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ORIGINAL ARTICLE

SEVERITY OF MALOCCLUSIONS AND ITS RELATIONSHIP WITH QUALITY OF LIFE IN CHILDREN ACCORDING TO SOCIOECONOMIC LEVEL IN THE LA ARAUCANÍA REGION, CHILE

Severidad de las maloclusiones y su relación con la Calidad de Vida en niños según nivel socioeconómico en la Región de La Araucanía, Chile

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ABSTRACT

Introduction: The Malocclusion-Associated Quality of Life (MAQOL) evaluates the impact of malocclusions on Oral Health-Related Quality of Life. The relationship between MAQOL and the severity of malocclusions and socioeconomic status is not clear and has not been studied in Chile. The aim of this research was to determine the level of MAQOL in children aged 10 to 16 years and to determine if there are differences according to the severity of malocclusion and the Community Development Index (CDI).

Material and Methods: A cross-sectional and inferential study was carried out with stratified probabilistic sampling with proportional allocation. 306 subjects were randomly selected from schools in the La Araucanía Region. The Dental Aesthetic Index and the Malocclusion Impact Questionnaire were applied. Descriptive analysis and non-parametric Chi-Square test were performed to determine associations. $p<0.05$ was chosen as the threshold for significance.

Results: The frequency of malocclusions was 45.8% minor malocclusion, 23.1% defined malocclusion, 17% severe malocclusion, and 14.1% very severe malocclusion. The MAQOL was poor (34%). Children with minor malocclusion presented a median MAQOL (33.6%), while those with defined, severe, and very severe malocclusion presented a poor MAQOL (36.6%, 46.2%, and 41.9% respectively), there was no relationship between CDI and MAQOL. The differences between cities of different IDC were not statistically significant.

Conclusions: The severity of malocclusion, by itself, is not capable of significantly interfering with MAQOL, nor is the socioeconomic environment, suggesting that the impact on MAQOL is influenced by psychological parameters of each individual.

Keywords: *Quality of life; Malocclusion; Oral health; Salud Bucal; Orthodontics; child and adolescent.*

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RESUMEN

Introducción: La calidad de vida relacionada a Salud Oral puede ser evaluada mediante el Cuestionario de impacto en La Calidad de Vida Asociada a Maloclusiones (CVAM). La relación entre la CVAM, la severidad de las maloclusiones y el nivel socioeconómico no está clara ni ha sido estudiada en Chile. El objetivo de esta investigación fue determinar el nivel de CVAM en niños entre 10 a 16 años y determinar si existen diferencias según la severidad de la maloclusión y el Índice de Desarrollo Comunal (IDC).

Material y métodos: Se realizó un estudio de corte transversal en una muestra de 306 sujetos, seleccionados aleatoriamente entre colegios de la Región de La Araucanía. Se aplicó el Índice de Estética Dental (IED) y el Cuestionario de Impacto de Maloclusiones.

Resultados: La frecuencia de maloclusiones fue 45,8% maloclusión menor, 23,1% maloclusión definida, 17% maloclusión severa y 14,1% maloclusión muy severa. La CVAM fue mala (34%). Los niños con maloclusión menor presentaron una mediana CVAM (33,6%), mientras que aquellos con maloclusión definida, severa y muy severa presentaron una mala CVAM (36,6%, 46,2% y 41,9% respectivamente)- No existió relación entre el IED y la CVAM. Las diferencias entre ciudades de distinto IDC no fueron estadísticamente significativas.

Conclusiones: La severidad de una maloclusión, por sí misma, no es capaz de interferir significativamente en la CVAM, tampoco el entorno socioeconómico, planteándose la hipótesis de que la afectación de la CVAM está influida por parámetros psicológicos de cada individuo.

Palabras clave: *Calidad de Vida; Maloclusión; Salud bucal; Ortodoncia; Niño y adolescente*

INTRODUCTION

Malocclusions are common developmental conditions in childhood that affect oral function and facial aesthetics. They range in severity from mild to very severe and are characterized by misaligned teeth and discrepancies between the jawbones. These abnormalities in the jawbones may not only cause physical complications but also exert a significant impact on children's quality of life.[1]

Malocclusions have been reported to have a direct impact on quality of life,[2] especially in children and adolescents —ages at which integration into the environment, identity formation, and the crucial development of self-esteem and self-perception begin. In this sense, a malocclusion of any degree may negatively influence personality.[3] Malocclusions also have a significant psychological impact, as they can affect facial aesthetics, placing individuals at social disadvantages that may compromise their well-being. People with malocclusions may experience lower self-esteem and feel that their attractiveness, social acceptance, interpersonal skills, and personality are judged critically. Consequently, social responses can be strongly conditioned by dental appearance and, in turn, significantly influence an individual's adaptation to their environment.[4] Likewise, malocclusions can cause difficulty in eating certain foods and increase susceptibility to temporomandibular, musculoskeletal, and traumatic disorders.[5]

International scientific literature consistently reports that malocclusions exert a direct impact on quality of life (Mercado *et al.*,[2] particularly during childhood and adolescence —developmental stages characterized by social integration, identity formation, and the

foundational development of self-esteem and self-perception. In this context, malocclusions of any severity may adversely affect personality development, Preciado *et al*.[3]

The psychological impact of malocclusions can be substantial, as alterations in facial aesthetics may lead to social disadvantages that compromise overall well-being. Individuals with malocclusions may exhibit reduced self-esteem and perceive that their attractiveness, social acceptance, interpersonal competence, and personality are critically evaluated by others, Calderón *et al*.[4]

However, the relationship between the objective severity of malocclusions and the subjective perception of quality of life may vary considerably depending on cultural and socioeconomic contexts. Chile presents specific characteristics that could modify this relationship relative to what has been reported in the international literature.

First, Chile exhibits one of the highest levels of socioeconomic inequality among OECD countries, a factor that may amplify or attenuate the impact of malocclusions according to socioeconomic status. The Community Development Index (CDI) reflects these disparities at the territorial level, revealing marked differences in access to health services, including orthodontic care.

In addition, Chile displays cultural particularities such as an increasing emphasis on dental aesthetics, largely influenced by media exposure, alongside limited public coverage for orthodontic treatment. The Araucanía Region, in particular, has the highest proportion of Mapuche population in the country and presents human development indicators below the national average. These conditions may generate distinctive patterns in the perception and evaluation of malocclusions compared with findings from studies conducted in other socioeconomic and cultural settings.

On the other hand, international studies have reported inconsistent findings regarding this relationship. While some researchers have identified a direct correlation between malocclusion severity and reduced quality of life, others have found that psychosocial factors such as self-esteem may mediate this association. However, most of these studies originate from European, North American, or Asian contexts, with limited representation of the Latin American and, particularly, Chilean realities.

The absence of specific studies on Malocclusion-Related Quality of Life (MRQoL) in Chile represents a significant knowledge gap. The recent development and validation of the Malocclusion Impact Questionnaire (MIQ) in Spanish Hope *et al*.,[5] now provide an appropriate instrument to assess this dimension within the Chilean population, enabling the generation of local evidence that may differ from international findings due to the aforementioned sociocultural specificities.

The aim of this study was to determine the level of MRQoL among children aged 10 to 16 years in the Araucanía Region of Chile and to analyze potential differences according to malocclusion severity and socioeconomic status, as expressed through the Community Development Index (CDI).
This research seeks to determine whether the relationship patterns between malocclusions and quality of life described in the international literature are replicated in the Chilean context or, conversely, whether the region's unique sociocultural and economic factors generate distinct dynamics. The results will contribute

local evidence to inform public oral health policies and establish prioritization criteria for orthodontic treatment that respond to the specific needs of Chilean children.

MATERIALS AND METHODS

A descriptive observational study was conducted in a population of children aged 10 to 16 years in the Araucanía Region of Chile. The study was approved by the Ethics Committee of Universidad de La Frontera (Document No. 063_22). The sample was selected among students from participating educational institutions using stratified probability sampling, with proportional allocation to each stratum.
The sample size for a finite population was calculated using the regional student database, which includes a universe of 120,757 students aged 10 to 16 years, with a 95% confidence level and 4% precision. A 15% prevalence of children with quite or very affected teeth was assumed,[1] re-sulting in a required sample size of 306 participants.

The Community Development Index (CDI) is a composite indicator used to measure the relative level of development of the population within a Chilean district or commune. The CDI combines 13 variables across three dimensions: health and social well-being, economy and resources, and education. It has revealed significant disparities in mu-nicipal (communal) development in Chile, reflecting underlying socioeconomic ine-qualities.
Based on the 2020 CDI, districts were gro-uped into four strata: upper-middle, middle, lower-middle, and low. Using proportional allocation sampling, 104 uppermiddle, 64 middle, 85 lower-middle, and 54 low stratum students were selected.
Exclusion criteria included children with a current or past history of orthodontic treatment, a history of ADHD, psychological disorders, severe facial deformities, or allergies to nickel or latex.

To ensure the reliability and validity of the collected data, multiple bias-control strategies were implemented. The evaluation team completed a standardized 16-hour training program, which included both theoretical instruction and practical exercises in the application of the Dental Aesthetics Index and the Malocclusion Impact Questionnaire.
Inter-examiner calibration yielded a Cohen's kappa coefficient greater than 0.85 for all measurements. A pilot study was conducted with 30 participants not included in the final sample, allowing for adjustments to the data collection pro-cedures and confirming the question-naire's comprehensibility among the local population.

To minimize selection bias, stratified probability sampling with proportional allocation was used, based on the Community Development Index. Information bias was reduced by standardizing examination conditions (consistent artificial lighting, calibrated instruments) and administering the questionnaires in a controlled, private setting to ensure the confidentiality of res-ponses. Statistical analysis was conducted using SPSS version 23.0.
The Kolmogorov–Smirnov test was applied to assess the normality of quantitative variables, confirming that the data did not follow a normal distribution ($p<0.05$). For descriptive analysis, absolute and rela-tive frequencies were calculated for categorical variables, while medians and interquartile ranges were reported for quantitative variables.

Associations between categorical variables (malocclusion severity *versus* MRQoL; CDI vs. MRQoL) were evaluated using Pearson's chi-

square test, with Yates' continuity correction applied when appropriate. A statistical significance level of $p<0.05$ was established for all tests. Effect size was assessed using Cramer's V to interpret the practical magnitude of statistically significant associations.

The "Malocclusion Impact Questionnaire" (MIQ) was administered, with scores interpreted as follows: Very Good MRQoL, Good MRQoL, Average MRQoL, and Poor MRQoL. Additionally, the Dental Aesthetics Index (DAI) was assessed through an oral examination, with scores classifying malocclusion as minor, definite, severe, or very severe.

RESULTS

Population

The findings obtained after administering the questionnaires are presented in tables 1 to 3.

Sex and age

Of the 306 subjects included, 175 (57.2%) were female, while 131 (42.8%) were male. The mean age was 12.66 years for females and 12.91 years for males (Table 1).

Malocclusion Severity and MRQoL

Regarding malocclusion severity, 45.8% of children had minor malocclusion, 23.1% had definite malocclusion, 17% had severe malocclusion, and 14.1% had very severe malocclusion.

Children with minor malocclusion had an average MRQoL (33.6%), whereas those with definite, severe, and very severe malocclusion had poor MRQoL scores (36.6%, 46.2%, and 41.9%, respectively), (Table 2).

When analyzing the distribution of MRQoL according to malocclusion severity, the 'Poor MRQoL' category was the most frequent across all levels of malocclusion (40.2% for minor, 32.8% for definite, 29.4% for severe, and 30.9% for very severe malocclusion). However, this distribution did not show statistically significant differences (χ^2 (9, N=306) = 7.69, p = 0.105).

Community Development Index *versus* MRQoL

Of the total subjects, 45.75% had a middle-high CDI, 23.2% had a middle CDI, 16.99% had a middle-low CDI, and 14.05% had a low CDI. The 'Poor MRQoL' category was more prevalent in municipalities or districts with a middle-low CDI (46.2%) and low CDI (41.9%). In contrast, municipalities with a middle-high CDI showed a more balanced distribution across MRQoL categories. Notably, municipalities with a middle-high CDI

Figure 1. Distribution of Malocclusion-Related Quality of Life (MRQoL) according to Malocclusion Severity

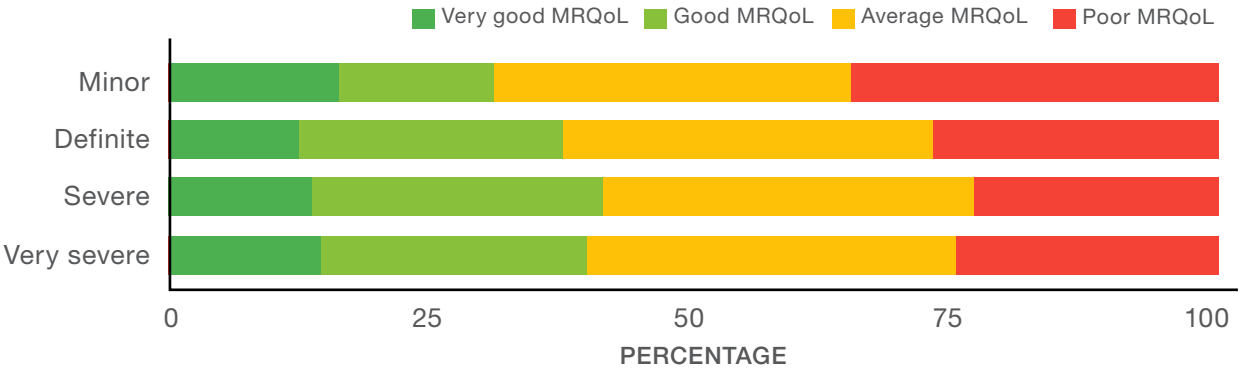

Figure 2. Distribution of Malocclusion-Related Quality of Life (MRQoL) according to Community Development Index

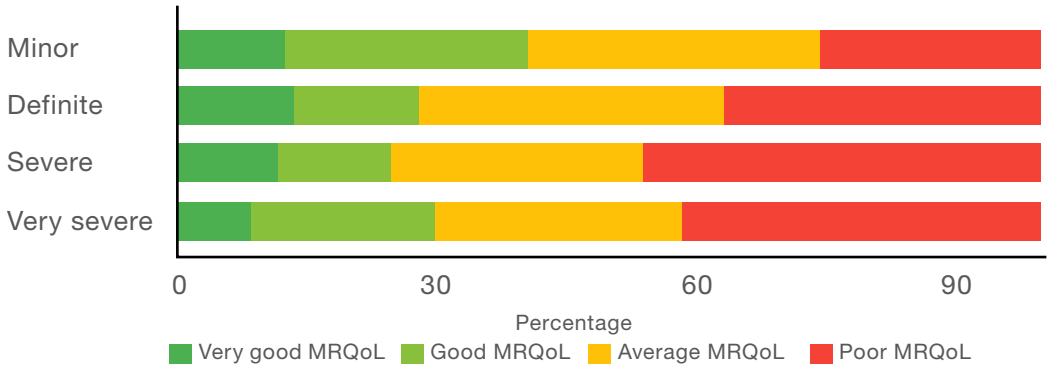

Table 1.
Distribution of SEX and AGE

Sex	Frequency	Percentage (%)	Mean age	Standard Deviation
Male	131	42.80	12.91	1.931
Female	175	57.20	12.66	2.116
Total	306	100		

Table 2.
Distribution of Malocclusion Severity *versus* Malocclusion-Related Quality of Life (MRQoL)

Malocclusion	Very good MRQoL		Good MRQoL		Average MRQoL		Poor MRQoL		Total
	n	%	n	%	n	%	n	%	
Minor	18	12.9	39	27.9	47	33.6	41	25.6	102
Definite	11	15.5	7	12.7	25	35.2	21	39.4	64
Severe	6	11.5	8	13.5	15	28.8	28	42.3	85
Very severe	4	9.3	10	20.9	12	27.9	18	41.9	55
Total	39	12.7	64	20.9	99	32.4	104	34.0	306

Table 3.
Distribution of Community Development Index (CDI)* *versus* Malocclusion-Related Quality of Life (MRQoL)

Malocclusion	Very good MRQoL		Good MRQoL		Average MRQoL		Poor MRQoL		Total
	n	%	n	%	n	%	n	%	
Upper middle	15	14.7	14	13.7	32	31.4	41	40.2	102
Middle	6	10.9	15	23.4	21	32.8	21	32.8	64
Lower middle	10	11.8	22	25.9	28	32.9	28	29.4	85
Low	8	12.7	13	23.6	18	32.7	18	30.9	55
Total	39		64		99		104		306

had the highest proportion of 'Good MRQoL' (27.9%) (Table 3). However, Pearson's chi-square test revealed no statistically significant association between CDI and MRQoL categories (p=0.704).

DISCUSSION

In the present study, the distribution of malocclusion severity indicated that most participants had minor malocclusions, while a smaller proportion exhibited very severe malocclusions. These findings are consistent with those reported by Pérez *et al.*,[6] who evaluated 12-year-old children in the Los Lagos, Los Ríos, and Biobío regions.
They observed prevalence rates of 35.7% for minor malocclusions, 27.1% for definite malocclusions, 16.3% for severe malocclusions, and 20.9% for very severe malocclusions. This similarity in distribution patterns reinforces the external validity of our results and suggests a relatively homogeneous prevalence of malocclusions among Chilean children. Malocclusion-Related Quality of Life (MRQoL) is a recently introduced theoretical construct that specifically examines the relationship between occlusal abnormalities and Oral Health-Related Quality of Life (OHRQoL).

This study is the first in Chile to systematically investigate MRQoL in a pediatric population. The results indicate a predominantly deficient MRQoL among children aged 10 to 16 years in the Araucanía Region, a pattern that appears independent of both the objective severity of malocclusion and socioeconomic status, as measured by the Community Development Index.
The prevalence of poor MRQoL observed in this study may be intrinsically related to the characteristics of the age group analyzed. During late childhood and adolescence, self-awareness and body perception develop rapidly, increasing susceptibility to concerns about physical appearance. This hypothesis is supported by Ashari *et al.*,[8] who compared 12- to 19-year-olds with 20- to 35-year-olds in a Malaysian population and found significantly lower OHRQoL values in the younger group, with no correlation to the Dental Aesthetics Index.

The authors attribute this phenomenon to adolescents' tendency to magnify their perception of dental aesthetic problems, particularly during a life stage characterized by intensified social and emotional relationships, when dental aesthetics play a decisive role in perceived physical attractiveness.

During adolescence, the construction of personal identity is closely linked to physical appearance. The scientific literature consistently shows that social perceptions of beauty are strongly influenced by dental alignment, which is associated with notions of professional success, intelligence, and social competence. This correlation under-scores the importance of considering dental aesthetics as a key component of psychosocial well-being during development.

Although there is consensus on the potential significant impact of malocclusions on children's self-perception —both physically and psychologically— the literature shows contradictory evidence regarding the universality and magnitude of these effects. This inconsistency may stem from various methodological factors, including differences in study populations, measurement instruments, sampling methods, and sample sizes. Moreover, cultural norms, traditions, and social behaviors shape perceptions of beauty differently across societies. In some ethnic groups, the high

prevalence of malocclusions may normalize these conditions, reducing their perception as problematic within the specific group. The psychosocial impact of malocclusions exhibits considerable inter-individual variability. Some patients with severe malocclusions report satisfaction or indifference toward their dental aesthetics, whereas others express significant concern over minor irregularities that have no objective functional or aesthetic relevance.

This variability suggests that the impact of malocclusions depends on multiple individual factors, including personal expectations, aesthetic preferences, economic resources, psychological profile, and the social and cultural values of the surrounding socioeconomical environment.
Young people may develop psychological adaptation mechanisms to their morphological condition, particularly because the development of malocclusions occurs gradually. This adaptation may be facilitated by the fact that daily activities are influenced more by individual psychological characteristics than by objective dentofacial appearance.

Systematic reviews have provided substantial evidence supporting this relationship. Dimberg *et al.*,[7] after analyzing six studies, concluded that high-quality evidence exists regarding the negative effects of aesthetically compromised malocclusions on individuals' emotional and social well-being. Occlusal alterations can reduce social acceptance and adversely affect self-esteem and quality of life through psychosocial mechanisms, particularly when unattractive occlusal features elicit unfavorable social responses, such as namecalling and peer bullying. More recent meta-analyses by Alrashed and *et al.*,[13] which included 11 studies, confirm that malocclusions can affect OHRQoL, although the magnitude of the impact appears relatively low. The authors emphasize that the avai lable evidence is consistently rated as low quality, primarily due to the cross-sectional design of the included studies, which increases vulnerability to reverse causality interpretations.

The literature presents divergent findings regarding the relationship between malocclusion severity and OHRQoL. Several studies have documented a positive correlation, with greater malocclusion severity associated with more pronounced OHRQoL impairment. However, other studies have not observed a clear gradient in OHRQoL scores according to malocclusion severity, reporting that only children with very severe malocclusions exhibited significantly different scores, while no differences were found among the minor, de-finite, and severe malocclusion groups.

Research focusing on specific types of malocclusions has provided additional insights. Fabian *et al.*,[35] examined the relationship between overbite and overjet and OHRQoL, finding that sagittal alterations have a greater impact than extreme deep bites. The authors suggest that vertical alterations may have a lesser effect on quality of life, possibly due to greater social acceptance of these types of malocclusions.

Regarding the influence of socioeconomic status, the literature presents contradictory findings. Anosike *et al.*,[44] suggested that the higher degree of self-awareness observed in upper social classes is unsurprising, as children from higher socioeconomic backgrounds tend to hold greater expectations of themselves and others, possibly accompanied by increased awareness of ideal occlusal characteristics. Conversely,

Oliveira *et al.*,[43] reported that adolescents from lower social classes experienced a greater dental impact than those from higher classes. However, a recent systematic review and meta-analysis by Alrashed *et al.*,[13] concluded that socioeconomic status is not a reliable indicator in the relationship between ma-locclusion and OHRQoL.

Self-esteem emerges as a key factor directly influencing the impact of OHRQoL. Psychological research indicates that self-esteem functions as a personal resource that helps individuals cope with less favorable conditions, such as poor dental aesthetics. Higher self-esteem is associated with greater life satisfaction and a more positive perception of facial appearance. Agou *et al.*,[40] identified self-esteem as a direct determinant of OHRQoL, observing that children with high self-esteem reported better OHRQoL, whereas those with low self-esteem experienced negative impacts that were not necessarily correlated with the normative severity of their malocclusion.

These findings suggest that psychological characteristics are more closely related to OHRQoL than objective clinical factors. The multifaceted impact of malocclusions on quality of life is shaped by individual expectations, personal preferences, economic resources, psychological profile, and the sociocultural values of the surrounding environment.

The current understanding of these mechanisms remains incomplete. It is recommended that this research be extended to other regions of the country to assess potential differences or similarities in the findings. Additionally, incorporating further variables would allow for a more comprehensive understanding of factors related to MRQoL in the Chilean child population. These could include specific measures of psychological factors, such as self-esteem, social anxiety, and body perception, as well as longitudinal studies evaluating changes in MRQoL before and after orthodontic interventions.

CONCLUSIONS

The results of this study on Malocclusion-Related Quality of Life (MRQoL) in children aged 10 to 16 in the Araucanía Region reveal several important findings.

First, the severity of malocclusions was not directly correlated with MRQoL impairment. Contrary to expectations, children with minor malocclusions exhibited a high proportion of poor MRQoL (40.2%), exceeding that of children with severe (29.4%) or very severe (30.9%) malocclusions. The absence of statistically significant differences suggests that the objective severity of malocclusion alone is not a reliable predictor of its impact on quality of life. Regarding socio-economic status, as measured by the Community Development Index (CDI), there was a tendency for hig-her proportions of poor MRQoL in lower socioeconomic levels compared to the upper-middle class.

However, these differences were not statistically significant, indicating that socioeconomic status, at least when assessed at the community level, does not solely determine the impact of malocclusions on quality of life. These findings have important implications for orthodontic practice, highlighting the need to consider psychosocial factors in addition to objective clinical criteria when assessing the need for and prioritizing orthodontic treatment in children and adolescents.

CONFLICT OF INTERESTS

The authors declare that they do not receive any commercial benefits or have any commercial or personal conflicts of interest with any company related to the instruments used

ETHICS APPROVAL

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AUTHORS' CONTRIBUTIONS

Álvaro Jerez Daza: Conceptualization, Research, Formal Analysis, Methodology, Resources, Visualization, Writing of the original draft of the manuscript.

Paulo Sandoval Vidal: Conceptualization, Formal Analysis, Methodology, Project Management, Supervision, Validation, Visualization, Writing, Review, and Editing of the manuscript.

Pablo Navarro Cáceres: Contributions: Formal Analysis, Methodology, Software, Validation, Writing and Review of the manuscript.

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