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Epidemiological Profile of Oral Health Conditions in Ecuador: A Retrospective Study From 2016 to 2022

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ABSTRACT

Introduction: The Global Action Plan on Oral Health 2023-2030 is reaffirmed, promoting prevention, equitable access, and affordability of essential oral healthcare, aligned with universal health coverage and addressing social and commercial determinants of oral health. The plan aims for resilient health systems based on primary healthcare (PHC).
Objective: The objective of this study is to determine the frequency and distribution of the main oral pathologies treated in the establishments of the Ministry of Public Health of Ecuador between 2016 and 2022.
Methodology: This study employs a retrospective methodology, utilizing a database provided by the Ministry of Public Health of Ecuador of the RDACAA and PRAS applications, treated in the Qview program, and presented in Microsoft Excel 2019. The Ministry of Public Health of Ecuador uses the ICD-10 code for the coding of diagnoses, considering age, sex, ethnic self-identification, and priority groups.
Results: The results show that dentin caries (K02.1) is the most frequent pathology, followed by acute gingivitis (K05.0) and deposits on teeth (K03.6).
Conclusions: This study provides crucial information at a national level and proposes to be a pioneer in the planning and execution of oral health policies in Ecuador, suggesting a reformulation of the National Oral Health Plan.

Introduction

To integrate oral health into global health systems and achieve universal health coverage by 2030, initiatives promoted by organizations such as the World Health Organization (WHO) and the World Dental Federation (FDI) have been proposed. This is based on the global crisis in oral health (World Health Organization, 2022)[1] that is reflected in 3,5 billion people affected by oral diseases worldwide (World Health Organization, 2024)[2] and almost half of the world's population with untreated diseases, as well as an increase of one billion cases in 30 years, aggravated by socioeconomic inequalities, despite a global expenditure of $390 billion that is high but uneven, which is why it is promoted to strengthen the prevention of oral diseases, as well as the integration of oral health in Primary Health Care (PHC), especially in middle-income countries and vulnerable groups, where there is limited access to the service (World Health Organization, 2022).[1]

The National Health System of Ecuador (SNS), founded on the principles of Renewed Primary Health Care (PHC), is structured around four core pillars: health promotion, disease prevention, treatment, and rehabilitation (Constitución Nacional de la República del Ecuador, 2008).[3]

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This model emphasizes the strengthening of health systems by integrating PHC into all levels of care and public policy.[4] In this context, the Basic Package of Oral Care (BPOC), developed by the Pan American Health Organization (PAHO), serves as a strategic tool for implementing PHC in the field of oral health globally.[5] This approach aligns with several Sustainable Development Goals (SDGs), including good health and well-being (SDG 3), reduced inequalities (SDG 10), and gender equality (SDG 5), thereby contributing to a more sustainable and equitable future.[6]

The Ministry of Public Health of Ecuador was established on June 16, 1967. In 1986, the National Directorate of Stomatology was created to oversee oral health policy and programs (Min.[7] Following the restructuring of state institutions, a new National Directorate for Strategies for the Prevention and Control of Non-Communicable Diseases, Mental Health, and the Socio-Economic Impact of Drugs was formed. Within this directorate, the Internal Management of Strategies for the Prevention of Cardiometabolic Diseases and Oral Health was created. This unit is responsible for developing regulatory instruments, technical guidelines, research proposals, and other strategies aligned with the country's epidemiological profile, aiming to prevent and control oral diseases at the national level (Min.[1,8] Currently, the National Directorate of Epidemiological Surveillance issues regular reports on health events under epidemiological monitoring; however, oral diseases are not included in these reports.

Since the establishment of the Ministry of Public Health of Ecuador, the National Statistics Division has been responsible for processing information related to the output of health facilities. This task was performed manually until 1985, when the use of computers was introduced. In 1997, an electronic clinical record in Excel format was developed, allowing for greater data storage capacity. By 2011, databases capable of generating dynamic tables were implemented, significantly reducing response times for users. In 2013, the Automated Daily Registry of Consultations and Outpatient Care (RDACAA) was introduced. This system is organized into four sections: information about the operating unit, the healthcare professional, the patient, and the consultation. It centralizes data on outpatient consultations and care within the health sector, supports analysis of the epidemiological profile, and enables cross-referencing of variables for statistical purposes through a centralized database.[9]

In 2016, the National Directorate of Information and Communication Technologies developed the RDACCA WEB system, enabling real-time registration of medical care across all health facilities. In 2017, the National Undersecretariat for the Provision of Services expanded the system's functionality, transforming it into medical software that allows for the comprehensive, real-time registration of patient care at all levels of the National Health System nationwide. This platform, known as the Health Care Registration Platform (PRAS), features a highly scalable and robust architecture, supporting the development of the Single Electronic Medical Record.[10]

At the national level, epidemiological studies on oral health in Ecuador are only available up to 2010; since then, there have been no updates on the prevalence and incidence of oral diseases.[11] Several local studies from various regions and age groups have attempted to generate data that can support decision-making in this field. Therefore, this study aims to present a national epidemiological profile spanning seven years, focusing on a significant portion of the population that seeks care through the public health system.

Methodology

To conduct this retrospective study, the Ministry of Public Health of Ecuador was requested to provide databases covering the period from 2016 to 2022. The criteria for data selection included patients treated at any Ministry of Public Health of Ecuador health centre between 2016 and 2022, ranging in age from 0 to the oldest recorded age, of any sex (female, male, or intersex), with an ethnic self-identification record, and belonging to one of the priority groups defined in the Constitution of the Republic of Ecuador.

In addition, the researchers created a list of 134 ICD-10 codes related to conditions of the stomatognathic system (detailed in table). To be included in the study, these codes had to correspond to confirmed (definitive) diagnoses.

For data standardization, the QlikView software was used. The seven databases provided were consolidated, and all categories not relevant to the study were filtered out. Only variables common to both registration systems – RDACCA and PRAS – were retained.

Each of the registration systems allows for the entry of up to five ICD-10 codes per patient. Therefore, the data in this study are reported by diagnosis rather than by individual patients. However, in cases where a patient was reordered multiple times across the study period with the same diagnosis, a 'Distinct' code was applied to remove duplicate entries, retaining only one record per patient per diagnosis, regardless of the year.

The following table was constructed to organize the data by ICD-10 chapters:

The use of the ICD-10 coding system was necessitated by the retrospective nature of this study and its reliance on official administrative data from the Ministry of Public Health of Ecuador, where ICD-10 is the mandated system for diagnosis and reporting. This system is crucial for national reporting and resource allocation, as it provides a standardized framework for morbidity statistics. However, it is a limitation that the ICD-10 system, unlike more detailed clinical systems such as the International Caries Detection and Assessment System (ICDAS), does not fully capture the severity or stage of carious lesions, in the case of our work it does not match the objective of the study.

Results

After systematizing the information according to Table, the master database was analysed using the QlikView software, yielding the following results:

Table – ICD-10 codes related to dentistry.

CHAPTER I – Certain infectious and parasitic diseases (A00-B99)	
Viral infections characterized by lesions of the skin and mucous membranes (B00-B09)	B00 Herpesvirus infections [herpes simplex]
Mycoses (B35-B49)	B37 Candidiasis
CHAPTER II – Neoplasms (C00-D48)	
Malignant neoplasms (C00-C75)	Malignant neoplasms of lip, oral cavity and pharynx (C00-C14)
Malignant neoplasms of respiratory and intrathoracic organs (C30-C39)	C31 Malignant neoplasm of accessory sinuses C32 Malignant neoplasm of larynx
Malignant neoplasms of mesothelial and soft tissue (C45-C49)	C46 Kaposi's sarcoma
Benign neoplasms (D10-D36)	D11 Benign neoplasm of major salivary glands
CHAPTER V – Mental and behavioural disorders (F00-F99)	
Somatoform disorders (F45)	F45.8 Other somatoform disorders – Teeth grinding
CHAPTER VI – Diseases of the nervous system (G00-G99)	
Disorders of nerves, nerve roots and nerve plexuses (G00-G99)	G50 Trigeminal nerve disorders G51 Facial nerve disorders
CHAPTER XI – Diseases of the digestive system (K00-K93)	
Diseases of oral cavity, salivary glands and jaws (K00-K14)	All mentioned in the group
CHAPTER XVII – Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	
Other congenital malformations of face and neck (Q18)	Q18.4 Macrostomia – Q18.5 Microstomia – Q18.6 Macrocheilia – Q18.7 Microcheilia
Cleft lip and cleft palate (Q35-Q37)	Q35 Cleft palate – Q36 Cleft lip – Q37 Cleft lip with cleft palate
Other congenital malformations of the digestive system (Q38-Q45)	Q38 Other congenital malformations of tongue, mouth and pharynx

Figure 1 highlights a clear predominance of dentin caries over other oral pathologies treated during the seven-year time frame in health centres under the jurisdiction of the Ministry of Public Health of Ecuador.

Dentin decay (K02.1) was the most frequently diagnosed condition across all population groups treated at public health facilities. The second most common diagnosis – acute gingivitis (K05.0) accounted for less than one-fifth of the total number of visits compared to dentin decay. Other conditions, such as dental plaque (deposits on the tooth) and enamel caries (K02.0), followed at a relatively consistent rate, each with approximately 50,000 diagnoses different from the previous tables. Retained tooth root (K08.3) ranked as the fifth most common condition. Between pulpitis (K04.0) (sixth) and chronic periodontitis (K05.3) (eighth), visit numbers fluctuated by fewer than 10,000 cases. Interestingly, cementum caries (K02.2) (ninth) – showed a resurgence, exceeding 40,000 visits. The tenth most treated condition during this period was periapical abscess without sinus tract (K04.7).

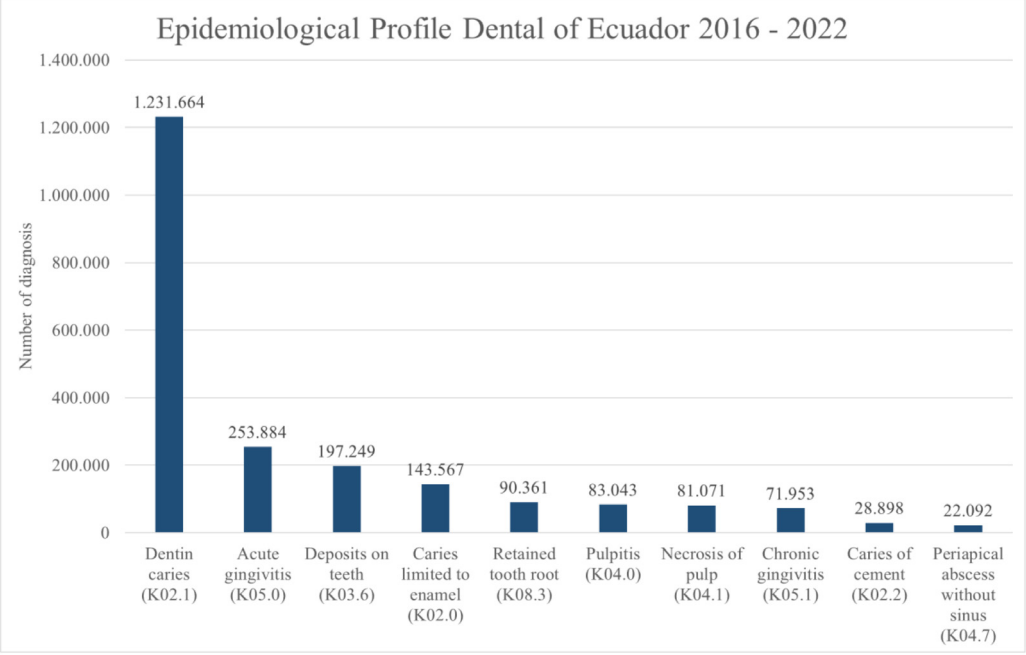

Fig. 1 – Dental epidemiological profile of Ecuador 2016-2022.

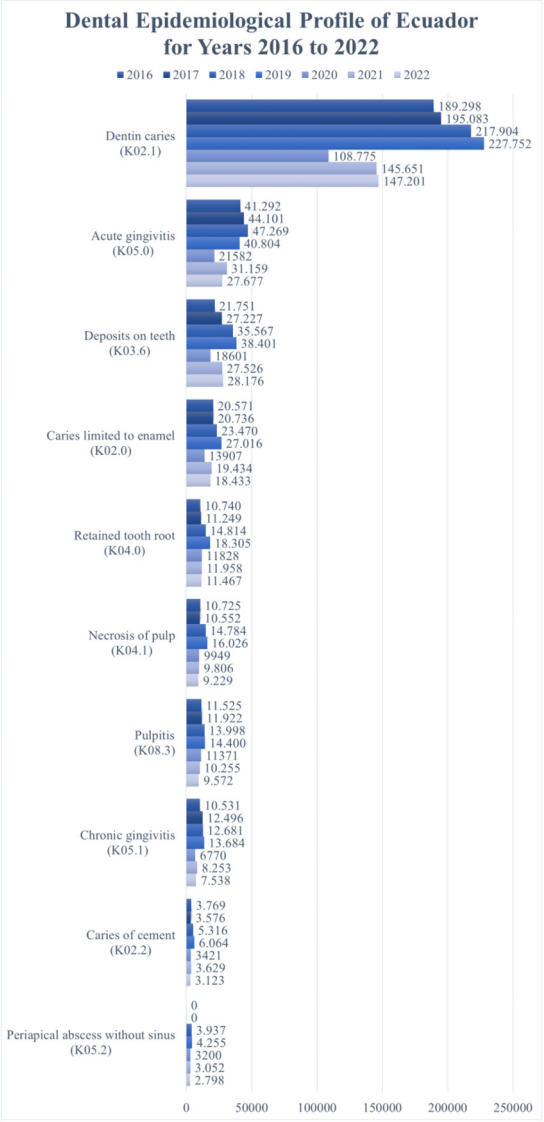

Fig. 2 – Annual distribution of the top 10 dental pathologies treated in Ecuador (2016-2022).

Figure 2 displays the yearly breakdown of the ten most frequently treated dental conditions in Ministry of Public Health of Ecuador healthcare centres. Overall, the years 2018 and 2019 saw the highest volumes of care delivered

Dentin decay (K02.1) consistently ranked as the leading cause of consultation across the study period, with 2019 registering the highest number of cases. Acute gingivitis (K05.0) peaked in 2018, while the highest number of visits for dental plaque occurred in 2019, along with other conditions such as enamel caries (K02.0), retained dental roots (K08.3), pulp necrosis (K04.1), pulpitis (K04.0), chronic gingivitis (K05.1), cementum caries (K02.2), and periapical abscess without fistula (K04.7).

Generally, the trend in patient visits for these pathologies shows a decline after 2019, with 2018 and 2017 also showing significant figures. Notably, no cases of periapical abscess with fistula (K04.6) were recorded in the years 2016 and 2017.

Figure 3 shows the distribution of the 10 main dental pathologies treated in Ecuador between 2016 and 2022, broken down by sex (female in pink and male in blue).

There is a predominance of dentin caries (K02.1) in both sexes. A higher proportion of cases is observed in women compared to men, exceeding seven hundred thousand diagnoses. Acute gingivitis (K05.0), dental deposits (K03.6), enamel-limited caries (K02.0), and chronic gingivitis (K05.1) also show a clear predominance in women, indicating a significant disease burden in this group.

Severe conditions such as pulp necrosis (K04.1), pulpitis (K04.0), cementum caries (K02.2), and periapical abscesses (K04.6-K04.7) occur with much lower frequency than dentin caries (K02.1). Nevertheless, even in these conditions, women present higher numbers than men, although the differences are narrower.

The figure reveals a high burden of oral disease, especially dentin caries (K02.1), with a greater impact on the female population. Overall, women show a higher frequency of diagnoses in almost all pathologies.

Figure 4 illustrates the ethnic variation in the most frequent oral health conditions recorded in Ecuador between 2016 and 2022. The data are presented as the percentage of affected individuals within each self-identified ethnic group: Mestizo, Indigenous, Afro-descendant, and Montubio.

Dentin caries (K02.1) is the most prevalent condition across all groups, with Mestizos and Indigenous populations both showing the highest proportion (57%), followed by Montubios (50%) and Afro-descendants (49%). Regarding periodontal conditions (acute gingivitis [K05.0] and chronic gingivitis [K05.1]), Afro-descendants show the highest combined prevalence, followed by Indigenous groups. In terms of pulpal pathologies (pulpitis [K04.0] and necrosis of pulp [K04.1]), Montubios present the highest proportions compared with the other ethnic groups. These results highlight clear disparities in the distribution of oral diseases among ethnic groups, with dentin caries as the dominant condition and variations in periodontal and pulpal pathologies across populations.

Figure 5 shows the frequency of the main dental pathologies diagnosed in pregnant women in Ecuador during the period 2016 to 2022.

Dentin decay (K02.1) is by far the most frequent condition, with 426,818 cases, representing a disproportionately high burden compared to other diseases. Acute gingivitis (K05.0) ranks second with 97,351 cases, followed by dental deposits (K03.6) (68,114) and caries limited to enamel (K02.0) (51,959).

Conditions such as pulpitis (K04.0) (17,323), pulp necrosis (K04.1) (11,994), retained dental roots (K08.3) (7612), and cementum caries – K02.2 (7526) are less common. The group labelled 'other caries' (K02.8) is the least frequent (5428 cases), which may include less classified or non-specific conditions.

Figure 6 shows the dental epidemiological profile of people with disabilities in Ecuador during the period 2016 to 2022.

Dentin caries (K02.1) accounts for nearly half of all dental diagnoses in this population. Retained dental roots (K08.3) (11%), acute gingivitis (K05.0) (8%), necrosis of pulp (K04.1) (8%), dental deposits (K03.6) (7%), and pulpitis (K04.0) (6%). Caries limited to the enamel (K02.0) (7%). Periodontal diseases

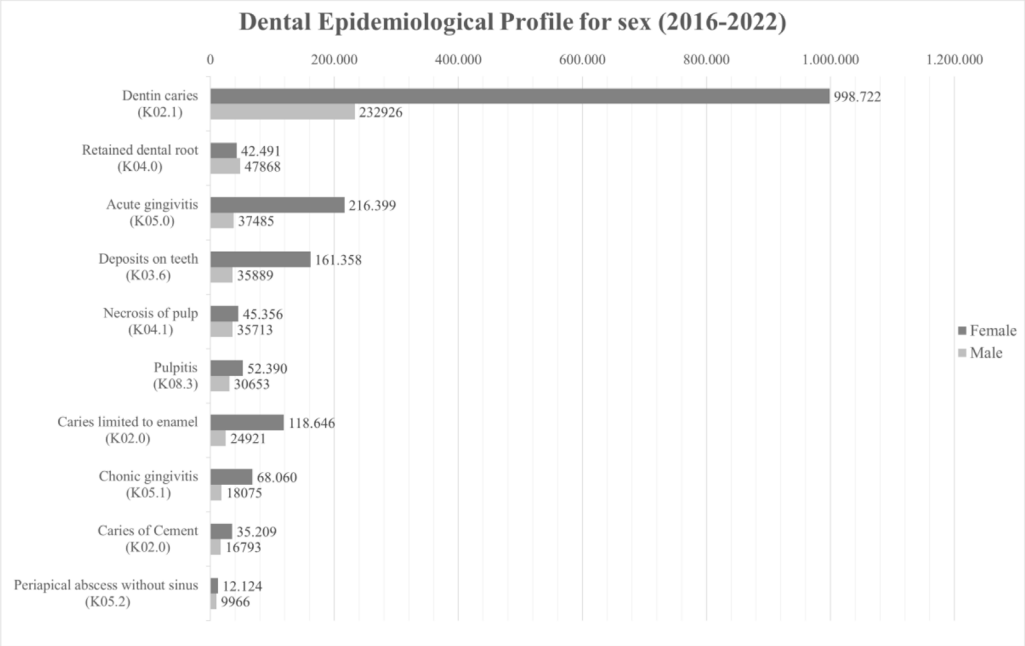

Fig. 3 – Dental epidemiological profile for sex (2016-2022).

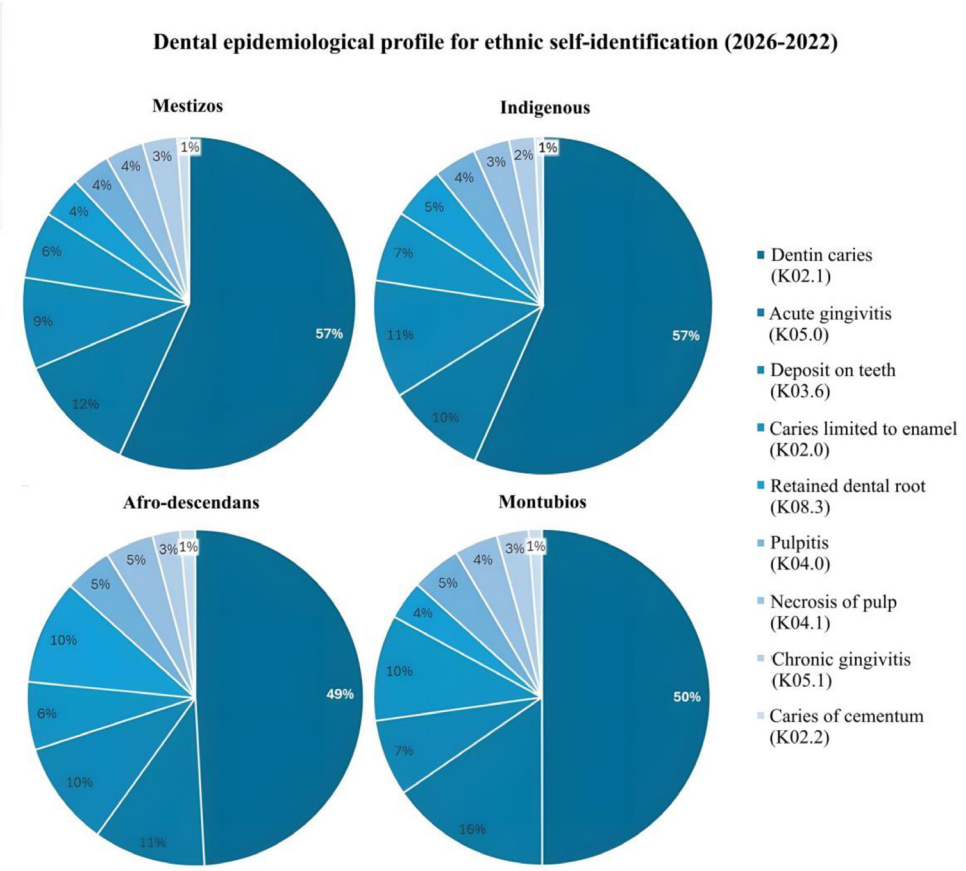

Fig. 4 – Dental epidemiological profile for ethnic self-identification (2016-2022).

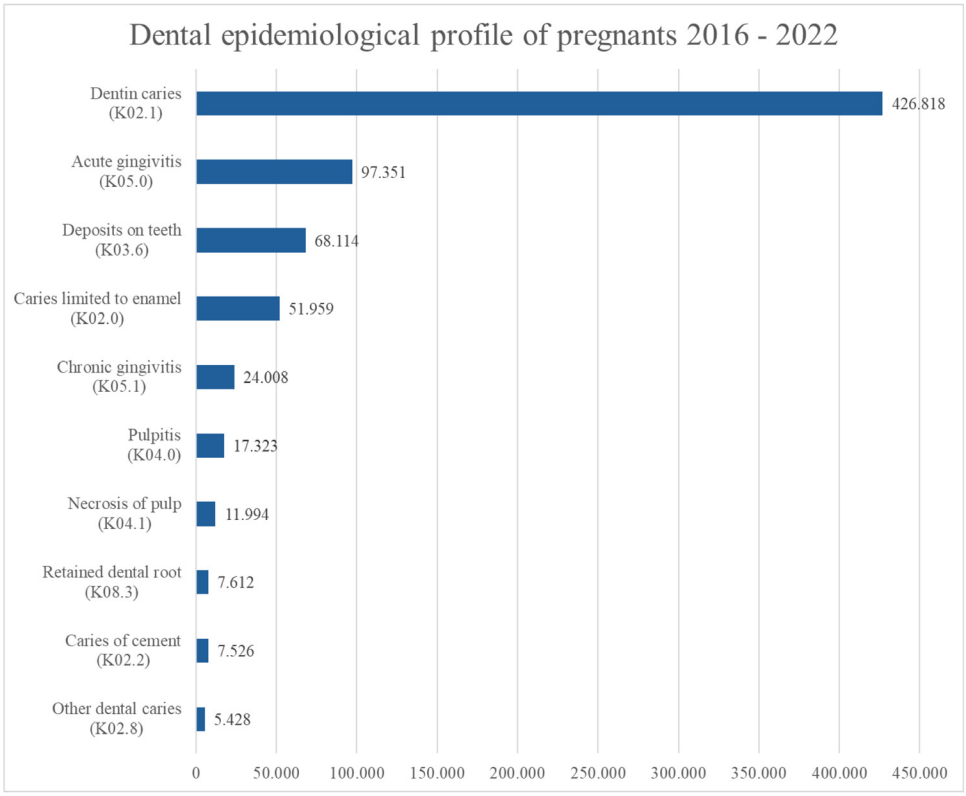

Fig. 5 – Dental epidemiological profile of pregnant (2016-2022).

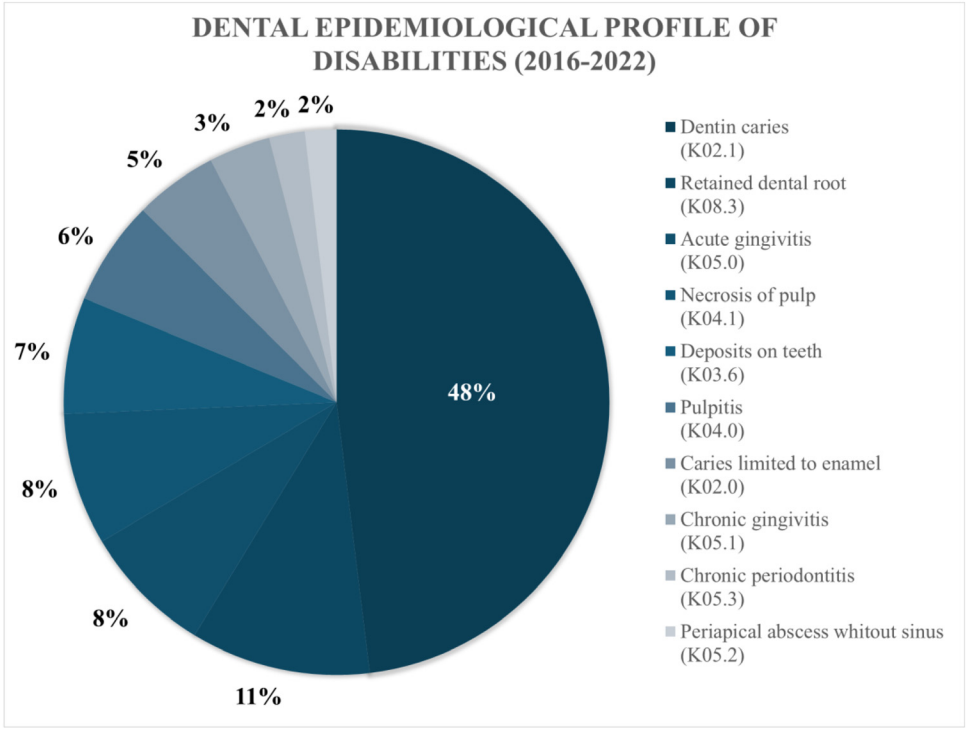

Fig. 6 – Dental epidemiological profile of disabilities (2016-2022).

(chronic gingivitis (K05.1) 3% and chronic periodontitis – K05.3 2%), periapical abscesses without fistula (K04.7) (2%).

Discussion

This epidemiological study, to our knowledge, is the first to gather and analyse all the variables described under this analysis model. In terms of the number of diagnosed cavities, even countries such as the USA[12] and Canada[13] report from the National Health and Nutrition Examination Survey (NHANES) an early age a high number of detections of this oral pathology as the most prevalent in the world, with similar data regarding the first causes of morbidity found in our country study. This aligns with broader global trends, where untreated dental caries consistently ranks as a leading cause of disability. A systematic analysis for the Global Burden of Disease (GBD) study by Qin et al revealed that globally in 2019, there were 2.03 billion prevalent cases of untreated dental caries in permanent teeth, representing a 46.07% increase since 1990. This study further highlighted that dental caries in permanent teeth ranked first among 328 diseases in terms of prevalence, underscoring its significant public health impact worldwide.[14] The value of standardized, international oral health datasets should be considered to have better context and overall comparisons. A study highlighting the use of these datasets across six countries emphasizes the importance of this approach for understanding global oral health trends.[15]

The high prevalence of dental caries aligns with the broader challenge of Non-Communicable Diseases (NCDs) in the region. According to PAHO,[16] NCDs, including cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes, were responsible for 6 million deaths in the Regions of the Americas in 2021, with 38% being premature. Dental decay shared risk factors, such as unhealthy diets, particularly high sugar intake, and tobacco use, are major drivers of the NCD burden and are thoroughly discussed within the PAHO report as key areas for intervention. This emphasizes the systematic nature of public health challenges, where factors influencing one NCD can also exacerbate others, including oral pathologies.

Changes in infection control protocols, such as fallow periods, may have also impacted practice capacity and access during this period. A review of fallow period guidance across Canadian jurisdictions is available.[17] A study, which forecasts future trends in disease burden across 204 countries and territories until 2050, includes specific categories related to oral health. These categories are Oral disorders and Lip and oral cavity cancer. The forecasts are presented in terms of Disability-Adjusted Life-Years (DALYS), both as total counts and age-standardized rates per 100000 population. Oral disorders are projected to increase significantly from 23631.2 thousand in 2022 to 36058.3 thousand in 2050.[18]

Our results show a significant predominance of the female gender in the diagnosis of the most frequent oral diseases, including caries, gingivitis and dental deposits, aligning with similar findings in regional epidemiological profiles.[19] This pattern is likely multifactorial, stemming from a combination of biological and socio-behavioural influences. We suggest three influential factors for this disparity. First, hormonal fluctuations-particularly during puberty, pregnancy and menopause-are a major biological factor that increases the risk of periodontal diseases (gingivitis) and potentially caries through effects of salivary composition and the oral microbiome.[20] Second, health-seeking behaviour may play a role; women in Ecuador, as in many parts of the world, tend to utilize primary public health services more frequently for overall health and preventive care than men, potentially leading to higher rates of detection and early diagnosis for common conditions.[21] Third, dietary and cultural factors related to gender roles, while needing further study, could contribute. The GBD study by Qin et al also noted sex-related differences, suggesting that while the global burden may be shifting, the higher prevalence among females in a specific utilization context like ours warrant closer investigation into these compounded biological and access factors. While the age-standardised incidence rate for permanent teeth showed a slight upward trend globally for both sexes, the prevalence and years lived with disability (YLDs) for permanent teeth decreased, with females generally showing a slightly larger decrease in age-standardized prevalence and YLD rates.[14] This suggests that while overall the burden might be decreasing in some aspects, the higher prevalence among females in our study warrants further investigation into contributing factors.

Across all dental pathologies analysed, there is a clear predominance of the Mestizo group, with proportions exceeding 80% in most cases. The relevant medical literature shows that, in Brazil, the prevalence of dental caries in adolescents aged 15 to 19 years is significantly higher in the group identified as 'mixed race' compared to other ethnic groups, including indigenous people. A national study found that mestizo adolescents had the highest probability of caries experience, followed by other ethnic groups,[22] while indigenous adolescents did not occupy second place in prevalence, but presented an intermediate or lower burden compared to mestizos and other non-indigenous groups, depending on the context and the variable analyzed.[23] In addition, although indigenous people may show a lower caries burden in some age groups, they have worse indicators of periodontal health and less access to restorative services compared to the non-indigenous population. Thus, while there is evidence that mestizos have the highest prevalence of dental caries, indigenous people do not consistently rank second in the number of oral disease diagnoses based on studies available in the medical literature.

This pattern may be related to their larger demographic representation in the country's general population and greater access to or use of public health services. In conditions such as pulpitis, pulp necrosis, or cementum caries, although the total numbers are lower, the proportion of cases among different ethnic groups tends to remain relatively constant. A systematic review and meta-analysis of dental decay in East Africa from 2000 to 2020, revealed a high pooled prevalence of 45.7%, with independent risk factors for dental decay, which was associated with a 1.34 times higher likelihood of developing the condition, and poor tooth brushing habits, which increased the risk by nearly two times.[24]

The study reflects a high burden of oral disease among the Mestizo population, which aligns with their majority

representation in the country. However, it also reveals a significant presence of oral pathologies among other ethnic groups, such as Indigenous and Afro-descendants.[25] [A1] [A2] While total DALys for both 'Oral disorders' and 'Lip and oral cavity cancer' are projected to increase globally by 2050, the age-standardized burden for general 'Oral disorders' remains relatively stable, whereas for 'Lip and oral cavity cancer', the age-standardized burden is also projected to increase. Efforts targeting behavioural and metabolic risk factors, such as tobacco smoking and dietary risks have the most significant potential to mitigate the forecasted increase in the burden of Lip and oral cavity cancer.[18]

We observed that pregnant women present a high number of cases of caries diagnosis; this was found by other studies.[26,27] In the study of prevalence of dental decay in Africa, the highest prevalence was in Eritrea and Sudan, with an overall mean DMFT score (Decayed, Missing, Filed Teeth) of 1.941, and being female was a risk factor, underscore the significant burden of oral disease in the region and the importance of targeted public health interventions.[24]

It is interesting to know that although one of the main causes of the difference in the number of conditions between men and women is the hormonal level and that it is expressed more strongly during pregnancy, causing gingivitis, among other periodontal problems, caries is still the most frequent diagnosis according to our data.

Our results suggest a critical need for preventive intervention during pregnancy, as this stage involves hormonal and behavioural changes that can affect oral health. This reflects a high burden of preventable diseases that could be addressed with basic oral hygiene measures and timely prenatal care. Overall, the data suggest that most dental problems in pregnant women occur in the early or intermediate stages of dental deterioration, indicating opportunities for prevention before these conditions become more severe.

Patients with disabilities were approximately 50% close to their diagnoses with caries disease, as was found in another study.[28] This high burden of untreated oral disease among people with disabilities highlights a significant public health challenge, indicating a lack of equitable access to, continuity in, or quality of preventive and curative oral health services. Barriers such as physical accessibility, communication difficulties, and financial constraints often impede dental care for this population, leading to the progression of preventable conditions.[1] Addressing these disparities requires inclusive strategies and a differential approach that prioritizes prevention and comprehensive support tailored to their specific needs.

This results a high burden of untreated oral disease that has progressed to involve the deeper layers of the tooth. It is a critical indicator of lack of access to, continuity in, or quality of preventive and curative oral health services. The chart reveals a high burden of preventable dental diseases among people with disabilities. The concentration of advanced pathologies suggests failures in prevention, timely diagnosis, and early treatment. People with disabilities may face physical, economic, or communication barriers that limit their access to oral health services. It is essential to design inclusive strategies, with a differential approach, that ensure equitable access to dental care, prioritizing prevention and comprehensive support.

A key limitation of our study relates to the analysis of priority groups, such as pregnant women and persons with disabilities. The elevated number of dental diagnoses in these populations does not necessarily indicate a higher epidemiological burden but rather reflects patterns of service utilization associated with the healthcare system's structure. Specifically, Ecuadorian regulations establish a mandatory obligation to provide and prioritize free-of-charge dental care to pregnant women throughout the National Health System (at least once during prenatal controls, ideally between weeks 13 and 28). Similarly, people with disabilities are constitutionally mandated as a priority group, ensuring preferential access. Given that our dataset did not include appropriate control groups for comparison, and considering the utilization bias induced by these regulatory mandates, these results must be interpreted with caution. Further research employing controlled and population-based designs is required to conclusively determine if these priority groups genuinely experience a disproportionate burden of oral disease.

Conclusions and public health recommendations

The findings from this national epidemiological profile carry direct and undeniable implications for the reorientation of oral health policy in Ecuador. It is imperative to redirect investment and effort away from restorative treatment (which currently saturates the system) and towards primary care and focused prevention. These efforts must be directed at the populations facing the highest disease burden, notably the Mestizo and Indigenous groups for caries, and the Afro-Ecuadorian population for periodontitis. Furthermore, strengthening auditing mechanisms is crucial to ensure mandatory adherence to oral health consultations for pregnant women and people with disabilities, thereby converting the legal mandate of prioritization into tangible health outcomes. For people with disabilities, policies must address physical, communicative, and financial barriers by funding mobile dental units, specialist training, and patient-specific oral hygiene support to ensure continuous and accessible care.

The Ministry of Public Health urgently requires the conduct of a national clinical epidemiological study, which will allow for a more accurate assessment of disease severity and a better evaluation of the effectiveness of implemented prevention programs

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Conflict of interest

None disclosed.

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