Periodontal Status Among Schoolchildren in the Republic of Moldova: A Cross-Sectional Study Using the Pathfinder Study Design

Leon Bilder*, Elena Stepco, Diana Unkuta, Harold Sgan-Cohen, Dror Aizenbud, Amir Bilder, Eli E. Machtei

* School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel
b Faculty of Stomatology, Public Institution, State University of Medicine and Pharmacy "Nicolae Testemitanu", Chisinau, Moldova
c Department of Community Dentistry, Hebrew University-Hadassah School of Dental Medicine, Jerusalem, Israel

ABSTRACT

Objectives: To screen a sample of Moldavian schoolchildren to establish their periodontal condition using the Pathfinder study design of the World Health Organization (WHO).

Methods: Two cohorts – 12- and 15-year schoolchildren – were screened in 12 schools around the country: four schools in the capital city; four more schools in two other larger cities (two schools in each city); and four village schools (one school in each village). In addition to demographic data, the periodontal parameters dental plaque, calculus and bleeding on probing (BOP) were collected. Periodontal pocket depth (PPD) was also measured but only in the cohort of 15-year-old schoolchildren. Measurements were recorded for the six Ramfjord index teeth.

Results: In total, 720 children were surveyed: 365 (50.7%) were 12 years of age and 355 (49.3%) were 15 years of age; 351 (48.8%) were girls and 369 (51.2%) were boys; 490 (68%) lived in an urban area and 230 (32%) lived in a rural area. Only 4.5% of 15-year-old children presented with a pocket depth of ≥3.5 mm. Children who lived in rural areas had higher plaque scores than children who lived in urban areas (64.8% vs. 54.1%, P = 0.007). In addition, children who lived in urban areas had significantly less calculus (P = 0.047) and shallower PPDs (P = 0.019). Deeper PPD was associated with higher PI and calculus scores.

Conclusions: Moderate-to-deep periodontal pockets were not uncommon in children in the 15-year-old cohort. Periodontal status was worse in children from rural areas than in children from urban areas. It is therefore suggested that an educational programme, together with preventive and interceptive protocols, should be adopted in early adolescence and especially in rural regions.

KEY WORDS:
Periodontal disease
Schoolchildren
Dental plaque
Calculus
Bleeding

Introduction

The 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions defined periodontal health as ‘the state free from the inflammatory periodontal disease’. Gingivitis is a reversible condition which can develop into non-reversible periodontitis.

Periodontitis is a chronic inflammatory multifactorial disease with progressive destruction of the supporting apparatus. Dental plaque is the primary aetiologial factor in gingivitis and periodontitis.

Periodontal disease among adolescents is usually characterised by gingivitis, but a small fraction of this population will exhibit periodontitis with non-reversible attachment loss. The World Health Organization (WHO) has recommended including 12- and 15-year-old children in epidemiological studies of oral health.

The prevalence and severity of periodontal diseases varies among different societies and geographical regions.
Therefore, regional data are needed in order to prepare population-based treatment strategies and training of professional manpower. To date, there is no adequate information on the periodontal health status of children and adolescents in the Republic of Moldova. The WHO has recommended ‘Pathfinder’ studies, focusing on epidemiologic surveys of small samples in different regions of observed countries.

The aim of the present study was to screen the periodontal health status of Moldavian schoolchildren using the WHO Pathfinder study design.

Material and methods

This investigation was conducted in full accordance with the World Medical Association Declaration of Helsinki and was approved by the Ethics Committee of the Chisinau State University of Medicine and Pharmacy ‘Nicolae Testemitanu’ in the Republic of Moldova (Helsinki approval No. 13/19).

The investigation was designed as a cross-sectional study according to WHO Pathfinder instructions. Sampling sites were chosen (numbers and locations) in accordance with guidance from local health administrators, to provide optimal representation of the population. Within each site and age cohort, school class clusters were randomly chosen by local administration.

The age cohorts were 12- and 15-year-old schoolchildren (grades 7 and 10), with children selected from schools in the following regions: Chisinau, the capital city (four schools); two other large cities (one school in each); and four small villages (one school in each).

The diagnostic criteria chosen were Plaque Index (PI), calculus (C), bleeding on probing (BOP) and periodontal pocket depth (PPD).

The following indices were recorded:

- PI (score 0–3).
- Modified calculus index: dichotomised (0/1).
- Modified BOP: dichotomised (0/1).
- Probing depth categories (measured in the 15-year-old cohort only): PPD was scored as 0 (pocket depth 0 to <3.5 mm), 1 (pocket depth ≥3.5 to ≤5.5 mm) and 2 (pocket depth >5.5 mm).

Measurements were taken from the Ramfjord index teeth: 16, 21, 24, 36, 41 and 44.

Prior to study commencement, a hands-on training session was performed for all examiners. The clinical training session began with full-mouth examination of 10 children, during which the ‘gold standard’ examiner demonstrated the protocols and highlighted the different elements of each indicator (PI, calculus index, BOP and PPD) selected to assess periodontal health. As per the WHO recommendation, examiners and recorders were calibrated and an interexaminer agreement (kappa level) of at least 85% was required.

The study was conducted between 12th January 2015 and 3rd May 2016 in the following localities: Bacioi, Balti, Chisinau, Hirbovet, Orhei, Oxentea and Soroca. Examinations were conducted using a WHO epidemiologic probe (CPITN-E) and plane mirrors, under good electric light, in classroom settings.

Table 1 – Demographic characteristics of the study population.

| Variables          | Participants n (%) |
|--------------------|--------------------|
| Age (years)        |                    |
| 12                 | 365 (51)           |
| 15                 | 355 (49)           |
| Gender             |                    |
| Female             | 351 (49)           |
| Male               | 369 (51)           |
| Habitation         |                    |
| Urban              | 490 (68)           |
| Rural              | 230 (32)           |

Statistical analysis included descriptive statistics as well as one-way analysis of variance (ANOVA) with Fisher’s LSD test and correlation analysis. IBM SPSS Statistics for Windows (Version 25.0, released 2017; IBM Corp., Armonk, NY, USA) was employed. A value of P < 0.05 was considered statistically significant.

Results

A total of 720, 12- and 15-year-old schoolchildren were examined. Three-hundred sixty-nine (51.2%) were boys and 351 (48.8%) were girls; 365 (50.7%) of these children were in the 12-year-old cohort while 355 (49.3%) were in the 15-year-old cohort. Among the total population, 490 (68%) resided in urban areas: 220 children lived in the capital city and 270 lived in two other cities. The remaining 230 (32%) schoolchildren lived in rural areas (Table 1).

A PI score of ≥1 was recorded among 57.5% of schoolchildren: there were no significant differences according to gender and age (Table 2). More than 20% of schoolchildren had calculus and 14.6% demonstrated BOP.

In the 15-year-old cohort, mean PPD scores ranged between 0 and 2. Only 4.5% of the 15-year-old children presented with a PPD score of ≥3.5 mm (i.e., a score of 1 or 2) and merely 0.22% had a PPD of >5.5 mm (i.e., a score of 2). We did not detect any differences according to gender or age for the other indices (calculus, BOP and PPD) (Table 2).

Children who lived in rural areas had better plaque scores than children who lived in urban environments (64.8% vs. 54.1%, P = 0.007). Children from urban areas presented less calculus (P = 0.047) and lower mean PPD scores (P = 0.019) than children from rural areas (Table 3).

Pocket depths of ≥3.5 mm were strongly and positively associated with the presence of calculus (OR = 6.64; P < 0.0001)

Table 2 – Mean clinical parameters of the study population.

| Variables          | Participants n (%) |
|--------------------|--------------------|
| PI (score 1, 2, 3) | 57.5               |
| Calculus (Yes)     | 20.4               |
| BOP (Yes)          | 14.6               |
| PPD (≥3.5 mm)      | 4.5                |

BOP, bleeding on probing; PI, plaque index; PPD, periodontal pocket depth.
and BOP (OR = 15.83, P < 0.001). The odds of schoolchildren from rural areas of having a PPD of ≥3.5 mm was 3.47 times greater than that of schoolchildren from urban areas (Table 4).

Discussion

This paper provides the first Pathfinder study data of the periodontal health status among adolescents in the Republic of Moldova. Overall, a rather low prevalence of plaque, calculus and BOP, and low PPD scores, were observed in this study population compared with recent studies in other countries. Botero et al. reported a low prevalence of periodontitis among children and adolescents in Latin America. An overall mean of 35% of these subjects exhibited gingivitis while <10% were diagnosed with periodontitis. By contrast, Zhang et al., in a survey of the periodontal status of 12-year-old Dai schoolchildren in China, reported that 93% of all children exhibited gingivitis.

Our results did not show a significant association between dental plaque score and gender or calculus and between gender and PPD. However, Furuta et al. in Japan, in 2013, Agbelusi and Jeboda in Nigeria, in 2006, and Levin et al., in the Republic of Georgia, in 2013, reported that male gender was a significant risk indicator for periodontal disease. Variation in the findings may reflect differences in the study populations, different design methods and different indices applied.

In the present study, the urban children presented with less plaque and calculus and lower PPD scores than rural children of the same age. This finding is in agreement with the results of several other studies. Vadiakas et al., in a similar epidemiological study, reported that adolescents living in urban dwellings had a significantly lower debris index and better periodontal health. Paolantonio et al., in a clinical and microbiological study, reported that the prevalence of Actinobacillus actinomycetemcomitans among adolescents living in rural areas (30.3%) was twice that found in urban populations (16.0%), irrespective of gender and age, and was statistically significant (P = 0.01). Differences in the oral microbiota between urban and rural schoolchildren might account for the higher PPD scores found among rural schoolchildren in the present study.

Low levels of dental plaque and dental calculus were found to be related to lower PPD scores. This is in agreement with other population-based investigations which suggested that a high level of periodontal disease is correlated with a low level of oral hygiene.

The small fraction (0.22%) of participants in our study with PPD >5.5 mm, is in contrast to Levin et al. and Elamin et al., who reported that PPD ≥5 mm was found in 20.1% and 8.2% of their study populations, 15 and 13–19 years of age, respectively.

The current sample size is large and this should lend credibility to the validity of the results. However, several limitations should be noted: the use of nondental settings for clinical examinations; that the Republic of Moldova is a multi-ethnic country; and that the political environment at the time when the study was performed prevented access to all territories and minorities.

Nevertheless, the findings of the present study should be used in the implementation of a national plan to prevent periodontal diseases, via changes in educational programmes, promotion of oral health behaviours and attitudes.

The European Workshop (2014) has suggested improving the oral health conditions among Moldavian schoolchildren by creating a suitable environment for dental care. In this process, it is necessary for the government to create and put into effect public oral health policies and strategies.

Conclusion

According to the findings presented in this study, rural schoolchildren in the Republic of Moldova exhibit higher prevalence and greater severity of periodontal disease than urban schoolchildren. An appropriate educational programme and manpower allocation should be directed primarily to rural regions of the country.

Acknowledgements

This study was supported by the Regional Development Programme of the International Association for Dental Research.

Conflict of interest

No competing interests were involved in this research.

Author contribution

Leon Bilder planned the study, and wrote the scenario and the first draft of the paper. He subsequently edited further drafts and the final version of the paper. Elena Stepco, Diana Unkuta and Amir Bilder contributed to creation of the
scenario and collected data. Harold Sgan-Cohen and Dror Aizenbud contributed to creation of the scenario and analysed the data. Eli E. Machtei contributed to creation of the scenario and to the writing of the paper.

REFERENCES

1. Chapple ILC, Mealey BL, Van Dyke TE, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: consensus report of workshop 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol 2018;89:S74–84.
2. Michaud DS, Fu Z, Shi J, et al. Periodontal disease, tooth loss, and cancer risk. Epidemiol Rev 2017;39:49–58.
3. Papapanou PN, Sanz M, Buduneli N, et al. Periodontitis: consensus report of workshop 2 of the 2017 World Workshop on the Classification of Periodontal and Periimplant diseases and conditions. J Clin Periodontol 2018;45:S162–70.
4. Loe H, Theilade E, Jensen SB. Experimental gingivitis in man. J Periodontol 1965;36:177–87.
5. Albandar JM, Rams TE. Global epidemiology of periodontal diseases: an overview. Periodontol 2000;2002:7–10.
6. World Health Organization. Oral Health Surveys. Basic Methods. 5th ed. Geneva: WHO; 2013.
7. Funieru C, Klinger A, Băicuş C, et al. Epidemiology of gingivitis in schoolchildren in Bucharest, Romania: a cross-sectional study. J Periodontal Res 2017;52:225–32.
8. Levin L, Margvelashvili V, Bilder L, et al. Periodontal status among adolescents in Georgia: A pathfinder study. PeerJ 2013;1:e137.
9. Botero JE, Rosing CK, Duque A, et al. Periodontal disease in children and adolescents of Latin America. Periodontol 2000;2015:34–57.
10. Zhang S, Xu B, Liu J, et al. Dental and periodontal status of 12-year-old Dai school children in Yunnan Province, China: a cross-sectional study. BMC Oral Health 2015;8:117.
11. Furuta M, Shimazaki Y, Takeshita T, et al. Gender differences in the association between metabolic syndrome and periodontal disease: the Hisayama Study. J Clin Periodontol 2013;40:743–52.
12. Agbelusi GA, Jeboda SO. Oral health status of 12-year-old Nigerian children. West Afr J Med 2006;25:195–8.
13. Giacaman RA, Bustos IP, Bazán P, et al. Oral health disparities among adolescents from the urban and the rural communities of central Chile. Rural Remote Health 2018;18:4312.
14. Kaur A, Gupta N, Baweja D, et al. An epidemiological study to determine the prevalence and risk assessment of gingivitis in 5-, 12- and 15-year-old children of the rural and the urban area of Panchkula (Haryana). Indian J Dent Res 2014;25:294–9.
15. Mishu M, Hubbard R, Haque S, et al. Gingivitis in Primary School Children of Bangladesh. Ibrahim Med College J 2009;3:71–4.
16. Vadiakas G, Oulis CJ, Tsinidou K, et al. Oral hygiene and periodontal status of 12 and 15-year-old Greek adolescents: A national pathfinder survey. Eur Arch Paediatr Dent 2012;13:11–20.
17. Paolantonio M, di Bonaventura G, di Placido G, et al. Prevalence of Actinobacillus actinomycetemcomitans and clinical conditions in children and adolescents from rural and urban areas of central Italy. J Clin Periodontol 2000;27:549–57.
18. Marques MD, Teixeira-Pinto A, da Costa-Pereira A, et al. Prevalence and determinants of periodontal disease in Portuguese adults: results from a multifactorial approach. Acta Odontol Scand 2000;58:201–6.
19. Levin L, Baev V, Lev R, et al. Aggressive periodontitis among young Israeli army personnel. J Periodontol 2006;77:1392–6.
20. Elamin AM, Skaug N, Ali RW, et al. Ethnic disparities in the prevalence of periodontitis among high school students in Sudan. J Periodontol 2010;81:891–6.
21. Hysi D, Eaton KA, Tsakos G, et al. Proceedings of a workshop, held in Constanta, Romania on 22 May 2014, on Oral Health of Children in the Central and Eastern European Countries in the context of the current economic crisis. BMC Oral Health 2016;1:69.