

# Dental caries among children in Georgia by age, gender, residence location and ethnic group

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**Objective:** To provide prevalence data for dental caries in Georgia. **Methods:** This World Health Organization pathfinder survey was conducted among 1,351 (6, 12 and 15 year-old) Georgian children, representing the main ethnic groups in urban and rural locations. Caries was analysed at univariate and multivariate levels, according to age, gender, urban/rural locality and ethnic group. **Results:** Caries experience levels among 6-year-olds were dmft=4.57, sd 3.42 (14.8% caries-free); DMFT=2.04 (sd 2.02) among 12-year-olds (31.1% caries-free); and DMFT=3.51 (sd 3.14) for the 15-year-olds (17.7% caries-free). Urban children at ages 6 and 12 years were more likely to be caries-free and have both lower levels of caries-experience and higher levels of filled or restored teeth. In multivariate regression analyses, most age groups showed a significant contribution from residence location. No differences were found by age and no consistent differences were detected by ethnic group. **Conclusion:** These data should provide the baseline for formulating and conducting public oral health efforts in Georgia, with emphases on rural residence locations.

**Key words:** dental caries, Georgia, WHO pathfinder survey

## Introduction

The International Association for Dental Research (IADR) awarded a group of researchers from Israel and Georgia a research grant within the IADR's Regional Development Program to assist and initiate the gathering of primary oral health data required for establishing a local databank, an essential first step towards planning and implementation of a national Georgian oral health program. Georgia (population 4,632,000) is a sovereign state in the Caucasus region of Eurasia, bordered to the west by the Black Sea, to the north by Russia, to the south by Turkey and Armenia, and to the southeast by Azerbaijan.

The World Health Organization (WHO) has recognized the importance of creating a global oral health databank (Aggerud, 1983; WHO, 2014). The objectives of the present study were to collect data on dental caries among Georgian children, with emphases on local ethnic groups in urban and rural localities.

## Material and methods

The study was broadly constructed according to the stratified cluster guidelines of the WHO recommended pathfinder surveys (WHO, 2013). The index age groups were 1<sup>st</sup>, 7<sup>th</sup> and 10<sup>th</sup> grade schoolchildren (6, 12 and 15 year-olds). Sampling sites were purposively chosen, according to advice of the local health administrators, so as to provide optimal information on the population

groups likely to have different levels of oral disease. Within each site and age group, school class clusters were randomly chosen. Three urban cities chosen were: Tbilisi, the capital; Batumi and Kutaisi. The four rural villages were Tlugh, Ambrolauri, Marneuli and Akhaltsikhe. Efforts were made to represent the three main ethnic groups: Georgians were located in the three cities and two villages (Tlugh and Ambrolauri); Armenians resided in the village of Akhaltsikhe; Azerbaijanis were located in the village of Marneuli. The Georgian authors classified these differences as truly ethnic and not simply cultural or due to heritage. Ethnicity was validated by asking the children and reconfirmed by their family names.

Total dental caries experience was recorded according to dmft for deciduous teeth among 1<sup>st</sup> grade schoolchildren, 6 year-olds, and DMFT for the permanent dentition among 7<sup>th</sup> and 10<sup>th</sup> grade schoolchildren who were 12 and 15 year-olds. Decayed teeth were recorded as the dt or DT components of dmft or DMFT; extracted (missing) teeth because of caries were recorded as the mt or MT components of dmft or DMFT; filled or restored teeth were recorded as the ft or FT components of dmft or DMFT. For all groups, percentages of caries-free children were also calculated. Caries were recorded visually and with a periodontal probe, plane mirrors, under optimally good electric light, in the school (WHO, 2013). No radiographs were employed. Diagnostic criteria had been diligently discussed at the preliminary workshop among the 10 dentist examiners (two professors and eight residents or PhD students).

## Results

A total of 1,351 schoolchildren were examined: 527 1<sup>st</sup> grade, 429 7<sup>th</sup> grade, 395 10<sup>th</sup> grade. According to the Georgian Educational Management Systems of Information (October, 2013), there are 138,852 children in these cohorts. The study group, therefore, constituted about 1% of the total population.

Inter-examiner calibration, employing a sub-sample of about 20 examinees, employing one of the senior Israeli dentists, reached an agreement level of above 85%. Thereafter, examinations were supervised by the two professor examiners. Table 1 presents distribution of the study population by caries experience (univariate analysis).

The prevalence of caries experience was: 4.57 (sd 3.42) dmft for 6 year-olds; 2.04 (sd 2.02) DMFT for 12 year-olds; 3.51 (sd 3.14) DMFT for 15 year-olds.

**6 year-olds:** The only difference, by gender, was for males who had more filled or restored teeth than females ( $p=0.048$ ). Children from rural areas had more decayed teeth ( $p<0.001$ ), fewer filled or restored teeth ( $p<0.001$ )

and a higher level of caries experience ( $p=0.001$ ), than their urban counterparts. Armenians had the most decayed teeth ( $p=0.003$ ); Azerbaijanis had the most extracted teeth ( $p<0.001$ ); Georgians had the most filled or restored teeth ( $p=0.004$ ) and also the highest level of caries experience ( $p=0.012$ ).

**12 year-olds:** We found no differences by gender. Children from rural areas had more decayed teeth ( $p<0.001$ ), fewer filled or restored teeth ( $p=0.002$ ) and more caries experience ( $p=0.001$ ), than their urban counterparts. For ethnic group, the only difference revealed was for extracted teeth, where Azerbaijanis demonstrated higher levels ( $p=0.001$ ).

**15 year-olds:** The only difference, by gender, was for females who revealed more filled or restored teeth than males ( $p=0.012$ ). The only difference, among 15 year-olds, by residence location, was for children in rural areas who had more extracted teeth ( $p<0.001$ ). For ethnic group Georgian 15 year-old children had the highest level of decayed teeth ( $p<0.001$ ) and the highest level of caries experience ( $p<0.001$ ).

**Table 1.** Univariate analysis of caries experience (dmft for 6 year-olds and DMFT for 12 and 15 year-olds, and their components), age, by gender, residence and ethnic group, among Georgian children

Age group	Socio-demographic variables		n	Decayed teeth (d or D)		p	Extracted teeth because of caries (m or M)		p	Filled or restored teeth (f or F)		p	Caries experience (dmft or DMFT)		p
				mean	sd		mean	sd		mean	sd		mean	sd	
6 yrs	Gender	Male	269	4.11	3.36	0.630	0.27	0.71	0.088	0.22	0.64	<b>0.048</b>	4.60	3.46	0.862
		Female	258	4.25	3.26		0.18	0.53		0.12	0.50		4.55	3.38	
	Residence	Urban	281	3.49	3.26	<b>&lt;0.001</b>	0.21	0.59	0.448	0.29	0.75	<b>&lt;0.001</b>	3.99	3.41	<b>&lt;0.001</b>
		Rural	246	4.97	3.27		0.25	0.67		0.02	0.18		5.24	3.31	
	Ethnicity	Georgian	404	3.93	3.31	<b>0.003</b>	0.20	0.58	<b>&lt;0.001</b>	0.21	0.65	<b>0.004</b>	4.34	3.40	<b>0.012</b>
		Armenian	63	5.41	3.01		0.13	0.38		0.03	0.25		5.57	2.98	
		Azerbaijani	60	4.58	3.61		0.53	0.95		0.00	0.00		5.12	3.74	
		Total	527	4.18	3.34		0.23	0.63		0.17	0.58		4.57	3.42	
12 yrs	Gender	Male	223	1.67	1.85	0.860	0.08	0.30	0.951	0.27	0.72	0.211	2.02	1.99	0.778
		Female	206	1.64	1.89		0.08	0.32		0.36	0.86		2.07	2.06	
	Residence	Urban	212	1.24	1.71	<b>&lt;0.001</b>	0.05	0.30	0.098	0.43	0.92	<b>0.002</b>	1.72	1.92	<b>0.001</b>
		Rural	217	2.06	1.93		0.10	0.32		0.20	0.61		2.36	2.08	
	Ethnicity	Georgian	306	1.68	1.97	0.914	0.05	0.27	<b>0.001</b>	0.36	0.86	0.136	2.08	2.13	0.830
		Armenian	62	1.63	1.59		0.11	0.32		0.19	0.62		1.94	1.71	
		Azerbaijani	61	1.57	1.63		0.20	0.44		0.20	0.51		1.97	1.82	
		Total	429	1.66	1.87		0.08	0.31		0.31	0.79		2.04	2.02	
15 yrs	Gender	Male	158	2.49	2.70	0.709	0.18	0.45	0.447	0.58	1.27	<b>0.012</b>	3.25	3.00	0.168
		Female	237	2.59	2.87		0.14	0.44		0.95	1.52		3.69	3.22	
	Residence	Urban	194	2.47	2.87	0.564	0.08	0.34	<b>&lt;0.001</b>	0.94	1.49	0.060	3.49	3.33	0.880
		Rural	201	2.63	2.73		0.23	0.51		0.67	1.37		3.54	2.96	
	Ethnicity	Georgian	276	2.88	3.00	<b>&lt;0.001</b>	0.13	0.43	0.227	0.86	1.43	0.400	3.87	3.32	<b>&lt;0.001</b>
		Armenian	60	2.33	2.31		0.18	0.47		0.80	1.84		3.32	2.70	
		Azerbaijani	59	1.25	2.70		0.24	0.47		0.58	0.91		2.07	2.15	
		Total	395	2.55	2.80		0.16	0.44		0.81	1.43		3.51	3.14	

Significant p values in bold

Table 2 presents percentages of caries-free children. Among 6 year-olds, more urban children were caries-free ( $p=0.001$ ). Among 12 year-olds, more urban children were caries-free ( $p=0.003$ ). Among 15 year-olds, more Azerbaijanis were caries-free ( $p=0.034$ ).

In linear regression analyses of total caries experience (Table 3), including age, residence and ethnic group, we found no contribution from gender. In all three age groups residence location made a significant contribu-

tion (6 year-olds:  $p<0.001$ ; 12 year-olds:  $p<0.001$ ; 15 year-olds:  $p=0.004$ ). The contribution of ethnic group was only significant among 12 ( $p=0.002$ ) and 15 year-olds ( $p<0.001$ ).

In multiple regression analyses of caries disease (not caries-free) children (Table 4), we again found no contribution of gender. Among 6 year-olds there was a higher chance ( $OR=3.44$ ) of being caries diseased among children in rural areas ( $p=0.015$ ). A similar finding was detected for rural 12 year-olds ( $OR=2.25$ ,  $p=0.005$ ), but not for 15 year-olds. The only difference by ethnic group was for Azerbaijanis who had a lower chance for being caries diseased ( $OR=0.23$ ,  $p=0.003$ ) at 15 years.

**Table 2.** Percentage of caries-free Georgian children by age, gender, residence and ethnic group from univariate analysis

Age group	Socio-demographic variables		Caries-free n (%)	p
6 yrs	Gender	Male	39 (14.5)	0.842
		Female	30 (15.1)	
	Residence	Urban	55 (19.6)	<b>0.001</b>
		Rural	23 (9.3)	
	Ethnicity	Georgian	65 (16.1)	0.129
		Armenian	4 (6.3)	
		Azerbaijani	9 (15.0)	
		All aged 6	78 (14.8)	
12 yrs	Gender	Male	72 (32.3)	0.572
		Female	61 (29.9)	
	Residence	Urban	80 (37.9)	<b>0.003</b>
		Rural	53 (24.4)	
	Ethnicity	Georgian	100 (32.8)	0.479
		Armenian	17 (27.4)	
		Azerbaijani	16 (26.2)	
		All aged 12	133 (31.1)	
15 yrs	Gender	Male	33 (20.9)	0.179
		Female	37 (15.6)	
	Residence	Urban	34 (17.5)	0.920
		Rural	36 (17.9)	
	Ethnicity	Georgian	41 (14.9)	<b>0.034</b>
		Armenian	12 (20.0)	
		Azerbaijani	17 (28.8)	
		All aged 15	70 (17.7)	

Significant p values in bold

## Discussion

Georgia, one of the republics which achieved independence from the former USSR, is currently in the process of a general development surge. The only previously available oral health data from Georgia was from the period of 1985-1990 (Kunzel, 1996). The caries experience found in the present study, among Georgian 12 year-olds was 2.04 DMFT. According to the WHO global oral health data bank (WHO, 2014), caries levels at age 12 years were 2.4 DMFT for Armenia, 2.5 DMFT for the Russian Federation and 1.9 DMFT for Turkey. No data were available from Azerbaijan (Gökalp *et al.*, 2010; Janushovich *et al.*, 2010; Kunzel, 1996; Marthaler, 1990). It is difficult to make comparisons between these neighboring countries because of differences in the survey methods.

The present data demonstrated a clear contribution of urban vs. rural dwelling in Georgia. Urban children at ages 6 and 12 years had significantly higher levels of % caries-free, lower levels of caries-experience (dmft or DMFT) and higher levels of filled or restored teeth. In multivariate regression analyses, most age groups showed a significant contribution of residence location.

For ethnic groups, there was no clear and consistent association with caries experience and filled or restored teeth, in all age groups. The major ethnic group (Georgians) was less healthy in several analyses, whereas

**Table 3.** Caries experience (dmft for 6 year-olds and DMFT for 12 and 15 year-olds), by age, gender and ethnicity, among Georgian children from linear regression analysis

Age groups		Un-standardized Coefficients		Standardized Coefficients	p	95% Confidence Interval for B	
		B	SE	Beta		Lower Bound	Upper Bound
6 yrs	Constant	9.769	3.355		<b>0.004</b>	3.177	16.360
	Gender	-0.016	0.294	-0.002	0.957	-0.594	0.562
	Residence	1.719	0.450	0.251	<b>&lt;0.001</b>	0.835	2.604
	Ethnicity	-0.276	0.316	-0.055	0.383	-0.897	0.345
12 yrs	Constant	-4.888	9.037		0.589	-22.650	12.875
	Gender	0.065	0.193	0.016	0.736	-0.314	0.444
	Residence	1.077	0.236	0.266	<b>&lt;0.001</b>	0.613	1.541
	Ethnicity	-0.501	0.162	-0.180	<b>0.002</b>	-0.820	-0.183
15 yrs	Constant	-5.678	11.351		0.617	-27.995	16.639
	Gender	0.356	0.317	0.056	0.263	-0.268	0.979
	Residence	1.127	0.391	0.180	<b>0.004</b>	0.358	1.896
	Ethnicity	-1.329	0.259	-0.313	<b>&lt;0.001</b>	-1.839	-0.820

Significant p values in bold

**Table 4.** Percentage of caries diseased (not caries-free) Georgian children, by age, gender and ethnicity from linear regression analysis

Age group			B	SE	p	OR	95%CI for EXP(B)
6 yrs	Gender	Male ref.	-0.012	0.250	0.960	0.988	0.605, 1.612
	Residence	Urban ref.	1.237	0.507	<b>0.015</b>	3.446	1.276, 9.308
	Ethnicity	Georgian	0.000	---	0.183	1.00	---, ---
		Armenian	0.029	0.717	0.968	1.029	0.252, 4.200
		Azerbaijani	-0.926	0.617	0.133	0.396	0.118, 1.327
	Constant		3.614	3.258	0.267	---	---, ---
12 yrs	Gender	Male ref.	0.159	0.213	0.455	1.173	0.772, 1.782
	Residence	Urban ref.	0.811	0.290	<b>0.005</b>	2.250	1.275, 3.971
	Ethnicity	Georgian	0.000	---	0.636	1.00	---, ---
		Armenian	-0.330	0.380	0.386	0.719	0.341, 1.515
		Azerbaijani	-0.281	0.385	0.466	0.755	0.355, 1.607
	Constant		13.581	10.316	0.188	---	---, ---
15 yrs	Gender	Male ref.	0.324	0.272	0.235	1.382	0.810, 2.357
	Residence	Urban ref.	0.727	0.446	0.103	2.069	0.864, 4.958
	Ethnicity	Georgian	0.000	---	<b>0.013</b>	1.00	---, ---
		Armenian	-0.940	0.512	0.067	0.391	0.143, 1.067
		Azerbaijani	-1.438	0.490	<b>0.003</b>	0.237	0.091, 0.620
	Constant		-3.685	9.331	0.693	---	---, ---

Significant p values in bold

Azerbaijanis, a minority ethnic group, were healthier in other analyses. This finding demands further investigation of oral health behaviour and other factors and may be due to sub-optimal representation of ethnic groups within the pathfinder structure.

The present survey could not ensure that the subjects included were optimally representative of the total Georgian population. Results are presented within the constraints of the stratified cluster pathfinder method (WHO, 2013). This method is “*recommended as a general guideline for basic oral health surveys for the planning, health surveillance and evaluation of oral health programmes.*” (WHO, 2013).

The international dental research community has become increasingly aware of global oral health inequalities, as reflected by the IADR-GOHIRA initiative (Sgan-Cohen *et al.*, 2013). The main cause for current concern is the developing status of Georgia. Research has clearly demonstrated that developing countries commonly reveal an initial trend of increasing dental caries levels (Sgan-Cohen and Mann, 2007).

The WHO has reported and described a continuing improvement of oral health in the 21<sup>st</sup> century (Petersen, 2003). The local Georgian authorities should learn from the rest of the world and adopt available and practical strategies that may improve oral health (Jürgensen and Petersen, 2013). Rural population groups should receive specific attention in dental caries prevention programs.

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