

THE ORAL HEALTH STATUS OF CHILDREN AND ADULTS WITH INTELLECTUAL
DISABILITIES: A LITERATURE REVIEW STUDY UTILIZING
SPECIAL SMILES DATA COLLECTIONS

by

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ABSTRACT

Individuals with intellectual disabilities (ID) experience significant disparities in oral health compared to the general population due to barriers such as limited access to care, communication challenges, socioeconomic factors, and a fractured healthcare system. This study analyzes global oral health outcomes among 48,902 Special Olympics athletes using data collected through Special Smiles screenings between 2019 and 2025. The program provides free dental screenings and education as part of the Special Olympics Healthy Athletes initiative. Findings highlight a high prevalence of oral health issues, including fluorosis, gingivitis, missing teeth, and several other conditions with regional variation. Data was collected using standardized procedures and documented through the Healthy Athletes Screening Form. The study highlights the need for inclusive dental health programs and sustained access to care to reduce oral health disparities and improve health outcomes for individuals with ID.

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CHAPTER I

INTRODUCTION TO THE STUDY

Children and adults with intellectual disabilities often experience significantly poorer health outcomes when compared to the general population. Oral health, a secondary area of healthcare, is a fundamental component of hygiene and overall well-being. Yet, oral care, as well as many other types of care, is neglected for individuals with intellectual disabilities (ID). Oral healthcare for this population in some cases begins before birth, or in youth in general, and continues throughout adulthood. Factors leading to limited access to dental care include reduced self-care abilities, communication barriers, and lack of specialized training among caregivers as well as healthcare professionals. As a result, this group is more susceptible to untreated dental caries (cavities), periodontal diseases, gingivitis, missing teeth, filled teeth, and long-term oral health complications that ultimately impact quality of life and systemic health.

One initiative aimed at addressing these disparities is Special Smiles, one of the seven branches of the Special Olympics Healthy Athletes program. Special Smiles provides free dental screenings, oral hygiene education, and referrals for athletes with intellectual disabilities during Special Olympics events worldwide. This program highlights the oral health challenges faced by individuals with ID, as well as providing data collection, raising awareness, and promoting preventative care. Special Smiles has served as a critical public health intervention for this group, but this population expands beyond Special Smiles. There remains a need for additional research that examines oral health care of this population beyond the Healthy Athletes program. This study will highlight findings and serves as a foundation produced through Special Smiles by further

exploring the oral health status of both children and adults with intellectual disabilities.

Rationale for the Study

Oral health is a critical but overlooked component of general health and quality of life. For individuals with ID, maintaining good oral health presents unique and significant challenges. Studies have shown that individuals with ID, both children and adults, experience a higher prevalence of oral diseases such as dental caries, periodontal disease, and untreated dental infections (Reid et al., 2003). This disparity stems from factors including cognitive and motor impairments, limited self-care capabilities, medication side effects, dietary patterns, and lack and access to specialized and accommodating dental care (Anders & Davis, 2010). Poor oral hygiene can further progress medical conditions and negatively impact nutrition, speech, social interaction, communication, and psychological well-being.

Despite an increase in awareness of these challenges, oral health among those with intellectual disabilities remains under-researched and underserved. Within this study, the data came from the Special Smiles screenings. Special Smiles plays a vital role in identifying common oral health problems among athletes with ID and providing them with preventative care services and education. Data from Special Smiles screenings were used in this study to reveal percentages of missing teeth, mouth pain, fluorosis, gingivitis, and filled teeth. Within these prevalence rates, discussed in Chapter III, there is an alarming need for dental care. Many of these conditions are often preventable with routine care (Special Olympics, 2021), but the first step is getting access to this care. This data is limited to those participating in Special Olympics and may not reflect the broader

population of adults and children with ID. The Special Smiles database gives insight into how important this healthcare is, but more representative research should follow to understand the true scope of oral health disparities among the whole population with ID.

Additionally, many healthcare providers, as well as much of the current literature, treat this population as a whole rather than dividing by adults and children. This method overlooks the distinct developmental, behavioral, and healthcare needs that exist across different age groups. While children may benefit from early intervention and caregiver services, adults with ID may face different challenges, including fewer accommodating providers and more complex health conditions. This study outlines the importance of dental care through Special Smiles data, but is unable to divide the population into adults and children, given the ages represented. In the future, looking into age-specific factors and barriers to effective care at different stages of life will be important, as this study groups these factors.

The rationale for this study resides in the need to improve both the understanding and provision of oral healthcare for individuals with ID. There is a pressing need to educate caregivers and patients, support the development of inclusive care, and educate the future generation of professionals. By building upon existing findings and addressing gaps in the literature, this study serves to the advancement of equitable healthcare practices. Ultimately, understanding the specific oral health challenges faced by both children and adults with intellectual disabilities is essential in managing interventions, creating, shaping public health strategies, and ensuring accessible and inclusive care to all.

Purpose of the Study

The purpose of the study is to describe the oral health status of Special Olympics athletes. This study seeks to explore how support systems and access limitations affect the prevalence of oral health conditions within this population. Utilizing both existing literature and the Special Smiles database, the research will investigate the prevalence of conditions and overall disparities for individuals with ID. This study aims to provide a guide to understanding the oral health status of Special Smiles athletes.

This investigation begins in a clinical setting, involving participants being screened onsite. Within the data collected, this study analyzes the frequency of conditions and provides findings that will tailor health interventions, policies, and education.

Research Questions

1. What is the prevalence of filled teeth, fluorosis, missing teeth, mouth pain, and gingivitis in the screened Special Smiles participants?
2. What are the primary barriers to accessing dental care for children and adults with intellectual disabilities?

Research Hypothesis

It is hypothesized that adults and children with intellectual disabilities will have a higher prevalence of dental conditions, such as gingivitis, fluorosis, and missing teeth, compared to the general population, and that these disparities will vary by region.

Research Design

A secondary data analysis will be conducted using existing datasets from Special Smiles screenings as well as online literature to support these findings. This approach allows for a worldwide large sample size comparison of oral health outcomes of those with intellectual disabilities to the general population. Secondary data analysis is appropriate for this study because it enables the researcher to examine trends, prevalence rates, and disparities using already collected and validated data.

Significance of the Study

If the study is implemented and the data analyzed, this research has the potential to make a meaningful contribution to both public health as well as the broader field of education and care for individuals with ID. By highlighting the disparities in oral health and understanding the prevalence, this study can provide interventions, education programs, and promote equitable access to dental care. The findings could guide dental professionals, students, and educators to provide more inclusive and accommodating practices. This research could support the overall well-being and quality of life for individuals with intellectual disabilities while also advancing the healthcare system regarding oral health.

Assumptions

1. Participants included in the secondary data accurately represent the broader population of children and adults with intellectual disabilities.
2. The original data collection procedures were conducted ethically, reliably, and

with standardized protocols.

3. The measures of oral health status used in the datasets are valid and appropriate indicators for individuals with intellectual disabilities.

Definition of Terms

1. **Intellectual Disability (ID):** A developmental condition characterized by significant limitations in cognitive functioning and skills such as learning, conceptual, social, and practical skills, which impacts a range of everyday skills. This condition impacts people before the age of 22.
2. **Caregiver:** a family member, friend, helper, or professional who assists with daily living tasks and healthcare needs for an individual with intellectual disabilities.
3. **Gingivitis:** A common and mild form of gum disease that causes irritation, redness, and swelling (inflammation) of the gingiva, the part of the gum that surrounds the base of the teeth. It can be treated with proper dental hygiene.
4. **Periodontal Disease:** A serious gum infection that damages the soft tissue and, without treatment, can destroy the bone that supports the teeth. This begins as gingivitis and may develop to more severe stages, involving tooth loss and other systemic health issues.
5. **Fluorosis:** A cosmetic condition affecting the teeth due to excessive exposure to fluoride during tooth development. It causes changes in the appearance of the tooth enamel, such as white spots, lines, or discoloration.

6. **Special Olympics:** A global sports movement that empowers individuals with intellectual disabilities through sports training and athletic competition in a variety of Olympic-type sports for children and adults, aiming to improve inclusion, physical fitness, and self-confidence.
7. **Special Smiles:** A specialized health initiative branch under the Special Olympics Healthy Athletes program that offers free dental screenings, education, and referrals to athletes with intellectual disabilities, while also collecting data to identify oral health needs to promote care interventions.

Dataset Coding Terms from Special Smiles Resources Page

1. **Gender:** Single value from the list of ['female', 'male', 'unknown/other']
2. **RegionOfAthlete:** Program of athlete. This is cleaned and matched to the program names in Census. This is the program where the individual is from. For example, if Mary from New Jersey goes to a HAS event in Florida, the ProgramOfAthlete will be New Jersey. (Recoded to Region)
3. **ss_clean_freq:** How often do you clean your mouth? Select one from: once or more a day, 2 to 6 times per week, once per week, less than once per week, not sure. In the Dental History section. (Recoded to “cleaning frequency”)
4. **ss_local_dentist:** Do you have a local dentist? Select from yes or no. (Recoded to “local dentist”)
5. **ss_dentist_freq:** If ss_local_dentist is yes, how often do you visit? Select from More than twice a year, Twice a year, Once a year, Less than once a year, or Only when I have a toothache. (Recoded to “dentist frequency”)

6. **ss_last_dental_visit:** About how long has it been since {you/SP} last visited a dentist? Include all types of dentists, such as, orthodontists, oral surgeons, and all other dental specialists, as well as dental hygienists. Select from in the last year, more than 1 year ago, never, or do not know. (Recoded to “last dental visit”)
7. **ss_filled_teeth:** If there are filled teeth, select from yes or no. (Recoded to “filled teeth”)
8. **ss_fluorosis:** If there is fluorosis, select from yes or no. (Recoded to “fluorosis present”)
9. **ss_gingival_signs:** If there is gingival signs, select from yes or no. (Recoded to “gingival signs”)
10. **ss_local_dentist:** Do you have a local dentist? Select from yes or no (Recoded to “local dentist”)
11. **ss_missing_teeth:** If there are missing teeth, select from yes or no. (Recoded to “missing teeth”)
12. **ss_pain:** Do you have pain inside mouth? Select from yes or no. In the Dental History section. (Recoded to “mouth pain”)

CHAPTER II

REVIEW OF RELATED LITERATURE

Overview

The oral health status of individuals with intellectual disabilities has accumulated increasing attention due to its significant impact on the overall well-being of many individuals. With a significant portion of the world's population having an intellectual disability, including about 6.5 million people in the U.S., one to three percent of the global population, or as many as 200 million people have ID (Geukes et al., 2019), this is an ever-growing issue in the oral health care field.

Overall health is much poorer in socio-economically disadvantaged groups, including persons with disabilities. Within the global population, the United Nations Development Program suggests that about 80 percent of all people with disabilities live in low-income countries. People with disabilities represent approximately one in ten people worldwide and are classified as one in five of the world's poorest people (SpecialOlympics.org, 2023). This is part of a nationwide trend, as the prevalence of intellectual disability has been growing globally, rising from approximately 1.5% in Western countries to 4% in developing nations over recent decades (Wu et al., 2010). When comparing countries, different healthcare systems mostly cause the differences in health situations. However, within countries, many variations result from the individual's characteristics (Naseem et al., 2015). It has been typically documented that individuals with intellectual disabilities have poorer health than the general population, as the needs within this population have not been met. This population struggles to access and handle care due to geography, socioeconomic status, physical, and anxiety/sensory-related

issues.

Impact of Poor Oral Hygiene

General hygiene problems include poor oral hygiene, high levels of tooth wear, and high rates of dental caries, along with behaviors like lip biting and tongue thrusting (U.S. Department of Health and Human Services, 2023). Hygiene issues may decrease the quality of life by limiting daily factors such as being able to sleep, eat, and function without pain (Lei & Hu, 2024 & National Institutes of Health, 2021). Poor oral hygiene may also lead to systemic illnesses such as cardiovascular disease, bacterial pneumonia, diabetes mellitus, and low birth weight. (Li et al., 2000). For many people, a smile is a form of communication, but for someone with a disability, this may be their main form of communication. This allows them to make connections, communicate feelings, express pain or discomfort, and send many other signals. Not only does poor oral hygiene limit their ability to express themselves, but it can ultimately lead to even more than the previously stated illnesses, such as aspiration pneumonia, systemic infection, and inflammation (Sanivarapu et al., 2024).

Children

Within the nationwide disabled child population, dental care falls into the top medical needs. Not only is this a top issue, but oral health problems also fall into the top 20 secondary conditions, resulting in restrictions on daily activities (American Academy of Pediatric Dentistry, 2024). Children with ID are limited in performing their daily activities, forcing them to fall behind in progression and development, as many

individuals in this population already have significant physical and cognitive limitations. From a dental perspective, children with ID tend to have more unmet dental care needs than typically developing children, posing a higher risk of dental concerns. This increased risk is due to many factors, such as frequent use of sugary medications, reliance on a caregiver for daily oral care, slower removal of food from the mouth, reduced saliva production, a preference for soft or sugary foods, and sensitivities that make oral care difficult. Some medications for conditions like seizures can cause gum overgrowth, while others, such as those for ADHD, can cause dry mouth, increasing the risk of cavities. (American Academy of Pediatrics, 2013). These children who are carrying a dental need and remain untreated are escalating their risk for dental diseases. This issue is ever-growing as the survival rates for children with disabilities who survive into adulthood have increased, reemphasizing the need for long-term care (Landes et al., 2020).

Adults

A significant challenge in adults with ID is the management of oral health. Information regarding oral health status and treatments for adults with ID is a necessity to prepare the best practices of inclusion in dental treatment, as well as strategies to protect the oral health of this vulnerable population. Many considerations, including age, ability to cooperate with dental treatment, and the type of residence, should be used to create preventative strategies (Morgan et al., 2012). In many countries, one being Serbia, by the time an individual turns 18, their full dental coverage has ended. This termination of coverage has been one of the key identified limiting factors for oral health care and delivery among the intellectually disabled population (Petrovic et al., 2016). The dental

health of adults is seen to deteriorate rather rapidly from childhood to adulthood. There are more decaying and removed teeth with fewer fillings than those that are non-ID. The challenge of the transition from youth to adulthood for those with ID in health services identifies large challenges. These include shortages of primary and specialist adult facilities, lack of reimbursement and resources for transfer care, and insufficient awareness of community support programs. Along with these challenges, there is what's called a fractured healthcare system in this transition from pediatric to adult healthcare process (Aloufi et al., 2022). This term refers to the lack of coordination and communication between different providers, services, and care settings. As a result, young adults begin to face confusion, have gaps in care, difficulty accessing necessary services, and ultimately increased stress levels. The systems' fragmentation can cause delayed treatment and increase the risk of health conditions, as important health information is lost or forgotten during the switch of healthcare providers.

Health Concerns

Malocclusion, a condition where the upper and lower teeth do not align properly during mouth closure, occurs more commonly in individuals with ID than in the general population. This dental concern affects both aesthetics and functional abilities, such as mastication and articulation. The most common types of malocclusion in individuals with ID are Class II malocclusion, commonly known as overbite, where the upper teeth overlap the lower teeth; Class III malocclusion, or underbite, where the lower teeth protrude past the upper teeth; open bite, where the front teeth do not touch when the mouth is closed; and overjet, where there is a protrusion of top teeth over bottom teeth.

These conditions can be caused or worsened by factors like abnormal muscle tone, oral habits (like thumb sucking or tongue thrusting), and other symptoms related to ID. This population experiences malocclusion more severely and more skeletally, but is the least likely to receive orthodontic treatment. When left untreated, malocclusion can cause difficulty with eating, speaking, swallowing, maintaining oral hygiene, as well as social impacts. Orthodontic treatments have been used for the treatment of excessive drooling due to a poor anterior oral seal (Rada et al., 2014). The evaluation of malocclusions is very important, as some patients are good candidates for full orthodontic treatment. Most importantly, the maintenance of primary teeth as long as possible, space maintenance, and disease maintenance are the most important.

For the population with ID, fixed prosthodontics, which involves permanent dental restorations such as crowns, bridges, or implants, is often more suitable than removable partial dentures. Unlike removable dentures, which have a mandatory upkeep consisting of regular removal, cleaning, and reinsertion, fixed prostheses remain permanently in the mouth. This is helpful for those who have difficulty maintaining daily oral hygiene. Fixed options are easier to maintain while also providing comfort and function improvements. For many individuals with ID, they experience limited manual dexterity and behavioral challenges, so this option is more appropriate. Depending on the patient and conditions, any patient who encounters seizures should not have removable partial dentures (Nirmala et al., 2018).

Poor oral health is a very common secondary condition impacting those with ID. The most frequent dental issue is tooth caries (cavities), while the gums and the structures that support the teeth are commonly infected by gingivitis and periodontal disease.

Cavities develop when mouth bacteria break down sugars and starches, producing acid that gradually removes tooth enamel. Inadequate oral hygiene allows bacterial plaque to build up on teeth, which can inflame the gums. Over time, this plaque can harden into tartar, irritating the gums and eventually leading to the gums pulling away from the teeth and even bone loss (American Academy of Pediatrics, 2013). The levels in this population of untreated dental decay have been continuously higher, with several studies showing more missing and decayed teeth and fewer filled teeth in this population. This population is susceptible to these oral health conditions due to their poor oral hygiene, including poor brushing technique and often a lack of caregiver training. (Wilson et al., 2018). Children with intellectual disabilities develop caries at about the same rate as children without disabilities, but they are less likely to receive treatment, so the number of untreated caries is significantly higher in the ID population. These early childhood caries are directly correlated with the several medications children get in the form of syrups. Many of these medications alter salivary flow, leading to increased plaque and calculus formation, resulting in poor oral conditions and halitosis, also known as bad breath.

Other oral conditions include habits like lip biting, which can cause abnormalities with jaw growth and result in a lack of space for permanent dentition (teeth) to come in properly, leading to malocclusion (misaligned bite). From birth, many children with ID may also have missing permanent teeth as well as enamel hypoplasia (underdeveloped or thin enamel), chipped/fractured anterior (front) teeth, and the possibility of various conditions affecting the gums and other soft tissue in the mouth (Nirmala et al., 2018). This loss of teeth typically results in speech impairments for many children as well. This

early childhood complication develops further into adulthood as 10.9% of a study of 4,732 adults were classified as having edentulism, a loss of all teeth, impacting daily tasks of speaking and eating (Morgan et al., 2014). These widespread and often untreated oral health problems not only impact physical well-being, but also impact the overall quality of life for individuals with ID as they may be unable to eat, speak, socialize, and maintain self-esteem throughout their life.

Special Smiles

Special Smiles, a branch within the Special Olympics organization, provides oral health examinations through free screenings and instructions on healthy habits. Special Olympic athletes are shown how to correctly brush and floss their teeth through the Special Smiles organization. This organization consists of volunteer dental health professionals and students. These individuals perform screenings, provide oral health instruction, mouthguard adaptations, and provide fluoride treatments for athletes taking part in the free screening. Special Smiles has seen great success in improving access to dental care for people with intellectual and developmental disabilities (IDD) and has created positive awareness (*Special Smiles (Dentistry)*).

Special Smiles, through access to free dental screening, is increasing access to dental care for individuals with intellectual and developmental disabilities. The program provides knowledge for this population to develop better oral hygiene habits, as well as educate the general population about the struggles and needs of children and adults with disabilities. Through this program, there is a growing awareness among dental professionals to acknowledge the oral health concerns of people in this population as well

as their struggles to access healthcare. The program gives a list of regional dental professionals to those who participate in Special Smiles.

Special Smiles screening and examinations have had many findings among the Special Olympics athletes in the U.S. Many of these athletes are unaware of the condition of their oral health. Some percentages found within screening in the U.S. are: 47% have gingival signs, 25% have untreated tooth decay, 25% have untreated tooth decay, 9% received an urgent dental referral, and 12% have mouth pain. (Special Smiles U.S. Fact Sheet). The percentages of these athletes' findings globally are even larger, with 46% having gingival signs, 37% having untreated tooth decay, 14% receiving an urgent dental referral, and 15% having mouth pain. (Special Smiles Global Fact Sheet). These findings highlight a critical and ongoing gap in dental care access and awareness for individuals with ID, both in the U.S. and around the world, further stressing the urgent need for more inclusive and preventative oral health initiatives.

Summary

The oral health of individuals with intellectual disabilities represents a significant and growing public health concern, affecting an estimated 1-3% of the global population. This population suffers from disproportionately high rates of oral diseases such as cavities, gingivitis, and periodontal disease, often due to factors including poor oral hygiene, medication side effects, lack of caregiver training, and limited access to regular dental care. Despite having similar rates of dental caries as the general population, individuals with ID experience a much higher rate of untreated dental conditions, which inhibits their abilities to eat, speak, socialize, and maintain a good quality of life.

Challenges continue into adulthood, as many individuals with ID lose access to pediatric dental services and face many barriers within a fragmented healthcare system. The transition from childhood to adulthood is poorly executed, leaving several gaps in treatment and increasing the risk of deteriorating oral health. Common issues such as malocclusion, missing teeth, and enamel defects are rarely addressed with appropriate orthodontic or prosthodontic interventions.

Programs like Special Smiles, a branch of Special Olympics, have been addressing many of these disparities through free dental screenings, education, and fluoride treatments, as well as referrals to local dental professionals. These efforts are raising awareness among dental providers and the public as they offer care and guidance to a much-needed population. However, the ongoing prevalence of untreated dental issues highlighted in Special Smiles data reiterates the continued need for expanded, inclusive, and sustainable oral health interventions for this vulnerable population.

CHAPTER III

METHODOLOGY

Participants

This study involved secondary data analysis of Special Olympics Healthy Athletes screenings. This data was made available through request and approval from Special Olympics International, which grants data access to researchers and clinicians. Ethics approval was obtained through the IRB process at Texas Christian University's Physical Activity and Developmental Disability Lab. Participants consisted of 48,902 Special Olympics athletes who attended Special Smiles screenings at all regions from 2019 to 2025. It should be known that the Special Olympics athletes are a generally higher-functioning and more active group of the ID population (Special Olympics, 2018).

To be an eligible participant, athletes must have a diagnosis of ID, cognitive delay, or developmental disability (SpecialOlympics.org, 2023). The minimum age a participant can be to be involved in Special Smiles is generally eight, but in some cases, six years old. All athletes and/or their legal guardians or caretakers must sign a consent form before involvement in any Special Olympic-related events. This consent also includes their de-identified health data to be used in research. Because Special Olympics uses an inclusive participation model, athletes have many abilities. However, the specific details about the individuals in the current sample, such as race, ethnicity, income level, severity of disability, other health conditions, and medication history, were not included in the de-identified Healthy Athletes database provided by Special Olympics International.

Data Collection Procedures

All data was collected onsite during Special Olympics worldwide events of all regions from 2019 to 2025 through Special Olympics Healthy Athletes standardized procedures and materials. Healthy Athletes offers health screenings and education to Special Olympics athletes and is currently the world's largest database on the health of people with ID. There have been over 2 million screenings since the beginning of Special Olympics in 1968 (Healthy Athletes, 2024). Special Olympics athletes are invited to participate in Healthy Athletes' eight branches of screenings voluntarily. All health screenings are performed by trained volunteers, students, and licensed professionals alongside the supervision of clinical directors.

To participate in Special Smiles, athletes must be registered participants in Special Olympics events and be willing to undergo a dental screening. Athletes are first introduced to Special Smiles by trained dental professionals and volunteers who explain the screening process and the types of services provided, such as oral health education, mouthguard fitting, fluoride varnish application, and referrals to community dental care providers if needed. Athletes are then asked for their verbal consent to participate in the screening.

Following consent, the screening is conducted by a licensed dental professional who assesses the athlete's oral condition and discusses their findings in a supportive and accessible manner. Volunteers document any evident dental conditions and provide appropriate referrals when more extensive treatment is needed, or the event is not being treated on-site.

Participation in Special Smiles offers athletes and their caregivers an opportunity to learn about the athlete’s oral health needs and receive personalized guidance on how to improve and maintain good dental hygiene. Athletes are given educational materials, dental hygiene products, a toothbrush, toothpaste, and floss, and a summary of their oral health status to take home. The Special Smiles Healthy Athletes Screening form (HAS) is used to record findings from the dental examination in two parts. Basic demographic details such as date, age, role, gender, region, and program are collected using the Healthy Athletes Screening (HAS) form. While information on untreated decay, presence of pain, gum health, missing teeth, filled teeth, and many other oral health conditions is collected through the oral examination.

The program helps identify oral health needs and aims to build long-term care relationships and raise awareness about the oral health disparities often experienced. Data collected through Special Smiles screenings are compiled and analyzed to monitor trends, inform public health initiatives, and support advocacy for improved access to dental care for individuals with intellectual disabilities. This standardized and structured approach to data collection enhances the quality and consistency of the data and provides a reliable foundation for future research, policy development, and the implementation of targeted interventions. Overall, the procedures ensure ethical, accurate, and impactful data collection that enhances efforts to reduce oral health inequities in this population.

Data Analysis

Data Cleaning and Inclusion Criteria

Special Olympics trains professionals, volunteers, and staff to follow Healthy

Athletes standardized measurement procedures and enter data in alignment with a decision-rule-based protocol (White et al., 2024). For this study, the following variables were used from the Special Olympics International Healthy Athletes database: athletes' gender, region, frequency of teeth cleaning, frequency of dental visits, last dental visit, local dentist, filled teeth, fluorosis present, missing teeth, mouth pain, and gingival signs. The initial database from Special Olympics International consisted of 50,001 total screenings. The database was cleaned of unified partners, missing, and zero values from the variables of interest. After cleaning, the dataset consisted of 48,902 participant screenings, which were utilized in the data analyses.

Statistical Procedures

All data were managed and analyzed using Microsoft Excel 2025 and IBM SPSS Statistics 29. Descriptive statistics were tested for all variables, including percentages and means, to describe the sample. These descriptive statistics were used to describe the oral health conditions athletes often reported. Lastly, to understand the participant demographics (age and gender), chi-square tests were conducted and proved no significance. To account for skewed regional data (e.g., a higher number of athletes from North America), the study looked at other countries, with the recognition that future research is needed to compare fully.

Results

A total of 48,902 Special Olympics Special Smiles athlete records remained in the dataset after inspection of missing and incomplete data. The ages of participants ranged

from 2 to 80 years, with an overall mean age of 27.8 years. Although there is typically a minimum age requirement for athlete participation, exceptions were made in this case due to parental consent and the benefits of early screening.

The mean age for females was 28 years, and 27.8 years for males. Most athletes were from North America (58.9%), followed by Europe, Eurasia (12.3%), Latin America (9.7%), Africa (6.9%), the Asian Pacific (5.6%), the Middle East (4.1%), and East Asia (2.5%). Figure 3.1 presents the sample distribution by gender, and Figure 3.2 represents the world region.

Figure 3.1

Distribution of Athletes by Gender

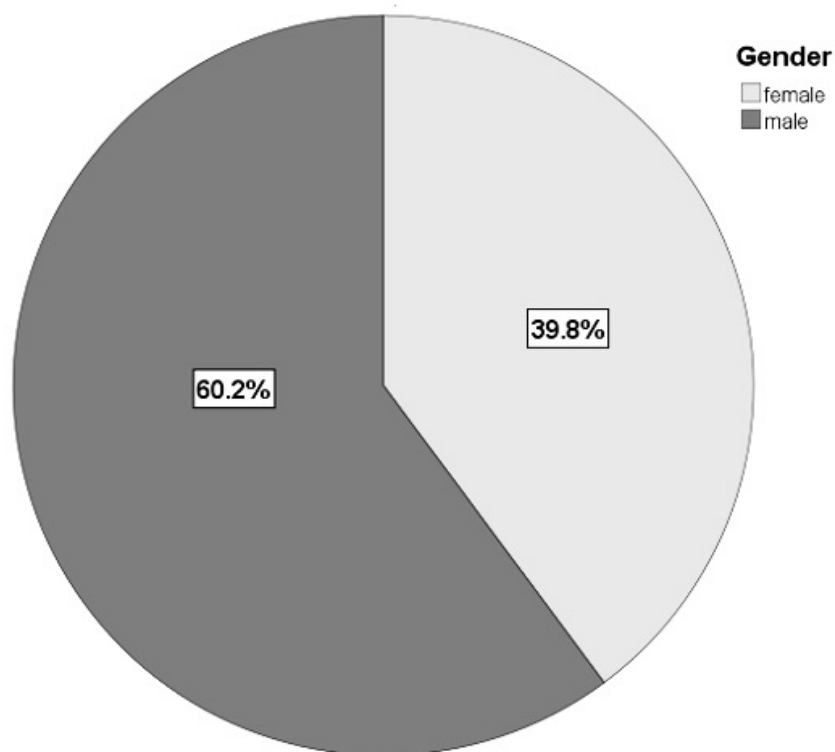
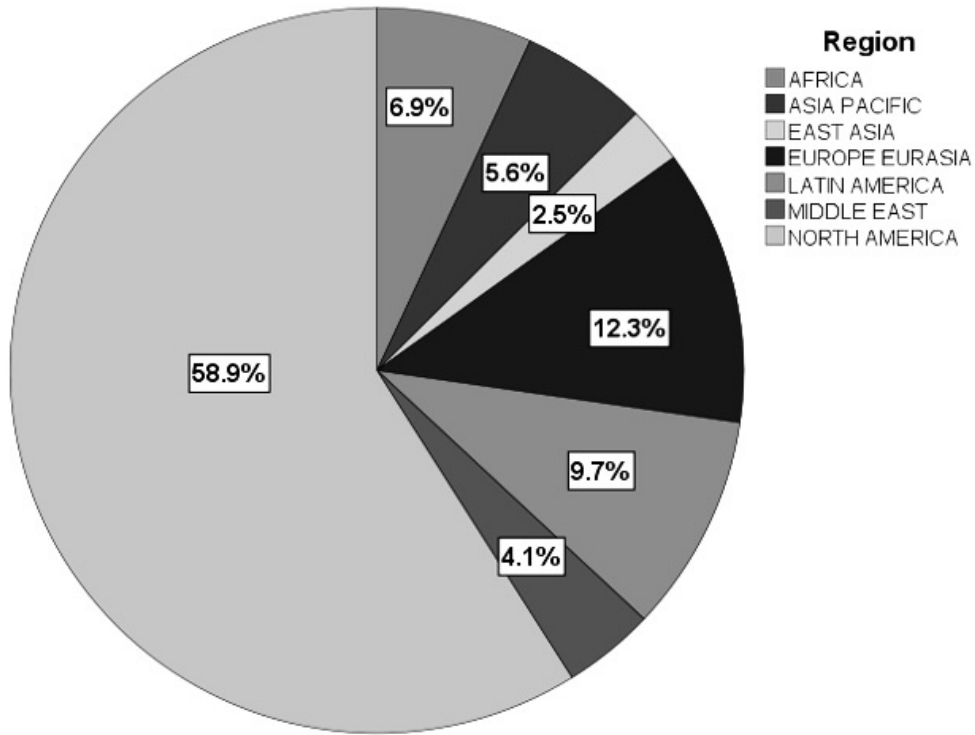


Figure 3.2

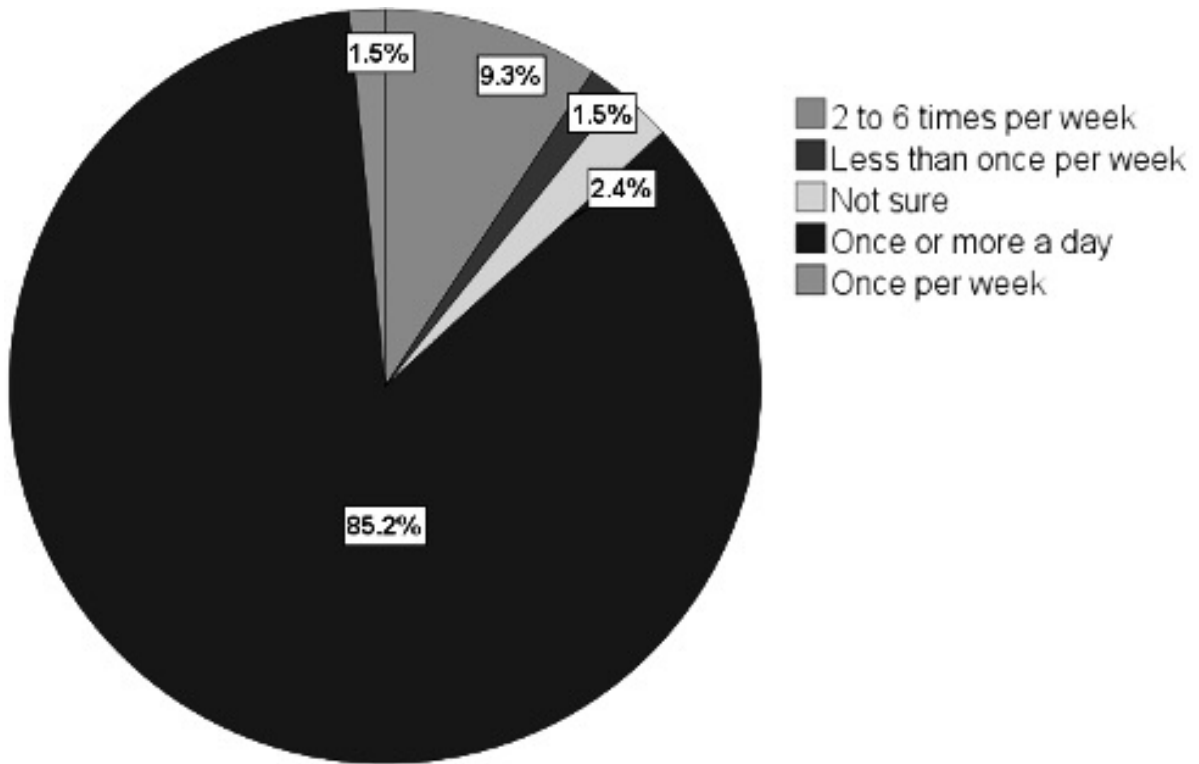
Distribution of Athletes by Region



The frequency of teeth cleaning reported by Special Olympics athletes is shown in Figure 3.3. The general standard of teeth cleaning is two times per day. The majority, 85.2% of participants, stated they clean their teeth once or more per day, while 9.3% recorded 2 to 6 times per week. Following these results, 2.4% do not know, 1.5% once per week, and 1.5% at less than once per week.

Figure 3.3

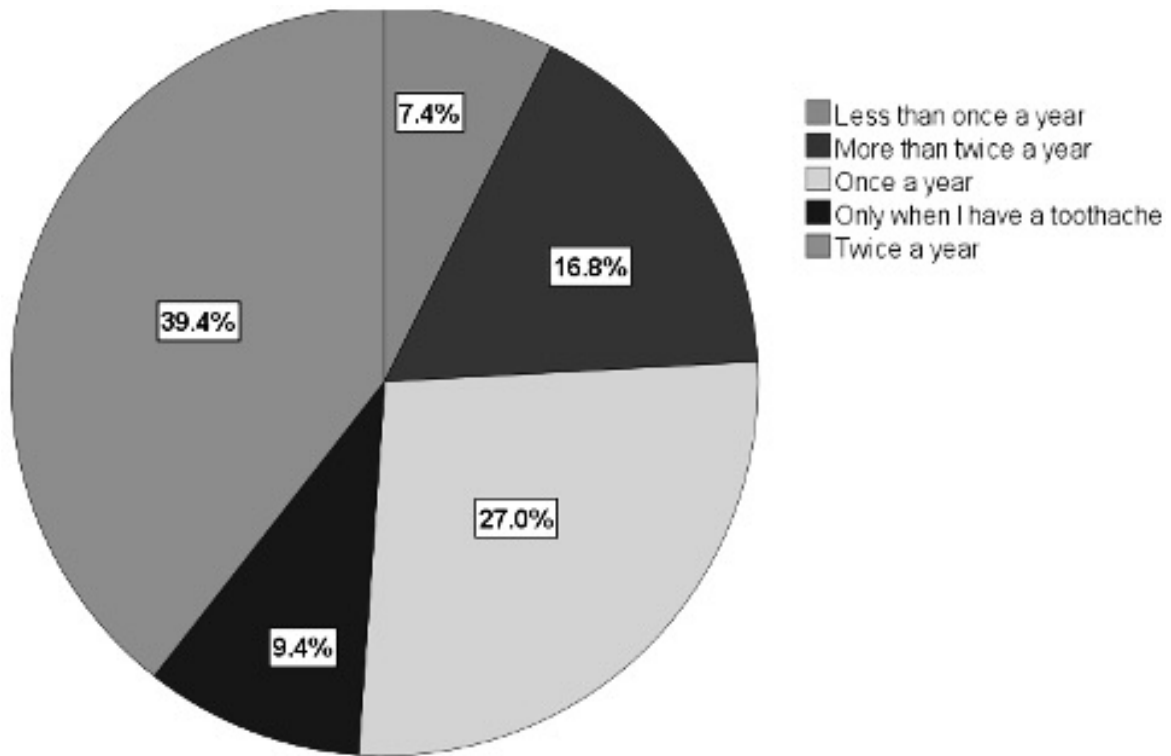
Frequency of Teeth Cleaning



The frequency of dental visits within the tested population sample is represented in Figure 3.4. The general standard to visit the dentist is every six months, or twice a year. 39.4% report going to the dentist twice a year, while 27% go once a year. Following these, 16.8% go more than twice a year, 9.4% only go when a toothache is present, and 7.4% go less than once per year.

Figure 3.4

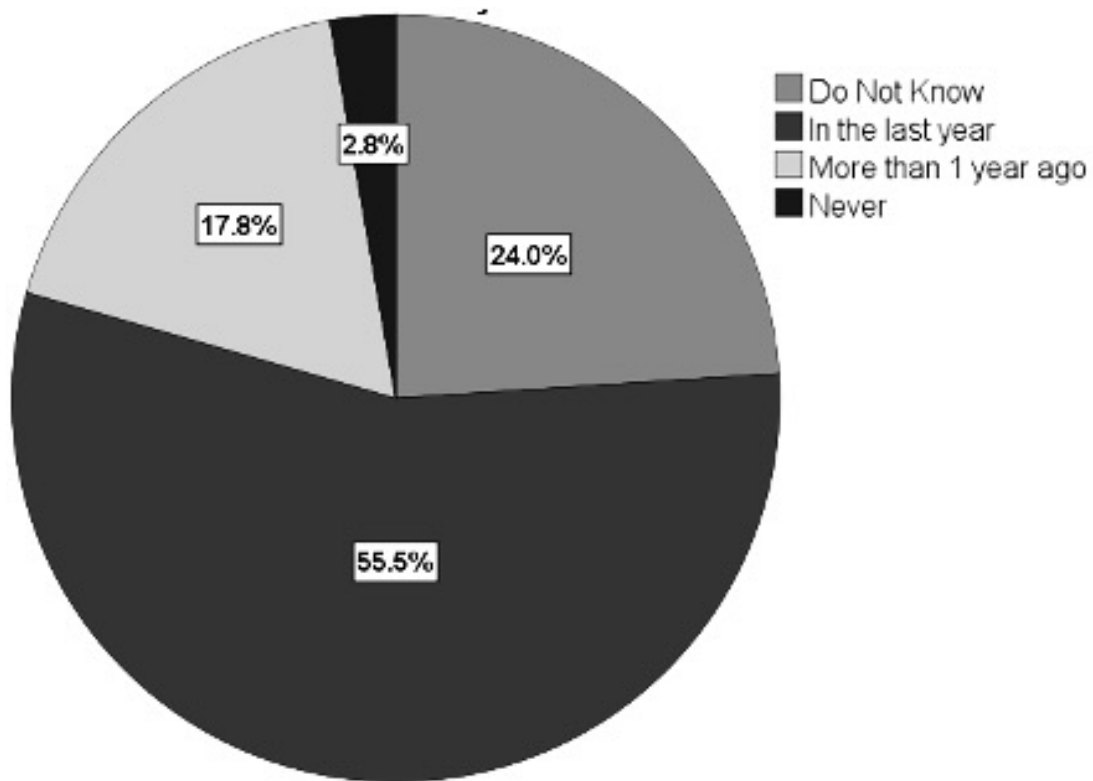
Frequency of Dental Visits



An illustration of the participant's last dental visit that they can recall is reported in Figure 3.5. 55.5% went in the last year, 17.8% more than one year ago, and 2.8% have never gone. There is also 24% that do not know. These results are taken under the understanding that intellectual disabilities impair cognitive functioning and events such as the last dental visit. Events are remembered based on prompts such as the last dental visit since Christmas, summer, etc.

Figure 3.5

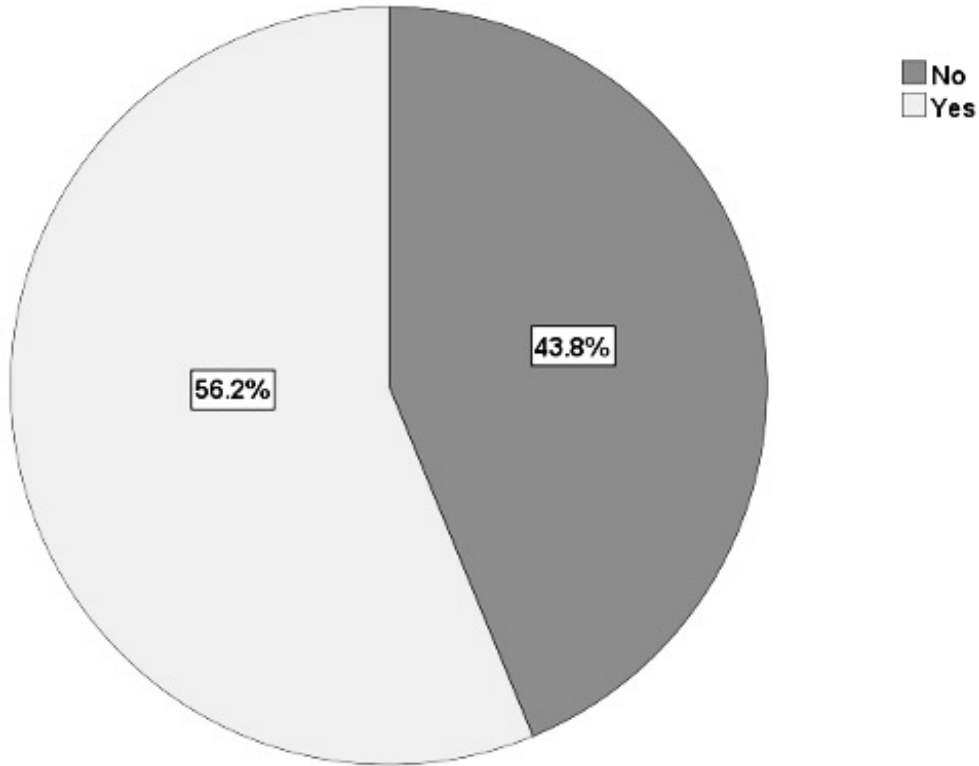
Last Dental Visit



Over half (56.2%) of athletes reported having filled teeth, while 43.8% reported no filled teeth, as represented in Figure 3.6. Although a large portion of the sample does not have filled teeth, this statistic does not account for the population of individuals without filled teeth who do need teeth filled, but cannot afford or physically cannot handle the procedure in this capacity.

Figure 3.6

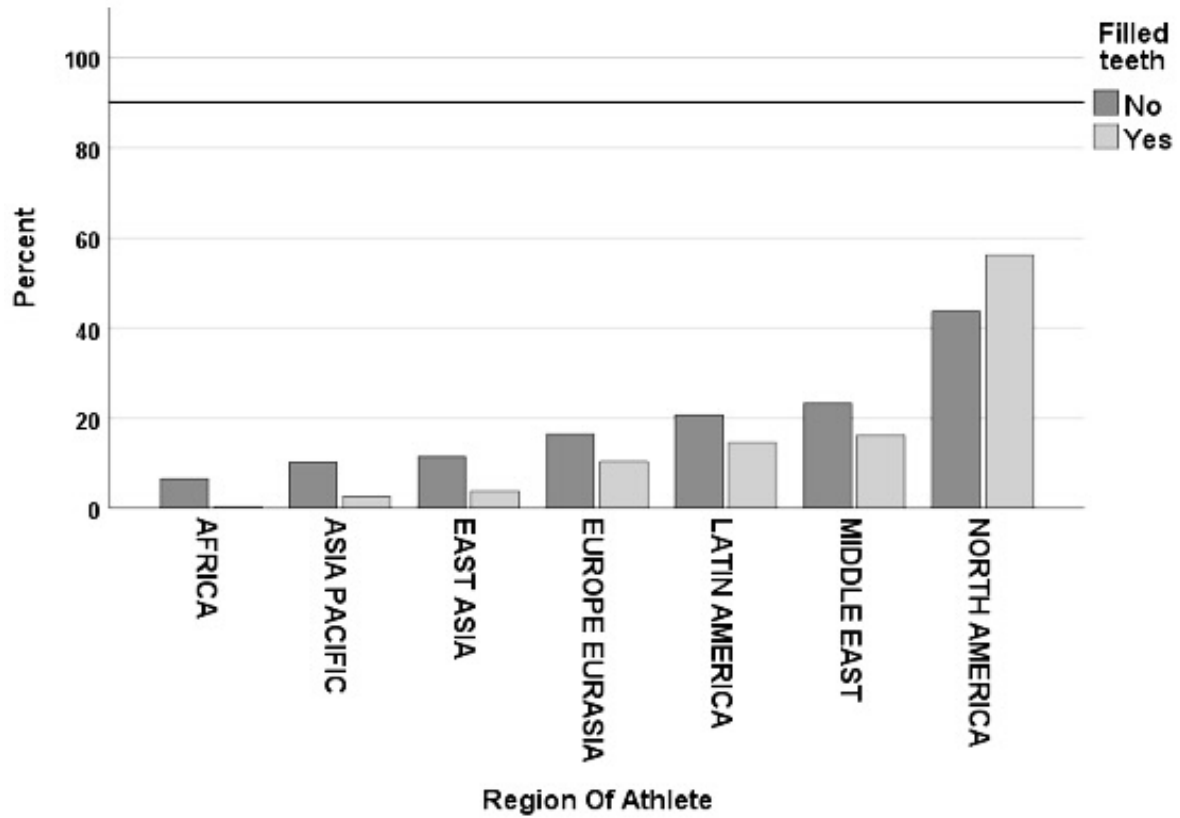
Do you have filled teeth?



A presentation of the regional breakdown of filled teeth, as well as the worldwide population statistic of 85% having filled teeth, is shown in Figure 3.7. This worldwide population is illustrated by a thick black line on the figure.

Figure 3.7

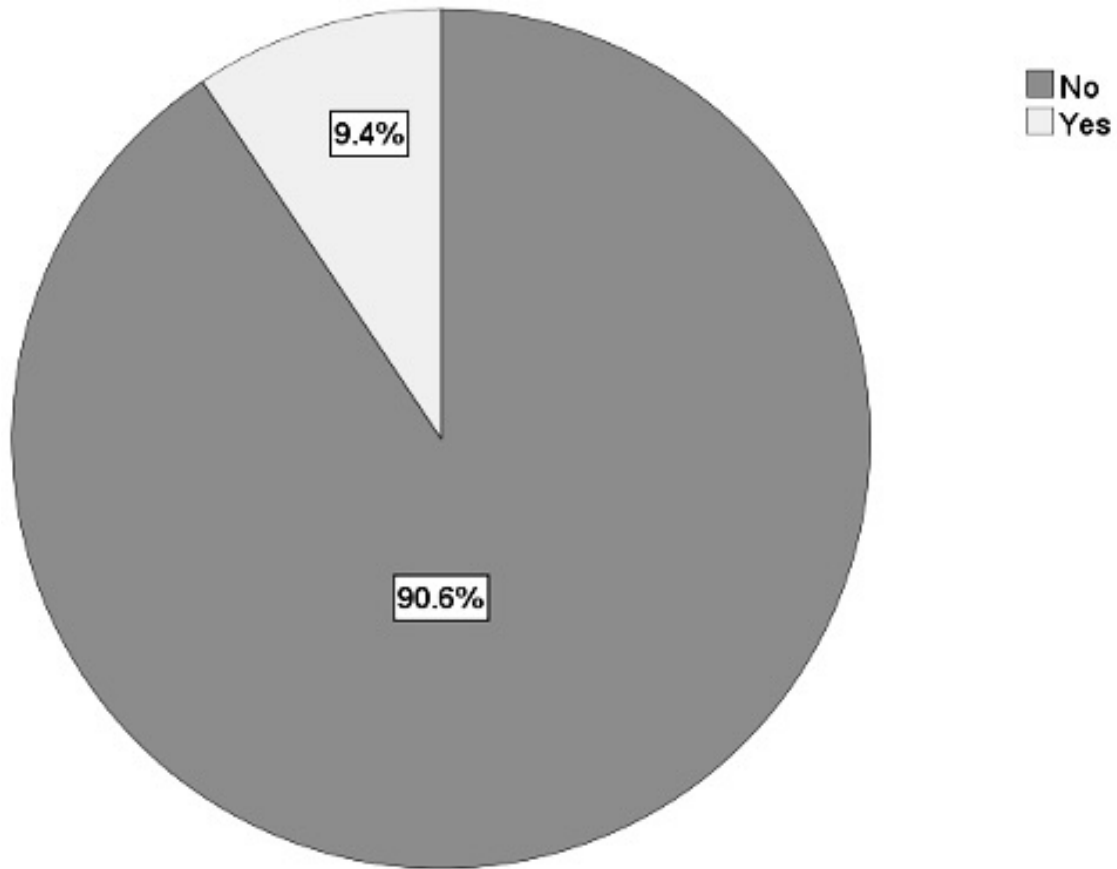
Regional Breakdown of Filled Teeth



Within the oral examination, 9.4% were found to have fluorosis present, while 90.6% had no fluorosis present described in Figure 3.8. Fluorosis is a cosmetic condition that results from the ingestion of too much fluoride during tooth development and causes a change in appearance, such as white spots, lines, or discoloration.

Figure 3.8

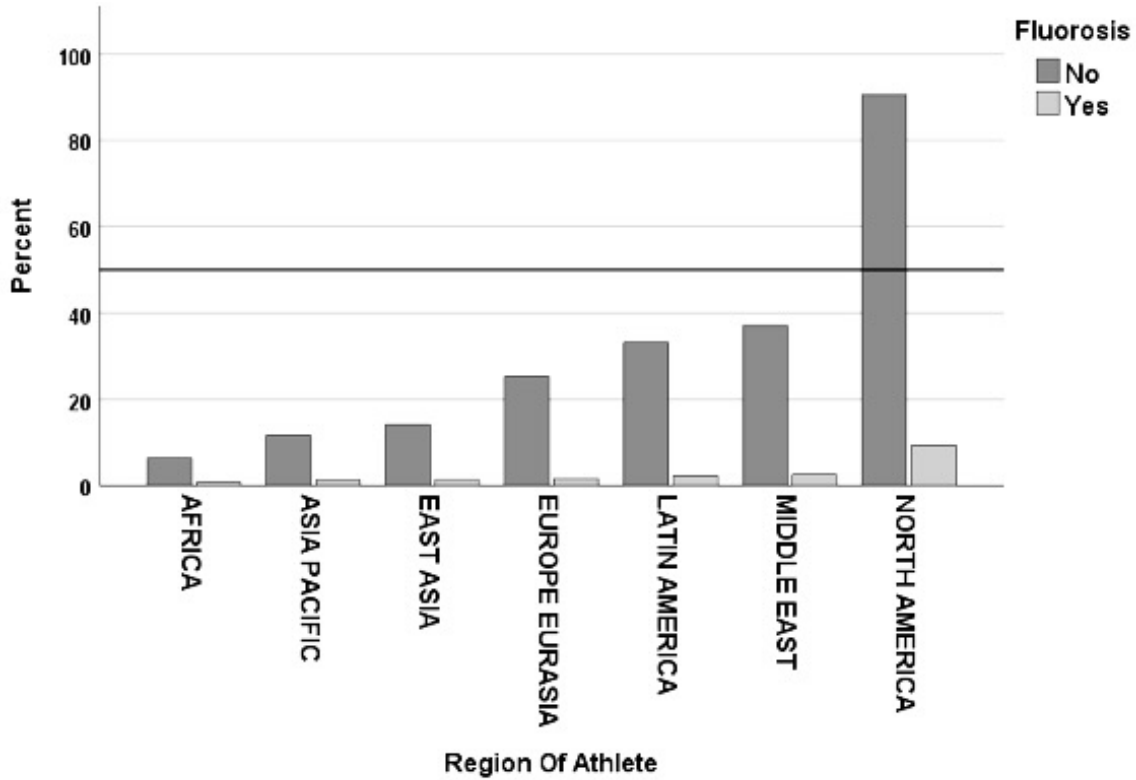
Fluorosis Present?



North America, particularly the United States, has the lowest prevalence of dental fluorosis within these results seen in Figure 3.9. This is primarily due to community water fluoridation programs and the implementation of lower optimal fluoride levels in drinking water. Other regions have higher rates due to the naturally occurring high fluoride level in the water or a lack of fluoridation programs.

Figure 3.9

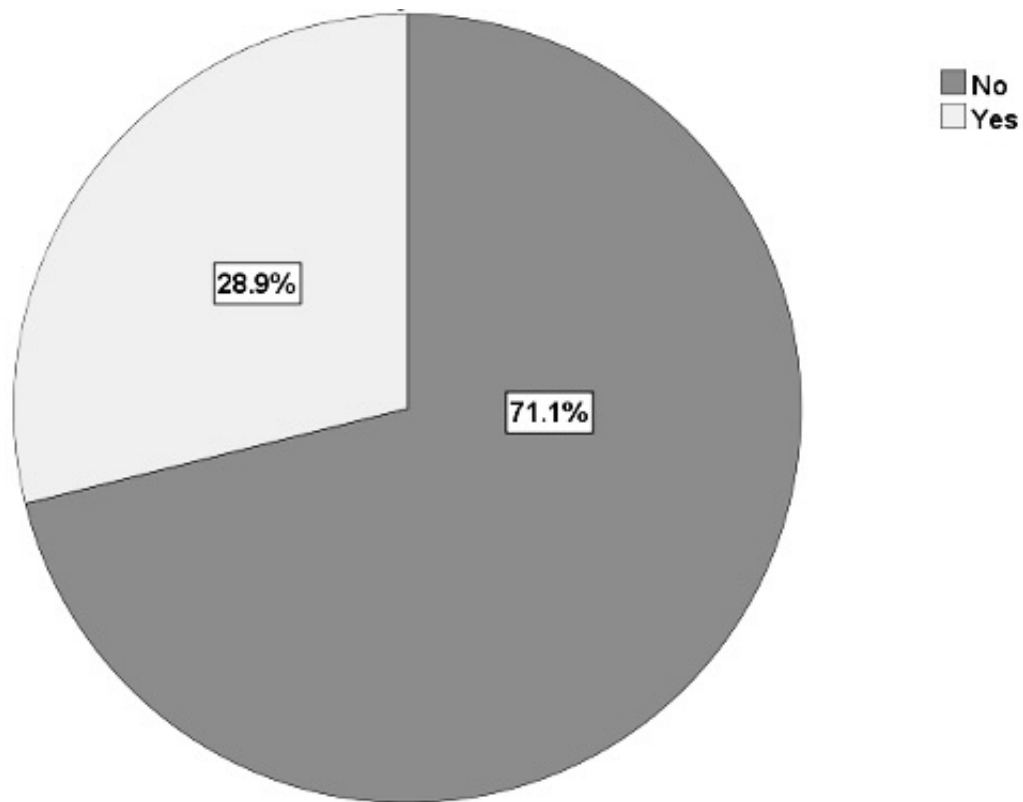
Regional Breakdown of Fluorosis



Of the population tested, Figure 3.10 presents that 28.9% have missing teeth, while 71.1% do not. There is no significant value of missing teeth, but there remains a problem with how many people are missing teeth.

Figure 3.10

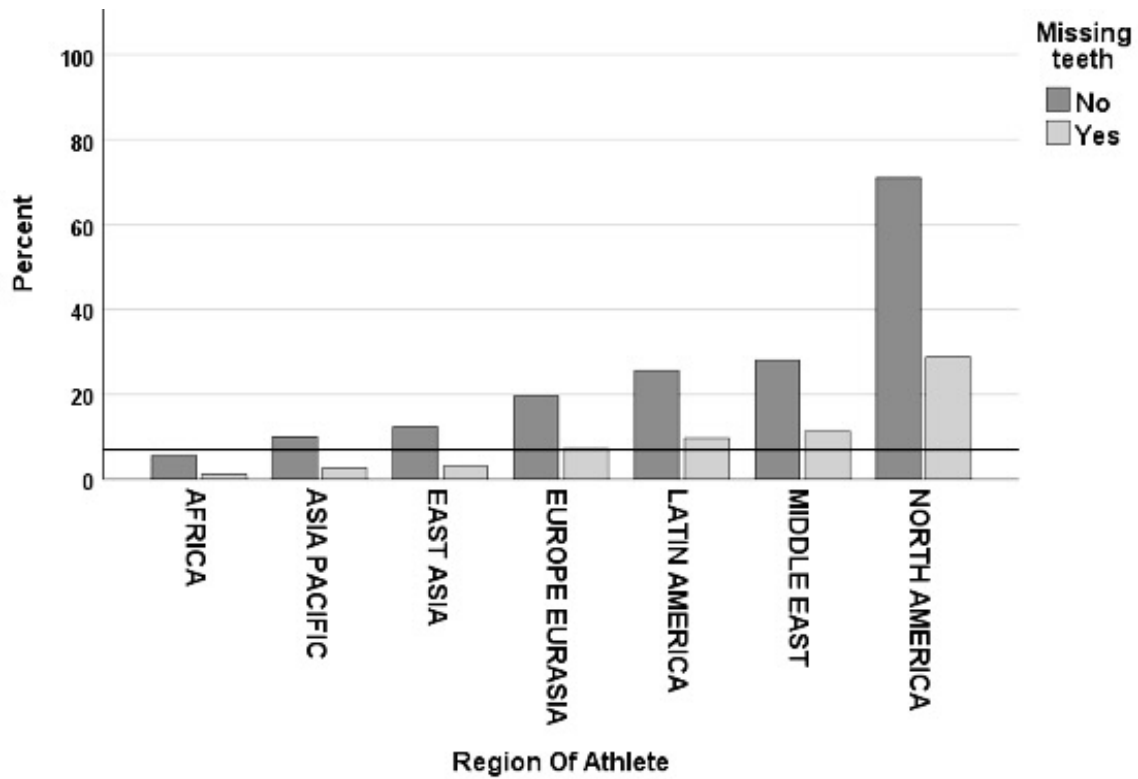
Missing Teeth?



Within the regional population of missing teeth, it can be noted that Europe Eurasia, Latin America, the Middle East, and North America all exceed the worldwide general population of missing teeth. Most missing teeth in this sample come from North America, as the majority of the sample is within this region represented in Figure 3.11.

Figure 3.11

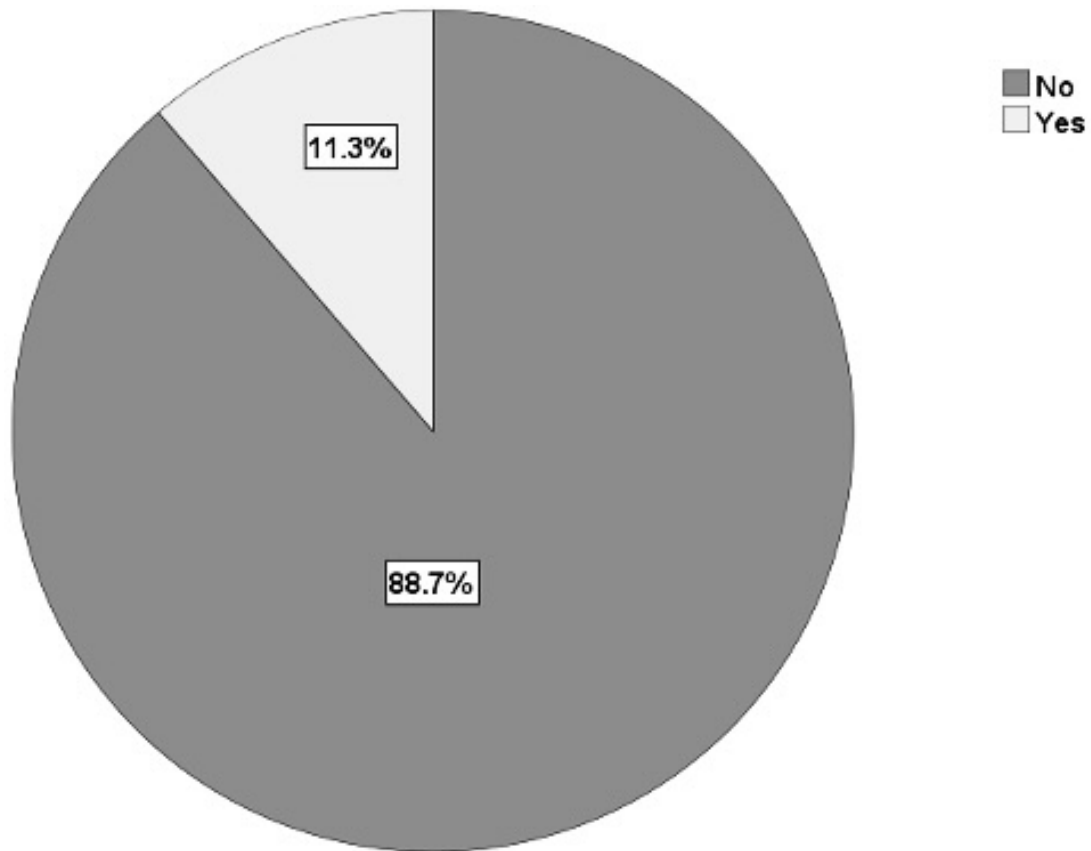
Regional Breakdown of Missing Teeth



As shown in Figure 3.12, 11.3% report mouth pain while 88.7% report no mouth pain. About one in nine people report mouth pain, which is a significant issue, especially for a population facing healthcare barriers to counteract pain. Mouth pain is an indicator of untreated decay, gum disease, infections, and tooth loss or trauma.

Figure 3.12

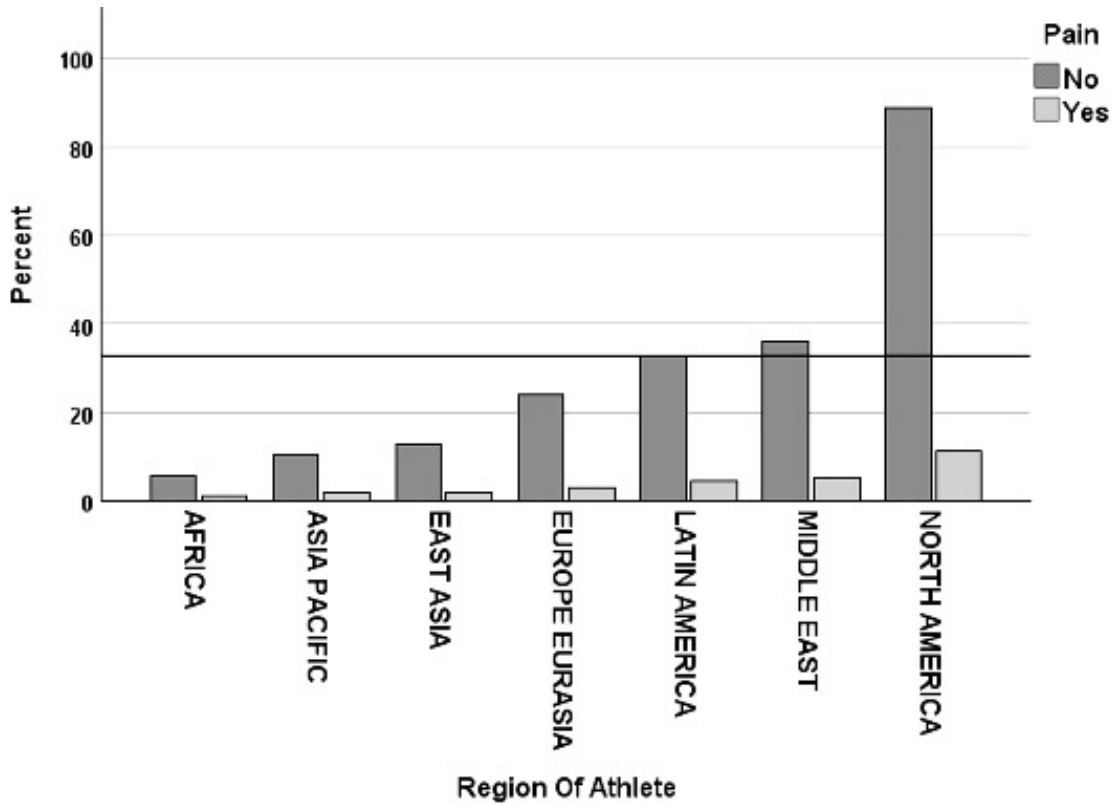
Mouth Pain?



North America reported the highest amount of mouth pain, see Figure 3.13, which is interesting due to the advanced healthcare present within the United States. This is suggestive of access and equity gaps existing even in an advanced healthcare system.

Figure 3.13

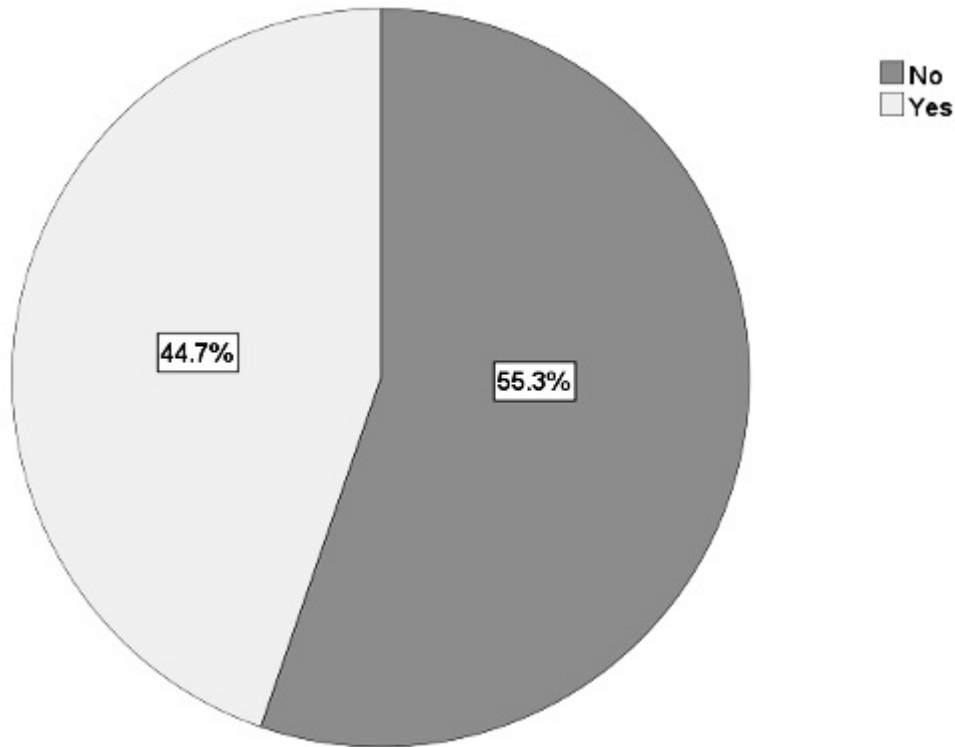
Regional Breakdown of Mouth Pain



It was hypothesized that the number of gingivitis would be higher than the results presented in Figure 3.14, as the literature suggests otherwise. It should be known that individuals with ID are more likely to experience gingivitis and periodontal disease than the general population. Within the results, 44.7% report having gingival signs while 55.3% do not. According to this data, nearly one in two athletes has signs of gingivitis. This suggests overall health neglect in people with ID who may not be able to express their symptoms easily.

Figure 3.14

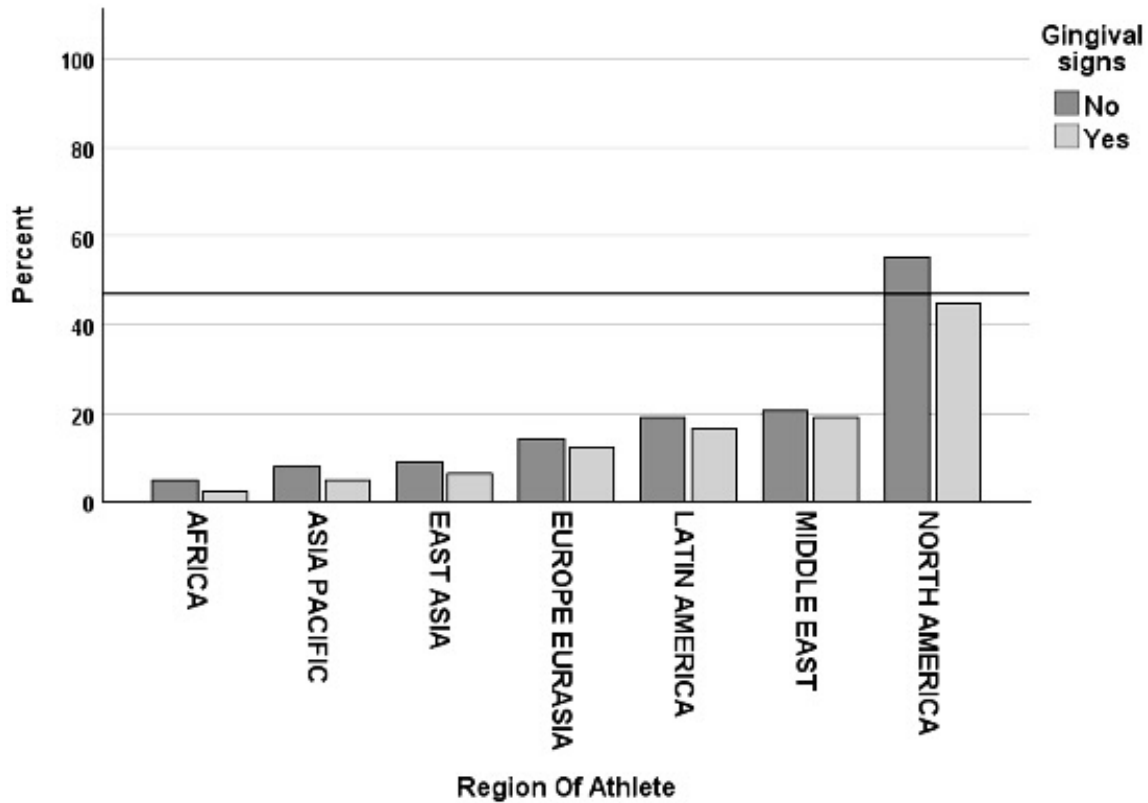
Gingivitis?



Regional differences in the prevalence of gingival signs among Special Olympics athletes are exhibited in Figure 3.15. North America had the highest rate of athletes showing signs of gingival disease. In contrast, Africa, Asia Pacific, and East Asia had the lowest rates, all under 10%. Other regions, including Europe Eurasia, Latin America, and the Middle East, showed moderate prevalence. These findings highlight disparities in oral health and point to the need for targeted interventions in higher-prevalence regions.

Figure 3.15

Regional Breakdown of Gingivitis



Strengths and Limitations

The present investigation used the largest health data set of individuals with ID. Within this data, an estimate of oral health conditions within the global population was achieved. Other strengths of the study include utilizing a large sample size and the info reported by the patient as well as by the professional. Additionally, the use of standard examination criteria, trained, calibrated examiners, and data from multiple geographic sites throughout the world was utilized.

There are also several potential limitations within this study. First, some of the datasets for the given 50,000 participants were incomplete. Patients with missing values

on categories of interest were removed, causing the sample size to decrease. Second, there was also a large representation of patient data from North America, as Special Olympics began in the United States and continues to have an advanced and well-resourced healthcare system. Third, the grouping of international countries within the data ignores the inter-country differences in disease prevalence and healthcare systems. Fourth, the validity and reliability of the Special Smiles examination have not been determined. Lastly, the participants of the Special Olympic Healthy Athletes cannot be considered representative of all people with intellectual disabilities. These athletes tend to be younger, healthier, and have less severe disability than the rest of the worldwide population of those with ID.

Discussion

This study aimed to explore the oral health status of individuals with intellectual disabilities using data collected from Special Smiles screenings. The analysis provides insight into the prevalence of dental conditions, such as missing teeth, filled teeth, fluorosis, gingivitis, and mouth pain, while also understanding trends related to access, hygiene habits, and global disparities. Oral health is an important component of overall health and well-being, yet many individuals with ID continue to experience several significant health inequities due to physical, mental, and social barriers. Special Smiles has made notable progress in reducing access barriers with screening and treatment. Early onset catching and preventative care, as seen through Special Smiles, will need to continue as an important factor in dental care for this population to reduce symptoms and concerns. It will also be important to adapt dental care to individuals and their needs.

Despite the increasing awareness and specialized programs like Special Smiles, the results suggest that considerable gaps are present in both access and quality of care.

Contrary to initial expectations based on prior literature and research, a large portion (56.2%), see Figure 3.6, of Special Olympics athletes reported having filled teeth. Although this result may seem positive, the interpretation of this percentage is very important. Many individuals within this population likely need dental restorations but are unable to access them due to the need for sedation, the complexity of the procedure, and financial or behavioral constraints. This percentage is still lower than the global population of 85%, which can indicate the lack of care individuals are able to access to get necessary care. Additionally, only 55.5% reported seeing a dentist in the past year, with an additional 34% unsure of their last visit. With cognitive impairments aside, this highlights a gap in access and awareness.

Findings related to missing teeth were also notable as a prevalent issue. Nearly 29% of athletes had at least one missing tooth, refer to Figure 3.10, which aligns with known risk factors for tooth loss within this population. Missing teeth for those with ID may be caused by developmental anomalies, trauma, or extractions performed in place of restorative work. Some of these missing teeth are due to prebirth developmental effects as well as traumatic experiences resulting in tooth loss. Tooth loss often stems from systemic barriers such as inadequate access to regular dental care, financial constraints, provider shortages, and a lack of accommodating clinical environments. Some of the challenges for the patient include motor skill difficulties, cognitive impairments, sensory sensitivities, and lack of supervision or support. Another large factor is medications and diet. Many medications taken by this population cause dry mouth, which increases

cavities. Many also consume a soft sugary food diet that is easier to eat due to their texture, but they ultimately grow bacteria in the mouth. Lastly, this issue persists due to some professionals preferring to remove the tooth rather than try to restore it due to sensory or anxiety issues and the need for sedation. Many places are not able or equipped to provide behavior or support for this. Dental professionals can choose extractions over restorations due to the complexity of providing care for patients with sensory sensitivities or the inability to tolerate in-office treatments. Regional disparities are also noted, as Europe, Eurasia, Latin America, the Middle East, and North America exceed the worldwide population for missing teeth. This could signify healthcare infrastructure and dental coverage policies present in these regions for this population.

Gingivitis is the early stage of gum disease, and it is preventable. If untreated, it can lead to pain, tooth loss, and serious infection. Gingivitis was present in 44.7% of athletes, see Figure 3.14, a significant figure considering this condition is preventable with consistent oral hygiene, routine care, and access to professional services. This result, though lower than anticipated, suggests that individuals with ID are likely to experience periodontal disease due to challenges in self-care, caregiver oversight, and professional training. Additionally, the prevalence of mouth pain was reported by 11.3% of athletes, see Figure 3.12. This statistic, also lower than predicted, is meaningful given the communication barriers faced by individuals with ID, which may lead to underreporting. Many individuals with ID struggle to communicate discomfort, are used to this pain, or are scared to report symptoms, suggesting that underreporting is likely, and actual pain prevalence may be higher.

Fluorosis was present in 9.4% of the sample, see Figure 3.8, with an obvious

regional variation. The lowest prevalence was observed in North America, refer to Figure 3.9, likely because of the standardized community water fluoridation and regulated fluoride use in consumer dental products. The World Health Organization suggested a limit of 1.5 mg/1 in drinking water and reports 260 million people drinking from high fluoride concentrations, with the highest reported as 2800 mg/1 in Kenya (Njenga et al., 2019). Naturally high fluoride levels in other regions, such as Kenya, water supplies, or a lack of regulation, may contribute to increased rates of fluorosis in these areas.

While descriptive analyses were conducted for age and gender (Figure 3.1), no statistically significant associations were found with oral health outcomes or within the sample. This may be due to the sample skewing of younger and higher functioning individuals, limiting variability and hiding potential trends that may be prevalent in broader or more demographically diverse populations. As discussed in the literature, age is a big factor that causes changes in oral health, access to care, and risk exposure, suggesting future studies should be performed to ensure more balanced samples.

Several explanations could account for the oral health outcomes seen within this study. One factor is the unique characteristics of the Special Olympics athlete population, generally more active, healthier, and with better support systems than those of the general ID population. Athletes involved in this program often receive better healthcare, higher levels of community involvement, and greater caregiver engagement. Therefore, the oral health status of this population may be somewhat better than the general worldwide population. This may be a limiting factor as it could be underestimating the true extent of the discussed disparities.

From a public health standpoint, the implications of these findings are significant.

First, the critical role of programs like Special Smiles in reducing barriers to care through screenings, referrals, education, and inclusion. Second, the regional differences in outcomes suggest that international strategies should be utilized to understand specific healthcare systems, cultural practices, and policy gaps. Lastly, the screening provides snapshot-related data but fails to provide longitudinal outcomes or treatment success in any of these regions.

This study aims to add to the growing body of literature on oral health among individuals with intellectual disabilities. It emphasizes the need for continued intervention through preventative care, education, and awareness for a more inclusive health system. Findings from this study can guide future directions for programs like Special Smiles in an attempt to improve the quality of care and public health efforts for an underserved global population.

Future Directions

Continuing to reduce inequalities will be a focus in the future, and programs should implement specialty care clinics to train professionals on how to treat this population. One of the projects, Special Smiles, is looking to move from snapshots to a longitudinal study. Because the data presented reflects only a single point in time from this screening, longitudinal data collection is strongly recommended to track symptom progression and follow-up care. Giving participants an incentive to come back and giving them an identifying number, QR code, or username will allow for the tracking of long-term trends. Screening site resources vary significantly, affecting data consistency and follow-up care. For future projects, researching the effectiveness of referrals and follow-

up care will be important to address how these issues are being handled and if they are being treated at all.

Conclusion

Overall, the Special Olympics athletes screened through the Special Smiles program signify oral health concerns with high rates of gingivitis, fluorosis, filled teeth, mouth pain, missing teeth, and limited access to dental care. While some positive trends are noted, such as regular teeth cleaning and dental visits, large disparities remain, especially across world regions. These disparities represent an ongoing and urgent public health concern.

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