THE EFFECT OF EDUCATIONAL FACTORS ON DENTAL CARIES IN COUNTRIES BELONGING TO MEDIUM HUMAN DEVELOPMENT INDEX GROUP

İnsani gelişim indeksi orta düzeyde olan ülkelerde eğitimle ilgili faktörlerin diş çürüklerine etkisi

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Abstract

Purpose: *In this study, some related educational indicators of decayed, missing or filled teeth (DMFT) index scores were investigated on the basis of national data for 44 countries which had medium human development index.*

Material and Methods: *Stepwise linear multiple regression technique was used to identify the variables which significantly associated with the DMFT index belonging to 12 years old. The six variables considered for inclusion in the regression model were adult literacy rate, mean year of schooling, pupil-teacher ratio for primary level, educational expenditure as percent gross national product, primary enrolment ratio and completing primary educational level rate. DMFT indices for 12 years old were considered as a dependent variable, and other six variables were chosen as independent (explanatory) variables.*

Results: *It was found out that, mean DMFT score in the investigated countries was 3.04. In these countries, adult literacy rate, mean year of schooling and completing primary educational level rates were 82.33 percent, 4.63 years and 72.73 percent respectively.*

Conclusion: *As a result of multiple regression analysis among these explanatory variables, completing primary level rate was the only one significantly associated with DMFT index scores for 12 years old.*

Key Words: *Dental caries, DMF index, Education*

Özet

Amaç: *Bu araştırmada, insani gelişim indeksi orta düzeyde olan 44 ülkenin ulusal verileri esas alınarak, bazı eğitimsel göstergelerin DMFT skoru ile ilişkisi incelendi.*

Gereç ve yöntem: *Oniki yaşındaki çocukların DMFT skoru ile önemli ölçüde ilişkili değişkenlerin belirlenmesi için stepwise (adım adım) lineer multiple regresyon yöntemi kullanıldı. Regresyon modeli için gözönünde bulundurulan altı değişken; yetişkin okuryazar oranı, ortalama okula gitme süresi (yıl), ilköğretim düzeyinde öğrenci/öğretmen oranı, gayrısafi milli hasıladan eğitime ayrılan pay, ilkokula başlama oranı ve ilkokulu bitirme oranı idi. Bağımlı değişken olarak 12 yaşındakiler için DMFT indeksi alındı. Diğer altı değişken bağımsız değişken olarak seçildi.*

Bulgular: *Araştırma kapsamına alınan ülkelerde ortalama DMFT skoru 3.04 olarak bulundu. Bu ülkelerde yetişkinlerde okur-yazarlık oranı %82.33, ortalama okula gitme süresi 4.63 yıl, ilkokula başlayanların ilkokulu bitirme oranı ise %72.73 idi.*

Sonuç: *Multiple regresyon analizi sonucunda, altı bağımsız değişkenden, sadece ilkokulu bitirme oranı 12 yaşındaki DMFT indeksi ile anlamlı ölçüde ilişkili bulundu.*

Anahtar Kelimeler: *Diş çürükleri, DMF indeksi, Eğitim*

Socio-economic factors or circumstances may increase caries risk. For instance, poor economic status, high unemployment rate, social deprivation, low knowledge on dental health and low educational level of parents are closely associated with dental health status. Finally, these conditions can lead to ingestion of more cariogenic foods, deterioration in oral hygiene, saliva problems, and reduced fluoride support. It is observed that 'bad economy and high unemployment' under certain circumstances may invoke dental caries, for example, if carbohydrate products in the area are cheaper than proteins,

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Geliş tarihi:3 Haziran 1999

carbohydrate consumption is going to be higher than protein consumption. In other nations, 'bad economy and high unemployment' may work in the opposite direction, as there will not be enough income to buy and consume sweet or other carbohydrates. Similarly, educational factors can influence dental health status. For instance, in societies which have high educational level, sugar consumption will be less amount per capita, tooth-brushing or other measures on prevention of dental caries will be applied more frequently.

The prevalence of dental caries has declined in recent 20 years in many developed countries, although its prevalence and severity are increasing in many developing countries. The decrease in the prevalence of caries has been mainly associated with the widespread use of fluoride toothpastes and changes in the pattern and amount of extrinsic sugar consumption whereas, the increase is primarily related to the increase in consumption of extrinsic sugars, especially sucrose (1,2).

According to Blinkhorn (3), mothers in deprived areas were more likely to give their children sweets, and allow sweet consumption throughout the day. Persson and Samuelsson (4) found that parents in higher socio-economic status were more prone to follow general nutritional recommendations and consequently restricted consumption of sucrose-rich foods.

Johansson (5) showed that cola-type soft drinks were strongly associated with presence of dental erosion. Decayed, missing or filled teeth (DMFT) or decayed, missing or filled surface (DMFS) indices were found significantly better among higher socioeconomic class urban residents, among those who brushed their teeth at least once a day, and among those who had better school performance (6). In other study, it was shown that the role of mother in determining the dental status of children was very important and socioeconomic factors significantly affected DMFT index score (7).

The present study was carried on to identify the role of educational factors on oral health and the prevalence of dental caries in countries belonging to medium human development index group.

MATERIAL AND METHOD

Data from 44 nations which had medium human development index were included in this study. These are located in different parts of the world including Thailand, Malaysia, Fiji, Mauritus, Kazakhistan, United Arab Emirates, Brazil, Jamaica, Georgia, Saudi Arabia, Turkey, Syria, Ecuador, Moldavia, Libyan Arab Jamahiriya, Tunisia, Kyrgyzistan, Paraguay, Suriname, Iran Islamic Republic, Botswana, Belize, Cuba, Sri Lanka, Uzbekistan, Oman, South Africa, China, Peru, Dominican Republic, Jordan, Philippines, Iraq, Indonesia, Nicaragua, Guyana, Guatemala, Algeria, Morocco, El Salvador, Bolivia, Honduras, Vietnam and Swaziland.

All epidemiological data with oral health (DMFT-12) were obtained from the World Health Organization's Global Oral Epidemiology Bank database (8). Educational factors listed in Table 1, were obtained from Human Development Report 1995 (9). It was accepted that these factors reflect the educational levels of the countries.

Stepwise multiple regression technique was used in analyzing data. The DMFT index score for 12 years-old children was chosen as a dependent variable, and six educational factors were used as independent (explanatory) variables. Pearson's simple correlation coefficients were determined for each factor and no high correlation ($r > 0.7$) and multicollinearity problem were detected among variables (Table 2). Therefore, all independent variables were considered finally for inclusion in the regression model. All statistical procedures were performed using a computational program, SPSS® on an IBM® compatible personal computer.

RESULTS

Pearson's correlation coefficients among all variables were presented in Table 2. Two of 6 dependent variables showed significant correlation

with the prevalence of dental caries. These were percent of completing primary level rate and pupil-teacher ratio ($p<0.0001$ and $p<0.05$, respectively). An insignificant correlation was observed with regard to educational expenditure as gross national product and mean year of schooling with DMFT index.

Table III indicated that only one independent variable showed significant association with DMFT index for 12 year-old in relation to results of stepwise multiple regression analysis ($p<0.001$).

Table I. Educational (independent) and dental (dependent) variables.

Independent variables	Variable name	Min.	Max.	Mean	SEM
Adult literacy rate	ADULIT	35	99	82.33	1.95
Mean year of schooling	MEANYR	0.90	8.00	4.63	0.17
Pupil-teacher ratio for primary level	PUPTEC	12.00	41.00	25.71	0.87
Educational expenditures as of GNP %	EDUEXP	1.40	9.20	4.52	0.26
Primary enrolment ratio.	PRENRR	65.00	127.00	103.58	1.71
Percent of completing primary level.	CMPPRL	14.00	98.00	72.73	3.22
Dependent variable					
DMFT-12	DMFT12	0.50	8.30	3.04	0.25

Table II. Pearson's simple correlation coefficients among all variables

	ADULIT	CMPPRL	DMFT12	EDUEXP	MEANYR	PRENRR	PUPTEC
ADULİT	1.000	0.127	0.067	-0.026	0.599	0.248	-0.183
CMPPRL	0.127	1.000	-0.509 *	0.257	-0.077	0.134	-0.372
DMFT12	0.067	-0.509	1.000	-0.140	0.143	-0.064	0.275
EDUEXP	-0.026	0.257	-0.140	1.000	-0.252	0.042	0.061
MEANYR	0.599	-0.077	0.143	-0.252	1.000	0.142	-0.066
PRENRR	0.248	0.134	-0.064	0.042	0.142	1.000	-0.073
PUPTEC	-0.183	-0.372	0.275 **	0.061	-0.066	-0.073	1.000

Table III. Variables which entered and not entered into multiple regression equation

Variables in the equation				95 % Confidence Interval B	Beta**	t	P
Variables	B	S.E. B*					
CMPPRL	-0.042	0.010	-0.064	-0.021	-0.530	-4.055	0.0002
(Constant)	6.228	0.799	4.615	7.841		7.795	0.0000
Variables not in the equation							
ADULIT					0.147	1.125	0.267
EDUEXP					0.075	0.549	0.586
MEANYR					0.122	0.934	0.356
PRENRR					-0.015	-0.115	0.908
PUPTEC					0.101	0.702	0.468
F= 16.44, P=0.0002		Multiple R = 0.530	Adjusted R2 = 0.264				

* *Standart error of partial regression coefficient*
** *Standardized regression coefficient*

DISCUSSION

The results of present study confirmed that prevalence of dental caries seemed closely related to some educational factors. Analysis of Pearson's correlation coefficients showed that two educational factors were significantly correlated with DMFT index score (Table 2). These were percent of completing primary level and pupil-teacher ratio for primary school ($p<0.0001$ and $p<0.05$, respectively).

The stepwise multiple regression model revealed that only one explanatory variable was significantly associated with DMFT index. This was percentage of completing primary level. Other variables did not show a significant relationship (Table 3). Percentage of completing primary level was accounted for nearly 26% responsible for the DMFT index score in these countries (adjusted R square=0.264). There was a linear association between dependent and independent variables, so multiple regression model was used for analyzing these data ($F=16.44$, $p<0.001$).

Educational status may affect dental health with different ways. For instance, tooth-brushing instruction for 6-19 year-old students seems to be responsible for the reduction in the prevalence of dental caries all over Germany (10). Szczurek (11) suggested that instruction on preventive measures in dental caries had also ensured a significant improvement in dental hygiene in a short time. He concluded that there was an urgent need to intensify the educational-prophylactic procedures. On the contrary, Van Palenstein (12) found that school-based oral health education programs did not result in significant reductions in the clinical parameters

measured exclusively but, Yoshihara (13) concluded that school-based fluoride mouth rinsing programs for 4 to 14 years-old children appeared to have remarkable benefits from the prevention of dental caries. Percentage of completing primary level and quality of primary school education also had an important role in reducing the prevalence of dental caries. Taani (14) has showed that the necessity of treatment in public schools was higher than those in private schools. According to Decklerck (15), dental health education programs in schools should be kept ongoing and even be extended towards adolescents. High knowledge levels of dental health were associated with good oral health habits and low DMFT scores (16). It was shown that children whose mothers had low education exhibited a higher total DMFT score than those whose mothers had higher education (17). In addition to general primary education, dental health education was also important for prevention of dental caries. Especially, the teachers should be considered highly relevant key personnel in dental health education for children (18).

Methodological restrictions are generally contingent on the collection of valid and reliable data in worldwide cross-national surveys. In particular, statistics related to oral health in developing countries must be selected carefully.

In conclusion, the prevalence of dental caries appears to be higher in countries where the percentage of completing primary level is low. Results of present study suggest that the prevalence of dental caries should be considered particularly as an educational problem and should be evaluated from this perspective.

It is considered that establishment of a child dental care is a matter of urgency in schools and dental health education and primary health care services should be organized in order to improve the oral health of 12 years old children.

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