

Oral Health and Nutritional Status in Relation to Intelligence Quotient (IQ) of Children in Baghdad

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Abstract

This study aimed to test the difference of dental caries, gingival health and nutrition among different groups of intelligence at eight years old children in Baghdad.

Randomly selected 132 children aged 8 years were enrolled from primary schools in Baghdad city. Examination of the dental caries was noted according to decayed, missed, filled indices for primary and permanent teeth, dental plaque was recorded by plaque index, gingival health condition was assessed by the gingival index, and dental calculus was measured by the calculus component of periodontal disease index. Raven's Progressive Matrices was used to measure the Intelligent Quotient. Nutritional status was classified according to Centers for Disease Control and Prevention Growth Charts. Statistical analysis was performed by IBM SPSS statistic version 23.

Lower level of dental caries of primary teeth and dental plaque in superior level group of intelligence was found with significant difference. As well as a significant association was found between the nutritional status and intelligence.

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Introduction

Intelligence is defined as the possessions of mind that incorporates many associated talents, such as the abilities to reason, plan, decipher the problem, think, comprehend ideas, use languages and to acquire.¹ Tests of intelligence are always termed as "Intelligence Quotient (IQ)".² There are many contributing factors of intelligence, the upmost important are nutrition and health care.^{3,4} The nutrition hypothesis forecasts that "improved nutrition would impact primarily on the most deprived and produce disproportionate gains at low intelligence levels"⁵. Nutrition may be correlated with several factors such as salivary zinc.⁶ Furthermore; malnutrition, as stated by many authors, affects the development of the brain, brain size and sensory organs^{7,8} and majority of subjects who were underweight were caries free.⁹

Dental caries, gingivitis, are oral diseases denoting major public health problems¹⁰. Review of literature concerning the relation between oral health and intelligence are scarce with contradictory results. Some studies found that more dental caries in low IQ group^{11,12}. However other researchers observed a direct proportional relation of IQ with dental caries¹³. On the other hand, the borderline intelligence was found to have the highest level of dental caries with no significant association between prevalence of dental caries and intelligence ($P = 0.572$).¹

The degree of gingival inflammation was found to be increase as the level of IQ decreases (mild gingivitis was maximum in superior group, while moderate gingivitis was more in low level of intelligence with statistically significant difference^{1,14,15}. Adding to previous studies reported that children with mental retardation or extremely low IQ had a high prevalence of gingivitis.^{16,17} There was a negative correlation between IQ and pretreatment anxiety scores and a significant positive correlation was found between IQ and Frankl behavior rating.¹⁸

Aims of the study:

1. To test the difference of dental caries of primary and permanent teeth and gingival health condition among different groups of intelligence in eight years old children.

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2. To test the difference of nutritional status among different groups of intelligence.

Materials and methods

Randomly selected 132 children aged 8 years were enrolled from primary schools in Baghdad city. Informed consent was obtained from parents or guardians by sending them a questionnaire, adding to approval from higher authorities was achieved by official letter from the Ministry of Education. Examination of the dental caries fulfilled the requirements of decayed, missed, filled (dmf and DMF) indices for primary and permanent teeth respectively, according to WHO 1987¹⁹. Dental plaque was recorded by plaque index (PII) according to the criteria reported by Silness and Loe²⁰. For the assessment of gingival health condition, the gingival index (GI) was used according to Loe and Silness²¹. Dental calculus was measured by the calculus component of periodontal disease index²².

The Standard Progressive Matrices is a part of series of three tests (Raven's Progressive Matrices) for persons of varying ages and/or abilities, all consisting of the same kind of nonverbal reasoning problems. Raven's Progressive Matrices was used to measure the Intelligent Quotient, which is based on logic, but is furthermore designed to test learning capability, memory, innovative thinking and the ability to

simultaneously address several problems. The test measures the general intelligence - g. It encompasses different plates to decide which figure that completes each one is. The test consists of 60 plates. To complete the test 45 minutes are set. IQ estimation is based on the statistical values for age. Nutritional and height status were classified according to Centers for Disease Control and Prevention (CDC) Growth Charts. Statistical analysis was performed by IBM SPSS statistic version 23.

Variables	Categories	Mean	Std. Deviation	Minimum	Maximum	F	P value
ds	Superior	8.47	8.27	0	44	9.637	.000
	Intermediate	14.33	10.50	0	48		
	Inferior	17.25	9.99	2	43		
ms	Superior	1.00	2.02	0	5	2.397	.09
	Intermediate	2.79	5.04	0	25		
	Inferior	1.82	3.90	0	20		
fs	Superior	1.64	3.15	0	13	6.080	.003
	Intermediate	0	0	0	00		
	Inferior	.45	2.37	0	15		
dmfs	Superior	11.11	7.96	2	44	8.252	.000
	Intermediate	17.16	11.87	0	53		
	Inferior	19.61	10.38	2	43		
dmft	Superior	4.60	2.34	1	11	9.856	.000
	Intermediate	6.40	3.11	0	12		
	Inferior	7.14	2.83	1	14		
Post hoc test	Dependent Variable	(I) IQ	(J) IQ	Mean Difference (I-J)	Sig.		
Tukey-Kramer	ds	Superior	Intermediate	-5.859	.01		
		Intermediate	Inferior	-8.783	.000		
		Inferior	Superior	-2.924	.33		
Dunnnett T3	fs	Superior	Intermediate	1.644	.003		
		Inferior	Superior	1.190	.13		
	Intermediate	Inferior	Superior	-4.55	.50		
		Inferior	Superior	-6.052	.02		
	dmfs	Superior	Intermediate	-8.503	.000		
		Inferior	Superior	-2.451	.66		
Tukey-Kramer	dmft	Superior	Intermediate	-1.795	.008		
		Inferior	Superior	-2.536	.000		
		Intermediate	Inferior	-.741	.42		

Table 1. Dental caries of primary teeth according to intelligence

Results

Descriptive statistics of the total sample comprises 132 children (101 boys and 31 girls), classified according to intelligence level into three groups (45 superior, 43 intermediates, 44 inferior).

Dental caries of primary teeth according to groups of intelligence exposed statistically significant difference in all fraction of dmfs index {ds (decayed surfaces), fs (filled surfaces)} except ms (missed surfaces). Superior level group had the lowest level of (ds), (dmfs) and (dmft) fractions and the highest level of (fs) than other groups. Post hoc tests revealed significant difference between superior level with both intermediate and inferior levels concerning the (ds), (dmfs) and (dmft) fractions, whereas a significant difference was found between the superior and intermediate levels concerning the (fs) fraction [table 1].

Variables	Categories	Mean	Std. Deviation	Minimum	Maximum	F	P value
DS	Superior	2.24	2.52	.00	8.00	1.864	.15
	Intermediate	3.21	3.46	.00	17.00		
	Inferior	3.30	2.52	.00	12.00		
MS	Superior	.00	.00	.00	.00	1.900	.15
	Intermediate	.35	1.69	.00	10.00		
	Inferior	.00	.00	.00	.00		
FS	Superior	.27	.78	.00	3.00	2.022	.13
	Intermediate	.05	.30	.00	2.00		
	Inferior	.09	.42	.00	2.00		
DMFS	Superior	2.51	2.66	.00	8.00	1.339	.26
	Intermediate	3.42	3.58	.00	17.00		
	Inferior	3.39	2.58	.00	12.00		
DMFT	Superior	1.78	1.66	.00	5.00	1.645	.19
	Intermediate	1.93	1.56	.00	4.00		
	Inferior	2.36	1.50	.00	4.00		

Table 2. Dental caries of permanent teeth according to intelligence.

Dental caries of permanent teeth according to groups of intelligence revealed statistically not significant difference in all fraction of (DMF) index [table 2].

Comparing the gingival health, which comprises pII, GI and Call, among different groups of intelligence exhibited significant difference concerning plaque index with the lowest level of dental plaque in the superior level group. Post hoc test revealed that the difference

was between superior level with both intermediate and inferior levels. Predominance of mild type of gingivitis was found in all groups with statistically not significant difference [table 3].

Variables	Categories	Mean	Std. Deviation	Minimum	Maximum	F	P value
Pll	Superior	1.013	.618	0	2.8	4.718	0.01
	Intermediate	1.282	.551	.2	3		
	Inferior	1.378	.573	.25	3		
GI	Superior	1.282	.544	.125	2.8	0.070	0.93
	Intermediate	1.284	.551	.3	2.58		
	Inferior	1.245	.548	0	2.8		
Call	Superior	.000	.000	.000	.000	----	-----
	Intermediate	.000	.000	.000	.000		
	Inferior	.000	.000	.000	.000		

(I) IQ	(J) IQ	Mean Difference (I-J)	Sig.
Superior	Intermediate	-0.270	0.07
	Inferior	-0.365	0.01
Intermediate	Inferior	-0.095	0.725

Table 3. Gingival health according to intelligence.

Not significant association was found between the gender and intelligence ($\chi^2 = 2.301$, P value = 0.36), while a significant association was found between nutritional status and intelligence [table 4].

			Nutritional status				Fisher exact	P value	Total
			Normal	Obese	Over-weight	Underweight			
IQ	Superior	Count	16	14	8	7	15.03	0.01	45
		% within IQ	35.56	31.11	17.78	15.56			100
	Intermediate	Count	28	6	5	2			41
		% within IQ	68.29	14.63	12.20	4.88			100
	Inferior	Count	29	11	3	1			44
		% within IQ	65.91	25.00	6.82	2.27			100
Total	Count	73	31	16	10	130			
	% within IQ	56.15	23.85	12.31	7.69	100			

Table 4. Association between the nutritional status and intelligence.

Discussion

This is the first Iraqi study relating the oral health, nutrition with the level of intelligence in children; also, it is one of the most infrequent studies concerning this subject all over the world. In spite of some limitations faced in conducting this study as the sample size, which is suggested to be at the national level to have a clear idea about the aims of this study for the country, one can consider the results logical and interpretable.

Occurrence of dental caries in primary teeth and amount of dental plaque were lower in the superior level of intelligence than other levels, besides; the level of filled primary teeth in this group was higher than others, confirming the results of other studies^{11,12} and giving a clue that the higher the intelligence level, the higher the awareness of dental care (either by prevention or treatment of dental problems) and understanding causes and effects, information and instructions, so this group of children is anticipated to behave adequately and communicate easily in dental clinic²³.

Nutrition has a direct impact on intelligence as the famous aphorism "the perfect mind is in the healthy body" and it had, with the health care, an effect on some physical factors as height and brain size²⁴. However, one can notice in the results of this study that the inferior level group had high percentage of normal weight children, which may be as a result of the difficulty in separation of the nutritional effects from socio-economic factors²⁵ or genetic factors²⁶ on intelligence, as some studies found that deprived environmental surroundings by itself is an adequate factor to result in mental retardation, even in case of good nutrition.

Conclusions

Lower level of dental caries of primary teeth and dental plaque in superior level group of intelligence was found with significant difference. As well as a significant association was found between the nutritional status and intelligence.

Implications for future studies: Larger sample size at national level, and inclusion of socio-economic status in the variables.

Declaration of Interest

The authors report no conflict of interest

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