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THESIS APPROVAL PAGE FOR MASTER OF SCIENCE IN ORAL BIOLOGY

Title of Thesis: "Prevalence of Early Childhood Caries and Its Related Risk Factors in the United States Military Dependent Pediatric Population"

Name of Candidate: Ancman, Lloyd
Master of Science Degree
MAY13, 2020

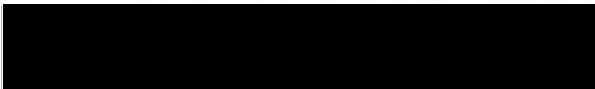
THESIS/MANUSCRIPT APPROVED:

DATE:

KREIDER,JOHN,KEITH. 1152698816
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7. Title Prevalence of Early Childhood Caries and Its Related Risk Factors in the United States Milita	
8. Intended Publication/Meeting N/A	
9. Required by	10. Date of Submission 06 May 2020
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Prevalence of Early Childhood Caries and Its Related Risk Factors in the United States Military
Dependent Pediatric Population

A Thesis

Presented to Faculty of the Advanced Education in General Dentistry, Two-Year Program,
United States Army Dental Activity, Fort Hood, Texas

And the Uniformed Services University of the Health Sciences – Post Graduate Dental College

In Partial Fulfillment of the Requirements for the Degree of
Masters of Science in Oral Biology

By

Lloyd Ancman, MAJ

United States Army Dental Corps

April 2020

Prevalence of Early Childhood Caries and Its Related Risk Factors in the United States Military
Dependent Pediatric Population

A REPORT ON

The Prevalence and risk factors of early childhood caries involving the military pediatric
Dependents Ages 0 to 6 years who are receiving care in the US Military Healthcare System at
Carl R. Darnall Army Medical Center Pediatric Clinic

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ACKNOWLEDGMENTS

The author would like to acknowledge and thank the following for their contributions and support during this research project:

- Dr. Sheteka Ross-Goodlett, Staff Pediatric Dentist and resident mentor of the AEGD-2YR Program, who was an excellent mentor, invaluable resource and subject matter expert throughout the research project
- Dr. Michael Mansell, Program Director of the AEGD-2YR Program within the U.S. Army for leadership, mentorship and guidance throughout the year
- Dr. John Kreider, Assistant Program Director of the AEGD-2YR Program within the U.S. Army for leadership, mentorship and guidance throughout the year
- Dr. Rachael Jones of the U.S. Army for support and direction during the eIRB process
- Dr. Sheila Frankfurt of the Clinical Investigation Research Office within the U.S. Army for guidance on statistical analysis
- All the leadership and staff at the Carl R. Darnall Army Medical Center Pediatric Clinic, who helped organize and screen the more than 200 participants for this research project

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ABSTRACT

Purpose: The purpose of this study was to determine if military-related risk factors have any influence on the prevalence of Early Childhood Caries (ECC) and the decayed, missing, filled and treated (dmft) scores of military dependents receiving care in the U.S. Military Healthcare System at Carl R. Darnall Army Medical Center (CRDAMC) Pediatric Clinic.

Methods: Parents/guardians and their children between the ages 6 to 72 months were recruited after their visit to Pediatric Department's Outpatient Clinic at CRDAMC. Participants answered 17 questions on military and caries risk factors. In addition the child received a screening exam and dmft score. Statistical analysis was performed with SPSS Software. Mann-Whitney U-tests and binary logistic regression were conducted to test for differences between low and increased caries risk and the categorical risk factors. Association between categorical risk factors and dmft scores was assessed using Mann-Whitney U-tests for dichotomous variables and Kruskal-Wallis tests for independent variables. The association between continuous/interval risk factors and dmft scores was assessed using Spearman's rho correlation.

Results: Data from 195 screenings and corresponding questionnaires showed significant increase in caries risk of the dependents if the military sponsor had a High School/GED education, the child was greater in age, first visit to the Dentist was later in life for the child, the child showed an increase in frequency of sweets consumption, the parents did not fully assist in tooth brushing, limited tooth brushing duration and lack of use of fluoride toothpaste. Dmft scores of the children showed a significant increase with regards to the number of PCS's during the child's lifetime ($p<0.05$), living in Fort Hood housing ($p<0.05$), frequency of parental aided tooth brushing ($p<0.05$), frequency of brushing per day ($p<0.05$), the length of time of brushing and the frequency of sweets intake ($p<0.05$).

Conclusion: This study confirmed the prevalence of ECC and the conformation of known risk factors for ECC in the military dependent population at CRDAMC Pediatric Clinic. Findings from this study can be used to improve existing preventive measures as well as future treatment of ECC and help guide future studies regarding ECC in the military population.

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INTRODUCTION

Early childhood caries (ECC) is a serious socio-behavioral and dental problem that afflicts infants, toddlers and adolescents worldwide.³⁹ ECC formerly known as nursing bottle caries and baby bottle tooth decay was defined by the American Academy of Pediatric Dentistry (2008) as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and six years of age. It is one of the most common preventable diseases and unfortunately its prevalence is on the rise in the majority of the world. Studies have shown a prevalence of up to 85% reported cases for disadvantaged groups.³ In the United States, 23.7% of children two to five years of age have had a caries experience, and 18.7% have untreated decay.⁵¹ The condition causes an increase in medical expenses, treatment times and health risks for the dependent and is detrimental to the overall success of pediatric dental care.

ECC is a disease that is very difficult to combat and prevent due to the complex interaction of behavioral, nutritional, cultural and biological risk factors that are associated with its initiation and progression. ECC is an aggressive form of dental caries that begins on tooth surfaces that are not usually affected by decay, affecting the labial surfaces of maxillary incisors.⁶ This is in contrast to conventional dental caries, which mainly involves dental plaque retentive areas. With this difference, there may be distinctive risk factors involved in the progressions of ECC. With ECC you have acid demineralization of enamel or dentin caused by predominately two species of bacteria, *Streptococcus mutans* and *Streptococcus Sobrinus*.^{22,29} Over time the interaction of these cariogenic microorganisms and fermentable carbohydrates may induce demineralization of tooth structure. Thus, it is paramount to both identify the disease and offer aid in preventative measures before irreparable damage is done to the child.

Oral health plays an important role in children to maintain oral functions and is required for eating, speech development, and a positive self-image.⁹ Greenwell, A.L. et al. (1990) showed that 84% of children who were caries-free in the primary dentition remained so in the mixed dentition, which furthers the need for prevention, identification and early treatment. Untreated ECC will cause future oral and systemic problems in adulthood and a need for orthodontic treatment causing extensive procedures.²⁰ With increased estimated treatment costs and the expertise of highly skilled professionals required, the burden that ECC places not only on the family but government run organizations is substantial. The need to trace the contributing risk factors of ECC is pivotal if we are to tailor a preventative approach to combat this avoidable disease. Along with identifying general health problems and screening for oral health disease, the pediatric medical team including the general dentist can advise parents on risk factors related to caries formation. With a greater understanding of ECC and its associated risk factors the medical team can provide pivotal anticipatory guidance on oral health related topics for the most at risk children and help prevent the disease progressing or even starting.

Previous studies have shown a myriad of risk indicators/factors for ECC, with a systemic review showing almost 90 identified.²⁴ The major contributing factors for high prevalence of ECC are improper feeding practices, familial socioeconomic background, parents/caregivers dental health, lack of parental education, and lack of access to dental care.³⁹ Children of military families are unfortunately not safeguarded from ECC. Known contributing risk factors for ECC, plus possible added military factors make pediatric patients seen in the U.S. Military Health Care System not immune to this debilitating disease.

To identify high-risk ECC population it is necessary to study the risk factors of ECC. One helpful tool utilized in this study to identify high-risk children is the American Dental

Association Caries Risk Assessment form for children less than six years of age. The Caries Risk Assessment form addresses known risk factors, which can help identify children who may be at a higher risk for ECC. Known risk factors of ECC being evaluated in the study include: frequency of sweets and sugary intake per day of the child, parental aided brushing of the child, frequency of brushing of the child, time involved with brushing and use of fluoride tooth paste of the child.⁴⁶ Military risk factors of the military sponsor with possible correlation to ECC being evaluated include: rank, years in service, number of PCS's, number of deployments, on or off post housing living, single or dual military household, and enrollment of the dependent in military dental insurance program.

Military Significance of the Study

A soldier faces many challenges, both while deployed and at home. Taking care of one's family is one of the biggest responsibilities and tasks for a soldier. Oral health care for their dependents, such as daily oral hygiene and attending regular dental appointments can be a challenge for many military families due to military obligations. Such obligations as deployments and PCS can be hectic times for military families and routine tasks such as proper oral health practices can be difficult. There are known risk factors for ECC, but very little information is known on the impact that possible military risk factors such as deployments and PCS's may have.

No research exists on military-influenced risk factors of the military sponsor or their dependent on the prevalence of ECC. Similar studies evaluating ECC in non-military settings have found that the social, economic and educational backgrounds of the child's caretaker greatly influence chances of ECC in the child.²⁶ By determining the military dependent populations who are the greatest at risk for ECC, the U.S. Military and Family Readiness

groups can target oral health promotion programs and other resources to bring down the prevalence of ECC in the U.S. Military. A goal of this study will be to help guide further research into establishing mechanism and causation if certain risk factors are shown to have higher associations with ECC. Future research can be used to help the Department of Defense identify at risk dependents and help prevent ECC.

PURPOSE

The primary purpose of this study was to assess the prevalence and possible military risk factors of ECC in the pediatric population at the Pediatric Department's Outpatient Clinic at CRDAMC. By assessing this patient population, the goal of a greater understanding of the relationship between ECC and military dependents can be obtained. The study design and data obtained can be utilized to help improve treatment of ECC and help guide future studies regarding ECC in the military population.

RESEARCH QUESTIONS/HYPOTHESES

Research Question 1: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months with an increase in time of service of the parental military service member?

Null Hypothesis 1: The dmft score and caries risk does not increase with an increase in time of service of the parental military service member.

Research Question 2: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months with an increase in the rank of the parental military service member during the life span of the dependent?

Null Hypothesis 2: The dmft score and caries risk does not increase with an increase in the rank of the parental military service member during the life span of the dependent.

Research Question 3: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months with an increase in the number of PCS's of the parental military service member during the life span of the dependent?

Null Hypothesis 3: The dmft score and caries risk does not increase with an increase in the number of PCS's of the parental military service member during the life span of the dependent.

Research Question 4: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months with an increase in the number of deployments of the parental military service member during the life span of the dependent?

Null Hypothesis 4: The dmft score and caries risk does not increase with an increase in the number of deployments of the parental military service member during the life span of the dependent.

Research Question 5: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months living in Fort Hood military installation housing?

Null Hypothesis 5: The dmft score and caries risk does not increase for a military dependent age six months to six years living in Fort Hood military installation housing.

Research Question 6: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months living in a dual military household?

Null Hypothesis 6: The dmft score and caries risk does not increase for a military dependent age 6 to 72 months living in a dual military household.

Research Question 7: Does the dmft score and caries risk increase for a military dependent age 6 to 72 months who are enrolled in TRICARE dental insurance?

Null Hypothesis 7: The dmft score and caries risk does not increase for a military dependent age 6 to 72 months who is enrolled in TRICARE dental insurance.

Research Question 8: Does the dmft score and caries risk increase for a military dependent age 6 months to 72 months who are utilizing military Child Care Centers?

Null Hypothesis 8: The dmft score and caries risk does not increase for a military dependent age 6 months to 72 months who are utilizing military Child Care Centers.

Research Question 9: Does the dmft score and caries risk increase for a military dependent age 6 months to 72 months when the parental military service member obtained only a high school/GED education?

Null Hypothesis 9: The dmft score and caries risk does not increase for a military dependent age 6 months to 72 months when the parental military service member obtained only a high school/GED education.

MATERIALS AND METHODS

Selection and Grouping of the Participants

A cross-sectional study involving 195 children ages 6 to 72 months and their parents/guardians were selected through voluntary means from patients seen at the Pediatric Department's Outpatient Clinic at CRDAMC over a two-week period. All parents and guardians were informed about the research study and agreed to voluntarily participation in the survey and oral exam. Exclusion criteria included children who did not fall within the study age requirements, 6 months to 72 months and children's parents or legal guardians who refused to participate in the study. As part of the U.S. Army protocols, the study design was reviewed and approved through an electronic Institutional Review Board to protect the rights and welfare of human subjects involved in research activities being conducted under US Army authority.

Questionnaires

Questionnaires were formulated following literature review and validated in conjunction with a statistician and pediatric dental officer within the U.S. Army. A pilot study of the questionnaire was conducted where questionnaires were distributed to 20 random U.S. Army soldiers in order to ensure that the questionnaire was easily interpreted and answered in a timely manner of less than five minutes. All subjects were informed that answering the questionnaires was voluntary and not personally identifiable. The questionnaires consisted of 17 study variables in total. The questionnaire reflected the child's military sponsor's military background and demographics, as well as the child's diet and oral hygiene habits. In conjunction with the questionnaire, the primary investigator, utilized the American Dental Association caries risk assessment form for zero to six years. By verbally asking the parent/guardian the five contributing conditions found on the form as well as visual findings during the oral exam, the primary investigator was able to extrapolate the caries risk of the

child. A copy of the questionnaire and the American Dental Association Caries Risk Assessment form ages zero to six years are included in Appendix A.

The child's military sponsor's military and demographic variables included:

- Military rank
- Years in service
- Number of PCS's since the child being examined was born
- Number of deployments of the military sponsor since the child being examined was born
- Level of education of the military sponsor
- Household status
- Housing arrangements of the military sponsor
- Number of dependents (0-18 years old) for the military sponsor

The child's oral health history and dietary habit variables included:

- Age of the child being examined
- Age of the child being examined when they were first seen by a Dentist
- Childcare status of the child examined
- Child enrollment in military dental insurance program
- Frequency of sweets and sugary drink consumption
- Do parents help brush child's teeth
- Frequency of brushing
- Time spent brushing (min)
- Use of fluoride toothpaste

Dental Examination

After consent was obtained, the primary investigator served as the dental examiner and recorder of the dmft scores of the children. An oral exam with no radiology was utilized, dmft scores was calculated and recorded for each child. All parents and guardians were informed of the oral findings after the exam.

Sample Size

With the aid of a statistician, the sample size was calculated and was modeled on a published peer-reviewed study of ECC risk factors in a nonmilitary sample.²⁷ As a similar

study utilizing a questionnaire with comparable variables and dmft screenings, they evaluated known and unknown risk factors of ECC. They determined a sample size $N = 108$ after assuming a statistical power level of 80%, and a probability level of $p < 0.05$. A power analysis utilizing an A-priori sample size calculator revealed to obtain a $p < 0.05$ with 80% power and accounting for a potential of 20% missing data, a minimum required sample size to be $N = 130$ dependents of military sponsors were required.

Statistical Analysis

All data from the questionnaires were analyzed using IBM SPSS Software Version 25. The primary outcome for the study is caries risk of the child, measured by the Caries Risk Assessment form for zero to six years of age from the American Dental Association. The caries risk of each child was determined and dichotomized into either low risk or increased risk (i.e., medium or high risk). The association between categorical risk factors (rank, number of dependents, number of PCS's, number of deployments, household status, highest level of education, housing arrangements, childcare status, military dental insurance coverage, frequency of sweet consumption, parental guided brushing, frequency of brushing, time total for brushing and fluoride toothpaste usage) and caries risk was assessed using chi-square analyses to test whether significant differences were observed between the two groups. A series of Mann-Whitney U-tests were conducted to test for differences between low and increased caries risk and the categorical risk factors. The association between continuous risk factors (years in service, age of dependent, and age of dependent when they first saw a dentist) and caries risk will be assessed using binary logistic regression.

The secondary outcome for the study is the dmft score of the child, which will assess whether there are significant differences in mean level of dmft scores that vary by military and nonmilitary risk factors. The association between categorical risk factors (household status, housing arrangements, military dental insurance coverage, parental guided brushing, frequency of brushing, and fluoride toothpaste usage) and dmft score will be assessed using Mann-Whitney U-tests for dichotomous independent variables and Kruskal-Wallis tests for independent variables with more than two levels (rank, number of deployments, level of education, childcare status, frequency of sweets, and time of brushing per session). The association between continuous/interval risk factors (years in service, number of dependents, number of PCS's, age of dependent, and age of dependent when they first saw a dentist) and dmft scores will be assessed using Spearman's rho correlation.

RESULTS

In total 195 military sponsors participated in the study and completed the survey. The ranks of all military sponsors are presented in Figure I. The majority (53.8%, $N = 105$) had E5-E9 ranks. One third had E1-E4 ($N = 66$), and smaller proportions had other ranks (W1-W5 5.1%, $N = 10$ and O1-O9 7.2%, $N = 14$).

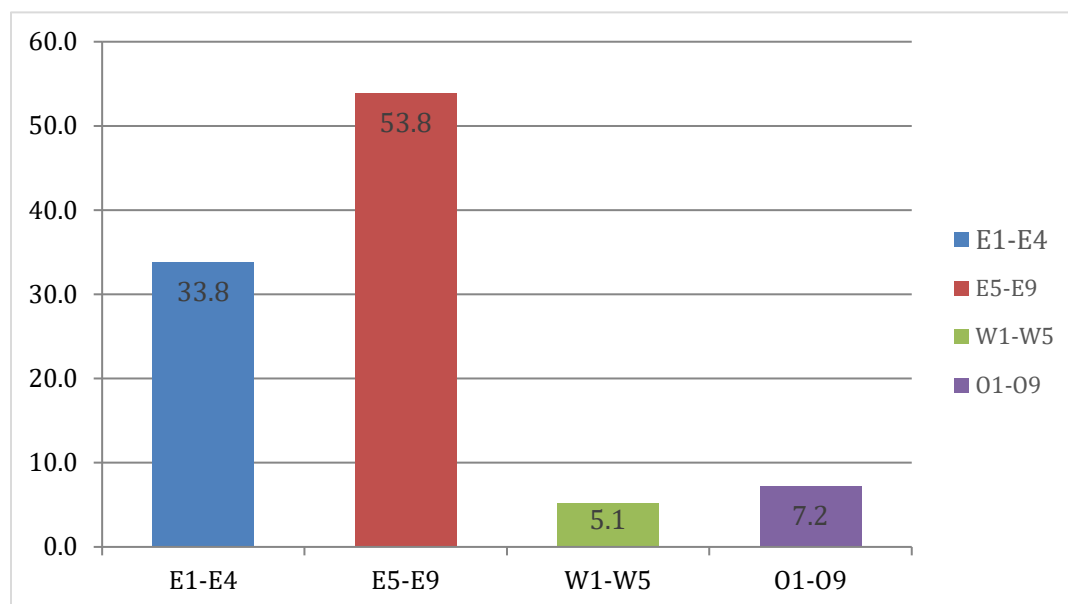


Figure I. Distribution of Military Sponsors by Rank

Regarding household status, 86.2% (N = 168) of the military sponsors are single military sponsors, while the rest (13.8, N = 27) are dual sponsors. When it comes to their education level, 48.2% (N = 94) of the military sponsors have High School / GED, 27.2% (N = 53) had Trade School / Associates, 14.9% (N = 29) had Bachelor's Degree, and 9.7% (N = 19) had Master's degree or higher. To be able to include this variable in later analysis, Bachelor's degree and Master's degree and higher were combined (24.6%, N = 48). See Figure II.

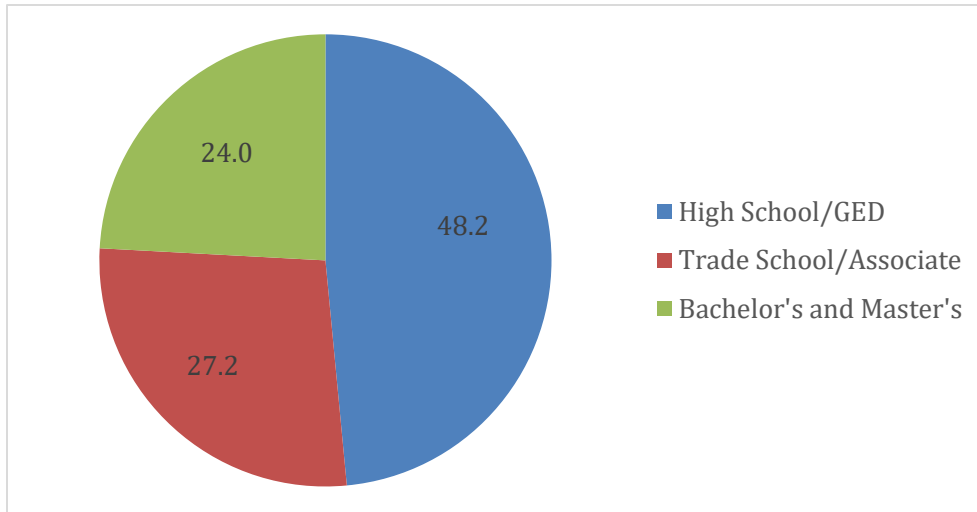


Figure II. Distribution of Military Sponsors by Level of Education

Current housing arrangements of the military sponsors was 39% (N=76) on post housing and 61% off post housing. The number of deployments for military sponsor ranged from zero to four, with the majority not having any deployments. In order to make more comparable categories, since there are only four sponsors with three deployments and one sponsor with four deployments, a merged category was formed including those with two or more deployments. The final percentage of sponsors in each group is: no deployment 48.2%, one deployment 40%, and two or more deployments 11.8%. See Figure III.

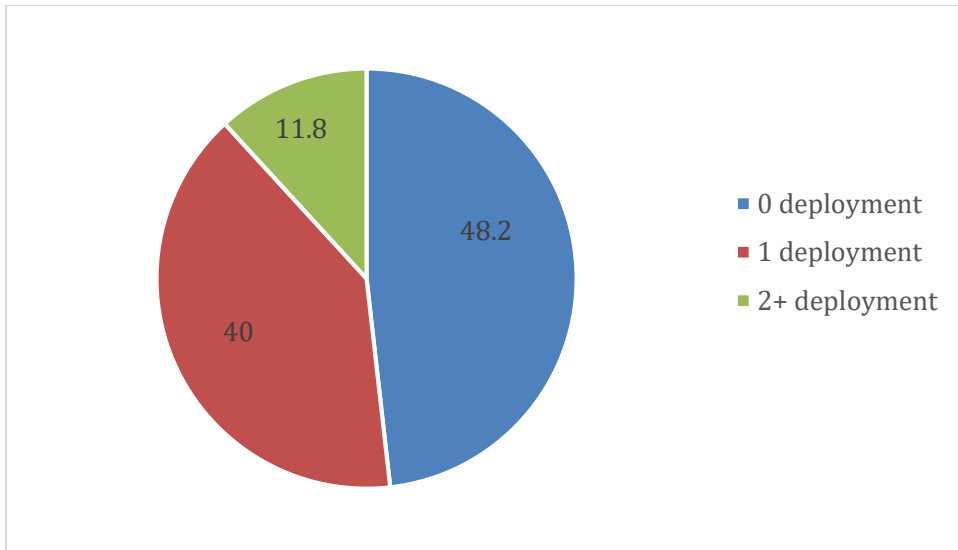


Figure III. Distribution of Military Sponsors by Number of Deployments

Childcare status of the dependents is presented in Figure IV. The majority of dependents do not have childcare services (49.7%, N = 97), while around a quarter either attended private childcare services or a military child development center.

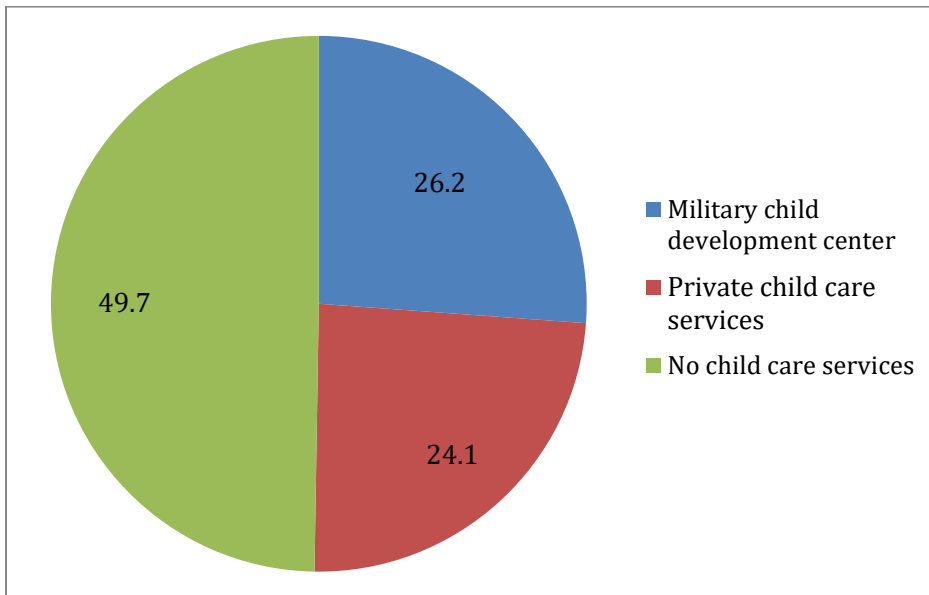


Figure IV. Distribution of the Dependents by Childcare Status

Distribution of sponsors by enrolment in Military Dental insurance is presented in Figure V. Since the 'I don't know' category had only nine cases, for further analyses it will be merged with the 'No' category. The 6show that 74.9% of sponsors enrolled in military dental insurance and 25.1% were not.

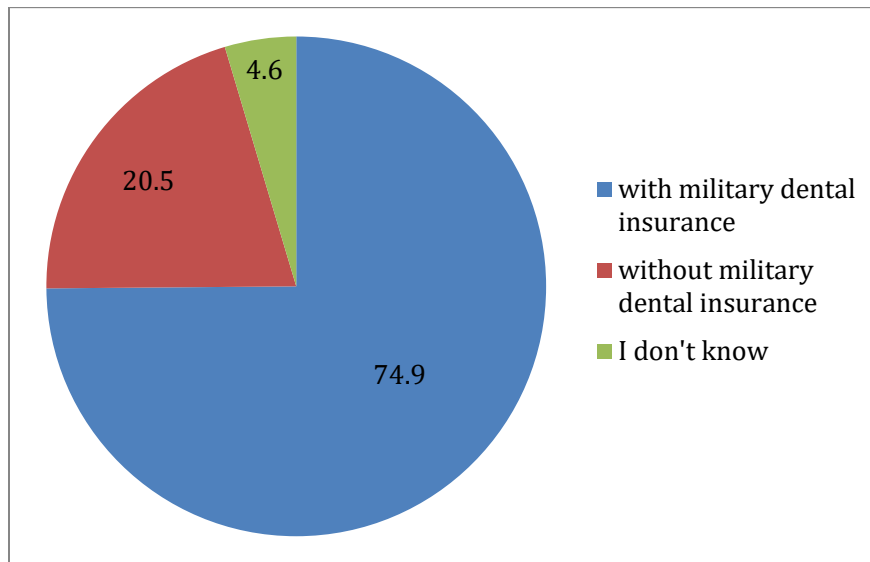


Figure V. Distribution of Military Sponsors by Enrolment in Military Insurance

Frequency of sweets intake of the dependents is presented in Figure VI. More than half of the children consume sweets once a day, while around quarter either do not consume sweets or consume sweets twice or more per day.

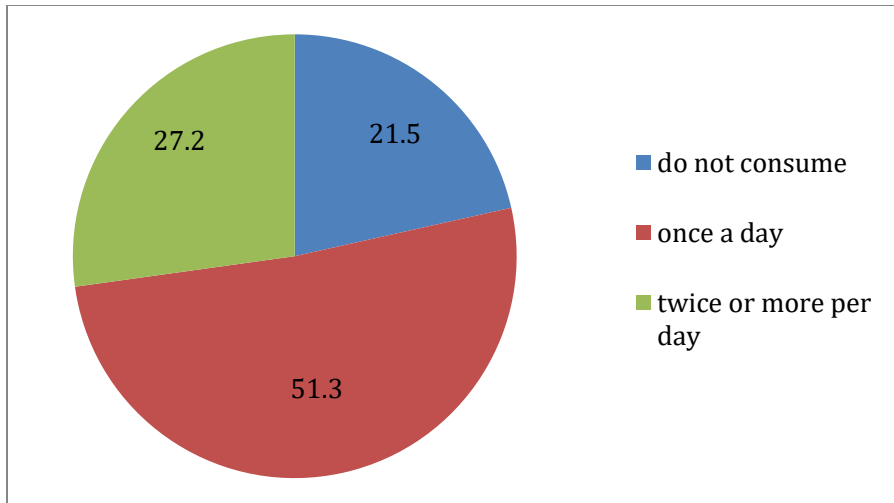


Figure VI. Distributing of the Dependents by daily Consumption of Sweets

Table I presents descriptive statistics (means, standard deviation and minimum and maximum) for the continuous variables in the data.

Table I

Range, means and standard deviations of continuous variables

Variable	min	max	<i>M</i>	<i>SD</i>
Number of dependents of the military sponsor	1	7	2.31	1.04
Number of PCS's	0	5	1.22	.97
Age of the pediatric dependent (months)	8	72	40.25	18.13
Age of the pediatric dependent when first seen by a dentist (months)	6	70	25.55	14.42
dmft scores	0	13	1.63	2.82

Distribution of children across categories of the four brushing variables is presented in Table II. As it can be noted, there are only three children whose parents never help brush, so this category was merged with the category 'occasionally', thus creating two final categories: parents help frequently (81%) and not frequently (19%). Similarly, there are only five cases

that do not brush teeth every day. For further analyses, this category was merged with the category 'once a day', resulting in two categories: brushing two or more times a day (63.1%) and once or less a day (36.9%).

Table II

Distribution of Children by Different Categories of Teeth Brushing Variables

Variable	Categories	Percentage	Count (N)
Parents' help brushing	Frequent	81.0	158
	Occasionally	17.4	34
	Never	1.54	3
Frequency of brushing per day	Two or more times	63.1	123
	Once	34.4	67
	Not every day	2.56	5
Time spent brushing	Three or more minutes	8.70	17
	One to three minutes	74.9	146
	Less than one minute	16.4	32
Brushing with fluoride	Yes	58.5	114
	No	28.7	56
	Don't know	12.8	25

Caries risk distribution is presented in Figure VII. Since cases are unequally distributed, medium and high caries risk were merged. Thus, the analyses will be carried out comparing low caries risk (33.8%) and increased risk (combining medium and high) (66.2%).

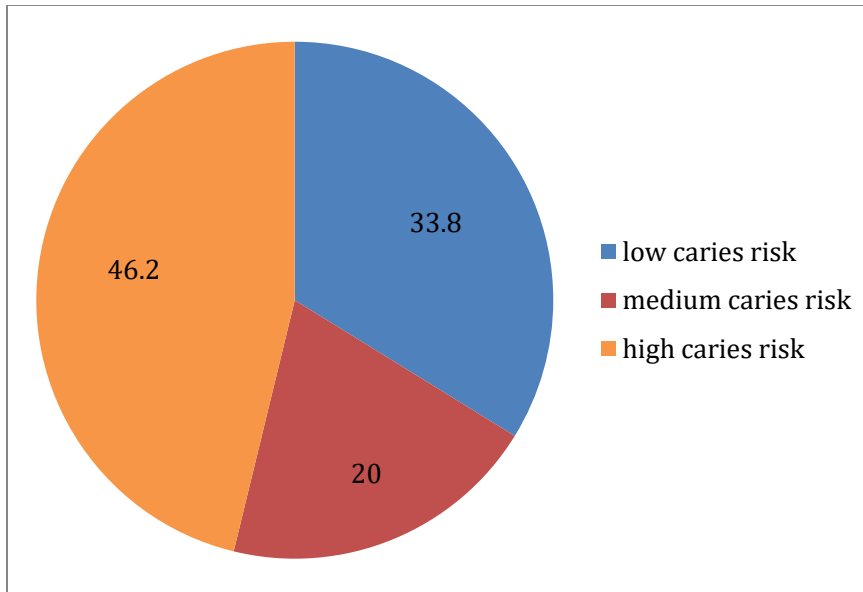


Figure VII. Distribution of dependents by carries risk

Dmft distribution is presented in Figure VIII. 118 of 195 children (60.5%) presented with a dmft score of 0. The average dmft per child was 1.63, which shows when ECC was found in 77 of the children it tended to present more severely.

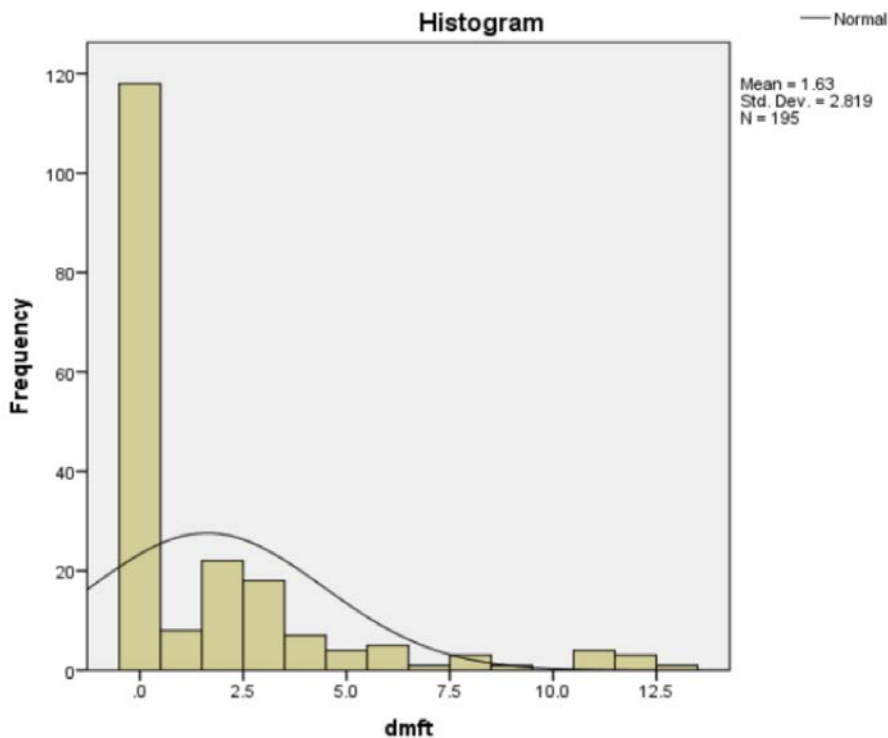


Figure VIII. Distribution of dependents by dmft score

Carries Risk

The distribution of cases of caries risk (low vs increased) by different independent variables are presented in Table III. The differences in proportions of caries risk were tested using Chi-square tests and the results are presented in the same table. The results were recorded as percentages and the mean standard deviation. P values < .05 were considered statistically significant. The results of the analyses showed significant differences between low and increased caries risk proportions for High School/GED guardian education, different frequency of sweets consumption, parents' assistance in brushing, duration of brushing, and use of fluoride toothpaste.

Table III

Distribution of carries risk and Chi-square tests results by different categorical independent variable

Variable	Levels	% Low caries risk	% Increased caries risk
Rank of military sponsor $\chi^2 = 6.497, p > .05$	E1-E4	25.8	38
	E5-E9	54.5	53.5
	W1-W5	7.60	3.9
	O1-O9	12.1	4.7
Number of deployments for military sponsor $\chi^2 = .931, p > .05$	0	53	45.7
	1	36.4	41.9
	2+	10.6	12.4
Household status $\chi^2 = 1.572, p > .05$	Single military sponsor	81.8	88.4
	Dual military sponsor	18.2	11.6
Level of education of military sponsor $\chi^2 = 4.668, p > .05$	High School/GED	37.9*	53.5*
	Trade School/Associates	30.3	25.6
	Bachelor's or higher	31.8	20.9
Current housing arrangements $\chi^2 = .714, p > .05$	On post housing	34.8	41.1
	Off post housing	65.2	58.9
Childcare status of the dependent $\chi^2 = .587, p > .05$	Military child development center	24.2	27.1
	Private childcare services	27.3	22.5
	No childcare services	48.5	50.4
Currently enrolled in Military Dental insurance $\chi^2 = .042, p > .05$	Yes	75.8	74.4
	No	24.2	25.6
Frequency of sweets of dependent (times per day) $\chi^2 = 9.076, p < .05$	0	30.3*	17.1*
	1	54.5	49.6
	2+	15.2*	33.3*
Do parents help brush $\chi^2 = 6.339, p < .01$	Frequently	90.9*	76*
	Not frequently	9.1*	24*
Frequency of brushing per day $\chi^2 = .013, p > .05$	Two times a day	63.6	62.8
	Once or less a day	36.4	37.2
Time of brushing per session (minutes) $\chi^2 = 13.154, p < .01$	3 or more	9.1	8.5
	1 to 3	87.9*	68.2*
	Less than 1	3*	23.3*

Brushing with fluoride $\chi^2 = 3.942, p > .05$	Yes	68.2*	53.5*
	No	22.7	31.8
	Do not know	9.1	14.7

*Indicates significant ($p < .05$) differences between low and increased caries risk proportions

Binary logistic regression analysis was carried out to test whether continuous variables (number of dependents, number of PCS's, years in service, age of the pediatric dependent and age of first visit) significantly predict caries risk group. The overall model was significant ($\chi^2 = 37.276, p < .001$) with percentage of variance explained ranging from 17.4% using the Cox & Snell R^2 predicting model to 24.1% using the Nagelkerke R^2 predicting model. The percentage of correctly classified cases was 73.3%, which is more than if there were no predictors included (66.2%). The percentage of correctly classified cases with low caries risk was 48.5%, and with increased risk of caries 86%. Table IV presents regression coefficients estimates of the model. The significant independent variables found were the age of the dependent and age of the child at first visit to the dentist, indicating that the older the child and the later the child makes the first visit to the dentist, the greater chances of increased caries risk.

Table IV

Binary Logistic Regression Coefficients for Predicting Low or Increased Caries Risk Groups

Independent variables	B	S.E.	Wald	df	p	Exp(B)
Number of dependents	.021	.170	.015	1	.901	1.021
Number of PCS's	-.219	.198	1.231	1	.267	.803
Years of service	-.028	.032	.758	1	.384	.973
Age of the dependent	.022	.011	3.842	1	.050*	1.022
Age of the dependent at first visit	.067	.017	15.768	1	.000*	1.069

*Indicates significant differences ($p < .05$)

Dmft Scores

Mann-Whitney U-tests were performed to test for differences in dmft regarding dichotomous independent variables, shown in Table V. There were no significant differences in dmft with regard to household status ($U = 85.000, p > .05$), status within military dental insurance ($U = 87.000, p > .05$), parents helping to brush ($U = 59.000, p > .05$) and whether a child is brushing with or without fluoride ($U = 83.000, p > .05$). There were significant differences in current housing arrangements ($U = 51.000, p < .043$), such that those children that live on post tend to have higher dmft scores ($M = 2.13, SD = 3.34$) than children who live off post ($M = 1.30, SD = 2.39$). Significant differences were also observed in frequency of brushing per day ($U = 43.000, p < .05$), indicating that those who brush once or less a day have higher dmft scores ($M = 1.86, SD = 2.69$) than those who brush twice a day ($M = 1.49, SD = 2.90$).

Table V

Results of Mann-Whitney U-test of dmft Scores between Levels of Dichotomous Independent Variables

Variable	Level	M	SD
Household status $U = 85.000, p > .05$	Single military sponsor	1.69	2.85
	Dual military sponsor	1.22	2.65
Current housing arrangements $U = 51.000, p < .043$	On post	2.13	3.34
	Off post	1.30	2.39
Military dental insurance status $U = 87.000, p > .05$	Currently enrolled	1.72	2.97
	Currently not enrolled	1.35	2.31
Parents' help brushing	Frequently	1.22	2.51

$U = 59.000, p < .001$	Not frequently	3.35	3.40
Brushing with fluoride	Yes	1.71	2.79
$U = 83.000, p > .05$	No	1.52	2.90
Frequency of brushing	Two times a day	1.49	2.90
$U = 43.000, p < .05$	Once or less a day	1.86	2.69

A series of Kruskal-Wallis tests was carried out to test for differences between independent variables with more than two levels. There were no significant differences in dmft scores with regard to number of deployments of the military sponsor ($\chi^2 = 2.147, p > .05$), level of education ($\chi^2 = .672, p > .05$), rank ($\chi^2 = 3.568, p > .05$), or childcare status ($\chi^2 = 1.019, p > .05$). However, differences were significant regarding time of brushing ($\chi^2 = 23.425, p < .001$), and frequency of sweets intake ($\chi^2 = 23.281, p < .001$). The mean and standard deviations of dmft scores by different levels of the independent variables are presented in Table VI. As it can be noted, children consuming sweets more than twice a day and those who brush less than one minute have significantly higher dmft scores.

Table VI

Means and Standard Deviations of dmft Scores across independent variables with more than two levels

Variable	Levels	M	SD
Frequency of sweets intake of dependent (times per day) $\chi^2 = 23.281, p < .001$	0	.48	1.33
	1	1.36	2.39
	2+	3.04	3.76
Time of brushing per session (minutes) $\chi^2 = 23.425, p < .001$	3 or more	1.24	2.95
	1 to 3	1.32	2.62
	Less than 1	3.25	3.13

Number of deployments of the military sponsor $\chi^2 = 2.147, p > .05$	0	1.60	2.91
	1	1.53	2.69
	2+	2.09	2.94
Level of education of the military sponsor $\chi^2 = .672, p > .05$	High School/GED	1.57	2.90
	Trade School/Associates	1.72	2.63
	Bachelor's or higher	1.63	2.91
Rank of military sponsor $\chi^2 = 3.568, p > .05$	E1-E4	1.71	2.86
	E5-E9	1.78	3.00
	W1-W5	1.20	2.15
	O1-O9	.357	.74
Childcare status $\chi^2 = 1.019, p > .05$	Military child development center	1.18	2.10
	Private childcare services	1.62	2.71
	No childcare services	1.87	3.17

Spearman's rho correlation analyses between dmft score and the continuous independent variables are presented in Table VII. It can be seen that the greater number of PCS's, higher age of pediatric dependents and higher age at first visit to a dentist for the dependent are significantly associated with higher dmft score.

Table VII
Spearman's Correlations between dmft Score and Continuous Independent Variables

Variable	Correlation
Number of dependents of the military sponsor	.086
Number of PCS's	.289*
Years in service of Military Sponsor	.016
Age of pediatric dependent (in months)	.523*
Age of pediatric dependent when first seen by a dentist (in months)	.363*

* $p < .01$

DISCUSSION

The goal of this study was to contribute to the ongoing pursuit for reliable risk predictors of ECC for both dental and non-dental professionals. The military dependent population ages 6 to 72 months at Fort Hood have received no previous evaluations regarding ECC prevalence and contributing risk factors. A total of seventeen risk indicators were evaluated, some of which were new and specifically targeted for military populations and some of which were derived from the AAPD's Caries-Risk Assessment and Management guidelines from 2019 and previous ECC studies of oral health risk predictors. Most of these risk factors are multi-faceted with multiple influences to aid in the development of ECC and may require further comprehensive in-depth studies to determine if they are true reliable risk indicators.

Time in Service, Rank, and Education of Military Sponsor

The results of this study have matched previous studies in showing that with a lower education level of the parent or guardian there tends to be a higher risk for caries in the child.²⁶ With 48% of the study group, the majority of the military sponsors had only a High School/GED level of education. This education level group consisted mainly of E1-E4 junior enlisted. Children of enlisted soldiers did show a higher mean dmft score 1.75 versus that of officers and warrant officers (0.77). These children also showed a significant increase in caries risk compared to the Trade School/Associates and Bachelor's or higher education groups. There was a mean dmft score of 1.57 for children of High School/GED sponsors and 1.66 for the other education levels. Despite the fact that in this study the dmft scores ($p > .05$) of the children were found to have no correlation with the education status of the sponsor, previous studies have reported the opposite and had positive correlation of dmft scores to lower education levels.^{18, 26}

There was a large range in the time of service for the military sponsors in this study, from 1 to 25 years. The average time of service of the military sponsor was 8.11 years and binary logistic regression for caries risk and Spearman's correlation for dmft did not show any correlation in regards to caries risk ($p > .05$) or dmft score ($p > .05$) of the dependent. Since military time in service has never been evaluated before for a risk factor of ECC, an equivalent studied risk factor would be the age of the parent or guardian in respect to ECC. A literature search found limited studies that evaluated the age of the parent or guardian and the prevalence of ECC. Such studies showed no significance between the parent's age and ECC of the child, which matches the findings in this study.^{40, 44}

In regards to time in service, rank and education of the military sponsor as risk factors for ECC, economic factors may play a big role causing a greater prevalence. This can be due to the max base pay of \$30,000 for an E4 and E1-E3 receiving less pay, based off of the 2019 military pay scale. These pay levels put families of these sponsors close too if not below the poverty line, which is \$37,500 for a family of three in the state of Texas.⁴⁹ Children living in poverty are especially affected by poor dental health, 16.9% of children living in poverty having untreated cavities.¹² 30% of children below the poverty line have untreated decay compared to 6% of children above the poverty line.⁵⁰ Children from low-income families have a harder time affording dental care, which can unfortunately be seen as an optional expense thus leading to an increase in caries prevalence. These facts, once again highlight the importance of identification and targeting of information regarding ECC to the most at risk, our younger and less educated soldiers with young children.

Household and Family Factors and the Effects of Caries Risk and Dmft Scores

Household and family factors assessed in this study were the current housing

arrangements, current household status, current childcare status of the child and the number of dependents 18 years and younger living with the military sponsor. These possible risk factors were added to the study to determine if any correlation to ECC is present and to identify if any further studies need to be performed. All four of these risk factors are multifactorial and would require a comprehensive in-depth study to determine if they are a reliable risk indicator.

Housing Arrangements

On or off post housing arrangements were assessed and it was found that 39% of the surveyed parents and dependents live in on post housing on Fort Hood. A significant correlation was found for the dmft scores ($p < .05$) of dependents between living on Fort Hood and off installation in this study. There are many considerations that may be influencing caries risk and dmft scores for families living on Fort Hood, from access of dental care, availability of healthy food options, and fluoridated drinking water to name a few. Of all dental clinics on Fort Hood only two treat family members ages six and younger with all other dependents having to seek care off post. This lack of availability and convenience can deter parents from seeking routine or even much needed dental care for their children. Below recommended levels of fluoridated drinking water has been an issue not only on Fort Hood, but also at many other Department of Defense installations.¹⁴ The most recent study of the fluoride levels on Fort Hood was 0.208 ppm from March 2019, which also matches the neighboring city of Killeen Texas at 0.21ppm.³⁰ This puts Fort Hood and the surrounding area well below the recommended amount of 0.7 ppm set by the U.S. Public Health Service (2015). Studies have shown that many of the surrounding counties around Fort Hood, such as Williamson, Hays and Llano have fluoride levels well above the recommended 0.7 ppm.⁵² With vast difference in concentrations of fluoridated drinking water from on Fort Hood and areas off installation, the

way we tackle preventative dentistry can be affected. The importance of fluoride varnishes and fluoride containing dentifrices will be key for families living on Fort Hood or immediately off post who have low levels of fluoride in their drinking water. Even though no significant correlation was found for the caries risk ($p > .05$) of dependents between living on Fort Hood or off installation in this study, recommended future studies are needed at Fort Hood and other Department of Defense installations. The addition of housing arrangements as a modification to the caries risk assessment may be beneficial in determining a true caries risk for this patient population.

Number of Dependents

Total number of dependents ages 0 to 18 of the military sponsor was evaluated. No correlation was found for caries risk ($p > .05$) and dmft score ($p > .05$) for the child as the number of dependents increased. Greater number of dependents for the military sponsors thus larger family sizes can have both a positive as well as a negative impact on young children towards their oral hygiene practices. For a young child, the first oral health practice that is acquired is tooth brushing, and normally this task is learned from parental figures. But, with siblings both positive and negative oral hygiene behaviors can be adopted through imitation and mimicry. It has been found that children who have siblings have better oral health when compared to those who do not.⁴¹ Mansoori, Mehta, & Ansari (2019) found the opposite in that children with three or more siblings showed a greater prevalence and were at higher odds of suffering from ECC. Young children with siblings have been shown to have a higher inclination to use fluoridated toothpaste in contrast to those who are the only child, thus providing better oral hygiene and health.⁴¹ Poor dental IQ and oral hygiene by parents and other

siblings can be inadvertently learned and can be very detrimental and instill life long bad habits. Children with a history of dental caries, whose primary caregiver or siblings have dental caries are regarded as being at an increased risk for ECC.¹⁰ Possible economic factors of raising multiple children and less individual attention provided by parents can be some of the reasoning why children of larger families may be more prone to ECC. With inconsistent results throughout multiple studies, further evaluation needs to be performed to determine if an increase in the number of siblings affects the oral health of children.

Household Status

The household status for the military dependent was evaluated in regards to a single or dual military family household. In 2016, there was a reported 42,000 dual military couples with children serving in the United States Military.²⁸ Many families are afflicted with financial difficulties requiring both parental figures to work, unfortunately military families are not immune from this scenario. Such common tasks as childcare and taking a child to a medical appointment can be a tedious endeavor for families with both parents working. Service members being required to work extended hours or shift work during times when normal day care providers are not in operation can be a common daily occurrence. For this study no correlation was found for caries risk ($p > .05$) and dmft score ($p > .05$) for the child in regards to having a single parent in the service or both parents serving. Acharya & Tandon (2011) evaluated how a parent's work status and their availability to leave work for their child's dental care correlates to prevalence of ECC in their children. They found no correlation in regards to ECC, which coincides with the findings in this study.

Childcare Status

Limited studies have been performed regarding the impact childcare has on the prevalence of ECC. With over 200,000 children of uniformed service members attending government run Child Development Centers, CDC's serve as the largest employer-sponsored childcare program in the United States.²⁸ 34% of the total military child population at Fort Hood are aged three years and under, thus the six CDCs that supervise 1,500-2,000 dependents ages six weeks to five years of age are paramount for families in which both parental units work.¹⁹ With full or part time child care, such important factors as diet and oral hygiene practices can have great influence on the prevalence of ECC. Those who provide child care, may that be military, private or family care are in a good position to influence not only the nutritional intake of the children but also the children's knowledge and attitudes on dietary matters. Rodrigues et Al evaluated child care centers in Brazil and found that many centers were not following the recommend set guidelines of sugar intake, and that those children were 4.87 times more likely to develop caries.⁴³ The results of this study showed no statistical significance for caries risk ($p > .05$) and dmft scores ($p > .05$) in regards to childcare status. Children attending CDCs did have a lower mean dmft score of 1.18 compared to 1.62 and 1.87 for private and family care. This may be due to greater regulation and control on dietary regiment at CDC facilities. With children spending a considerable amount of time at childcare facilities a focus on child care centers as possible venues for reaching and improving the health of high-risk children for ECC is essential and can be key to fighting this disease.

Age of the Child and When First Seen By a Dentist

According to the AAPD (2013), a child should establish a dental home and visit a dentist by their first birthday. A visit to a pediatric dentist by a child's first birthday and at least

every six months after that is key to a lifetime of healthy smiles. By not getting dental problems corrected when they are first diagnosed, little problems that could have easily been addressed may become more extensive and expensive over time. This study found significant correlation between increased caries risk ($p < .05$) and increased dmft scores ($p < .05$) as the dependent increases in age and the age of when the dependent first saw a dentist. This finding is consistent with the study of Yu et al. (2015) who reported increased prevalence of ECC in children with an increase in age of the child. As the child ages, this allows more time for exposure with cariogenic food and allowing time for poor oral hygiene to take effect, thus with increase time comes increased risk for caries. As established risk factors for ECC, it is important to educate service members with young dependents to maintain regular dentist visits to instill a life long habit and provide greater chances of their dependents becoming less susceptible to ECC.

Military Dependent Factors

For service members, serving in the U.S. military is both an honor and can be a rewarding career, but comes with many demanding and turbulent times. With constant demands, such as short notice deployments and multiple PCS's in a career, challenges to both work and family life are a common occurrence. For deployments, service members not only need to worry about the challenges of completing the mission, but who is going to look after their family while they are gone. This burden usually falls on spouses and family, and with the service member gone, such daily chores such as providing balanced healthy meals and administering proper oral hygiene to dependents can be arduous.

Number of Deployments

Since 2001, approximately 2.3 million service members have been deployed to Iraq and Afghanistan, with many deployments lasting 18 months. With numerous service members having experienced multiple deployments, there have been approximately two million military children who have experienced the deployment of a loved one since the War on Terror began in 2001.²³ Unfortunately, studies have shown increasing concern for stress, mental health problems, and child maltreatment of dependents while service members are deployed. Such young children show specific behavior problems to include: increased need for attention, clinginess, temper tantrums, queries concerning the parent's absence, defiance, appetite changes and sleep problems.³ These behavioral traits can be detrimental for both medical providers and parents trying to instill adequate dental care and hygiene practices. There are no previous studies that have evaluated the effects deployments may have on ECC in military dependents. Fort Hood is the largest U.S. Army base with over 50,000 assigned soldiers and additional 100,000 family members. With rapid deployments and a large family member population at Ft. Hood, the Ft. Hood pediatric population was found to be a good study sample to determine if any correlation exists. In this study, there was no correlation found for caries risk ($p > .05$) of the dependent in relation to the number of deployments of the military sponsor. In regards to dmft score, there was also no correlation found ($p > .05$), but there was a marked increase of mean dmft score of children who had military sponsors with two or more deployments (2.09) versus children whose sponsors have never deployed during the life of the dependent (1.60). Even with no correlation found, with constant deployments happening not only at Fort Hood but also across the Army, it is imperative to instill knowledge to Family Readiness Groups and deploying service members with young children to help prevent ECC.

Number of PCS's

Changing living locations for a family can be a very stressful event not only for the military service members, but for their family as well. Military families go through transition and stress more often than a traditional family, with PCS'ing on average every two to four years during a military career, which can cause both emotional and psychological concerns especially for younger children. Residential moves during early childhood can have long-term effects on social-emotional outcomes, which suggests that stability and routine is important early in life. With multiple PCS's, each move is associated with small declines in both social and emotional skills as well as behavioral problems.¹³ A study of 500,000 military dependents found that dependents who made a geographic move had increased odds of mental health problems when compared to kids who did not move.³⁵ With changes in friends, daycares, houses, schedules and routines, it's a lot of change for a young child to endure. A simple task as brushing teeth can become more tedious in a new unfamiliar setting. In regards to caries risk of the dependent there was no correlation found ($p > .05$) for increased number of PCS's. A significant correlation was found with the number of PCS's during the life-time of the dependent in association with a higher dmft scores ($p < .05$). With these findings from this study, targeted resources and treatment modalities can be fabricated in order to better treat dependents of service members who find themselves PCS'ing with children under the age of six.

Military Dental Insurance

The TRICARE dental program is a voluntary premium-based dental insurance program offered by United Concordia to eligible family members of active duty, National Guard and Reserve service members. It utilizes voluntary enrollment offering world wide portable dental

coverage with both single member and family plans with monthly premiums. It offers 100% coverage for most preventive and diagnostics services, and has comprehensive coverage for most other dental services. The current cost for an active duty family to participate in the TRICARE dental program is \$30 a month.⁴⁸ In this study, it was found that 74.9% of sponsors were enrolled in the TRICARE dental program. This matches the average found in previous studies of 77% of children in the United States having some form of private dental insurance.³² There was no significant difference found in both caries risk ($p > .05$) and the dmft scores ($p > .05$) of dependents whose families participated in the TRICARE dental insurance program. There was some uncertainty of enrollment in military dental insurance by 4.6% of the parents who answered 'I don't know' as an answer. All of these study subjects were grouped into the 'No' category, even though some may actually be enrolled. This action may have had some impact on the outcome of both caries risk and dmft scores. Just by having dental insurance is not going to solve the overall dental health of young children, this is due to multifactorial of issues, such as specific cost-sharing requirements, the dental network itself and payment structures. Even with these limitations, studies have shown that there is a positive impact on children who are enrolled in dental insurance programs due to increase access to dental care and preventive dental services.³¹ Based on the results of this study, it can be determined that both caries risk and the dmft score are not correlated with enrollment in military dental insurance, but further studies need to be performed.

Child's Oral Hygiene Habits and Frequency of Sweets

As known risk factors for ECC determined from previous studies, oral hygiene habits were added to this study and questionnaire to assess how the military dependent population evaluated compares to previous study populations. If the military dependent population

evaluated reveals correlations with known risk factors for ECC, this will help verify the validity if any correlation is found in regards to the unknown risk factors.

Parental Brushing Intervention

Toothbrushing is an important aspect of a child's oral health self care, with oral hygiene habits as known key factors in both caries risk and caries progression. Promoting frequent toothbrushing and the use of fluoride are two main approaches to prevent dental caries by the dental team and is invaluable knowledge to pass on to parents and guardians. Parental brushing intervention of the child was evaluated in this study, and it was found that 81% of the parents frequently helped their children brush their teeth. According to the AAPD (2008), parents should aid in tooth brushing of their children as younger children lack motivation and dexterity needed to brush their teeth. By parents helping their children brush their teeth, there was a significant decrease in the child's caries risk ($p < .012$) and a significant decrease in the dmft score ($p < .001$) of the child. These findings are identical to previous studies showing that parental influence on brushing habits greatly affects the oral health of the child.⁴⁷

Frequency and Time Per Brushing Session

The frequency and time per session at which the child brushes their teeth was also evaluated. It was found that 63.1% of the children brushed their teeth twice or more a day, which falls within the ranges found in previous studies, from 50 to 64% of children four years of age.²⁵ Harris et al. (2004) found that the single best predictor of children being caries free was not a behavior factor, but a parent's belief that they could carry out regular tooth brushing. Another study reported that in parents who insisted on brushing twice daily, their children were

1.8 times less likely to have ECC compared to parents who did not insist on brushing twice daily.⁴² There was a significant difference in dmft scores ($p < .05$) for children brushing two or more times a day with an average dmft of 1.49, compared to once or less a day, average dmft of 1.86. No significant difference was found between low and increased caries risk in regards to frequency of brushing. Time of brushing per oral hygiene session was found to be of significance in regards to both increased caries risk ($p < .01$) and higher dmft score ($p < .001$) of the child. The longer an oral hygiene session for the child, the greater chance of removing more plaque and cariogenic food remnants, with two minutes of brushings or more the ideal.³⁷ It can be determined based on this study that brushing two or more times a day for one to three minutes greatly influences the dmft of children in regards to ECC.

Frequency of Sweets

The frequency of sweets consumed by the dependent daily was evaluated and found to show great significance for both higher caries risk ($p < .05$) and a greater dmft score ($p < .001$). ECC is an infectious disease that is caused by predominately two species of bacteria, *Streptococcus Mutans* and *Streptococcus Sobrinus*.^{22,29} Diet plays an important role in the progression and clinical manifestation of ECC. Sugared foods and beverages are readily metabolized by *Streptococcus Mutans* and *Sobrinus* to organic acids that can demineralize enamel and dentin. Children with ECC typically experience frequent and prolonged consumption of sugared food and beverages.³⁴ Caries risk is greatest if sugars are consumed at high frequency and are retained in the mouth for longer periods of time.³⁶ A high frequency of sweets consumption can maintain oral pH at a low level, which can increase the risk for caries. Studies have shown that people with habitually high consumption levels of sugars also have levels of caries higher than the average population.⁵⁵ Results from this study confirm with

previous studies that sugar consumption is correlated to higher caries risk and dmft scores for a child.

Use of Fluoride Toothpaste

The use of fluoride in the form of over the counter toothpaste during a tooth brushing session was evaluated. Fluoride based caries preventive interventions in the form of toothpaste are the most significant and widespread form of caries control used globally.⁴⁵ In this study, 58.5% of parents or guardians reported that their children utilized fluoride-containing toothpaste while brushing their teeth. The data showed that there was a significant difference ($p < .05$) between low and increased caries risk of children that reported use of fluoride containing toothpaste. The dmft scores obtained did not correlate with previous studies findings, with the average dmft score of 1.71 for use of fluoride and 1.52 for children that did not. A reason for this outcome can be due to the eleven children twelve months or younger who participated in the study who's parents or guardians reported an alternative oral hygiene regime to brushing, thus no fluoride use. Due to minimal erupted teeth, the parents or guardians oral hygiene protocol was a moist rag to remove food debris. All of these children had no dmft score, which may have caused a skewed mean dmft for no fluoride toothpaste users. After discussions with the parents during the questionnaire and oral exam it was found that there was a high incidence of toothpaste utilization for all children. Unfortunately, a majority of the parents who answered no for fluoride use reported using training toothpaste, which contains no fluoride. One such study showed a meta-analysis of eight clinical trials on caries increment in preschool children and how tooth brushing with fluoridated toothpaste significantly reduces dental caries prevalence in the primary dentition.¹⁵ Wright et al. (2004) found that toothpastes with 500 ppm fluoride or more have a greater effect on caries reduction compared with toothpastes below this

concentration in children six years or younger. It can be concluded from this study that there is a correlation of fluoride containing toothpaste use and a lower caries risk for a child. Even though this study did not find a correlation between usages of fluoride toothpaste and lower dmft scores, previous studies have shown otherwise, and fluoride toothpaste is still a key tool in fighting ECC.

Limitations in the Study

There were a couple of limitations found in this study. One such limitation was the assessment for eligibility of government programs on the ADA Caries Risk Assessment Form (Age 0-6). According to the form any dependent of a family who is eligible for WIC, Head Start, Medicaid or SCHIP is automatically placed in the high caries risk column. The subjects in the study most affected by this were the dependents of junior enlisted (E1-E4). 34 out of 66 (51.5%) guardians of dependents of military sponsors who were E1-E4 said that they were eligible for WIC. By automatically placing these children in the high caries risk category for being affiliated with WIC, the data may have been skewed towards showing a prevalence for higher caries risk. According to a spokesperson of the Fort Hood WIC clinic, approximately 3,500 soldiers stationed at Fort Hood are utilizing the WIC program. The spokesperson further went on to say that unlike most civilian families on WIC, almost all military families do not qualify for SNAP (Supplemental Nutrition Assistance Program) food benefits, i.e. food stamps. Under WIC, families have a strict set of food choices, all food available in the program are screened to rule out unhealthy options. In the SNAP program unlike WIC there is no restriction on food choices, this can lead to less than ideal food purchases, with the purchase of more cariogenic foods. According to Edelstein (2000), oral health and dental accessibility among children who were enrolled in the Head Start program faced a higher risk of dental caries. Such

studies are a possible reason why the ADA decided to label children in government programs like WIC as having a high caries risk. This limitation could have been avoided with the use of a different caries risk assessment form that does not assess involvement in government aid programs as a risk factor. The Caries-risk Assessment Form for 0-5 Year old from the AAPD could have been a suitable substitute.

Another limitation in this study involved subjects who were all obtained through voluntary means. Upon review some of the guardians of the dependents purposefully pursued advice or a second opinion from the principle investigator. Approximately six of the dependents evaluated in this study were recently seen by a general dentist or pediatric dentist and treatment planned for comprehensive dental treatment. Due to this prior evaluation the dependents guardians already had a preconceived notion that their children had dental concerns that needed to be addressed and decided to participate in the study only to obtain second opinions. These six children having already been diagnosed with ECC were some of the more severe cases evaluated in the study. With the goal of the study to obtain a non-bias random collection of children that accurately represented the dependent population at Fort Hood, these six children defeated the intention of a random sample. For future studies more control over the study subject selection is required to try and obtain a true random subject population.

CONCLUSION

The present study found the following relevance in regards to the prevalence and risk factors of ECC in the U.S. Military Healthcare System at CRDAMC Pediatric Clinic:

Rejected null hypothesis:

Null hypothesis #1: The dmft score and caries risk does not increase with an increase in time of service of the parental military service member.

Null hypothesis #2: The dmft score and caries risk does not increase with an increase in the rank of the parental military service member during the life span of the dependent.

Null hypothesis #4: The dmft score and caries risk does not increase with an increase in the number of deployments of the parental military service member during the life span of the dependent.

Null hypothesis #6: The dmft score and caries risk does not increase for a military dependent age six months to six years living in a dual military household.

Null hypothesis #7: The dmft score and caries risk does not increase for a military dependent age six months to six years who is enrolled in TRICARE dental insurance

Null hypothesis #8: The dmft score and caries risk does not increase for a military dependent age six months to six years who are utilizing Military Child Care Centers.

Null hypothesis #9: The dmft score and caries risk does not increase for the military dependent when the parental military service member obtained only a high school / GED education.

Accepted Null Hypothesis:

Null hypothesis #3: The dmft score does increase with an increase in the number of PCS's of the parental military service member during the life span of the dependent.

Null hypothesis #5: The dmft score does increase for a military dependent age six months to six years living in Fort Hood military installation housing.

1). No correlation was found between ECC and caries risk and dmft scores of military dependents aged 6 to 72 months in regards to:

- Time in service of the military service member
- Education level of the military service member
- Rank of the military service member
- Number of deployments of the military service member
- Single or dual service member household
- Number of dependents 0 to 18 for the military service member
- Childcare status of the dependent
- Enrollment in TRICARE dental insurance of the dependent
- Use of fluoride toothpaste by the dependent

2). Significant correlation was found between ECC and dmft scores of military dependents aged 6 to 72 months with a positive association with the following factors:

- The greater amount of PCS's during the lifetime of the dependent
- Dependents who live in Fort Hood military housing
- Dependents who brush their teeth less than two times a day

3). Significant correlation was found between ECC and both caries risk and dmft scores of military dependents aged 6 to 72 months with a positive association with the following factors:

- As the dependent age increases
- The older the dependents when they first visit the dentist
- Dependents who brush less than one minute per brushing session
- Dependents who consume sweets more than twice a day
- Dependents whose parents don't frequently help with tooth brushing
- Dependents who brush their teeth less than two times a day

With an infinite number of variables and interactions for causation of ECC in children, it is important not to pinpoint just one element as a causative factor but look at the disease as a multifactorial amalgam of risk factors. By better understanding risk factors within high-risk populations, we can equip those who interact most with children at high risk, such as medical providers, daycares and parents with better information and tools to recognize oral health problems. The findings in this study will help guide further research into establishing mechanisms and causations of risk factors in association with ECC in the US military

dependent population with the end goal of preventing this disease from occurring in our children.

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APPENDIX A

Study: Prevalence of Early Childhood Caries and its Related Risk Factors in the US
Military Dependent Pediatric Population

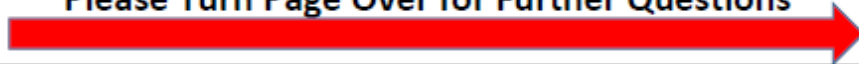
Questionnaire: # _____

- 1). **Branch of Service of the military sponsor?**
A). Army B). Air force C). Navy/Marines
- 2). **Rank of the military sponsor?**
A). E1 – E4 B). E5 – E9 C). W1 – W5 D). O1 – O9
- 3). **Years in service of military sponsor?**
_____ (Years)
- 4). **Number of dependents (0-18 years old) for the military sponsor?**
_____ (# of dependents)
- 5). **Number of PCS's for the military sponsor since the child examined was born?**

- 6). **Number of deployments of the military sponsor since the child examined was born?**

- 7). **Household status for the child being examined? (Single or Dual military household)**
A). Single military sponsor B). Dual military sponsors C). No military sponsors
- 8). **Highest level of education of the military sponsor?**
A). High School/GED B). Trade School/ Associates C). Bachelors
D). Master's or higher
- 9). **Current housing arrangements for the military sponsor and family? (Zip code 76544 is on post housing)**
A). On post housing B). Off Post housing
- 10). **Age of the child examined? (Example: 4 years 3 months old)**
_____ (Years) _____ (Months)

Please Turn Page Over for Further Questions



11). Age of the child examined when they were first seen by a Dentist?

_____ (Years) _____ (Months)

12). Childcare status of the child examined?

- A). Military Child Development Center B). Private Child Care Services Off Post
C). Child Care at Home (Family Care)

13). Is the child examined enrolled in the Military Dental Insurance (TRICARE) program?

- A). Yes B). No C). I Do Not Know

14). Frequency of sweets or sugary drinks consumption of child examined (times per day)?

- A). 2 or more B). 1 C). Never

15). Do parents help brush the child's teeth being examined?

- A). Frequently B). Occasionally C). Never

16). Frequency of brushing teeth per day of child being examined?

- A). 2 or more B). 1 C). Not every day

17). Time of brushing (min) per session of the child being examined?

- A). 3 or more minutes B). 1 to 3 minutes C). Less than 1 minute

18). Is the child being examined brushing with fluoride toothpaste?

- A). Yes B). No C). Do not know

Stop!!!! Last 2 questions answered by the Dentist!!!!

19). Caries Risk Assessment of the patient?

- A). Low B). Medium C). High

20). What is the dmft score for the child?

Scale _____ (0-20)

APPENDIX B

ADA American Dental Association®
America's leading advocate for oral health

Caries Risk Assessment Form (Age 0-6)

Patient Name:			
Birth Date:		Date:	
Age:		Initials:	

		Low Risk	Moderate Risk	High Risk
Contributing Conditions		Check or Circle the conditions that apply		
I.	Fluoride Exposure (through drinking water, supplements, professional applications, toothpaste)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
II.	Sugary Foods or Drinks (including juice, carbonated or non-carbonated soft drinks, energy drinks, medicinal syrups)	Primarily at mealtimes <input type="checkbox"/>	Frequent or prolonged between meal exposures/day <input type="checkbox"/>	Bottle or sippy cup with anything other than water at bed time <input type="checkbox"/>
III.	Eligible for Government Programs (WIC, Head Start, Medicaid or SCHIP)	<input type="checkbox"/> No		<input type="checkbox"/> Yes
IV.	Caries Experience of Mother, Caregiver and/or other Siblings	No carious lesions in last 24 months <input type="checkbox"/>	Cariou lesions in last 7-23 months <input type="checkbox"/>	Cariou lesions in last 6 months <input type="checkbox"/>
V.	Dental Home: established patient of record in a dental office	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
General Health Conditions		Check or Circle the conditions that apply		
I.	Special Health Care Needs (developmental, physical, medical or mental disabilities that prevent or limit performance of adequate oral health care by themselves or caregivers)	<input type="checkbox"/> No		<input type="checkbox"/> Yes
Clinical Conditions		Check or Circle the conditions that apply		
I.	Visual or Radiographically Evident Restorations/ Cavitated Cariou Lesions	No new cariou lesions or restorations in last 24 months <input type="checkbox"/>		Cariou lesions or restorations in last 24 months <input type="checkbox"/>
II.	Non-cavitated (incipient) Cariou Lesions	No new lesions in last 24 months <input type="checkbox"/>		New lesions in last 24 months <input type="checkbox"/>
III.	Teeth Missing Due to Caries	<input type="checkbox"/> No		<input type="checkbox"/> Yes
IV.	Visible Plaque	<input type="checkbox"/> No	<input type="checkbox"/> Yes	
V.	Dental/Orthodontic Appliances Present (fixed or removable)	<input type="checkbox"/> No	<input type="checkbox"/> Yes	
VI.	Salivary Flow	Visually adequate <input type="checkbox"/>		Visually inadequate <input type="checkbox"/>

Overall assessment of dental caries risk: Low Moderate High

Instructions for Caregiver:

Caries Risk Assessment Form (Age 0-6)

Circle or check the boxes of the conditions that apply. Low Risk – only conditions in “Low Risk” column present; Moderate Risk – only conditions in “Low” and/or “Moderate Risk” columns present; High Risk – one or more conditions in the “High Risk” column present.

The clinical judgment of the dentist may justify a change of the patient’s risk level (increased or decreased) based on review of this form and other pertinent information. For example, missing teeth may not be regarded as high risk for a follow up patient; or other risk factors not listed may be present.

The assessment cannot address every aspect of a patient’s health, and should not be used as a replacement for the dentist’s inquiry and judgment. Additional or more focused assessment may be appropriate for patients with specific health concerns. As with other forms, this assessment may be only a starting point for evaluating the patient’s health status.

This is a tool provided for the use of ADA members. It is based on the opinion of experts who utilized the most up-to-date scientific information available. The ADA plans to periodically update this tool based on: 1) member feedback regarding its usefulness, and; 2) advances in science. ADA member-users are encouraged to share their opinions regarding this tool with the Council on Dental Practice.