



## Scientific Research Report

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

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## 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  $\geq 3.5$  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.

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## 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’<sup>1</sup>. Gingivitis is a reversible condition which can develop into non-reversible periodontitis<sup>2</sup>.

Periodontitis is a chronic inflammatory multifactorial disease with progressive destruction of the supporting apparatus<sup>3</sup>. Dental plaque is the primary aetiological factor in gingivitis and periodontitis<sup>4,5</sup>.

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.

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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<sup>6</sup>.

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<sup>6</sup>. 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<sup>6</sup>.

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  $\geq 3.5$  to  $\leq 5.5$  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<sup>6</sup>.

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<sup>6</sup>.

**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  $\geq 1$  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  $\geq 3.5$  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  $\geq 3.5$  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 ( $\geq 3.5$ mm)	4.5

BOP, bleeding on probing; PI, plaque index; PPD, periodontal pocket depth.

**Table 3 – Mean number of teeth presenting plaque, calculus, bleeding on probing and probing depth  $\geq 3.5$  mm in participants from urban and rural areas.**

Variables	Participants (Urban, %)	Participants (Rural, %)	P value
PI (scores 1 + 2 + 3)	54.1	64.8	<b>0.007</b>
Calculus	18.4	24.8	<b>0.047</b>
BOP	15.5	12.6	0.305
PPD $\geq 3.5$ mm	2.6	8.3	<b>0.019</b>

Significant P values in bold.

and BOP (OR = 15.83,  $P < 0.001$ ). The odds of schoolchildren from rural areas of having a PPD of  $\geq 3.5$  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<sup>7,8</sup>. Botero et al.<sup>9</sup> 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.<sup>10</sup>, 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.<sup>11</sup> in Japan, in 2013, Agbelusi and Jeboda<sup>12</sup> in Nigeria, in 2006, and Levin et al.<sup>8</sup>, 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<sup>13–15</sup>. Vadiakas et al.<sup>16</sup>, 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.<sup>17</sup>, 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.<sup>16–18</sup>

The small fraction (0.22%) of participants in our study with PPD  $>5.5$  mm, is in contrast to Levin et al.<sup>19</sup> and Elamin et al.<sup>20</sup>, who reported that PPD  $\geq 5$  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<sup>21</sup>. In this process, it is necessary for the government to create and put into effect public oral health policies and strategies<sup>21</sup>.

## 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.

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## 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

**Table 4 – Logistic regression variables.**

	Sig.*	Adjusted OR	95% CI for EXP(B)	
			Lower	Upper
Habitation <sup>†</sup> Urban vs. Rural	0.019	3.47	1.23	9.79

EXP(B), exponentiation of the B coefficient.

\* Significant P values in bold.

<sup>†</sup> Habitation predicts periodontal pocket depth of  $\geq 3.5$  mm.

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.

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