

IMPROVEMENT IN THE DIAGNOSIS OF CHRONIC PERIODONTITIS IN CHILDREN

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ABSTRACT

The clinical development of periodontitis in children differs in many ways from the similar pathological process in adults. This is due to the fact that these processes take place in morphologically and functionally immature tissues, which are unable to respond adequately to the causative factors. Despite the fact that destructive periodontitis is less common, children are more likely to develop severe forms of periodontitis than adults. Chronic periodontitis is the cause of acute inflammatory processes in the maxillofacial region (abscess, phlegmon, lymphadenitis) in 85-98% of cases and is a manifestation of systemic and other dental diseases.

Key words: Chronic periodontitis in children, incidence rate, discriminant model.

INTRODUCTION

Chronic periodontitis occupies a key position among the dental diseases that represent not only a general medical problem, but also a social problem, characterised by a significant prevalence throughout the world. The prevalence of chronic periodontitis is now very high in different age groups. The increase in the incidence of chronic periodontitis in children is of particular importance. Many studies show that chronic periodontal disease is prevalent in children of all ages, reaching 80% to 88%. It has been found that the diagnosis of chronic periodontitis in children and adolescents is four times more common than is the diagnosis of chronic catarrhal gingivitis [6].

The clinical development of periodontitis in children has many differences from the similar pathological process in adults, which is connected with the fact that these processes take place in morphologically and functionally immature tissues, which are unable to react adequately to the causative factors [2]. Despite the fact that destructive periodontitis is less common, children develop severe

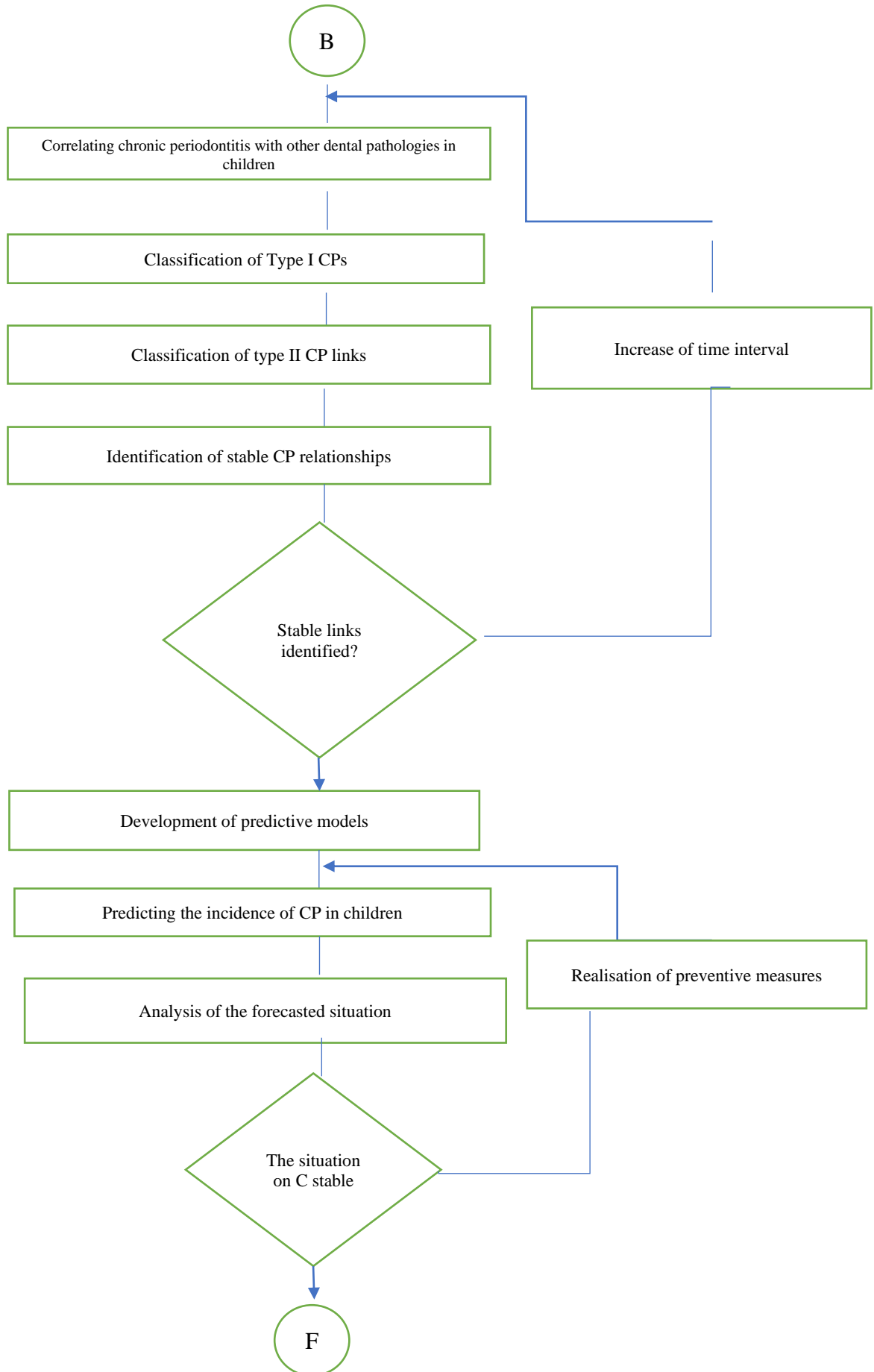
forms of periodontitis more often than adults [13]. Prepubertal and juvenile age is the time of onset for generalised and localised periodontitis in children [17]. Chronic periodontitis is the cause of acute maxillofacial inflammatory processes (abscess, phlegmon, lymphadenitis) and manifestation of systemic and other dental diseases in 85-98% of cases [14].

Methods of Research

An algorithm for studying the incidence of this pathology in children was developed to study the interrelations and predict the prevalence of chronic periodontitis in children (Fig. 1). The study of the morbidity and correlations of chronic periodontitis in children in Samarkand was carried out for the years 2021-2024 on the basis of official statistical data of the Department of Social Protection and Public Health of Samarkand. The overall volume of statistical monitoring for this period was 2801 cases of chronic periodontitis in temporary and prosthetic teeth. At the same time, 4375 cases of other dental diseases during the same years among the child population of Samarkand were included in the statistical analysis. The correlation method was used to analyse the relationship between chronic periodontitis in childhood and other dental pathologies. The correlation method, as it is known, can be reduced to the measurement of the closeness or degree of conjugation between different characteristics, as well as the determination of the form and direction of the existing relationship between them [1, 7]. Therefore, direct and inverse correlations have been observed when assessing the relationship between the incidence of chronic periodontitis and other dental morbidity in children. The correlation coefficient was calculated and the values obtained were analysed in order to measure the degree of conjugation between the characteristics (diseases) X and Y under consideration. Furthermore, the discriminant method has been used for the construction of mathematical models.

The mathematical models developed on the basis of the most informative indices of individual oral hygiene provide a high quality classification of the bio-objects of the first and second classes. The proportion of children with chronic periodontitis misclassified as practically healthy was 12.3%. In the classification of the practically healthy children, 12.5% of the patients with chronic periodontitis were wrongly included in the group of the patients with chronic periodontitis. The obtained results show that the developed discriminant models can be effectively implemented in the diagnostic process of detection of chronic periodontitis in a cohort of children. The calculated diagnostic sensitivity of the developed mathematical models for individual oral hygiene indices for the diagnosis of chronic periodontitis in childhood is 0.92, and the diagnostic specificity is 0.90

Fig.1. Algorithm of the study of the incidence of chronic periodontitis (ChP) in children.



Discussion

Diagnostic evaluation of individual oral hygiene based on the relevant indices in children suffering from chronic periodontitis revealed a worse condition compared to the control group (Table 1). For example, the ONI-S in the main group was in poor condition with a marked difference compared to the control group ($P<0.001$). The PMA index of the patients with chronic periodontitis was significantly higher than that of the control group, which is a clear indication of a poor state of oral hygiene. The same is typical for the index PI and the cariesogenicity of the dental plaque. Particularly significant differences were observed for plaque cariesogenicity. This value was several times higher in children with chronic periodontitis than in the main group ($P<0.001$).

Tab.1. Hygiene index in chronic periodontitis children (M±m)

Name of the hygiene index	Basic group	Control
OHI-S, %	2,5±0,01	0,8±0,02
PMA, %	48,6±0,7	9,2±0,4
PI, %	1,3±0,02	0,7±0,01
Cariesogenicity of plaque, %	82,5±0,8	9,3±0,2

The frequency of unsatisfactory hygiene indices was also higher in the main group (Table 2). The most frequent unsatisfactory condition of the PMA index is found in the children with chronic periodontitis. Unsatisfactory OHI-S and PI were found in a high proportion of the children. High cariesogenicity of plaque was found in more than half of the patients studied.

Tab.2. Distribution of children with chronic periodontitis according to inadequate oral hygiene indices (%)

Name of the hygiene index	Basic group	Control
OHI-S, %	61,2±4,3	0,5±0,7
PMA, %	66,4±4,2	1,2±1,0
PI, %	57,5±4,4	0,8±0,8
Cariesogenicity of plaque, %	52,7±4,4	0,9±0,9

Mathematical calculations to determine the informative parameters of hygiene indices in chronic periodontitis patients showed that the highest value corresponds to OHI-S (Table 3). In descending order of informativeness of individual hygiene indices is PMA, which took second place. The third position among the oral hygiene indices that have been studied is occupied by the PI. The cariesogenicity of dental plaque occupies the fourth position. It has a high informative value.

Tab.3. Significance of oral hygiene indices in children with chronic periodontitis

Name of the hygiene index	The informativeness of Kulbak	Ranking place
OHI-S, %	633,642	1
PMA, %	568,214	2
PI, %	526,339	3
Cariesogenicity of plaque, %	457,80	4

In the development of discriminant models to support decision making on the diagnosis of the pathology in question, the age of these hygiene indices was used. The discriminant model that has been constructed for patients with chronic periodontitis is as follows

$y_6 = 3,682x_7 + 1,215x_8 - 2,487$, где y_6 – patients with chronic periodontitis in the paediatric population x_7 – OHI-S, x_8 – PMA.

Discriminant function constructed from OHI-S and PMA indices for Practically Healthy group:

$y_5 = 7,816x_7 + 19,624x_8 - 31,358$, where y_5 - patients with chronic periodontal disease in the paediatric population x_7 – OHI-S, x_8 – PMA.

A high quality classification of first and second class bio-objects is provided by mathematical models developed according to the most informative indices of individual oral hygiene (Table 4). The proportion of children with chronic periodontitis misclassified as practically healthy is 12.3%. When classifying practically healthy children, 12.5% of patients with chronic periodontitis were wrongly included in the group of patients with chronic periodontitis. The results obtained show that the discriminant models that have been created can be used effectively in the diagnostic process for the detection of chronic periodontitis in a paediatric cohort.

Tab.4. Parameters of the Mahalanobis distance in the diagnosis of chronic periodontitis in children according to indices of oral hygiene

Code of trait	Observed	G 1:0	G 2:1
1	G 1:0	1,015	35,452
2	G 1:0	0,858	21,68
3	G 1:0	0,652	34,205
4	G 1:0	0,034	22,757
5	G 1:0	0,685	22,156
6	G 1:0	2,448	20,804
7	G 1:0	3,521	40,524
8	G 1:0	2,224	30,781
9	G 2:1	19,587	0,205
10	G 2:1	36,241	1,318
11	G 2:1	19,842	1,789
12	G 2:1	30,586	1,114

13	G 2:1	42,187	3,804
14	G 2:1	23,508	0,827
15	G 2:1	14,517	3,108
16	G 2:1	17,852	2,796

The calculated diagnostic sensitivity of the developed mathematical models on individual indices of oral hygiene for the diagnosis of chronic periodontitis of children was 0,92 and the diagnostic specificity was 0,90.

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