ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Prevalence of the Main Stomatological Diseases at Teenagers and Persons of Young Age.

A.B. Kulmirzayeva*, A.M. Yeslyamgaliyeva, D.B. Yegizbekova, A.A. Abdikarimova.

"Astana Medical University" JSC, Astana.

ABSTRACT

The research objective is to study the prevalence of the main stomatological maladies and pathological changes of the temporomandibular joint (TMJ) in teenagers and people of young age. Widespread presence of the main stomatological ailments in teenagers is one of the reasons of the pathology of Temporomandibular Disorders (TMD). Our results show that the magnitude of DMFT index causes TMJ pathologies ($p<0.05$), whereas presence of dentoalveolar anomalies (DAA) does not lead to TMJ pathologies ($p<0.05$). Comparison of caries intensity in groups of 12-, 25-, and 17-year olds did not identify any statistically significant differences in all comparison combinations between groups. Those diagnosed with TMJ pathologies had statistically significant higher level of DMFT and deft ($p<0.05$). Our study showed a weak (insignificant) connection between DAA and TMJ pathologies in all three age groups. The collected results point to the necessity of a more detailed study and development of prophylactic programs for caries and its complications in children and teenagers in Kazakhstan.

Keywords: caries, periodontal diseases, dentoalveolar anomalies, temporomandibular disorders, level of dental care (LDC).

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Caries and ailments of the periodontal tissues are among the most widespread diseases in teenagers (1-3). According to the latest statistical data in the Republic of Kazakhstan (RoK), stomatological diseases are found in 73.1% of urban children, and in 74.1% of children from rural areas. The percentage of children requiring dental debridement is 39% (4).

The prevalence of these diseases in teenagers is one of the reasons of TMD. The scientific literature on this subject is widespread and on the radar of many scientists. According to papers by the foreign colleagues, about 3-7 per cent of the population require treatment of TMJ. The frequency of TMD varies between 25 and 65 per cent, and 16-30 per cent in teenagers. TMJ dysfunction is the most frequent pathology, accounting for 70-89 per cent of all TMJ diseases (5-8).

MATERIAL AND METHODS

In accordance with the main objectives of the research we identified the subjects and formulated the observation unit.

Selection of the school and the institution as research bases was formed on the requirements of representation (average school students as well as first year students of a medical institution). On the selected bases we conducted a transverse cross-sectional research using continuous method. We examined and surveyed 377 teenagers and young people, who were split up in three sub-groups. The first group consisted of examinees of 12 years of age (136 people), the second group comprised of 120 15-year olds, and the third group - of 121 17-year olds. Oral cavity inspection was performed according to World Health Organization (WHO) recommendations (9-11).

In each case, we identified the indicators of stomatological disease spread and intensity, hygiene of the oral cavity, conditions of periodontal tissue (caries spread, DMFT and deft; index of hygiene Green и Vermillion (1964 r.), PMA). The existence of DAA and the needs in orthodontic treatment were diagnosed using the modified IOTN index, which is used in epidemiological research (Index of Orthodontic Treatment Need modified for use in Epidemiological Surveys: Modified IOTN) (12). TMJ was examined by palpation. The level of dental Care (LDC) was calculated using the following formula:

$$LDC = 100\% - (100 * \frac{(D + M)}{DMFT})$$

where: LDC - level of dental care, 100% - conditional maximum level of dental services to the population; D - number of untreated decayed teeth; M - the number of missing teeth, not restored with dentures; DMFT– caries intensity index (13).

In the process of the research we formulated the null hypothesis, which states that there is no correlation of the values of DMFT/DMFT+deft with:

- periodontal diseases
- DAA
- TM disorders
- Level of oral hygiene

The distribution to three groups was correct, and Student's criterion (t) was used for parametrical analysis.

Caries intensity was calculated using the Average arithmetic method, taking into account the age difference of the groups.

ISSN: 0975-8585

Statistical Analysis

Statistical data was processed using a personal computer with MS Windows Vista operating system. The software used included MS Office Excel 2007 and IBM SPSS Statistics 22.

Using the software we used the methods of descriptive statistics (finding the arithmetic Average, RMS deviation, variance, median values, modes, quartiles etc.) as well as methods of parametric statistics. Within parametric statistics methods, we used t-criterion for related and unrelated samples. Out of nonparametric methods in this work we used χ2-criterion. Graphical capabilities of the mentioned software solutions were used to evaluate the characteristics of initial data distribution. Significance level of less than 0.05 was regarded as substantial.

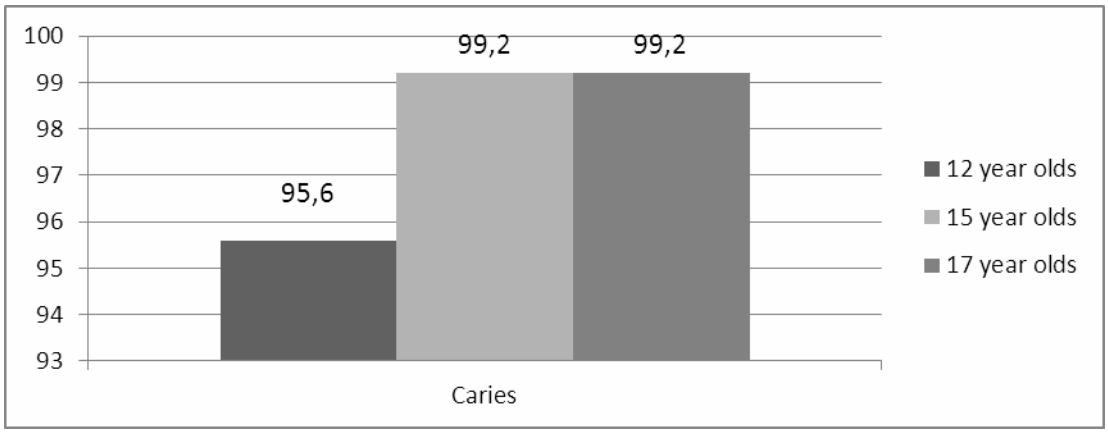
RESULTS

In the first group, the average indicator DMFT+deft was equal to 3.88 with a median of 4.0 and the standard deviation of 2.5. Minimum value was 0, and maximum - 12. In the second group, average DMFT was equal to 5.69, with a median of 5.0 and the standard deviation of 3.99. Minimum was 0, and maximum - 22. In the third group, average DMFT was equal to 7.77, median of 7.0 and the standard deviaiton of 4.74. Minimum was 0, and maximum - 30 (Table 1).

Table 1. Examinees distribution by groups

		1-st group	2-nd group	3d group
Number of examinees	Valid	136	120	121
	Disregarded	0	0	0
Average		3,88	5,69	7,78
Median		4,0	5,0	7,0
Standard deviation		2,50	3,99	4,74
Minimum		0	0	0
Maximum		12,0	22,0	30,0
Percentiles	25	2,0	3,0	4,0
	50	4,0	5,0	7,0
	75	5,0	8,0	10,0

Caries prevalence in the first group was 95.6±1.8 for every 100 examinees. In the second and third groups, the result was 99.02±0.8 caries prevalence for every 100 people examined (Picture 1).



Picture 1 - Caries prevalence by groups

Caries intensity on average made up 3.9±0.2 in the first group, 5.7±0.4 in the second, and 7.8±0.4 in the third group, which according to the WHO corresponds to “average”, “high”, and “very high” levels respectively (Table 2).

ISSN: 0975-8585

Table 2. Caries intensity by groups

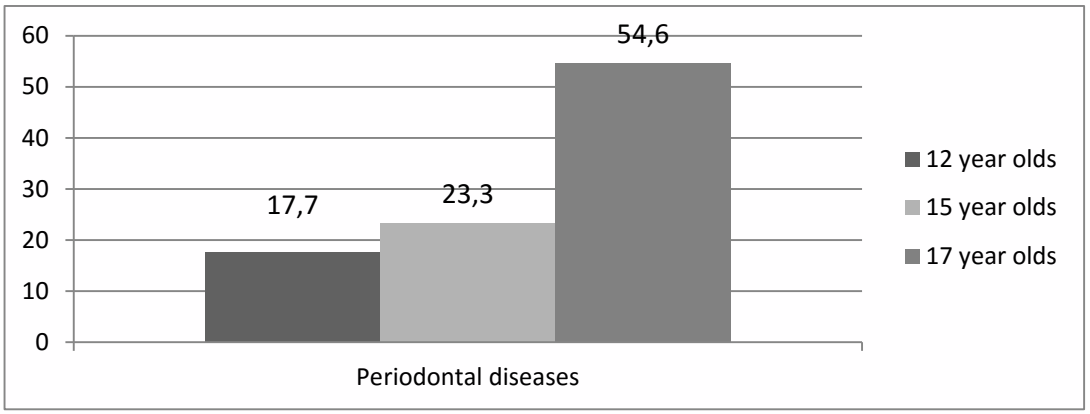
Indicators Groups	The arithmetic Average (M)	Standard deviation (±σ)	Error of Average (±m)	Confidence interval (CI)	
First	3,9	2,5	0,2	3,5	4,3
Second	5,7	4,0	0,4	4,9	6,5
Third	7,8	4,7	0,4	7,0	8,6

Comparing the results among the groups helped us to reveal significant differences in all possible combinations (Table 3).

Table 3. Significance of differences in caries intensity indicators in the researched groups

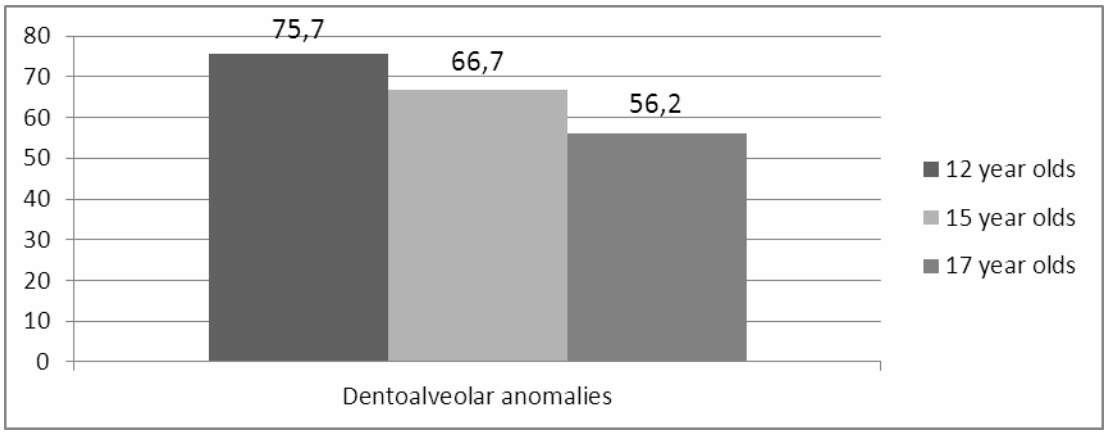
	M1	M2	M3
M1		<0,001	<0,01
M2	<0,001		<0,001
M3	<0,01	<0,001	

Periodontal diseases were diagnosed in 17.6±3.3 for every 100 persons examined in the first age group, and 23.3±3.9 and 54.5±4.5 in the second and third groups, respectively (Picture 2).



Picture 2 – Prevalence of periodontal diseases

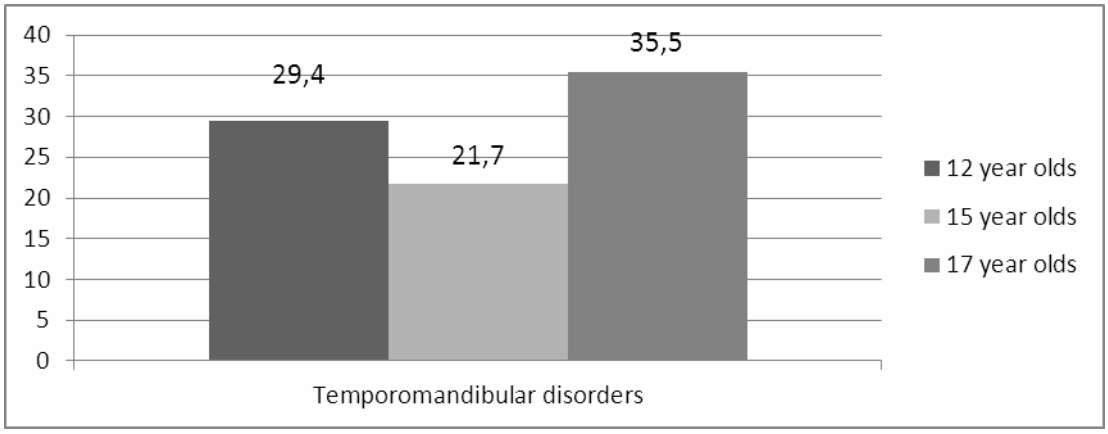
Prevalence of DAA by groups for every 100 people examined is as follows: 75.7±3.7 in the first group, 66.7±4.3 in the second, and 56.2±4.5 in the third group (Picture 3).



Picture 3 - Prevalence of DAA

ISSN: 0975-8585

Symptoms and signs of TMD were encountered in 29.4±3.9 people in the first group, 21.7±3.8 in the second, and in 35.5±4.4 in the third group, for every 100 people examined (Picture 4).



Picture 4 - Prevalence of temporomandibular disorders

Due to the high significance of difference (p) in the first group, the null hypothesis was confirmed in relation to DAA (p=0.2) and hygiene level (p=0.8), which underscores lack of relation of the above-mentioned indicators and the levels of «DMFT+deft».

The hypothesis has been refuted, however, for correlation of the level of «DMFT+deft» to existence of signs of periodontal diseases. That is, for those diagnosed with periodontal maladies, the level of «DMFT+deft» was significantly higher statistically, compared to those without any signs of periodontal diseases ($p<0.05$). Those who had signs of TMD also had a significantly higher ($p<0.05$) levels of «DMFT+deft» (Tables 4 and 7).

Table 4 - Statistically significant signs of the first group

Signs	Presence of signs	Occurrences (n)	Average of DMFT (M)	Standard deviation (± σ)	Standard error of the Average (± m)
Periodontal diseases	yes	24	5,4	3,1	0,63
	no	112	3,5	2,2	0,21
TMD	yes	40	5,2	2,8	0,45
	no	96	3,3	2,1	0,22
The first group in total		136	3,9	2,5	0,21

In the second group, we confirmed lack of correlation between indication of DMFT related to periodontal disease (p=0.05), DAA (p=0.7), hygiene levels (p=0.1). The null hypothesis has been refuted with regards to the relation of DMFT and TMD, which Averages that members of the second group who have TMD, statistically have much higher ($p<0,05$) level of DMFT when compared to the analogous indicators in people without such signs (Tables 5 and 7).

Table 5. Statistically significant sing in the second group

Sign	TMD	Occurrences (n)	Average of DMFT (M)	Standard deviation (± σ)	Standard error of the Average (± m)
DMFT	yes	26	7,92	4,31	0,84
	no	94	5,07	3,69	0,38

For the third group we confirmed no relation between the indicator of DMFT and periodontal diseases (p=0.02), DAA (p=0.2), and hygiene level (p=0.2). People examined in this groups and diagnosed with TMD

ISSN: 0975-8585

have statistically significantly higher ($p<0.05$) level of DMFT when compared to the same indicator in the group of people without the diagnose (Tables 6 and 7).

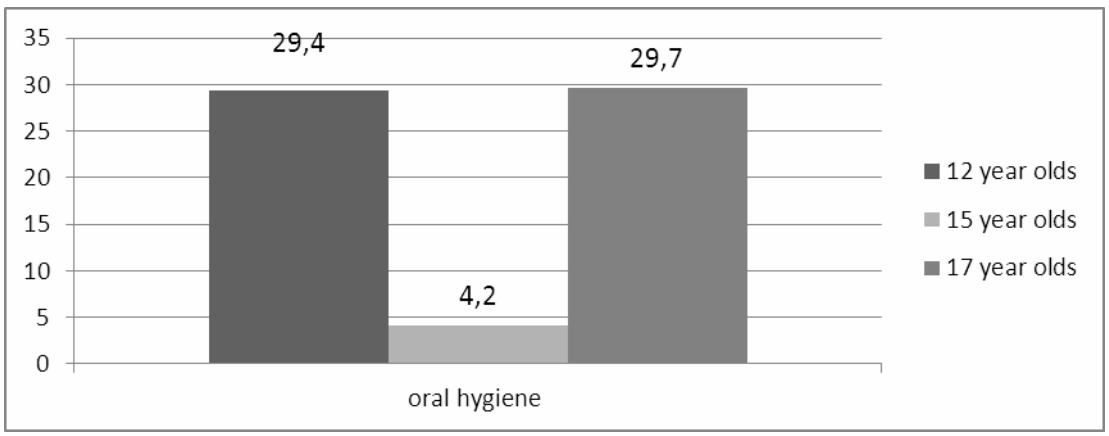
Table 6. Statistically significant sing in the third group

Sign	TMD	Occurrences (n)	Average of DMFT (M)	Standard deviation (± σ)	Standard error of the Average (± m)
DMFT	yes	44	9,64	4,32	0,65
	no	77	6,71	4,67	0,53

Table 7. Statistically significant dependence of signs for the groups

		Livigne dispersion equality criterion		t- criterion						
				t	St. bond	Significance P (2-sided)	Difference of averages	The standard error of the difference	95% confidence interval of the difference between the Averages	
		F	P value						Lower limit	Upper limit
First group DMFT+deft										
With periodontal diseases	1	4,37	0,04	3,44	134	0,001	1,86	0,54	-2,93	-0,79
	2			2,79	28,30	0,009	1,86	0,67	-3,23	-0,49
With TMD	1	2,81	0,1	4,11	134	0,000	1,83	0,44	-2,71	-0,95
	2			3,68	58,59	0,001	1,83	0,5	-2,83	-0,83
Second group DMFT										
With TMD	1	1,28	0,26	3,36	118	0,001	2,85	0,85	-4,53	-1,17
	2			3,07	35,77	0,004	2,85	0,93	-4,73	-0,97
Third group DMFT										
With TMD	1	0,01	0,94	-3,40	119	0,001	-2,92	0,86	-4,62	-1,22
	2			-3,47	95,48	0,001	-2,92	0,84	-4,59	-1,25
1. Dispersion equality is supposed 2. Dispersion equality is not supposed										

According to the results of the research, low level of knowledge on oral cavity hygiene in the first group was discovered in 27.9±3.8 people for every 100 examinees. In the second group the result was 4.2±1.8, and for the examinees in the third group the index of unsatisfactory oral hygiene was 29.7±4.2 (Picture 5).



Picture 5. Oral cavity hygiene results by groups according to Green-Vermillion index

DISCUSSION

High number of children suffering from caries became an object of scientists' interest, and the factors affecting prevalence of this pathology are confirmed by many studies (3, 14-23). While some scientists confirm that obesity increase chances of caries (14, 15, 17, 24), others conclude that obese children do not have higher risk of caries (25. 26). Inadequate control of glucose levels in blood and early stage of Type 1 diabetes may increase the risk of caries development. Another object of research was correlation of carious processes in oral cavity and cardiovascular diseases, chronic renal failure (16, 18, 21). Some studies looked at correlation of caries and DAA (27). Yet another research attempted to find correlation between lifestyle of children, in particular long hours watching TV, and carious processes in oral cavity (20). According to these studies, caries prevalence in children of school age is 60-90% (22, 23, 27, 28). Virtually 100% of the global population has caries (2, 29). According to Kazakhstani researchers, 62.6% of 12-year olds, and 70.1% of 15-year olds suffer from caries (30).

Our research results confirm high prevalence of caries in 12- and 15-year olds as well as young people (Picture 3). In the first group the number of people with dental fillings and untreated caries prevailed, which may serve as evidence of untimely or late treatment. That, in turn may be because of low availability of dental services as well as subpar development preventive measures.

Caries intensity on average (average DMTF) constituted 3.9±0.2 in the first group, 5.7±0.4 in the second, and 7.8±0.4 in the third group (Table 2). It was identified that there was a difference in all combinations, with the biggest significance ($p<0.001$) of the difference when comparing the second group to the other two (Table 3). According to the results of other studies the index of caries intensity was found to be in the range of 1,86 to 8 (2, 23, 27, 31-33).

According to the data of foreign researchers, periodontal diseases are found in 13-85% of teenagers (23, 28, 34-36), which confirms our own results (Picture 2). Teeth bleeding symptoms were found in 21.5-46% and dental plaque in 19.4-56% of the examines (37-39). The information about periodontal disease occurrence in RoK differs and constitutes 11% to 78%, bleeding symptom is found in 44.7%, and occurrence of the same symptom in combination with plaque in 22.6% of the examined (30).

From periodontal diseases found in the group of 12-year olds, chronic catarrhal gingivitis was the most frequent, which most likely was the result of inadequate oral hygiene and change of teeth. In the second group, the most frequent was edematous form of hypertrophic gingivitis, most likely caused by hormonal changes in teenagers. In the third group the frequent occurrence of beginning phases periodontitis was caused by inadequate oral cavity hygiene and untreated DAA. The main reasons causing development of periodontal diseases in teenagers are juvenile age, low social and economic status, low level of education, inadequate spread of dental services, low level of oral hygiene, smoking, psychological stress and genetic factors. Disease etiology is difficult to trace and this question was studied by many scientists. Some authors devoted their time to studying the effects of oral microflora on development of periodontal pathologies (40-43), others studied interrelation of periodontal diseases and carious lesions of hard tissues of teeth (44), yet others researched correlation with DAA (45). Genetic predisposition was noted as the main reason of development of periodontal diseases (46. 47).

Prevalence of DAA in teenagers, according to global data, varies between 6.5 and 96 per cent. Normal occlusion in teenagers was defined between 6.5%-35% (48-53). According to research conducted in Kazakhstan, DAA are found in 47.4-69% examined children (54), which matches our findings (Picture 3). Considerable number on DAA was comprised of the acquired deformations, occurring as a result of growth and development of jaw bones and during the period of changing occlusion. In the group of 17-year olds we found deformations that occurred as a result of teeth removal which was not timely compensated with dentures. High number of DAA in teenagers in Kazakhstan, in our opinion, has many causes connected to privatization of big networks of dental clinics, offering low number of dentists in rural areas, lack orthodontic services as part of dental care in polyclinics, lack of public awareness about the necessity of dental care and treatment, and low effort in preserving teeth.

The spread of clinical symptoms of TMJ dysfunction among population varies greatly (6% to 93%) (55, 56). 7% of teenagers were diagnosed with painful dysfunction of TMJ (57). According to some authors, 22% of

children and teenagers had one or more symptoms of TMD: 17% from the age of 11, to 24% at 19 years of age (58). The results in RoK show that 51.1% of children, teenagers and young people have various symptoms of TMD, with more frequent occurrences in females. DAA such as deep occlusion, dental crowding, crossbite, and progenic occlusion is found in almost a half (48.28%) of the examined who had any symptoms of TMJ anomalies (57, 59).

Lower number of TMJ pathologies in the second group, when compared to the first, serves as evidence of completion of the joint formation with formation of occlusion (Picture 4). However, increase in these symptoms in the third group may be caused by many reasons, and perhaps points to complications of DAA due to insufficient orthodontic treatment and significant loss of molar teeth and height of occlusion.

One of the objectives was to find out whether or not the index of DMFT and deft had any correlation to presence of the main stomatological maladies and whether it was connected to oral hygiene. In all three groups we identified statistically significant correlation of DMFT and deft with the presence of TMJ pathologies ($p<0.05$). That is, those examined with symptoms of TMJ pathologies had higher index of DMFT and deft (Table 7). Our study showed a weak (insignificant) correlation between presence of DAA and TMJ pathologies in all three age groups: $\chi 2 = 0,56; 2,97; 2,58$, respectively. This signifies that in all the cases, the value of criterion is higher that level of significance $p=0,05$.

Interrelation of main stomatological diseases has been studied by many researchers. Authors did not note any positive correlation between the pressure of occlusion and caries in physically challenged teenagers (27). Researchers found a weak correlation between TMJ dysfunction and need for orthodontic treatment (58). We analyzed prospective, longitudinal and retrospective studies, and they did not support occlusion having the main role in the development of problems with TMJ. In addition these studies confirm the hypothesis about multifactorial theory of origin of problems with joints (60).

According to the authors, 25% of the examined 12-year olds, 39% of 15-year olds (38), and 70% of 19-year old teenagers had low level (≥50%) of dental hygiene (34). 84.3% of 16-year olds and 83.7% of 18-year old teenagers cleaned their teeth at least two times per day (61). In our opinion (Picture 5), representatives of this group (well in their “transition period”) demonstrated better oral hygiene due to increased attention to one’s appearance. The representatives of the third group (first year university students), who in the process of adaptation to the new lifestyle, shift the importance of oral hygiene to the background.

LDC comprised 10.7% (insufficient), which in our opinion may be caused by high level of migration in Astana and inadequate coverage of dental care services (62, 63). The problem of inadequate dental care service availability is an important one, and requires appropriate measures. According to authors, 5.8% of teenagers aged 6-17 had some kind of stomatological complaint within the last 12 months (64). The authors also report a correlation between the lack of access to medical care and high level of caries and occlusal pathologies (2).

CONCLUSION

Widespread presence of the main stomatological ailments in teenagers is one of the reasons of the pathology of Temporomandibular Joint Disorders.

Our results show that the magnitude of DMFT index causes TMJ pathologies ($p<0.05$), whereas presence of DAA does not lead to TMJ pathologies ($p<0.05$). Comparison of caries intensity in groups of 12-, 25-, and 17-year olds did not identify any statistically significant differences in all comparison combinations between groups. Those diagnosed with TMJ pathologies had statistically significant higher level of DMFT and deft ($p<0.05$). Our study showed a weak (insignificant) connection between DAA and TMJ pathologies in all three age groups. The collected results point to the necessity of a more detailed study and development of prophylactic programs for caries and its complications in children and teenagers in Kazakhstan.

ACKNOWLEDGEMENT

The study was self-funded. No funding to declare.

ISSN: 0975-8585

CONFLICT OF INTEREST

The authors of this manuscript certify that they have no conflict of interest regarding this research.

REFERENCES

[1] Oh TJ, Eber R, Wang HL. Periodontal diseases in the child and adolescent. Journal of clinical periodontology. 2002;29(5):400-10.

[2] Aamodt K, Reyna-Blanco O, Sosa R, Hsieh R, De la Garza Ramos M, Garcia Martinez M, et al. Prevalence of caries and malocclusion in an indigenous population in Chiapas, Mexico. International dental journal. 2015;65(5):249-55.

[3] Gonzalez de Dios J, Monerris Garcia E, Ortega Pastor E, Quesada de la Gala C, Gomez Gomez R, Calpena Vera MT, et al. [Orodental hygiene habits in preadolescents and adolescents from 2 urban and 2 rural secondary schools]. Anales espanoles de pediatria. 1996;45(1):14-20.

[4] "KazContent" J. In Kazakhstan decreased dental diseases among the inhabitants of villages and towns. http://bnews.kz/ru/news/obshchestvo/v_kazahstane_snizilas_stomatologicheskaya_zabolevaemost_sredi_zhitelei_sel_i_gorIn. «BNewsKZ» - Breaking News Kazakhstan. 2014.

[5] Koltunov AV. Occlusal result of changes in the capsule of the temporomandibular joint. Abstract of the dissertation of the candidate of medical sciences from St Petersburg State Medical University named after academician IP, Pavlov. 2010:50.

[6] Panikarovskii VV, Grigor'ian AS, Petrosov Iu A. [Temporomandibular joint structural characteristics in children and adolescents normally and in pathology]. Stomatologiia. 1981;60(6):6-9.

[7] Volkov SI, Bazhenov DV, Semkin VA, Bogdanov AO. [Temporomandibular joint morphological changes in abnormal occlusion]. Stomatologiia. 2013;92(2):9-11.

[8] Pisarevskii Iu L, Belokrinitskaia TE, Khyshiktuev BS, Semeniuk VM, Kholmogorov VS. [Hormonal correction in combined therapy of temporomandibular joint dysfunction in women]. Stomatologiia. 2002;81(3):33-8.

[9] World Health Organization. Oral health surveys : basic methods. 4th ed. Geneva: World Health Organization; 1997. vii, 66 p. p.

[10] Organization WH. Oral health surveys: basic methods: World Health Organization; 1987.

[11] Education WHOECoDH. Dental Health Education: Report of a WHO Expert Committee: World Health Organization; 1970.

[12] Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. European journal of orthodontics. 1989;11(3):309-20.

[13] Leontyev VK, Pahomov GN. Prevention of dental diseases. 2006:416.

[14] Galkina Iu V, Gavrilova OA, Piekalnits I, Dianov OA. [Dental status in children and adolescents diagnosed with obesity]. Stomatologiia. 2015;94(1):57-8.

[15] Alm A, Fahraeus C, Wendt LK, Koch G, Andersson-Gare B, Birkhed D. Body adiposity status in teenagers and snacking habits in early childhood in relation to approximal caries at 15 years of age. International journal of paediatric dentistry / the British Paedodontic Society [and] the International Association of Dentistry for Children. 2008;18(3):189-96.

[16] Kelishadi R, Mortazavi S, Hossein TR, Poursafa P. Association of cardiometabolic risk factors and dental caries in a population-based sample of youths. Diabetology & metabolic syndrome. 2010;2:22.

[17] Larsson B, Johansson I, Hallmans G, Ericson T. Relationship between dental caries and risk factors for atherosclerosis in Swedish adolescents? Community dentistry and oral epidemiology. 1995;23(4):205-10.

[18] Larsson B, Johansson I, Weinehall L, Hallmans G, Ericson T. Cardiovascular disease risk factors and dental caries in adolescents: effect of a preventive program in Northern Sweden (the Norsjo project). Acta paediatrica. 1997;86(1):63-71.

[19] Miko S, Ambrus SJ, Sahafian S, Dinya E, Tamas G, Albrecht MG. Dental caries and adolescents with type 1 diabetes. British dental journal. 2010;208(6):E12.

[20] Zeng X, Sheiham A, Sabbah W. The association between dental caries and television viewing among Chinese adolescents in Guangxi, China. BMC oral health. 2014;14:138.

[21] Andrade MR, Antunes LA, Soares RM, Leao AT, Maia LC, Primo LG. Lower dental caries prevalence associated to chronic kidney disease: a systematic review. Pediatric nephrology. 2014;29(5):771-8.

[22] Silva AE, Menezes AM, Assuncao MC, Goncalves H, Demarco FF, Vargas-Ferreira F, et al. Validation of self-reported information on dental caries in a birth cohort at 18 years of age. PloS one. 2014;9(9):e106382.
[23] Szoke J, Petersen PE. [Oral health of 18-year-old adolescents in Hungary]. Fogorvosi szemle. 2001;94(5):185-90.
[24] Kopycka-Kedzierawski DT, Auinger P, Billings RJ, Weitzman M. Caries status and overweight in 2- to 18-year-old US children: findings from national surveys. Community dentistry and oral epidemiology. 2008;36(2):157-67.
[25] Sohn W. Obese or overweight children do not have a higher risk of dental caries. The journal of evidence-based dental practice. 2009;9(2):97-8.
[26] Alves LS, Susin C, Dame-Teixeira N, Maltz M. Overweight and obesity are not associated with dental caries among 12-year-old South Brazilian schoolchildren. Community dentistry and oral epidemiology. 2013;41(3):224-31.
[27] Vellappally S, Gardens SJ, Al Kheraif AA, Krishna M, Babu S, Hashem M, et al. The prevalence of malocclusion and its association with dental caries among 12-18-year-old disabled adolescents. BMC oral health. 2014;14:123.
[28] Biazevic MG, Rissotto RR, Michel-Crosato E, Mendes LA, Mendes MO. Relationship between oral health and its impact on quality of life among adolescents. Brazilian oral research. 2008;22(1):36-42.
[29] World Health Organization. Oral health. Geneva: World Health Organization; 2012.
[30] Aldasheva MA. Prevention of main dental diseases in children. study guide. 2004:144.
[31] Veerasamy A, Kirk R, Gage J. Epidemiology of dental caries among adolescents in Tamil Nadu, India. International dental journal. 2016.
[32] Nunez FL, Sanz BJ, Mejia LG. [Dental caries and early childhood development: a pilot study]. Revista chilena de pediatria. 2015;86(1):38-42.
[33] Baciu D, Danila I, Balcos C, Gallagher JE, Bernabe E. Caries experience among Romanian schoolchildren: prevalence and trends 1992-2011. Community dental health. 2015;32(2):93-7.
[34] Abrahamsson KH, Koch G, Norderyd O, Romao C, Wennstrom JL. Periodontal conditions in a Swedish city population of adolescents: a cross-sectional study. Swedish dental journal. 2006;30(1):25-34.
[35] Califano JV, American Academy of Periodontology--Research S, Therapy C, American Academy of Pediatric D. Periodontal diseases of children and adolescents. Pediatric dentistry. 2005;27(7 Suppl):189-96.
[36] Abid A. Oral health in Tunisia. International dental journal. 2004;54(6 Suppl 1):389-94.
[37] Antunes JL, Peres MA, Frias AC, Crosato EM, Biazevic MG. [Gingival health of adolescents and the utilization of dental services, state of Sao Paulo, Brazil]. Revista de saude publica. 2008;42(2):191-9.
[38] Vadiakas G, Oulis CJ, Tsinidou K, Mamai-Homata E, Polychronopoulou A. Oral hygiene and periodontal status of 12 and 15-year-old Greek adolescents. A national pathfinder survey. European archives of paediatric dentistry : official journal of the European Academy of Paediatric Dentistry. 2012;13(1):11-20.
[39] Li LW, Wong HM, Sun L, Wen YF, McGrath CP. Anthropometric measurements and periodontal diseases in children and adolescents: a systematic review and meta-analysis. Advances in nutrition. 2015;6(6):828-41.
[40] Timmerman MF, Van der Weijden GA, Arief EM, Armand S, Abbas F, Winkel EG, et al. Untreated periodontal disease in Indonesian adolescents. Subgingival microbiota in relation to experienced progression of periodontitis. Journal of clinical periodontology. 2001;28(7):617-27.
[41] Suda R, Kobayashi M, Nanba R, Iwamaru M, Hayashi Y, Lai CH, et al. Possible periodontal pathogens associated with clinical symptoms of periodontal disease in Japanese high school students. Journal of periodontology. 2004;75(8):1084-9.
[42] Shimomura-Kuroki J, Yamashita K, Shimooka S. Tannerella forsythia and the HLA-DQB1 allele are associated with susceptibility to periodontal disease in Japanese adolescents. Odontology / the Society of the Nippon Dental University. 2009;97(1):32-7.
[43] Ooshima T, Nishiyama N, Hou B, Tamura K, Amano A, Kusumoto A, et al. Occurrence of periodontal bacteria in healthy children: a 2-year longitudinal study. Community dentistry and oral epidemiology. 2003;31(6):417-25.
[44] Sioson PB, Furgang D, Steinberg LM, Fine DH. Proximal caries in juvenile periodontitis patients. Journal of periodontology. 2000;71(5):710-6.

[45] Shishinashvili TE, Tsagareli ZG, Khimshiashvili NB. [The importance of local and general factors in development of inflammatory periodontal diseases in children and adolescents]. Georgian medical news. 2012(211):18-22.
[46] American Academy of Periodontology-Research S, therapy C. Periodontal diseases of children and adolescents. Pediatric dentistry. 2008;30(7 Suppl):240-7.
[47] Nanaiah KP, Nagarathna DV, Manjunath N. Prevalence of periodontitis among the adolescents aged 15-18 years in Mangalore City: An epidemiological and microbiological study. Journal of Indian Society of Periodontology. 2013;17(6):784-9.
[48] Bugaighis I, Karanth D. The prevalence of malocclusion in urban Libyan schoolchildren. Journal of orthodontic science. 2013;2(1):1-6.
[49] Silva RG, Kang DS. Prevalence of malocclusion among Latino adolescents. American journal of orthodontics and dentofacial orthopedics : official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics. 2001;119(3):313-5.
[50] Proffit WR, Fields HW, Jr., Moray LJ. Prevalence of malocclusion and orthodontic treatment need in the United States: estimates from the NHANES III survey. The International journal of adult orthodontics and orthognathic surgery. 1998;13(2):97-106.
[51] El-Mangoury NH, Mostafa YA. Epidemiologic panorama of dental occlusion. The Angle orthodontist. 1990;60(3):207-14.
[52] Borzabadi-Farahani A, Borzabadi-Farahani A, Eslamipour F. Malocclusion and occlusal traits in an urban Iranian population. An epidemiological study of 11- to 14-year-old children. European journal of orthodontics. 2009;31(5):477-84.
[53] Peres KG, Frazao P, Roncalli AG. [Epidemiological pattern of severe malocclusions in Brazilian adolescents]. Revista de saude publica. 2013;47 Suppl 3:109-17.
[54] Dolgoarshinnyh AY. Development and implementation of the concept of providing free dental care for children's population in a predominantly non-public Health of Kazakhstan. Abstract of the dissertation of the doctor of medical sciences Sciences Moscow; Karaganda State Medical Academy and FGU "CNIIS and Maxillofacial Surgery". 2009:41.
[55] Barbosa Tde S, Miyakoda LS, Pocztaruk Rde L, Rocha CP, Gaviao MB. Temporomandibular disorders and bruxism in childhood and adolescence: review of the literature. International journal of pediatric otorhinolaryngology. 2008;72(3):299-314.
[56] Lin SL, Wu SL, Tsai CC, Ko SY, Yang JW. Serum cortisol level and disc displacement disorders of the temporomandibular joint. Journal of oral rehabilitation. 2016;43(1):10-5.
[57] Ibragimova RS, Bokaeva AM, Fedorov DE. The prevalence of functional disorders of the temporomandibular joint in children, adolescents and young adults. http://kaznmu.kz/press/2013. 2013.
[58] Spalj S, Slaj M, Athanasiou AE, Zak I, Simunovic M, Slaj M. Temporomandibular disorders and orthodontic treatment need in orthodontically untreated children and adolescents. Collegium antropologicum. 2015;39(1):151-8.
[59] Poveda Roda R, Bagan JV, Diaz Fernandez JM, Hernandez Bazan S, Jimenez Soriano Y. Review of temporomandibular joint pathology. Part I: classification, epidemiology and risk factors. Medicina oral, patologia oral y cirugia bucal. 2007;12(4):E292-8.
[60] Farronato G, Rosso G, Giannini L, Galbiati G, Maspero C. Correlation between skeletal Class II and temporo-mandibular joint disorders: a literature review. Minerva stomatologica. 2016.
[61] Kallestal C, Matsson L, Holm AK. Periodontal conditions in a group of Swedish adolescents. (I). A descriptive epidemiologic study. Journal of clinical periodontology. 1990;17(9):601-8.
[62] Committee on Statistics of the Ministry of national economy of Kazakhstan AcDoS. Migration of population. http://www.astana.stat.gov.kz/arkhiv-novostej-2014-god/1332-1419364800.html. 2014.
[63] Committee on Statistics of the Ministry of national economy of Kazakhstan AcDoS. About the demographic situation in Astana city. http://www.astana.stat.gov.kz/arkhiv-novostej-2014-god/1331-1419364800.html. 2014.
[64] Agaku IT, Olutola BG, Adisa AO, Obadan EM, Vardavas CI. Association between unmet dental needs and school absenteeism because of illness or injury among U.S. school children and adolescents aged 6-17 years, 2011-2012. Preventive medicine. 2015;72:83-8.