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# Oral Health Status of Children in a Community in Northeastern Brazil

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## ABSTRACT

**Objective:** To assess the oral health status of public school students of São Francisco do Conde, Bahia. **Material and Methods:** Cross-sectional, descriptive and analytical-comparative study with 350 children aged 7-12 years of both sexes. Oral health was analyzed using indicators recommended by WHO: soft tissue condition, DMFT, dmft, CPI, dental fluorosis, and DAI, and analysis of dental care, salivary examinations, chronology of eruption of permanent teeth, frequency of tooth brushing and visits to the dentist. The results were analyzed using descriptive statistics and statistical tests –t-Student,  $\chi^2$ , Fisher exact test, ANOVA, Tamhane and F Levene. **Results:** dmft and DMFT values of 1.45 and 0.53 were found, respectively. Among black (49.4%) and brown students (49.1%), 72.5 % had mixed dentition, 0.3% deciduous, and expected chronology of eruption of permanent teeth in 70.6 %, 56.3 % reported experiencing caries, 38.3% of children had fluorosis, 96.9% of individuals with normal saliva buffer capacity, while 23.2% had reduced salivary flow. CPI in children aged 12 years found that 79 % had healthy periodontium, no bleeding or presence of calculus. In relation to DAI, 21.1 % of children had normal or slightly altered occlusion and 71.5 % had some degree of malocclusion. Only 14.6 % of the sample reported not having had any contact with dentist and 38.6 % reported brushing their teeth three times a day or more. **Conclusion:** The oral health pattern of schoolchildren is satisfactory, requiring particular care with occlusion. The effectiveness of the results of this epidemiological survey allowed the adequacy of public policy actions on oral health in the municipality in which orthodontics service in the public network will be established.

**Key-words:** Oral health; Oral health surveys; Dental caries.

## INTRODUCTION

Dentistry in Brazil has experienced great scientific and technological advancement though dental caries, followed by periodontal disease continue to affect a relevant part of the population, particularly families of children belonging to social groups with low purchasing power, with serious impacts on health and education, where early loss of deciduous and permanent teeth culminates in edentulous adolescents or with poorly positioned teeth committing self-esteem and social life. Thus, high prevalence and incidence of these diseases are associated with social, economic, political and educational conditions and not only to biological factors that interact in the etiology of these diseases [1].

Considered a public health problem in underdeveloped or developing countries like Brazil, studying dental caries has become a major topic of interest to researchers who seek strategies for control or prevention in areas of higher incidence of the disease [1,2].

The success of epidemiological surveys aimed at identifying the reality of each region or country is in

agreement with the aspirations of those who seek to know in detail the health status of communities under their care and the physical, human and financial resources provided by the specific sector [2].

The oral health indicators reported in the epidemiological survey - SB Brasil 2010 [3] point to a reduction in the DMFT from 2.8 to 2.1 [3] at 12 years of age, reflecting the benefits due to the increased exposure of people to fluoride in its various forms of application, to higher emphasis on health promotion activities, improvement of the quality of life and health conditions, and ultimately to changes in diagnostic criteria for dental caries [2].

Other indicators such as the Social Development Index (SDI) and the Gross Domestic Product (GDP) are also used as an international reference in the reflection of the health development conditions of a given population [4]. Accordingly, evaluating the oral health status of a population as one of the specific components of these indicators seeks to subsidize public managers in diagnosing the general health conditions, allowing the implementation of more suitable public policies. Therefore, the importance of determining the oral health status of school children aged between 7 and 12 years, particularly in northeastern Brazil, taking as reference

the city of São Francisco do Conde, Bahia, was due to the fact that this municipality shows expressive per capita GDP and negligible SDI, with evidence of uneven income distribution and reflections on oral health, despite the high municipal tax revenues that should result in benefits to the entire population [5].

## MATERIAL AND METHODS

This research conducted in the municipality of São Francisco do Conde, Bahia, is a cross-sectional, descriptive and analytical study approved by the Ethics Research Committee of the “Climério de Oliveira” Maternity, Federal University of Bahia and approved under registration CEP. 111 / 09 and Resolution No. 005/2010. The sample consisted of 350 children randomly selected based on the number of children aged between seven (age established at the time for admission in elementary school) and 12 years enrolled in five municipal urban schools, considering confidence index equivalent to 95 %. There was no sample loss due to an increment of 10 % in the sample size so as to ensure the minimum number determined. Instructive meetings with researchers and subsequent signing of the Informed Consent Form ensured the conduction of the study.

In addition the sheet recommended for epidemiological studies, as the model of WHO [6], consisting of identification, physical examination and records concerning intraoral clinical examination, the previously tested sheet adopted by the “Projeto SB Brasil 2010” Field Team [3] was used as a tool for collecting dental data, considering the presence of white spots and fluorosis, DMFT, dmft, also determining the Community Periodontal Index- CPI in children aged 12 years, the Dental Aesthetic Index - DAI, added of the previously validated items: “salivary conditions”, “saliva buffering capacity”, “chronology of eruption of permanent teeth”, “frequency of tooth brushing” and “visits to the dentist”.

In pilot tests, examinations were performed considering DMFT, CPI, DAI and Fluorosis in order to identify the diagnostic difficulties that could hamper the calibration process of the single researcher, performed close to the stage of data collection for the application of instruments adopting the following procedures: theoretical training for the recognition of different oral health conditions to be evaluated and knowledge on the “Projeto SB Brasil 2010” Field Team Manual [3], as well as practical training designed to standardize oral examinations and diagnostic criteria.

The intra-examiner agreement (how much the examiner agrees with himself) was estimated after examinations, considering the DMFT performed before the survey and repeated in 20 children aged 12 years old for five consecutive weeks in a classroom provided by the “Arlette Magellan” Municipal School, with natural light and use of properly sterilized instruments, consisting of plane mirror and CPI probe recommended

by WHO, and later comparison, yielding a diagnostic reproducibility for dental caries equivalent to 0.83 of the Kappa index. During data collection, individual dental examinations were repeated [3].

Saliva samples were obtained before tooth examination to determine the speed, flow rate and buffering capacity of this fluid. To determine the amount and salivary flow rate produced / minute, a piece of paraffin (1.5 Gr - Parafilm®), 10 mL graduated cylinder, funnel, and stopwatch were used. Initially, the paraffin was left in the mouth for one minute and the participant was instructed to swallow the accumulated saliva during this period; then, the Parafilm® was chewed for three minutes - time set for the case of children, and collected on a funnel over the graduated cylinder. From the moment the stopwatch was turned on, the salivary flow measurement was directly given by reading the total volume of stimulated saliva obtained within three minutes. The final result was expressed in milliliters of stimulated saliva produced per minute (mL / min) [7].

To verify the saliva buffering capacity, 1.0 ml of saliva collected for each child was added to 3.0 mL of 0.005 % HCl; after shaking the tube and after ten minutes, the pH was read by Digimed digital potentiometer model DMPH-2, previously calibrated using buffer pH 4.0 and 7.0. The buffering capacity was expressed by reading the final pH of the saliva - acid mixture and evaluated with established parameters [7]. To analyze the chronology of eruption of permanent teeth, the expected eruption chronology was used as a reference, suggested by Logan and Kronfeld, modified by McCall & Wald, considering the presence of tooth related to the child's chronological age adopting the following criteria [8]:

- Early - if the child was younger than the minimum age of the expected chronology;
- Expected - if the child was older than the minimum age and less than the average the expected eruption chronology;
- Small delay - if the child age was between the average and the maximum age of the expected chronology;
- Delayed - if the child was older than the maximum age of the expected chronology.

Results were descriptively expressed through absolute distributions and measures of descriptive statistics: mean, standard deviation, median, minimum and maximum values. Statistical tests were inferentially used: t- Student test with equal variances, t-Student test with unequal variances, F (ANOVA) test to compare the categories of variables in relation to the means of numerical variables (dmft and DMFT) and independence chi-square ( $\chi^2$ ) (Pearson) to verify the hypothesis of significant association between two variables. The Fisher exact test was used when the conditions for the use of  $\chi^2$  were inadequate.

In case of significant differences obtained by the F test (ANOVA), the Tamhane comparison test was used

and the verification of hypothesis of equality of variances was performed using the Levene's F test. The margin of error used in the statistical tests was 5.0 %. The data were entered into an Excel spreadsheet and the software used for the statistical calculations was SPSS version 11 (SPSS Inc., Chicago, USA).

## RESULTS

The main criteria adopted for the selection of students was chronological age: minimum of seven years established for entry into elementary school in the municipality of São Francisco do Conde and maximum of 12 years. The sample characterization is shown in Table 1.

**Table 1. Distribution of children according to the characterization data.**

Variable	n	%
• Age group (years)		
7 to 8	111	31.7
9 to 10	143	40.9
11 to 12	96	27.4
• Gender		
Male	173	49.4
Female	177	50.6
• Race/Color		
White	5	1.4
Black	173	49.4
Brown	172	49.1
• School grade		
1 and 2	138	39.4
3 and 4	212	60.6
• School		
Arlete Magalhães	77	22.0
Frei Eliseu Eisman	96	27.42
Maria das Dores Alves	87	4.9
Julietta Porciúncula Ribeiro	90	25.7

When inspecting possible changes of soft tissues in the oral cavity, no lesions were observed in 347 children that participated in this study. Only three of them had lesion suggestive of herpetic nature located on the lower lip and two had lesions suggestive of aphthous ulcers.

Upon teeth examination, 255 (72.5 %) students had mixed dentition, 94 (26.9 %) had permanent dentition and only one (0.3 %) had only deciduous dentition. It was observed that 197 (56.3 %) of them had caries experience, while 153 (43.7 %) had all healthy dental units. Mean DMFT and dmft were 1.45 and 0.53, respectively.

Periodontal conditions were only observed in children aged 12 years and the results are found in Table 2.

The presence of white spots was identified in 134 (38.3 %) children and of these, the presence of

questionable fluorosis was observed in 79 (22.6 %) children, while in 41 (11.7%) it was categorized as very mild, in 12 (3.4 %) as mild and in one (0.3 %) as moderate, and in only one (0.3 %) as severe. The occlusion analysis through DAI is represented in data shown in Table 3.

**Table 2. CPI of children aged 12 years.**

Variable	n	%
Healthy periodontal conditions	30	79.0
Gingival bleeding	5	13.1
Dental calculus	3	7.9
Total	38	100.0

**Table 3. Need for treatment according to the IED of children evaluated.**

Variable	n	%
DAI		
Normal occlusion mild occlusal alteration (up to 25)	74	21.1
Defined malocclusion (TTO Elective - 26 to 30)	68	19.5
Severe malocclusion (highly desirable TTO - 31 to 35)	65	18.6
Very severe or deforming malocclusion (required TTO - 36 or more)	117	33.4
Not informed	26	7.4
Total	350	100.0

In the present study, it was found that the chronology of eruption of permanent teeth in 247 students (70.6 %) was within the expected standard early in 68 (19.4 %), showing small delay in 21 (6.0%) and delay in 14 (4.0 %).

For the salivary conditions, the results showed normal flow and buffering capacity for most participants in the sample, as described in Table 4.

**Table 4. Distribution of children analyzed according to the salivary condition.**

Variable	n	%
• Salivary flow		
Hyposalivation (0.1 to 0.7 mL / min )	44	12.6
Low (0,70 a 1,0 mL/min)	37	10.6
Normal (>1,0 mL/min)	206	58.9
Hypersalivation ( > 2.0 mL / min )	63	18.0
• Buffer capacity		
Insufficient saliva	6	1.7
Threshold (pH between 4.5 and 5.5)	5	1.4
Normal (pH> 6.0)	339	96.9
Total	350	100.0

In this study, the tooth brushing frequency of twice a day or more was 95.2 %, being higher for females and it was found that 84.3 % had been to dentist appointment, according to data shown in Table 5.

## DISCUSSION

For this study, 350 students were distributed according to the following variables: age, gender, race /

**Table 5. Distribution of children analyzed according to the tooth brushing frequency and visits to the dentist.**

Variable	n	%
<b>• Tooth brushing frequency</b>		
Once	81	23.1
Twice	130	37.1
Three times or more	135	38.6
Not informed	4	1.2
<b>• Visit to the dentist</b>		
Yes	295	84.3
No	51	14.6
Not informed	4	1.1
Total	350	100.0

color, school grade and school attended (Table 1). The study sample consisted of 98.5 % of blacks and browns, reflecting the population characteristics mentioned by the Brazilian Institute of Geography and Statistics, according to the Population Count held in 2010, where the municipality of São Francisco do Conde had a population of 33,183 inhabitants predominantly composed of African descent, 39% black, 50% brown, 8.7 % white, 2.1% yellow and 0.2% Indians.

Only three of these children had lesions in soft tissue: one lesion suggestive of herpetic nature, located on the lower lip and two lesions suggestive of aphthous ulcers, considered very common in children and with undefined cause [9]. Mucosal lesions can only be characterized by means of differential diagnosis, which was not performed, since it was an epidemiological survey.

According to the “SB Brasil 2010” project [3], the proportion of decayed teeth is significantly higher in the Northern and Northeastern regions, while the proportion of restored teeth is higher in the Southern and Southeastern regions. When results are compared between state capital and municipalities within each region, it appears that the dmft index is generally higher in the inland, reflecting the inaccessibility to dental services. At 12 years of age, children have on average 2.07 teeth with caries experience. For this age, the lowest indexes were found in the Southeastern and Southern regions, while the highest were found in Northern, Northeastern and Center-Western regions [3].

The results of this study showed a reduction in dental caries among school children, since the average dmft and DMFT values were 1.45 and 0.53, respectively, compared to values shown in a study conducted in the same municipality in 2009 with children aged 12 years from five schools representing urban and rural areas, selected to provide sample representativeness, and the DMFT value found for these children was 3.63 [5].

Data from the “SB Brasil 2010” project [3] show value of 62.9 % for children aged 12 years free from caries, with the highest percentage in the Southeastern region (67.9 %) and lowest in the Northern region (41.6 %), thus attenuating the proportion of caries-free individuals (dmft / DMFT = 0) as a function of age. At five years of age, 46.6 % of Brazilian children are free from caries in the deciduous dentition and at 12 years of age,

43.5 % showed this condition in the permanent dentition, close to those found in the present study, in which 43.7 % of children were free from caries and much higher than the percentage found in Montenegro, Rondônia, where only 14.81 % of students aged 12 years were free from caries [10].

In studies conducted in developing countries in the city of Campeche, Mexico, with 713 children, 50 % of females with mean age of 7.42 years, dmft and DMFT of 2.48 and 0.40, respectively, were found [11]. In Udaipur, rural area of India, 750 children aged from six to ten years were examined and it was found dental caries prevalence of 63.20%, reflecting a significant public health problem that demands immediate intervention [12]. In Delhi, India, a city located in urban areas, dental caries prevalence of 52.3% and mean DMFT of 1.0 were found among 520 schoolchildren aged from nine to 12 years [13].

In a study in the state of Paraíba, Brazil, dental caries prevalence of 70.5 % in children aged 12 years and DMFT of 2.09 were found [14]. The results of the survey conducted by Almeida and other researchers (2011) with 143 children aged four to seven years in Rondônia showed dental caries prevalence of 71.53 % in the deciduous dentition, dmft of 3.0 and DMFT of 0.3 due to the reduced number of permanent teeth [15].

In 2001, in Salvador, Bahia, 3,313 adolescents enrolled in public and private schools, 1,750 aged 12 years and 1,563 aged 15 years were examined. The DMFT at 12 years was 1.44 and 2.66 at 15 years and the dental caries prevalence was 49 % [16]. In this study, there were no records of periodontal pockets because students aged less than 15 years and soft-tissue abnormalities may be associated with rash and not to the presence of pathological periodontal changes.

In the global data analyzed by SB Brasil 2010 Project, the presence of dental calculus was the worst periodontal condition observed, with prevalence of 23.7 %, and 11.7 % of 7,328 children aged 12 years showed gingival bleeding [3]. The results of this project indicate that the percentage of individuals without periodontal disease at the age of 12 years was 62.9 % [3], also close to that found for the total schoolchildren aged 12 years in the present study.

In study conducted with 335 children of both genders aged between five and 12 years living in the municipality of Santa Rita do Pardo, Mato Grosso do Sul, the following was found: as age increases, the frequency of schoolchildren with healthy periodontal condition decreases ( $p < 0.001$ ); gingival bleeding affects around 50.0 % to 70.0 % of them, depending on age; the prevalence of dental calculus is increased from the age of nine years, reaching 45.5 % of schoolchildren at the age of 12, reflecting the consequences of inaccessibility of dental services and discontinuity of health programs [17]. The global data analyzed by the SB Brasil 2010 Project showed that the presence of dental calculus was the worst periodontal condition observed in 23.7 % of 7,328 children aged 12 years; 11.7 % had gingival bleeding and 62.9 % had no periodontal problems [3], below the value



found for all schoolchildren aged 12 years in this study. The relationship between presence of some oral pathogens as predictors of risk for periodontal disease and / or caries has been studied, as the results observed in 196 children selected in Taubaté, São Paulo, which showed the prevalent presence of *Streptococcus mutans* (71.9 %), with dmft / DMFT of 6.68; *Prevotella intermedia* associated with inflammation ( $p < 0.05$ ); and the presence of *Campylo bacterrectus* was related to the periodontal health of children ( $p < 0.05$ ) [18].

With index higher than that found by the SB Brasil 2003 Project [3], which reported severe or deforming malocclusion in about 21 % of Brazilian 12-year-old children, the present study found very severe or deforming malocclusion in 33.4 % of the 350 children with malocclusion, confirming the need for specialized care under the National Health System due to this degree of severity [19].

When 1,947 students aged 12 years enrolled in public and private schools in Goiânia, Goiás, were compared, the prevalence of caries, periodontal condition, fluorosis and dentofacial anomaly, a similar study was conducted, showing conflicting results. According to the observed IED, 22.5 % of students had some of these diseases, highlighting higher severity and prevalence of malocclusion in students enrolled in public schools than those in private schools; dental caries prevalence of 64 %; DMFT index equal to 2.29; some type of periodontal change in 28.6 %; and fluorosis present in 5.6% of the sample [20].

According to results of this study, there was need for intervention of managers of the municipality studied in relation to orthodontic treatment, since, regardless of the severity of occlusal changes, 52 % (sum of IED) needed treatment, excluding 59.4% for which treatment would be elective.

In research using IED recently held with 919 students aged 12 years in a municipality from northeastern Brazil (Feira de Santana, Bahia, Brazil), the prevalence of malocclusion in 53 % it was verified, with 10.1% very severe / incapacitating, 17.2 % severe and 25.7 % defined, with no significant difference between the degree of severity and variables, type of school (public or private), rural or urban residence zones, gender and race of students [21].

With results similar to those obtained by the SB Brasil 2010 Project [3], of the 350 students that composed the sample of this study, 255 (72.5 %) had mixed dentition, 94 (26.9 %), permanent dentition and only one (0.3 %) only deciduous dentition.

The present study showed that 70.6 % of students presented the chronology of eruption of permanent teeth within the expected pattern. The highest percentage difference between genders was recorded among children who had early tooth eruption, with higher percentage in females than in males (24.9 % vs. 13.9%), and in those with delayed eruption, being higher among males (6.9 % vs. 1.1%).

For salivary conditions, the results were: 206 (58.95%) of the sample had normal salivary flow, 63

(18.0%) had hypersalivation, 44 (12.6%) hyposalivation and 37 (10.6 %) low salivary flow rate. In 6 children (1.7 %), the test to investigate the buffering capacity could not be performed for failing to collect sufficient amount of saliva; however, 5 (1.4%) had threshold capacity - pH between 4.0 and 4.99 and 339 (96.9 %) were within normal ranges, pH between 5.0 and 7.0.

In a study with mining children aged from five to seven years, we attempted to relate the buffering capacity and salivary flow rates with the incidence of dental caries, associating other factors such as diet and hygiene. Of the children studied, 23 % had salivary flow rate below average, in 62 %, the CTS values allowed classifying them as susceptible to dental caries, and the correlation between DMFT and dmft indexes was moderate ( $p = 0.79$ ), confirming the complexity of the dental caries etiology [22].

A previous study conducted in Sweden with 392 schoolchildren aged from ten to 11 years assessed the risk of caries using Cariogram model, which did not include salivary tests, reported that the prevalence of caries in the population under examination was 40 %, but the accuracy of caries risk prediction was significantly impaired without the adoption of salivary tests [23]. Currently, saliva has become a promising option for the diagnosis of some diseases, to monitor the evolution of certain pathologies or dose of medications or drugs. Its advantages as a diagnostic tool include some facilities such as collecting it [24,25].

Research carried out in order to correlate salivary levels and oral hygiene conditions [26] revealed that the 25 students of both genders investigated in Campina Grande, Paraíba, showed low correlation because only 11.7 % of the bacterial plaque index variability were explained by the amount of *Streptococcus mutans* (CFU / ml  $\times 10^4$ ), which meant that the bacterial plaque index present in these schoolchildren was not associated with the amount of salivary microorganisms of that type [26].

In the present study, 75.7 % of students brushed their teeth two or three times daily, although comparative analyses between genders were not performed. In a similar study conducted in the city of Guatapar, So Paulo, with 336 students of both genders aged from six to 12 years, similar results were obtained, since it was found that 70.8 % of students brushed their teeth daily [27].

In some Brazilian cities, only 3 % of respondents reported never having been to the dentist, in contrast to results obtained in the epidemiological survey on the oral health status of the population living in the Metropolitan Region of Porto Alegre published in the SB - RS 2003 Report. This percentage differs from that found in the study using data from the National Household Sampling Survey (PNAD), in which 19 % of the population have never been to the dentist, corroborating the results found in SFC - Bahia. This difference can be attributed to regional, cultural, social and economic differences characteristics of Brazil [28].

Other researchers found that 73.4 % of

schoolchildren surveyed in Campina Grande, Brazil, had been at least once to the dentist, while 26.6 % had never been to the dentist [14]. Despite slightly higher, data obtained in this study corroborate the above study, since 84.3 % of students reported having visited the dentist at least once, revealing an improvement in access to oral health services in relation to oral health survey previously conducted.

One of the most important actions of the primary health care is to encourage the regular habit of cleaning the mouth mainly in childhood. There is much debate regarding the tooth brushing frequency that has been recommended after meals for adequate control of bacterial plaque deposited on the tooth surface. For some authors, this cleaning can be performed at any time of day, and there is evidence that only one daily tooth cleaning, since meticulous, is effective, regarding more its quality than its frequency [29].

A previous study showed that 82.5 % of 553 students brushed their teeth at least twice once a day and 17.5 % only once (14), whereas this study confirmed a daily brushing frequency of 98.8 % and 75.7% for this procedure performed at least twice daily.

In a cross-sectional study investigating the association between oral hygiene habits and use of dental services in 1,170 schoolchildren of Gravataí, Rio Grande do Sul, it was found that 77.8 % of them brushed their teeth > 3 times / day, 68.9 % visited the dentist annually and girls had higher tooth brushing frequency compared to boys. Additionally, healthy lifestyle and oral hygiene habits were associated to the use of dental services [29].

When comparing the frequency of daily brushing with the mean dmft and DMFT, it appears that the lowest average number of decayed deciduous teeth occurred among those who brushed three or more times (0.92); the mean number of filled teeth was higher among those who brushed three times or more (0.38); and the mean dmft decreased with increasing brushing frequency (1.58 to 1.33); however, for the fixed margin for error (5.0%), significant differences between the frequency of daily brushing and the average values of dmft and components ( $p > 0.05$ ) were not verified. The only significant difference observed between the brushing frequency was the DMFT variable: the average was higher for those who brushed once a day (0.78), and lower for those who brushed three times or more daily (0.39).

Oral hygiene habits can play an important role in the health-disease process and reflect the living conditions of a population as demonstrated by the results of this study, in which a reduction in the DMFT and dmft of children was observed, while the city SDI (5191) has risen, giving the municipality the 1<sup>st</sup> place in the ranking of the highest economic performance rates and 4<sup>th</sup> place of the highest social performance rates – 2010, according to the Superintendence of Economic and Social Studies of Bahia - SEI .

The oral health standard of schoolchildren evaluated is acceptable, given the low DMFT, dmft and CPI indexes, as well as the chronology of eruption of permanent teeth, predominantly expected. The results shown in this study helped the implementation of orthodontic interventions in the public sector; however, special attention should be given to the continued health education and dental care along with regular dental hygiene.

The effectiveness of the results of this epidemiological survey makes possible the adequacy of public policy actions to the real oral health conditions of the population of São Francisco do Conde, Bahia, considering the relevant Gross Domestic Product of the municipality and the change in its Social Development Index.

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## CONCLUSION

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