Crown size of deciduous teeth in Icelanders

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Mesiodistal and buccolingual crown diameters of deciduous teeth were measured from dental casts of 540 Icelandic children. Statistically significant sexual dimorphism was present in five of the buccolingual and in six of the mesiodistal diameters. The variability of the measurements followed the field concept but did not show systematic sexual dimorphism. In accordance with the permanent teeth, the size of the deciduous teeth also proved to be at the top of the range for populations of European origin. □ *Dental anatomy; dental anthropology; odontometry*

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Data on the size of the deciduous teeth are needed both in anthropology and in odontology. The size relationship between deciduous molars and their permanent successors represents odontometric data that have important practical applications in orthodontics. Variations in tooth size and shape among contemporary populations and among skeletal populations from various historical periods are of considerable interest in anthropology (1).

It is generally held in dental anthropology that the deciduous dentition has changed less than the permanent dentition during evolution. Reduction in the size of the human permanent teeth to the present level (2) took place long before the corresponding reduction in the size of the deciduous dentition (3). Whereas a slight increase in the size of the permanent teeth after the Middle Ages has been reported (4–6), the size of the deciduous teeth seems to have remained much the same during the last few thousand years (3, 7, 8).

The size of the permanent teeth in modern Icelanders has been shown to be somewhat larger than expected on the basis of the European ancestry of the population (9). The purpose of the present paper is to present statistical data on the odontometrics of the deciduous dentition in Icelanders.

Materials and methods

The material consists of stone casts of the dentitions of 540 children from three locations in Northeast Iceland (Table 1).

Table 1. Number of individuals examined by sex and location

	M	F	M + F
North Thingeyjarsýsla	67	64	131
South Thingeyjarsýsla	102	94	196
Húsavík	117	96	213
Total	286	254	540

The maximum mesiodistal (MD) crown diameter was measured parallel to the occlusal and vestibular surfaces. The buccolingual (BL) crown diameter was the greatest distance between the vestibular and lingual surfaces at right angles to the MD measurement. The material and methods used have been reported previously in more detail (9, 10).

The error of measurement was determined by repeating measurements after an interval of a few weeks.

Table 2. Mesiodistal diameter (in mm) of the deciduous teeth of modern Icelanders

Tooth	Sex	*n*	$\bar{x}$	s	CV	R	*t*
di^1	M	20	6.49	0.45	6.92	5.70–7.75	0.41
	F	18	6.43	0.45	7.01	5.60–7.10	
	M + F	38	6.46	0.45	6.88	5.60–7.75	
di^2	M	71	5.35	0.38	7.11	4.55–6.35	0.90
	F	50	5.28	0.35	6.68	4.65–6.60	
	M + F	121	5.32	0.37	6.93	4.55–6.60	
dc^1	M	236	6.98	0.36	5.18	5.90–8.20	2.25*
	F	193	6.90	0.35	5.10	6.00–8.05	
	M + F	429	6.94	0.36	5.17	5.90–8.20	
dm^1	M	116	7.17	0.48	6.75	6.20–8.55	2.16*
	F	118	7.04	0.40	5.69	6.25–8.15	
	M + F	234	7.11	0.45	6.30	6.20–8.55	
dm^2	M	168	9.00	0.45	4.97	7.90–10.15	0.67
	F	158	8.97	0.45	4.97	7.80–10.65	
	M + F	326	8.98	0.45	4.96	7.80–10.65	
di_1	M	10	4.27	0.30	6.96	3.90–4.90	2.31*
	F	6	3.90	0.33	8.47	3.50–4.50	
	M + F	16	4.13	0.35	8.51	3.50–4.90	
di_2	M	36	4.70	0.38	8.17	4.05–5.65	1.36
	F	26	4.57	0.35	7.68	3.90–5.30	
	M + F	62	4.64	0.37	8.03	3.90–5.65	
dc_1	M	187	5.94	0.33	5.58	4.90–6.85	3.23†
	F	132	5.82	0.31	5.26	5.20–6.90	
	M + F	319	5.89	0.33	5.53	4.90–6.90	
dm_1	M	80	7.98	0.45	5.57	6.70–9.20	2.46*
	F	80	7.81	0.45	5.80	6.80–8.90	
	M + F	160	7.90	0.46	5.77	6.70–9.20	
dm_2	M	96	10.11	0.44	4.32	8.85–11.30	2.31*
	F	93	9.95	0.48	4.83	8.80–11.70	
	M + F	189	10.03	0.46	4.62	8.80–11.70	

Number of teeth measured (*n*), means ($\bar{x}$), standard deviations (s), coefficients of variation (CV), and ranges (R) are given for men, women, and both sexes. Student's *t* test values (*t*) indicate sexual dimorphism.

* $0.05 > P > 0.01$.

† $0.01 > P > 0.001$.

‡ $0.001 > P$.

Results

The error of measurement varied between 0.56% and 1.79% of the mean of the two measurements, the molar measurements showing the smallest errors. The first measurement was larger in 9 of the 10 MD and 8 of the 10 BL measurements.

Analysis of the results for the MD diameter are given in Table 2 and for the BL diameter in Table 3. Statistically significant sex differences were noted in 5 of the 10 BL measurements and in 6 of the 10 MD measurements. The coefficient of variation showed no systematic sexual dimorphism and it was smallest in the second molars and largest in the incisors. Table 4 shows the sexual dimorphism in percentage of the mean. It was largest in the lower incisors.

Crown indices, modules, and areas are given in Table 5. Crown index showed little sexual dimorphism, but it was consistently a little more variable in boys than in girls. Crown module was consistently larger in

Table 3. Buccolingual diameter (in mm) of the deciduous teeth of modern Icelanders

Tooth	Sex	*n*	x̄	s	CV	R	*t*
	M	29	5.08	0.26	5.19	4.65–5.55	0.91
di^1	F	20	5.01	0.30	6.07	4.45–5.70	
	M + F	49	5.05	0.28	5.55	4.45–5.70	
	M	70	5.01	0.34	6.88	4.30–5.75	1.26
di^2	F	54	4.93	0.38	7.67	4.25–6.10	
	M + F	124	4.98	0.36	7.25	4.25–6.10	
	M	238	6.37	0.39	6.10	5.30–7.85	2.82*
dc^1	F	196	6.27	0.36	5.67	5.40–7.20	
	M + F	434	6.33	0.38	5.96	5.30–7.85	
	M	212	8.87	0.46	5.16	7.50–9.95	4.16‡
dm^1	F	174	8.69	0.40	4.57	7.55–9.80	
	M + F	386	8.79	0.44	5.01	7.50–9.95	
	M	245	10.10	0.44	4.38	9.00–11.50	5.57‡
dm^2	F	200	9.88	0.41	4.11	8.90–11.00	
	M + F	445	10.00	0.44	4.41	8.90–11.50	
	M	11	3.91	0.22	5.63	3.40–4.15	1.00
di_1	F	6	3.78	0.33	8.86	3.50–4.40	
	M + F	17	3.86	0.26	6.83	3.40–4.40	
	M	35	4.45	0.30	6.80	3.80–5.15	2.24*
di_2	F	26	4.29	0.23	5.42	3.85–4.70	
	M + F	61	4.38	0.28	6.49	3.80–5.15	
	M	188	5.71	0.34	5.91	4.95–6.95	2.73†
dc_1	F	133	5.61	0.32	5.66	4.90–6.55	
	M + F	321	5.67	0.33	5.87	4.90–6.95	
	M	162	7.35	0.40	5.46	6.30–8.65	1.41
dm_1	F	136	7.29	0.38	5.14	6.40–8.25	
	M + F	298	7.32	0.39	5.33	6.30–8.65	
	M	133	9.09	0.37	4.12	7.80–10.05	1.60
dm_2	F	107	9.02	0.38	4.25	7.95–10.00	
	M + F	240	9.06	0.38	4.18	7.80–10.05	

Abbreviations and symbols are explained in Table 2.

Table 4. Percentage sexual dimorphism (M/F − 1.00)×100

	Mesiodistal		Buccolingual	
Tooth	%	Rank	%	Rank
di^1	0.93	9	1.40	8
di^2	1.33	7	1.62	6
dc^1	1.16	8	1.59	7
dm^1	1.85	5	2.07	4
dm^2	0.33	10	2.23	3
di_1	9.49	1	3.44	2
di_2	2.84	2	3.73	1
dc_1	2.06	4	1.78	5
dm_1	2.81	3	0.82	9
dm_2	1.61	6	0.78	10

boys than in girls, and the same was true of crown area. Neither of them showed systematic sexual dimorphism in variability.

Discussion

Crown area is perhaps the most relevant and widely used measure of tooth size in dental anthropology. It is not a very reliable estimate of the true functional occlusal area (1), but the degree of overestimation is not likely to be so variable as to invalidate comparisons between populations. Unfortunately, odontometric data suitable for comparisons are

Table 5. Crown indices, modules, and areas (in mm) of the deciduous teeth of modern Icelanders

Tooth	Sex	*n*	Crown index§		Crown module¶		Crown area‖	
			$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s
di^1	M	17	77.68	5.24	5.83	0.30	33.49	3.37
	F	18	78.09	5.00	5.72	0.33	32.31	3.74
	M + F	35	77.89	5.05	5.78	0.32	32.88	3.57
di^2	M	62	93.93	6.75	5.19	0.30	27.00	3.05
	F	47	93.45	6.62	5.12	0.31	26.28	3.28
	M + F	109	93.72	6.67	5.16	0.30	26.69	3.15
dc^1	M	224	91.53	5.12	6.67	0.33	44.43	4.37
	F	186	91.04	5.07	6.59*	0.31	43.34†	4.09
	M + F	410	91.31	5.10	6.63	0.32	43.93	4.28
dm^1	M	115	124.09	7.94	8.02	0.40	63.68	6.52
	F	113	123.52	7.08	7.88†	0.33	61.47†	5.18
	M + F	228	123.80	7.52	7.95	0.37	62.58	5.99
dm^2	M	163	112.38	4.30	9.55	0.41	91.05	7.84
	F	149	110.41‡	3.87	9.43†	0.40	88.84*	7.61
	M + F	312	111.44	4.21	9.49	0.41	89.99	7.80
di_1	M	9	91.34	8.34	4.10	0.19	16.77	1.55
	F	5	97.71	2.99	3.85	0.36	14.86	2.92
	M + F	14	93.61	7.46	4.01	0.28	16.10	2.23
di_2	M	35	94.69	7.02	4.58	0.29	21.04	2.71
	F	25	94.55	5.48	4.43*	0.27	19.65*	2.39
	M + F	60	94.63	6.38	4.52	0.29	20.46	2.65
dc_1	M	180	96.60	5.72	5.83	0.28	34.02	3.29
	F	127	96.60	4.96	5.71	0.28	32.68‡	3.26
	M + F	307	96.60	5.41	5.78	0.29	33.47	3.34
dm_1	M	73	91.47	5.09	7.66	0.34	58.66	5.15
	F	79	93.05*	4.79	7.53*	0.37	56.74*	5.59
	M + F	152	92.29	4.98	7.59	0.36	57.66	5.45
dm_2	M	86	89.67	3.12	9.59	0.35	91.87	6.66
	F	86	90.45	2.98	9.48*	0.41	89.77	7.73
	M + F	172	90.06	3.07	9.54	0.38	90.82	7.27

Abbreviations and symbols are explained in Table 2.
§ Crown index = (buccolingual diam. × 100)/mesiodistal diam.
¶ Crown module = (mesiodistal diam. + buccolingual diam.)/2.
‖ Crown area (robustness) = mesiodistal diam. × buccolingual diam.

available only for a limited number of skeletal populations and for very few living populations. Calculating from published data on MD and BL measurements, modern whites (11) of mainly Northwest European origin have clearly smaller deciduous teeth than Icelanders. On the other hand, the size of the deciduous teeth of Australian aborigines (12) is considerably greater than that of the Icelanders.

Among skeletal populations pre-Columbian Peruvians (13), prehistoric Indians (14), and Middle Paleolithic Europeans (3) show larger deciduous teeth than Icelanders, whereas Megalithic Europeans (7) and Iron Age Europeans (3) equal Icelanders in tooth size. The deciduous teeth of Bedouins and recent Europeans (3) and of Neolithic Swiss and Middle Age Europeans (7) were smaller than those of Icelanders.

Comparing the MD diameters of Swedes from the Stockholm area (15) with those of the Icelanders in this study also indicates a larger tooth size in Icelanders. In both the deciduous and the permanent dentition (9) Icelanders seem to be at the top of the range for tooth size among populations of European origin.

As expected, the sexual dimorphism in tooth size proved considerably smaller in the deciduous than in the permanent dentition. Perhaps chance occurrence in a small sample ($n = 10 + 6$) increased the sexual dimorphism in the MD diameter of the lower central incisor to 9.5%, the percentage ranging from 3.73 to 0.33 in the other measurements. Unlike the permanent dentition, the deciduous canines did not display the greatest dimorphism.

The variability in the MD and BL measurements follows the field concept (16, 17). The second molars are less variable than the first ones. The lateral incisors are more variable than the central ones in the upper jaw, whereas the situation is reversed in the lower jaw. The mean coefficient of variation was 5.98 in the deciduous dentition and 6.15 in the permanent dentition (9). Considering that the coefficient of variation has a tendency to become larger as the mean becomes smaller, it might be said that the variability of the deciduous tooth size appears to be less than that of the permanent tooth size.

Although human odontometry in general has only limited taxonomic value (1), the so-called canine breadth index (MD c′/MD i′ × 100) has been shown to distinguish reliably among the major human races (18). Index values of 105 or more are typical of the Caucasians, whereas index values around 100 are typical of the Mongoloid and Negroid races. The uniqueness of the high canine breadth index of Caucasians seems to be a relatively new characteristic. On the basis of the data published by Brabant (7) and Smith (3), the change in the size relationship between upper deciduous canines and central incisors seems to have taken place since the Upper Paleolithic period. The canine breadth index value in Icelanders was 107.4, which is clearly within the Caucasoid range, according to Hanihara's criteria (18).

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References

1. Wood BA. Tooth size and shape and their relevance to studies of hominid evolution. Philos Trans R Soc Lond [Biol] 1981;292:65–76.
2. Brace CL. Environment, tooth form, and size in the Pleistocene. J Dent Res 1967;46:809–16.
3. Smith P. Evolutionary changes in the deciduous dentition of Near Eastern populations. Bull Group Int Rech Stomatol Odontol 1976;19:187–98.
4. Ebeling CF, Ingervall B, Hedegård B, Lewin T. Secular changes in tooth size in Swedish men. Acta Odontol Scand 1973;31:141–47.
5. Frayer DW. Metric dental change in the European Upper Paleolithic and Mesolithic. Am J Phys Anthropol 1977;46:109–20.
6. Kirveskari P, Hansson H, Hedegård B, Karlsson U. Crown size and hypodontia in the permanent dentition of modern Skolt Lapps. Am J Phys Anthropol 1978;48:107–12.
7. Brabant HE. The human dentition during the Megalithic era. In: Dahlberg AA, ed. Dental morphology and evolution. Chicago: The University of Chicago Press, 1971:283–97.
8. Sciulli PW. A descriptive and comparative study of the deciduous dentition of prehistoric Ohio Valley Amerindians. Am J Phys Anthropol 1977;47:71–80.
9. Axelsson G, Kirveskari P. Crown size of permanent teeth in Icelanders. Acta Odontol Scand 1983;41:181–86.
10. Axelsson G, Kirveskari P. Sixth and seventh cusp on lower molar teeth of Icelanders. Am J Phys Anthropol 1979;51:79–82.
11. Black TK. Sexual dimorphism in the tooth-crown diameters of the deciduous teeth. Am J Phys Anthropol 1978;48:77–82.
12. Margetts B, Brown T. Crown diameters of the deciduous teeth in Australian aboriginals. Am J Phys Anthropol 1978;48:493–502
13. Sawyer DR, Allison MJ, Pezzia A, Mosadomi A. Crown dimensions of deciduous teeth from pre-Columbian Peru. Am J Phys Anthropol 1982; 59:373–76.
14. Lukacs JR. Crown dimensions of deciduous teeth from prehistoric India. Am J Phys Anthropol 1981;55:261–66.
15. Lysell L, Myrberg N. Mesiodistal tooth size in the deciduous and permanent dentitions. Eur J Orthod 1982;4:113–22.
16. Butler PM. Studies of the mammalian dentition. Proc Zool Soc Lond 1939;13:1–36.
17. Dahlberg AA. The changing dentition of man. J Am Dent Assoc 1945;32:676–90.
18. Hanihara K. Relative size of the deciduous upper canine—a new racial character in the dentition. Zinruigaku Zassi 1966;74:9–18.