Analysis of Pediatric Oral Health Outcomes Reveals Differences Between English and Limited English Proficiency (LEP) and Non-English Speakers

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Abstract

Language based inequality is an increasing problem in the United States healthcare system. Non-English speaking patients face barriers in health care settings that can result in substandard treatment and worse health outcomes than English speaking patients. Although previous research has demonstrated this disparity in medicine, no research has looked at the oral health outcomes of pediatric English speaking patients versus non- English-speaking patients in dentistry. To assess this, a retrospective study was conducted on data from the 2018 - 2022 pediatric population at the UNLV School of Dental Medicine. Restorations, crowns, and extractions were compared. Analysis of this data revealed that there was no significant difference between English/Non-English speaking pediatric patients for restorations (p = 0.9800). However, more complicated procedures, such as crowns (n = 414), exhibited differences within this patient population - with the proportion of patients speaking other languages significantly higher (5.1% versus 1.2%), p = 0.0003. In addition, analysis of extractions (n = 1,095), revealed significant differences among non-English speakers (2.1%) compared with the overall clinic population (1.2%), p = 0.0084. This data suggests disparities in dental health care between pediatric English and non-English, alternative language speakers. Furthermore, this suggests there are possible differences in routine dental hygiene, oral health maintenance, and access to dental care for pediatric English and non-English speakers. Further investigation will be needed to understand the cause of these discrepancies and how to reduce the higher rates of more complicated dental treatments needed for non-English speaking pediatric patients.

Keywords: *Minority; Non-English Speakers; Oral Health Outcomes; Pediatric Patients*

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Introduction

There are many different facets of health inequities and inequality, although race and ethnicity and corresponding racism and bias appear to be major contributors to the observed disparities [1,2]. More detailed analysis of these systematic and integrative reviews has revealed additional details regarding these findings, which suggests that language-based inequality (particularly among immigrant populations speaking little or no English) has been an increasing problem in the United States (US) healthcare system [3,4]. For example, asylum seekers and refugees from various parts of the world who have entered the US are often co-localized with family or others from their country or region of origin to better enable them to integrate into their communities - which may facilitate the tendency to utilize the native non-English language and delay the adoption of English language learning that contributes to the disparities and inequities in healthcare access and efficiency [5,6].

Non-English speaking patients face barriers in US health care settings that can result in substandard treatment and significantly reduced health outcomes compared with English speaking patients [7,8]. This may be due not only to language-specific barriers and linguistic challenges of direct and indirect communication, but also due to cultural and social distinctions when they differ between the patient and the interpreter or the provider of care [9,10]. Some evidence has demonstrated that limited English proficiency (LEP) patients, such as international refugees and asylum seekers, may face significant challenges and barriers to access routine dental care that may not be a cultural, social or regional healthcare "norm" from their point of origin [11-13].

Recent studies from this public dental institution have found an increasing trend of LEP patients among the pediatric clinic population [14]. This information supports other recent studies that have demonstrated not only rising percentages of patients with LEP, but also significant dental disparities and outcomes associated specifically with these populations [15,16]. Although these studies have mainly focused on adults, some evidence has suggested these same effects are magnified among pediatric patients that lack the power of concordant language skills and maturity, as well as parents or guardians with those same skills for advocacy, guidance and healthcare-driven decision making [17,18].

Additional research from this institution has demonstrated significant challenges and barriers to dental care and access for minority populations [19-21]. However, to date no research has looked at the oral and dental health outcomes specifically comparing pediatric English speaking patients, non- English-speaking and LEP patients in this specific patient population. Based upon this lack of evidence, the primary objective of this study was to perform a retrospective analysis of pediatric dental patients and determine if differences in routine dental procedures (e.g. restorations), versus more serious dental interventions and outcomes (e.g. crowns, extractions) differed between these patient populations.

Materials and Methods

Protocol approval

The protocol for this retrospective study and analysis was reviewed by the Office for the Protection of Research Subjects (OPRS) and subsequently approved by the Institutional Review Board (IRB) from the University of Nevada, Las Vegas (UNLV) under Protocol 1619329-1 titled "Retrospective analysis of Oral Health Status of Dental Population". This involved review and analysis of non-identifiable data regarding pediatric clinic patients from the UNLV School of Dental Medicine (SDM) clinic. The protocol was deemed Exempt under Federal Regulation 45 CFR 46, which states that the study of existing data, documents or records that currently exist and are not prospectively collected, where (1) Participants cannot be directly identified; and (2) Participants cannot be identified through identifiers linked to them. Based upon this information, Informed Consent was not needed and was waived pursuant to the Basic Health and Human Services (HHS) Policy for the Protection of Human Research Subjects (46.101) regarding IRB exemption for Exempt research. No patient identification, patient chart, or other patient-specific information was available to the study authors.

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Data analysis

Basic demographic information provided to the study authors included the patient age at the time of service or treatment, sex, race or ethnicity, and primary or secondary languages spoken. More detailed information regarding dental treatment and services was also provided for restorations, dental crowns, and tooth extractions. Summary data including total number and percentages of males and females, minority and non-minority patients, as well as languages spoken were imported into Microsoft Excel 2021, Office 365 Version from Microsoft (Redmond, Washington). Analysis of these data included descriptive statistics, such as overall numbers and corresponding percentages that were calculated and reported from the retrieved retrospective data set. Differences between prevalence of treatments, such as dental restorations, crowns and extractions for English-language speakers compared with ESL and limited English proficiency or LEP patients was calculated and compared using Chi Square statistics, which is appropriate for this type of non-parametric data analysis.

Results

The study sample included a total of 24,460 patients were seen between 2013 and 2022 in the pediatric clinic at UNLV-SDM (Table 1). These patients were approximately 47.8% male and 52.2% female, which closely approximates the overall patient population, which was 47.2% male and 52.8% female, p = 0.8414. Of the patients with complete demographic information, 21.9% self-identified as White/ Caucasian (non-Minority) with 78.1% indicating non-White or Minority as their racial or ethnic background, which was similar to the overall patient demographics of the UNLV-SDM patient clinic of 24.7% and 75.3%, respectively, p = 0.4884. The majority of these patients were Hispanic or Latino (59.8%), with fewer Black or African Americans (13.8%) and Asians (4.3%), which closely matched the overall clinic patient population (52.4%, 12.2%, and 3.8%, respectively). Finally, the average age of the study sample was 9.11 years, which was similar to the overall clinic population average of 9.04 years, p = 0.902.

Demographic variable	Study Sample 2013-2022	UNLV-SDM clinic population	Statistical analysis
Sex or Gender			
Male	47.8% (n = 11,702/24,460)	47.2%	X^2 = 0.040,d.f.-1 p = 0.8414
Female	52.2% (n = 12,758/24,460)	52.8%	
Race or Ethnicity			
White/Caucasian (non-Minority)	21.9% (n = 3,703/16,889)	24.7%	X^2 = 0.480,d.f.-1 p = 0.4884
Minority (non-White)	78.1% (n = 13,186/16,889)	75.3%	
	Hispanic/Latino 59.8% (n = 10,100/16,889)	52.4%	
	African American 13.8% (n = 2,337/16,889)	12.2%	
	Asian American 4.3% (n = 721/16,889)	3.8%	
Age			
Average Range	9.11 years 0 to 17 years	9.04 years 0 to 17 years	Two tailed t-test p = 0.902

Table 1: *Demographic characteristics of study sample (2013 - 2022).*

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To evaluate the pediatric English-speaking versus non-English speaking and LEP patients, an evaluation of languages spoken for the study sample was assessed (Table 2). The percentage of English speaking patients was 52.4% with a similar percentage of Spanish speaking patients 46.4%, with 1.2% listed as another alternative language (non-English, non-Spanish or other). These data from the study sample were significantly different from the overall local population, which includes 79.1% English speaking, 20.5% Spanish speaking, and 0.4% other or alternative language speakers, p = 0.0001. An analysis of the alternative language speakers revealed these were divided into the more commonly spoken Pashto (30.1%), Tagalog (12.6%), Arabic (10.6%), and Chinese (9.7%) languages, as well as the less commonly spoken Dutch (7.7%), Sign (7.7%), Korean (5.8%), Ukrainian (5.8%), and Persian (3.8%). Uncommon languages included Portuguese (1.9%) and Amharic (1.9%), as well as Armenian (0.9%) and Ethiopian (0.9%).

Language	Study Sample 2013 - 2022	Nevada Population	Statistical Analysis
English	52.4%	79.1%	X^2 = 45.678, d.f. = 2 p = 0.0001
Spanish	46.4%	20.5%	
Other languages	1.2%	0.4%	
Additional languages			
Amharic, AMH	1.9%		
Arabic, ARA	10.6%		
Armenian, ARM	0.9%		
Chinese, CHI	9.7%		
Dutch, DUT	7.7%		
Ethiopian, ETHIO	0.9%		
Korean, KOR	5.8%		
Persian, PER	3.8%		
Portuguese POR	1.9%		
Pashto, PUS	30.1%		
ASL or Sign, SIGN	7.7%		
Tagalog, TAG	12.6%		
Ukrainian, UKR	5.8%		

Table 2: *Analysis of languages spoken.*

Analysis of a routine dental procedure, restorations or fillings, was compiled for all study sample patients identified (Table 3). No significant differences were observed between male and female patients receiving restorations compared with the overall study sample, p = 0.8412. However, a significantly higher proportion of minority, non-White patients (92.4%) had one or more of these procedures compared with the overall percentage within the study sample (78.1%) - most of which were Hispanic/Latino (87.3%), p = 0.0007. Comparison of language spoken revealed that similar percentages of English-, Spanish-, and alternative language- speaking patients received restorations (50.8%, 48.5%, 0.6%) compared with the overall study sample (52.4%, 46.4%, 1.2%), p = 0.9800.

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Variable	Restorations	Study Sample	Statistical Analysis
Sex			
Male	47.9%	47.8%	$X^2 = 0.040$, d.f. = 1 p = 0.8412
Female	52.1%	52.2%	
Race or Ethnicity			
White/Caucasian (non-Minority)	7.5%	21.9%	$X^2 = 11.422$, d.f. = 1 p = 0.0007
Minority (non-White)	92.4%	78.1%	
Hispanic/Latino	87.3%	59.8%	
Language spoken			
English	50.8%	52.4%	$X^2 = 0.041$, d.f. = 2 p = 0.9800
Spanish	48.5%	46.4%	
Other	0.6%	1.2%	

Table 3: *Analysis of restorations or fillings among study sample.*

Analysis of more complex and complicated procedures, such as dental crowns, was also completed (Table 4). These data revealed males were more likely than females to have these procedures (60.2%, 39.8%), which was significantly different from the overall study sample demographics (47.8%, 52.2%), p = 0.0163. In addition, the percentage of patients needing dental crowns that were identified as White/Caucasian or non-Minority was also higher than their percentage within the overall study sample (52.2% versus 21.9%), which was also statistically significant, p = 0.0001. Finally, although the percentage of English- and Spanish-speaking patients needing crowns (50.4%, 44.4%) was similar to the overall study sample (52.4%, 46.4%), the percentage of patients speaking additional non-English, non-Spanish languages was significantly higher than the overall study sample population (5.1%, 1.2%), p = 0.0003.

Variable	Crowns	Study Sample	Statistical Analysis
Sex			
Male	60.2%	47.8%	$X^2 = 5.769$, d.f. = 1 p = 0.0163
Female	39.8%	52.2%	
Race or Ethnicity			
White/Caucasian (non-Minority)	52.2%	21.9%	$X^2 = 52.448$, d.f. = 1 p = 0.0001
Minority (non-White)	47.8%	78.1%	
Hispanic/Latino	46.1%	59.8%	
Language spoken			
English	50.4%	52.4%	$X^2 = 16.192$, d.f. = 2 p = 0.0003
Spanish	44.4%	46.4%	
Other	5.1%	1.2%	

Table 4: *Analysis of crowns among study sample.*

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Finally, analysis of dental extraction was performed, which are among the most serious dental procedures used as a last resort if no other reasonable procedures can be used to save a tooth (Table 5). These data revealed that there were no significant differences between males and females (51.1%, 48.9%), or between those needing extractions and the overall study sample population (47.8%, 52.2%), p = 0.5482. However, more significant differences were observed with race or ethnicity, with higher percentages of minority (non-White) patients (95.4%) needing extractions compared with the overall percentage of minorities within the study sample (78.1%), p = 0.0001. Finally, significant differences were also found between English- (65.5%), Spanish- (32.4%), and alternative language-speaking (2.1%) patient extractions, compared with their percentages within the overall study sample (52.4%, 46.4%, and 1.2%, respectively), p = 0.0084.
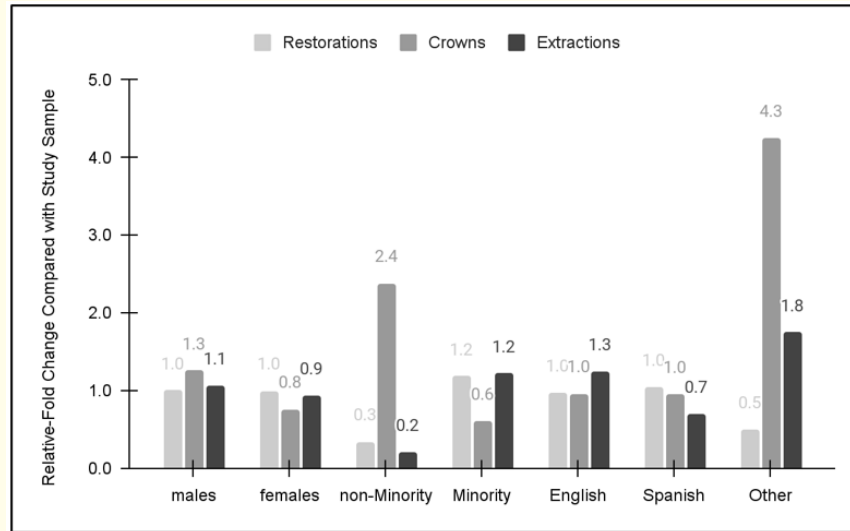
Variable	Extractions	Study Sample	Statistical Analysis
Sex			
Male	51.1%	47.8%	X^2 = 0.361, d.f. = 1 p = 0.5482
Female	48.9%	52.2%	
Race or Ethnicity			
White/Caucasian (non-Minority)	4.6%	21.9%	X^2 = 16.841, d.f. = 1 p = 0.0001
Minority (non-White)	95.4%	78.1%	
Hispanic/Latino	82.1%	59.8%	
Language spoken			
English	65.5%	52.4%	X^2 = 9.556, d.f. = 2 p = 0.0084
Spanish	32.4%	46.4%	
Other	2.1%	1.2%	

Table 5: *Analysis of extractions among study sample.*

To further visualize these data regarding restorations, crowns and extractions were sorted according to demographic variables (males and females, minorities and non-minorities), as well as by language spoken (Figure 1). These data clearly demonstrate that although some minor differences were found with crowns and the sex of the patient, most of the differences were found between the race or ethnicity of the patients or the language spoken. More specifically, the largest differences were seen between minorities and non-minorities with the most expensive dental treatments (crowns), with many fewer minorities (0.6-fold) and more non-minorities (2.4-fold) undergoing this treatment. In addition, very large differences in alternative-language patients were found not with routine dental restorations (0.5-fold) but were seen with more serious and invasive dental procedures, such as crowns (4.3-fold) and extractions (1.8-fold) - which greatly exceeded the percentage of alternative language speakers with limited English proficiency.

Discussion

The primary goal of this study was to perform a retrospective analysis of pediatric dental patients and determine if differences in routine dental procedures (e.g. restorations), versus more serious dental interventions and outcomes (e.g. crowns, extractions) differed between alternative language speaking (limited English- or Spanish-proficiency) patient populations. These data clearly demonstrate

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Figure 1: *Analysis of dental procedures (restorations, crowns, extractions) with demographic characteristics and language. Data were sorted by demographic variables, such as sex, race or ethnicity and language spoken, revealing differences with more males but fewer minorities receiving (0.6-fold) crowns, and many more alternative language speakers receiving both crowns (4.3-fold) and extractions (1.8-fold) compared to the overall study population.*

several important findings that should be discussed further. For example, the percentage of non-English, non-Spanish speaking patients at this clinic and within the study sample was three times higher than within the local population, which has been demonstrated to significantly impact the quality of medical care requested and the quality of care delivered for these patients within the US [22-24].

However, as most information has been accumulated regarding dental patient experiences and communication strategies LEP or alternative language speakers, this study may be among the first to focus more specifically on dental outcomes [25,26]. These findings suggest that although no significant differences were found between English-, Spanish- and alternative-language speakers in routine dental procedures, such as restorations, more significant differences were observed with more complex and serious interventions, such as crowns and extractions. This supports other findings that suggest refugees and others with limited language proficiency may encounter barriers and challenges that lead to more serious and complex dental outcomes and needs [27,28].

In fact, more and more studies are now focusing on this issue as the evidence continues to grow that refugees, asylum seekers, and others displaced from their countries of origin may encounter significant barriers and challenges to receive adequate access to preventive dental care and services [29,30]. As evidence continues to emerge regarding the dental and oral healthcare problems faced by those with limited language skills, studies that evaluate and outline the scope of the problem and issues faced by these communities become ever more important [31]. This information is particularly important for researchers focusing on pediatric patients who need strong advocates and guidance regarding healthcare prevention and maintenance, while adjusting to their new communities and culture [32,33].

Despite the importance of these findings, there are some limitations associated with this study that should also be addressed. For example, this study focused on a small number of dental procedures that may not accurately represent the entire scope and spectrum of dental and oral healthcare issues facing patients with limited language proficiency [29-31]. In addition, the study authors only had access

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to retrospective data from this public dental school institution and may not reflect the entire community of patients with limited language proficiency - but rather may be focused more specifically on low-income and minority populations that are the focus of the outreach efforts for this dental clinic [34,35]. Finally, there may be specific aspects of dental healthcare practitioners, such as intrinsic or extrinsic operator bias based on stereotypes that may more readily lead to particular decisions including extractions, which could have influenced the outcomes of this study [36-38].

Conclusion

This retrospective study of pediatric dental patients at a public dental school clinic found a significantly higher proportion of limited language proficiency patients than would be expected given the local community and surrounding population. In addition, analysis of these data also revealed that more complex and serious dental interventions, such as crowns and extractions, were more prevalent among these non-English, non-Spanish speaking patients than would be expected given their percentages within the clinic population. These data will be useful for public health researchers and oral health epidemiologists, who are working to design methods and technologies that will reduce these disparities and improve pediatric patient outcomes [39,40].

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Author Contributions

VS and KK were responsible for the overall project design. CJ and AR were responsible for data generation, analysis, and the writing of this manuscript.

Conflict of Interest

The authors declare that they have no conflicts of interest to report.

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