in Table 2, it is shown that the young people with the highest simplified dental hygiene index are at the age group of 21-23 years, reaching a value of 4.6 which is broken down by 2.7 in alba materia and 1.9 of dental calculus, followed by the ages of 24-25 with an index of 4.4 in which 2.7 is of alba materia and 1.7 of calculus. In the same way, it was reflected that the group which obtain an index with lower value belong to the ages of 15-20 years with an IHOS of 3,8 in material alba and calculus. These described findings demonstrate the existence of a significant index of both local irritants in ages between 21-23 years and in turn a predominance of alba materia over dental calculus in all ages studied.

• According Russell's periodontal index

Russell's Criteria	F	FR
0: Absence of inflammation	0	0
1: Mild gingivitis with inflammation in the free gingivae.	3	10%
2: Gingivitis with a complete inflammation of the tooth.	9	30%
6: Periodontitis with inflammation and pocket depth >4mm.	12	40%
8: Severe Periodontitis with inflammation, pocket depth and mobility (attachment loss).	6	20%
<b>Average values</b>	30	100%

Source: Form of the O.P.S. /O.M.S. Oral Health (2012)

Table 3: Russell's periodontal index in young people with Down syndrome at Carabobo Bolivarian Workshop of Labor Education

According to the results from Table 3, in the 30 young people with Down syndrome was evident that 22 of them shown a greater criterion 6 with inflammation of gums and formation of pocket depth in a 40%, likewise, another group affected was of 9 young people with the criterion 2 which includes a complete inflammation of the tooth in a 30%, then it was observed a slight increase in 6 young people with the criterion 8 with inflammation, pocket depth and mobility in a 20%. The lowest prevalence was found in 3 young people with criterion 1 with inflammation just in the free gingivae. Therefore, it is determined that periodontal disease is found in the whole selected sample, where there is more predominance of periodontitis than gingivitis.

• According to periodontal disease frequency

Criteria	Female sex		Male sex	
	F	FR	F	FR
0: Absence of inflammation.	0	0%	0	0%
1: Mild gingivitis.	1	10%	2	10%
2: Gingivitis.	3	30%	6	30%
6: Periodontitis.	4	40%	8	40%
8: Severe Periodontitis.	2	20%	4	20%
<b>Average values</b>	10	100%	20	100%

Source: Form of the O.P.S. /O.M.S. Oral Health (2012)

Table 4: Periodontal disease frequency in young people with Down syndrome at the Carabobo Bolivarian Workshop of Labor Education.

In relation to the data shown in Table 4, a higher frequency is found for periodontal disease in male gender, which corresponds to 20 young people examined which is broken down in a 60% periodontitis and in a 40% gingivitis, in the same way, it was found a lower prevalence in female gender since it was found in 10 young people where 60% corresponds to periodontitis and 40% to gingivitis. However, it could be because there are a greater number of men than women in the sample studied.

Discussion

After the presentation of the results, the analysis of the obtained data which allowed correlating the objectives of the investigation is made to facilitate and/or allow the following discussion:

In relation to the present study, it was found that in the studied sample of 30 young people with Down syndrome, there is a high presence of dental biofilm at the ages between 24-25 years, representing the sample most affected by the local irritant, due to a poor oral hygiene [4]. These results coincide with the authors Mogollón and Navas, who in their study of oral health conditions of children and adolescents with Down syndrome, showed a high index of dental biofilm in the adolescent examined a result that reflects a lack of oral hygiene. So it was considered that the high presence of dental biofilm is a sign of a poor oral hygiene.

Other studies ratify such studies of high prevalence of periodontal disease in adolescents, adults, and older individuals makes it a public health concern. Several risk factors such as smoking, poor oral hygiene, diabetes, medication, age, hereditary, and stress are related to periodontal diseases. Robust evidence shows the association of periodontal diseases with systemic diseases such as cardiovascular disease, diabetes, and adverse pregnancy outcomes. Periodontal disease is likely to cause 19% increase in the risk of cardiovascular disease, and this increase in relative risk reaches to 44% among individuals aged 65 years and over. Type 2 diabetic individuals with severe form of periodontal disease have 3.2 times greater mortality risk compared with individuals with no or mild periodontitis. Periodontal therapy has been shown to improve glycemic control in type 2 diabetic subjects. Periodontitis is related to maternal infection, preterm birth, low birth weight, and preeclampsia. Oral disease prevention strategies should be incorporated in chronic systemic disease preventive initiatives to curtail the burden of disease in populations. The reduction in the incidence



and prevalence of periodontal disease can reduce its associated systemic diseases and can also minimize their financial impact on the health-care systems. It is hoped that medical, dental practitioners and other health-care professionals will get familiar with perio-systemic link and risk factors, and need to refer to the specialized dental or periodontal care [23].

When analyzing the local factors of materia alba and dental calculus, a high index of IHOS was observed, they were present in the whole studied group, accentuating more the presence of same and dental calculus in the individuals examined. In the same way, the study of Ramos stands out [5]. There he makes reference to the Periodontal State with Diagnosis of Periodontitis in the Periodontic unit at the University of Guatemala, in which he observed the presence of dental calculus and a low materia alba in the whole selected sample. The result of the study inferred that there is a prevalence in terms of dental calculus, but in materia alba it is differentiated with respect to this investigation [24]. Also, a studied carried out by Habashneh, where 206 patients between 13 and 16 years old with Down syndrome were sample, finding a high IHOS, especially in those patients with low resources.

Similarly, a high prevalence of periodontal disease could be observed in the 30 young people with Down syndrome, having more incidence the periodontitis than gingivitis in the Russell's index criteria 6 and 8, with circumscribed inflammation extending all around the tooth, formation of periodontal pocket and dental mobility [2]. In this sense, he agrees with Carranza who reflects that Russell's periodontal index establishes the high prevalence of periodontal disease in the population and in turns, it measures gingival inflammation such as bone destruction [25]. In the same way, he coincides with Hernández and López in their research about Periodontal Disease in School Children with Down Syndrome, there they determined that the prevalence of periodontal disease was high in the whole group, it also presented a high Russell's index that explain the behavior of gingival and periodontal disease. This is why he considered that through Russell's index can be known in its different levels of gingival inflammation and periodontitis. In the same way, a study made by Kamer, in 2016, found a relationship between the increase in the incidence of periodontal disease in patients with Down syndrome and Alzheimer. Finding that at least a 50% of the patients with Down syndrome who survive after 60 years and evidence some kind of mental illness, in turn have periodontal disease [26].

Finally, it was evidenced in the research that the predominance of periodontal disease was more frequent in male gender, represented by 20 young people who lack of a correct oral hygiene, while the female sex, represented by 10 young people, the frequency was lower [25]. Coinciding with Hernández and López in their study about Periodontal Disease in School Children with Down syndrome, there it is expressed that there is a lower frequency in female sex and a high frequency in male sex. Reason why it is inferred that periodontal disease affects with greater predisposition to male sex and preventive measure must be taken to reduce it and keep a healthy mouth

## Conclusion

Based on the studies raised in this research and the results obtained from the analysis of the information, the following conclusions were reached:

There is a high prevalence of periodontal disease in young people with Down syndrome, with ages between 15 and 25 years at the Carabobo Bolivarian Workshop of Labor Education.

It was also observed the abundant presence of dental biofilm and an increase of materia alba on the dental calculus, which determined that the studied sample showed a poor oral hygiene.

Similarly, it was reflected that there is a predominance of periodontitis, with inflammation of the gum, sack formation and dental mobility in relation to gingivitis in the young people studied. Observing a higher frequency of periodontal disease in the male sex.

Young people with Down syndrome are generally vulnerable to periodontal disease due to poor oral hygiene and incorrect daily brushing habits. These young people, due to their special characteristics, should be cared for and oriented by their parents, relatives or caregivers to help them to keep a good oral hygiene, getting favorable results and reducing the disease.

## Recommendations

It is suggested to design special programs aimed to these young people with Down syndrome to educate them about prevention and oral health, emphasizing periodontics, thus improving the oral and integral health of this study population, located at Carabobo Bolivarian Workshop of Labor Education.

It is recommended the intervention and participation of different entities of the state in terms of awareness campaigns and implementation of hygiene programs, control and prevention of oral diseases, where health authorities, educational and preventive institutions, the family and dentistry professionals are involved.

Educational programs of a preventive and assistance nature are required to help these young people and their family group to become aware of the importance of oral health and brushing techniques.

It is necessary to train parents, relatives and people responsible for the care of these young people with Down syndrome in order to encourage them in the importance of oral care from the early years of childhood, together with the dentist and teachers, since the periodontal diseases are more frequent in them and it is a consequence of bad oral hygiene.

It is recommended to take these young people to the dentist, at least every six months and according to the age of the pediatric dentist, for their respective control and thus reduce periodontal disease.

Perform new studies on periodontal disease at national, state and municipal levels, involving different educational institutions with the purpose of knowing the epidemiology of this disease in the country.

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