

Oral health and quality of life in Norwegian and Russian school children: A pilot study

Natalia Kuposova, Eeva Widström, Martin Eisemann, Roman Kuposov, Harald M. Eriksen

SUMMARY

Objective. To document the oral health status, to study oral health determinants and oral health-related quality of life among 12-year-olds from the Barents Euro-Arctic Region.

Material and methods. The study was conducted in Severodvinsk (North-West Russia) and Tromsø (Northern Norway). Two schools representing each region were selected and all 12-year-old pupils having obtained their parents' written consent were included (Severodvinsk n=48, Tromsø n=36). Background factors were collected by questionnaires. Oral health conditions, i.e. caries (DMFT/S), oral hygiene (OHI-S) and satisfaction with their own dental appearance were recorded under field conditions and possible associations between background factors and the children's oral health status were studied.

Results. Oral health was better among Norwegian than Russian participants. The most important factors explaining variation in oral health were country of origin and treatment (filling/no filling) received at the last dental visit. Among parental factors, education and oral health status were of importance. Oral health related quality of life (OHRQoL) was found to be related to oral health conditions.

Conclusions. Norwegian 12 year old pupils presented with better oral health than their Russian counterparts. Oral health is of importance for self-perceived quality of life.

Key words: Oral health, school children, quality of life, Barents region.

INTRODUCTION

Northern Norway, Sweden, Finland and North-West Russia named the Barents Euro-Arctic region represent Europe's largest region for inter-regional cooperation. The region consists of 5.5 million inhabitants, 3.9 in Russia and 1.6 in the Nordic countries in an area totalling 1.75 million km². In a global context Sweden, Norway and Finland are characterized as affluent societies with well-developed health care and educational systems and with the most fundamental prerequisites for health (peace, housing, education,

food, income and material resources) available for most citizens. This is opposite to Russia, a country that has undergone dramatic socioeconomic, political, and ideological changes during the last 20 years [1, 2]. In North-West Russia where the prerequisites for health care are not in place, the recent positive development in economy has neither exerted a major positive influence in demography nor improved health care [3, 4]. In addition, the northernmost regions in all these countries included in the Barents region have historically been less developed economically, educationally and as concerns employment status than the more southern parts [5]

School children's oral health status depends both on their own and parental attitudes and behaviour such as oral hygiene and eating habits [6]. In addition, parental education [7], socio-economic status [8] and other demographic and cultural characteristics have been shown of importance.

Assuming that both individual, cultural and economic factors as well as the oral health care system may explain differences in oral health in a region, it is

¹Institute of Clinical Dentistry, University of Tromsø, Norway

²Department of Psychology, University of Tromsø, Norway

³Center for Child and Adolescent Mental Health, Institute of Clinical Medicine, University of Tromsø, Norway

*Natalia Kuposova*¹ – PhD stipendiate

*Eeva Widström*¹ – Professor in Community Dentistry

*Martin Eisemann*² – Professor in Psychology

*Roman Kuposov*³ – Assoc. professor in Psychiatry

*Harald M. Eriksen*¹ – Professor and Head of Institute of Clinical Dentistry

Address correspondence to: Natalia Kuposova, Institute of Clinical Dentistry, University of Tromsø, 9037, Tromsø, Norway.

E-mail address: natalia.kuposova@uit.no

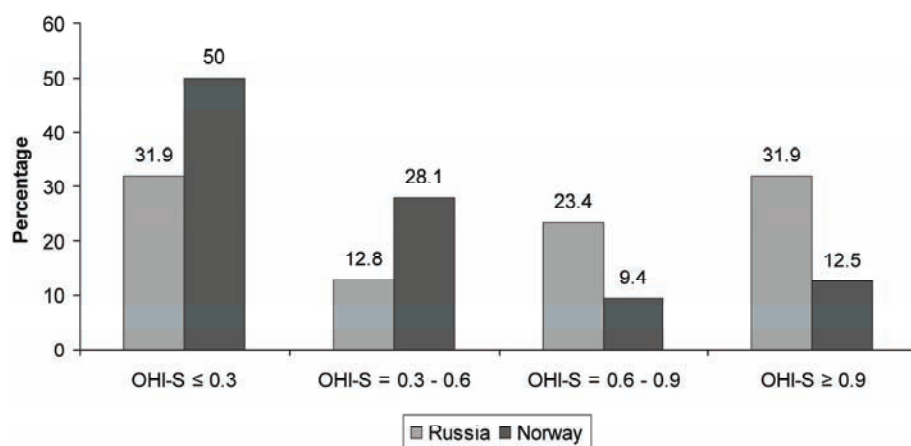


Fig. 1. Distribution of OHI-S values among Russian and Norwegian 12-year-old school children

appropriate to study determinants of school children's oral health in a cross-cultural context. This might be of relevance both for detecting individuals being at risk for oral diseases and for planning appropriate preventive strategies as well as improving dental care.

Oral health-related quality of life is another area that has attracted interest during the past two decades [9, 10]. Reduced oral-health-related quality of life has been found among children in Italy [11] and UK [12]. Studies are also indicating that the poor are the most vulnerable [13-15]. On the other hand, a study in 19-year-olds from Sweden did not show any oral health-related variation in self-perceived quality of life [16].

Accordingly, the aims of the present study were to document the oral health status, to study oral health determinants and oral health-related quality of life among 12-year-olds from the Barents region. A second aim was to generate hypotheses concerning oral health conditions to be tested in a more comprehensive oral health project that is in progress.

MATERIALS AND METHODS

Two schools representing a North-West Russian region and two schools representing a Northern Norwegian region were selected using a stratified cluster sampling procedure. Two classes from each school

Table 1. Mean numbers of decayed, missing and filled teeth and tooth surfaces and total DMFT/DMFS-scores per individual in Russian and Norwegian 12-year-old school children

	Russia (n=48)	Norway (n=36)	p-value	Russia (n=48)	Norway (n=36)	p-value
	Teeth Mean (SD)	Teeth Mean (SD)		Surfaces Mean (SD)	Surfaces Mean (SD)	
Decayed	2.1 (1.8)	0.1 (0.3)	<0.001	3.5 (3.4)	0.1 (0.3)	<0.001
Missing	0.1 (0.4)	0	>0.05	0.5 (2.4)	0	>0.05
Filled	1.1 (1.5)	0.4 (0.9)	<0.05	1.9 (2.9)	0.5 (1.1)	<0.01
TOTAL	3.3 (2.3)	0.5 (0.8)	<0.001	5.9 (5.1)	0.6 (1.1)	<0.001

were invited and subjects with a written consent from their parents included in the study. Forty-eight 12-year-olds from Severodvinsk (Arkhangelsk region, North-West Russia) (70% attendance rate) and 36 subjects from Tromsø (Northern Norway) (46% attendance rate) participated.

Information from the parents about socio-economic status, education, oral health conditions, the school dental service, satisfaction with oral care provided and their child's dental care habits was collected

using questionnaires constructed for the purpose. From the school children, information on family conditions, eating habits, general and dental health as well information on leisure activities was also collected by means of questionnaires. In order to collect information on oral health-related quality of life, the Child Oral Health Quality of Life Questionnaire (COHQLoQ) developed by Locker and co-workers [17] was used. In addition, a clinical investigation was performed including caries assessment using the DMFT/S index system according to the criteria of World Health Organisation [18] and level of oral hygiene using the Simplified Oral Hygiene Index (OHI-S) [19]. The clinical assessment of the dental status was carried out in a regular office using mirror and probe and a reading lamp as the light source by the first author (NK) who is a specialist in pediatric dentistry. Before initiating the study, clinical calibration and training sessions and validation of the questionnaires were performed at a public dental clinic in Tromsø.

The questionnaires used were translated from English both into Norwegian and Russian. The translation was performed by two independent translators following established guidelines including independent back translations [20]. Finally, another independent translator made back translations, which was further compared with the originals, and inconsistencies being analyzed and corrected.

The investigation was approved by the Ethical Committee of the Northern State Medical University, Arkhangelsk, Russia and by the Regional Committee for Medical Research Ethics of Northern Norway. Permission to perform the survey was also given by the Regional Department of Education in

Severodvinsk and from the schools included.

An analysis of reasons for non-attendance was not accepted by the Regional Committee for Medical Research Ethics of Northern Norway due to principles of protection of privacy and has therefore not been performed.

Data analysis

Data from the total material were analyzed using the Statistical Package for Social Sciences (SPSS-15.0). T-test was carried out to assess the differences in distribution of mean values for decayed, missing and filled teeth as well as total DMFT scores. Pearson's χ^2 test was used to study associations between the children's oral health status, oral hygiene and various self-reported characteristics from children and parents.

Binary logistic regression analyses were conducted separately for each variable in order to determine the associations between children's and parents' self-reported oral health related factors and the children's dental conditions according to the results of the clinical investigation. Odds ratios (OR), 95% confidence intervals (CI) and p-values (p) were calculated for establishing associations. Variables showing statistically significant associations with DMFT and OHI-S were subsequently included in the multiple logistic regression analysis in order to establish the predictive power of the variables for DMFT and OHI-S. A stepwise method with socioeconomic variables entered in the first step was implemented, variables on self-reported oral health status in the second step and finally with oral health attitudes and eating habits variables entered in the third step and

Table 2. Results of logistic regression analyses using caries experience as the dependent variable and selected independent variables

Variable	DMFT>0 n (%)	OR	95% CI	p-value
Country of origin				
Norway (ref)	10 (20)	#	#	#
Russia	41 (80)	15.2	5-45	<0.001
Gender				
Girls (ref)	23 (45)	#	#	#
Boys	28 (55)	1.01	0.4-2.4	>0.05
Family status				
Two parents, mother and father (ref)	35 (69)	#	#	#
One parent or other care taker	16 (31)	1.05	0.4-2.7	>0.05
Tooth brushing frequency				
More than once per day (ref)	30 (59)	#	#	#
Once per day or less	21 (41)	2.6	0.9-7	<0.05
Oral hygiene				
Good OHI-S≤0.6	24 (47)	#	#	#
Poor OHI-S>0.6	27 (53)	4.1	1.4-11.9	<0.01
Use of fluoride rinse				
Regularly (ref)	12 (25)	#	#	#
Irregularly/never	36 (75)	0.2	0.1-0.5	<0.001
How often do you eat breakfast during an ordinary week?				
Regularly (ref)	43 (84)	#	#	#
Irregularly/never	8 (16)	2.8	0.5-14	>0.05
Money spent on sweets per week				
0-3 € (<100 rub)	38 (78)	#	#	#
≥3 € (≥100 rub)	11 (22)	0.6	0.2-1.7	>0.05
Filling obtained during last visit to the dentist				
No (ref)	24 (49)	#	#	#
Yes	25 (51)	9.4	2.5-35	<0.001
Feelings about visit to dentist				
Relaxed (ref)	13 (26)	#	#	#
Somewhat concerned/tense/nervous/afraid	38 (74)	2.3	0.8-5.8	>0.05
Time spent in front of TV/PC				
<2 hours per day (ref)	33 (65)	#	#	#
>2 hours per day	18 (35)	1.2	0.2-2.3	>0.05

The percentage is indicating part of the original total sample.

Table 3. Results of logistic regression analyses using caries experience as the dependent variable and selected parental independent variables

Variable	DMFT>0 N (%)	OR	95% CI	p-value
Parental education				
≥12 yrs (ref)	18 (38)	#	#	#
<12 yrs	30 (62)	4.1	1.5-10.1	<0.01
Opinion on child's oral health				
Good	16 (33)	#	#	#
Moderate or bad	32 (67)	13.5	4.0-45.2	<0.001
Satisfaction with school dental service				
Satisfied (ref)	15 (32)	#	#	#
Not satisfied	32 (68)	6.1	2.2-16.8	<0.001
Estimation on own (parent) oral health				
Good (ref)	12 (25)	#	#	#
Bad	36 (75)	4.1	1.6-10.9	<0.001
Oral health problems during last 2 years				
No (ref)	7 (15)	#	#	#
Yes	41 (85)	4.8	1.7-14.1	<0.01
Number of teeth present				
≥25 teeth (ref)	33 (73)	#	#	#
<25 teeth	12 (27)	3.3	0.8-12.8	>0.05

The percentage is indicating part of the original total sample.

Table 4. Results of logistic regression analyses using oral hygiene as the dependent variable and selected independent variables

Variable	OHI-S> 0.6 N (%)	OR	95% CI	p-value
Country of origin				
Norway (ref)	7 (21)	#	#	#
Russia	26 (79)	4.4	1.6-12	<0.01
Gender				
Girls (ref)	11 (33)	#	#	#
Boys	22 (67)	2.4	0.9-6	<0.05
Family status				
Two parents, mother and father (ref)	19 (58)	#	#	#
One parent or other care taker	14 (42)	2.7	0.9-7.1	<0.05
Tooth brushing frequency				
More than once per day (ref)	18 (55)	#	#	#
Once per day or less	15 (45)	2.6	1.1-7	<0.05
How often do you eat breakfast during an ordinary week?				
Regularly (ref)	25 (76)	#	#	#
Irregularly/never	8 (24)	7	1.3-35	<0.01
Filling obtained during last visit to dentist				
No (ref)	16 (50)	#	#	#
Yes	16 (50)	2.9	1.1-7.7	<0.05
Money spent on sweets pr week				
0-3 € (< 100 rub)	23 (72)	#	#	#
≥3 € (≥100 rub)	9 (28)	0.2	0.1-0.6	<0.01
Feelings about visit to dentist				
Relaxed (ref)	9 (27)	#	#	#
Somewhat concerned, tense, nervous, Afraid	24 (73)	1.6	0.6-4.1	>0.05
Time spent in front of TV/PC				
≤2 hours per day (ref)	18 (55)	#	#	#
>2 hours per day	15 (45)	1.6	0.6-3.9	>0.05
Dental caries				
DMFT/S=0 (ref)	6 (18)	#	#	#
DMFT/S>0	27 (82)	4.1	1.4-11.9	<0.01

The percentage is indicating part of the original total sample.

Table 5. Results of logistic regression analyses using oral hygiene as the dependent variable and selected parental independent variables

Variable	OHI-S> 0.6 N (%)	OR	95% CI	p-value
Parental education				
≥12 yrs	13 (41)	#	#	#
<12 yrs	19 (459)	1.8	0.7-4.4	< 0.05
Opinion on child's oral health				
Good	15 (47)	#	#	#
Moderate or bad	17 (53)	1.5	0.6-3.7	> 0.05
Satisfaction with school dental service				
Satisfied (ref)	10 (32)	#	#	#
Not satisfied	21 (68)	3.1	1.2-7.9	< 0.05
Estimation on own (parent) oral health				
Good (ref)	7 (22)	#	#	#
Bad	25 (78)	3.3	1.2-9.1	< 0.05
Parents dental health problems last 2 years				
No (ref)	4 (12)	#	#	#
Yes	28 (88)	4	1.2-13.3	< 0.05
Number of teeth present				
≥25 teeth (ref)	22 (71)	#	#	#
<25 teeth	9 (29)	2.4	0.7-7.6	> 0.05

The percentage is indicating part of the original total sample.

Nagelkerke R² was calculated. All regression analyses were performed on the total sample.

RESULTS

The mean DMFS-scores among the school children were higher in the Russian than in Norwegian sample, 5.9 (SD 5.1) versus 0.6 (SD 1.1), respectively. Among the different components of the index system, the DS-part showed the greatest difference, 3.5 versus 0.1 (Table 1). Oral hygiene was also better among the Norwegian adolescents compared to their Russian counterparts (Fig. 1).

Regarding possible association between the child's oral health parameters and their background factors, a pattern as depicted in Table 2, emerged. There was a statistically significant association between prevalence of dental caries and country of origin, Norwegian versus Russian. Tooth-brushing frequency once per day or less, oral hygiene level and irregular use of fluoride mouth-rinse showed a statistically significant association with prevalence of dental caries (Table 2), while the use of fluoride-containing toothpaste did not significantly discriminate between the groups of subjects with and without dental caries. However, almost all participants used fluoride tooth-paste which may explain this lack of association. An association between types of treatment during last dental visit (filling/no filling) also seemed to have an impact. On the other hand, gender, family status, money spent on sweets, degree of fear for visiting a dentist and lack of physical activity (time spent on PC or TV) did not show a statistically significant association with caries prevalence (Table 2).

Parental factors showing the strongest association with variation in their children's dental caries status were level of education awareness of their child's oral health, the parents' own oral health, dissatisfaction with the dental health service and dental problems during the last two years (Table 3).

Regarding the children's report of factors related to oral hygiene, country of origin, gender, family status, tooth brushing habits, eating habits, and money spent on sweets were found to be statistically significantly associated with inferior oral hygiene level (Table 4). Operative treatment during the last visit to the dentist was also associated with oral hygiene levels, while dental treatment anxiety and physical inactivity were not associated with the children's oral hygiene level (Table 4).

A parental educational level of less than 12 years and parents' oral health were shown to be statistically significantly associated with the children's oral hygiene level (Table 5).

Regarding oral health-related quality of life, the Russian participants scored higher on most items, indicating inferior living conditions compared with their Norwegian counterparts (Table 6). When comparing quality of life with overall prevalence of dental caries and oral hygiene among all participants, children with dental caries scored significantly higher on emotional well-being (higher score indicating inferior condition). Statistically significant differences were also found for level of oral hygiene and functional limitations, emotional- and social well-being (Table 7).

Results of the stepwise logistic regression analysis implemented with school children's variables entered into the regression model demonstrated that at the first step the strongest association among socio-economic variables with variation in school children's dental caries was found to be country of origin (OR=7.5, 95% CI 1.9-29) (Nagelkerke $R^2=0.39$). When entering the oral health-related variables, filling obtained during last visit to dentist (OR=20.8, 95% CI 2.3-38) was found to be statistically significantly associated with dental caries with Nagelkerke R^2 increasing to 0.51. Finally, after entering eating habits variables into the model, regular eating at lunch time (OR=0.1, 95% CI 0.01-0.97) was found to be a statistically significant variable increas-

Table 6. Oral Health Related Quality of Life scores (mean \pm SD) related to oral conditions (higher scores indicate inferior condition)

	Russia, mean (SD)	Norway, mean (SD)	p-value
Experienced oral symptoms	5.2 (2.2)	5.8 (2.8)	>0.05
Experienced functional limitations	4.8 (3.8)	3.1 (4.1)	<0.05
Emotional well-being	5.8 (5.3)	2.8 (4.1)	<0.01
Social well-being	4.8 (5.1)	2.4 (4.1)	<0.05
Total score	20.2 (13.1)	14.2 (12.6)	<0.05

Subscale values and total scores among 12-year-olds from Russia and Norway are presented

Table 7. Oral Health Related Quality of Life scores (mean \pm SD) related to oral conditions (higher scores indicate inferior condition)

	DMFT=0 Mean (SD)	DMFT>0 Mean (SD)	p-value	OHI-s \leq 0.6 Mean (SD)	OHI-S>0.6 Mean (SD)	p-value
Experienced oral symptoms	5.6 (2.8)	5.4 (2.3)	>0.05	5.6 (2.7)	5.5 (2.3)	>0.05
Functional limitation	3.4 (4.1)	4.5 (4.0)	>0.05	3.2 (3.8)	5.1 (4.3)	<0.05
Emotional well-being	2.9 (3.9)	5.7 (5.4)	<0.01	3.3 (3.2)	6.8 (6.4)	<0.001
Social well-being	2.7 (3.7)	4.5 (5.3)	>0.05	2.3 (2.2)	6.1 (6.5)	<0.001
Total score	14.8 (10.7)	20.2 (14.3)	>0.05	14.4 (9.3)	24 (16.4)	<0.01

Subscale values and total scores among 12-year-olds from Russia and Norway are presented

ing the explained variance to 58%. This model fitted the data well with $\chi^2=40$, $df=3$, $p=0.001$.

Regarding the school children's oral hygiene level, we found that after entering socio-economic variables into the model at first step, oral health status variables at second step and eating habits at third step, country of origin (OR=4.2, 95% CI 1.4-13.3) and irregular eating in the morning (OR=7.6, 95% CI 1.3-45) were the only significant variables while oral health status variables were not remaining in the regression equation. The established model fitted the data with Nagelkerke $R^2=0.21$ ($\chi^2=11$, $df=2$, $p=0.003$).

Results of the stepwise logistic regression analysis implemented with parental variables entered into the regression model demonstrated that at the first step the strongest association with variation in school children's dental caries status was found to be parental education level (OR=4.1, 95% CI 1.1-15) (Nagelkerke $R^2=0.4$). When entering the oral health-related variables, parental description of their child's oral health condition (OR=8.5, 95% CI 2-36) and parental satisfaction with the dental health services (OR=6, 95% CI 1.5-24) were found to be statistically significantly associated with dental caries with Nagelkerke R^2 increasing to 0.46. By entering oral health attitudes into the model, time since last visit to the dentist (OR=0.1, 95% CI 0.02-0.7) was found to be a statistically significant variable increasing the explained variance to 53% (Nagelkerke $R^2=0.53$) ($\chi^2=36$; $df=4$; $p=0.000$).

Regarding the school children's oral hygiene level, we found that after entering into the model socio-economic and oral health related variables, we found that only parents' own oral health (OR=4.3, 95% CI 1.3-14) and parental concern about their child's oral hygiene habits (OR=0.3, 95% CI 0.1-0.9) were statistically significantly associated with oral hygiene levels. This model fitted the data acceptably well ($\chi^2=9$; $df=2$; $p=0.01$), explaining 17% of the variance (Nagelkerke $R^2=0.17$).

DISCUSSION

Clinical assessments and questionnaires were used in order to record oral health, oral health determinants and oral health-related quality of life among Norwegian and Russian 12 year old school children from the Barents region. The clinical part consisted of well-known assessment methods, DMFT/S [18] and OHI-S [19].

The questionnaires used for recording parents' and children's background factors were based on a variety of relevant documents and adapted to local conditions. The validity and reliability of the OHRQoL questionnaire used have been tested thoroughly by the original authors [17, 21].

The findings of this cross-cultural survey demonstrated a difference in dental caries depending on country of origin. The total DMFS-scores among Russian children was ten times higher (5.9 versus 0.6) than their Norwegian counterparts and the children from Russia presented with higher scores on all components of the dental caries index, i.e. decayed, missing and filled. There was not any Norwegian participant missing teeth due to dental caries (Table 1). The Russian participants also presented with inferior oral hygiene compared with the Norwegian children.

When considering the role of background factors, children and the parent variables showed in general a similar impact on the children's dental caries and oral hygiene status. This is in contrast to the findings by Wigen and co-workers reported in a recently published investigation on 5-year-olds from Southern Norway [22].

Country of origin [23], oral hygiene, tooth brushing frequency and type of treatment received (filling/no filling) at the last dental visit seem to play a role both for prevalence of dental caries and level of oral hygiene among the school children while gender, family status, dental anxiety and physical activity show no substantial impact (Table 2 and 4). An association between inferior oral hygiene, oral hygiene habits and dental health problems is well established [24, 25].

Among the parental factors, education [26, 27] oral health status and insight in their child's oral health condition seem to play a role. The results are in line

with socioeconomic disparities observed in North America where level of income and education rather than social class are used as indicators of socioeconomic position [28]. This pattern was confirmed by multiple logistic regression analyses.

Quality of life is increasingly acknowledged worldwide as a significant and appropriate indicator of dental service needs [10, 29]. Previous studies have demonstrated that a reduced OHRQoL may be associated with poor oral health and reduced access to care [12, 21]. Results from the present study indicate that reduced OHRQoL was a more common characteristic of subjects with dental caries and poor oral hygiene as well of subjects from Russia rather than from Norway. These associations can be that those suffering most from inferior oral health are found among the poor of all ages, leaving poor children particularly vulnerable [13], especially in countries lacking prerequisites for health care and limited access to dental care [14, 15]. The established findings on a relationship between decreased quality of life and dental caries and poor oral hygiene suggest that OHRQoL should be considered as an important indicator in comparative studies [30-32].

The findings from the present study suggest that Norwegian school children presented with better oral health than their Russian counterparts and that children's oral health-related habits are associated with their oral health conditions. Parental factors seem to represent important determinants of children's oral health. This points to the importance of parental monitoring regarding children's oral health habits as well their own oral health in addition to the development of appropriate dental care for the young population. Increased attention should be paid to oral hygiene habits which in our study were found to be associated with the parents' own oral health and concern about their child's oral hygiene habits. Insufficient oral hygiene may potentially put an individual at risk for decreased quality of life and dental caries and imposing costs both on the individual and societal level.

This work has the general limitations of cross-sectional studies precluding the possibility of revealing causal relationships. Small sample size and the lack of analysis of reasons for non-attendance are factors limiting the possibilities to draw definite conclusions. Even with these limitations, many traditional and well-known determinants of oral health were confirmed in the present study to be of relevance to 12 year olds in the Barents Region. In addition here are some associations documented that may create a basis for new hypotheses to be tested on a more extensive population sample from the Barents region expressed in the following conclusions.

CONCLUSIONS

- Nationality has an impact on oral health
- Parents oral health status and opinion on quality of the school dental care system has an impact on children's oral health
- Oral health has an impact on school children's perceived quality of life

- There is no association between consumption of sweets, dental fear, lack of physical activity and children's dental caries status

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