**UDC 616.314.4**

**A. Zh. Bakirova**

## GENERAL TRENDS AND FEATURES OF PERMANENT TEETH ERUPTION

Karaganda state medical university (Karaganda, Kazakhstan)

At certain age periods for the assessment of the biological age and morphofunctional state of the child's body, knowledge of the timing of the eruption of certain groups of teeth can be invaluable. Of great importance is the systematic study of the indicators of biological maturity among children at the population level, due to the diversity of the peoples of the region and climatic, geographical, socio-economic influences and environmental factors. Although there is a tendency to accelerate the change of teeth, the problems of lagging in teething remain significant, which is important in assessing the development of the child and public health.

*Key words:* eruption, permanent teeth, children.

In the aesthetic perception of man, a great role is played by beautiful teeth and the beauty of the external appearance of the individual, his self-confidence largely depends on the correct correlation of the dentition and his smile. Morphological features of the teeth in the period of permanent bite are the values determining the structure of the dentition, bite, facial skeleton in general, and, as a result, the appearance of the person, on which his psychoemotional state and social adaptation largely depends. Therefore, the prevention of major dental diseases (caries, periodontal pathology, dentoalveolar anomalies) is primarily aimed at creating a strong structure of the tooth tissues and periodontal tissues both during their growth and development, and after completion of this process.

Timely establishment of all deviations in the development of the dentoalveolar system from the norm and their prevention is impossible without a clear understanding of the laws of growth and development of the teeth and their age-related anatomical and physiological features.

In the development of permanent teeth T. F. Vinogradova distinguishes three main periods: 1) intramural dentition, 2) their eruption, 3) root growth and periodontal formation [56]. Along with other periods, the greatest interest in the studies of the most researchers is the period of eruption that provides the correct formation of the dentoalveolar apparatus.

Unfortunately, at the moment there is no clear definition of the notion of eruption of permanent teeth. Teeth should be classified as erupted by the recommendation of the Central Research Institute of Dentistry and Oral and Maxillofacial Surgery, if the gum area where the permanent tooth is supposed to be is lightened and a hard tooth is felt during probing [9]. The appearance of one cusp or cutting edge in the oral cavity, i.e. breakthrough gums, is considered an eruption from the point of view of a number of authors [13, 14, 15, 24]. According to the degree of crown eruption K. R. Kamalyan divides into the following: 1) in the oral cavity there are cusps of the lateral teeth or cutting edge of the front teeth, 2) the crown of the tooth is visible to the equator, 3) the entire crown was erupted (until touching the teeth with antagonists). It is worth noting that L. B. Belugina supplemented this method of assessing the tooth age, which improved the evaluation technique of eruption, making it more informative [3]. She introduced the integral and relative eruption index, the asymmetry index, where the determination of the degrees of eruption of permanent teeth was taken as a basis. Thus, although there is a huge number of ways, but there is no universal approach for assessing dental age.

Most researchers present data on the timing of eruption in a certain climatogeographical territory, as a result of which the indicators vary among different authors. To determine the physiological maturity of the body, doctors working with children (pediatricians and dentists) rely on the early, middle and late periods of dentition. There are such concepts as «dental» and «bone» age, which are compared among themselves, namely, the degree of calcification of highly mineralized tissues is determined. At the same time, the tooth age most accurately reflects the biological level of the development of the organism. But due to the fact that the teeth of permanent bite erupt and form only in a certain period, this method of determining the biological maturity of the body has a temporary limitation.

The results of studies on the timing of dentition are significant variations for each tooth separately. Ye. I. Goncharova (2014) believes that the full range of time in which the eruption of each tooth occurs is a long time – from 4 to 8 years. L. N. Katashinskaya (1972) points out that the eruption of certain teeth is prolonged for a

long time: fangs appear from 7 to 15 years, the second premolars – from 7 to 14 years [17, 27].

It is well known that biological development reflects the health of the child's organism as a whole. In the changing conditions of the habitat, the rate of individual growth and formation of the child's organism shows biological age, which is a proven fact [2, 5, 6, 33]. The average timing of eruption and the number of teeth of a permanent bite, height, changes in proportional relationships of the body, as well as the degree of pubertal development determine the biological maturity of the child's body.

Growth and development are closely interrelated processes, characterized by an increase in the mass of tissues due to an increase in the number and size of cells and their differentiation. The growth process is subordinated to three main factors: genetic, endocrine, trophic [17]. Also, the growth process is influenced by factors such as the environment and socio-economic factors [44].

The connection between the growth and development of the teeth with the growth and development of the whole organism is confirmed by the fact that the length indices and the number of perforated permanent teeth increase with age [8, 16].

Ye. I. Goncharova (2014) in her studies revealed that with the increase in the indices of physical development the number of erupted permanent teeth increases. In addition, the author established sexual dimorphism in the growth and formation of permanent teeth and general physical development in children: in boys, the growth and development of permanent teeth are slower than in girls [17].

When determining the level of biological maturity of an organism, various indicators deserve special attention in accordance with the child's passport age [29, 33]. It is known that in the younger school and preschool age the main criterion of the level of development of the body is the number of erupted permanent teeth on the upper and lower jaws. Change of teeth is a natural long process, during which the development of the child's organism takes place. Teeth eruption consists of two stages. The first stage is the eruption of the first permanent molar and both incisors. The second stage is the eruption of all other teeth. The follicle of the first permanent molar and incisor is laid in antenatally and, consequently, the parameters of tooth age are less susceptible to changes from external factors, in contrast to bone age. And for this reason, correctly reflects the level of biological maturity of preschool and primary school age children. V. G. Galonsky et al. (2012) believe that the dynamics of the height variation of the clinical crown of the permanent tooth will serve as the most appropriate indicator of the biological age for preschool and primary school children [14]. A. G. Vatlin (2005) and M. S. Kochetova (2009) indicate that, in comparison with other parameters, the most correctly reflect the biological age of children is the time of eruption of permanent first molars and central incisors [31, 54]. Thus, at certain age periods, knowing the timing of eruption of individual groups of teeth can provide invaluable help to assess the biological age and the morphofunctional state of the child's organism.

It is generally known that the indicator of biological development alone can not serve as an objective measure of the maturity of the child's organism [14, 29]. Due to the interdependence of all criteria for assessing biological maturity, the systemic approach is considered the most appropriate [20, 45]. L. A. Zolotaryova (2004) conducted a study of the parameters of height and weight in children and adolescents aged 5 to 14 years in the Republic of Udmurtia, the dental age was estimated. It has been established that belated periods of dentition are often observed in groups of children with a level of physical development low or below average, with a deficiency of body weight and disharmonization [60]. Data of L. B. Belugina suggest that there is a correlation between the timing of eruption of permanent teeth and such anthropometric parameters as body length, body weight, chest circumference, girth of the head and thighs, and height of the face. According to the researcher, the greatest number of correlations in individuals aged 5-7 and 12-14 years, since during these periods the first and second growth shifts occur respectively [3]. A. Al-Hadlaq et al. (2008) conducted a study in Saudi Arabia among male children aged 9-15 years, and using X-ray data, the connection between the eruption of the first premolar and the second molar of the lower jaw with the degree of facial skeleton maturity, the absence of significant difference between the dentition and bone age [26].

Physical development is one of the main indicators of child health. At the same time, data on the physical development of children are often local, therefore, general criteria for assessing physical development should be regional and compiled separately for children of different climatic and geographical zones and ethnic groups. (B. A. Nikityuk, 1972, 1985) [34].

Studying the status of physical development Ye. S. Bogomolova found that, although the

general characteristics of the process of growth and development of the child population remain, adverse changes occur in the morphofunctional development of children. This is expressed in the apparent disharmony of physical development. The number of children and adolescents with excessive body mass index increases, the frequency of hypertension and tachycardia increases. What can be described as adaptability beyond acceptable [6].

Growth rates and level of development of children and adolescents were not always the same in different historical periods, as evidenced by a large number of studies. Acceleration of all parameters of the maturity of a child's body has become the main trend of the biological development of a growing generation of the last century (up to the 80s) [23, 38]. Studies over the past decades show that acceleration processes at the population level are suspended. Although the indicators of biological development continue to grow in individual populations, in general, the acceleration is declining, and in some regions it is suspended, and even the phenomenon of deceleration is observed [32, 37]. There is an increase in the number of students with reduced body mass index, body length. There is also a decrease in physiometric and morphofunctional parameters, lagging pubertal development [11, 36]. The literature devoted to the problem of assessing the dental age of children and adolescents shows that the results of studies of the average terms of the eruption of permanent teeth differ significantly in the temporal aspect. According to the authors, who conducted a study among Indian children in the 50s – 80s of the twentieth century, the first molar at 6.5 years old began to erupt, and then the central incisor after half a year [35]. When examining London children, it was found that the first permanent erupting teeth are the first molars on average at the 7th year of life, followed by the central incisors [18]. Researchers in the Western Hemisphere analyzed trends in the eruption of each permanent tooth in 287 children in Oregon separately. The average term of eruption of the first permanent molar was 6.5 years. The sexual dimorphism of the process was indicated [4]. In the last decade of the twentieth century in India conducted a study among 1036 preschoolers and schoolchildren. Where it was found that the teeth on the lower jaw erupt first. On average when girls are 5 years old and boys are 4.9 years old [51]. At the beginning of this century, a large number of studies aimed at studying the timing of the appearance of permanent molars were conducted. Where it is noted that the first permanent teeth bite are the first permanent molars that come out at the age of 6 years, and then the central incisors are at the age of 7 years, the eruption begins with the lower jaw. Also sexual dimorphism observed [49, 55]. Ye. N. Polosukhina in her study, conducted in children and adolescents aged 5-14 years in Saratov, notes a tendency to acceleration. When the results of the study of the process of permanent bite teeth eruption in children of the same age in 2002 and 2007 were compared, it was established that the periods of eruption began to occur faster. More obvious indicators were among boys [43]. When the children of the Karaganda region were examined, it was found that 16.7% of boys and 24.5% of girls aged 14 years and 14.3% and 3.3% of persons, respectively, between the ages of 16-19 years, have a delay in the eruption of permanent teeth. compared with children from other regions of the former Soviet Union, which is explained by the author's as close proximity to the former nuclear test site [10]. The researches in which the secular trend was studying, conducted in the territory of the Eurasian continent and the United States, show that the process of eruption in children's population is heterogeneous. In order to obtain general trends and changes at the present time, it is important to continue a comprehensive study of the parameters of biological age at the interregional level and the level of a certain population.

According to A. K. Yatsenko and others who conducted the study among the children of Vladivostok, there is a link between the time of eruption of permanent teeth and the harmony of physical development, and its degree. It was found that among children with an average and above average degree of harmonious development, the rate of teething of permanent teeth is much higher than in the group with a low level of physical development. And there is a tendency to accelerate among preschoolers in the region again [59]. According to Ye. S Bimbas. (2016) children of primary school age of Yekaterinburg also has a tendency to an earlier change of teeth [4]. Fatih Oznurhan (2016) revealed an early eruption of premolars in children of Ankara, which is associated with the early loss of milk molars [41]. At the same time, the absence of the secular trend of maturation was revealed in children of Turkey [28]. According to some authors, the secular trend is explained by the presence of caries in the temporal bite, which is a strong predictor of the early eruption of permanent teeth [21, 25, 30]. Dealing with the influence of the secular trend on Finnish children, the earliest dates of the beginning of the teeth change and the late com-

pletion dates of those born in 1998-2002 compared to the group 1976-1985 were revealed, which increases the time period of active orthodontic treatment [47]. Against the background of a general acceleration of the time of eruption, there are problems of slow eruption, which is important in assessing the development of a child and public health [12]. That is, the data of modern studies show that the general tendency of teething of permanent bite in children and adolescents is heterogeneous and differs in each specific region.

It is known that the parameters of the biological age of the child's organism are determined hereditarily, but at the same time they are subject to great environmental influence. Also noteworthy is the fact that methods for estimating dental age developed in a particular region may not be suitable for assessing children living in other regions, such as the well-known method proposed by Demirjian, who conducted his work among the French population [53]. Recent studies aimed at studying the role of risk factors in teething permanent bite among children and adolescents show an increase in their adverse effects. L. B. Belugina emphasizes the convincing hereditary predetermination of the eruption process, since in the study of the relationship between this process and social, financial and living conditions, as well as environmental factors, it was not found [3]. At the same time it was found by L. A. Zolotaryova that definitely a strong influence on the indicators of dental age have such factors as: parental age, occupational hazards of spouses, addiction, the presence of chronic pathology and adverse pregnancy, the health of the baby up to one year and the type of feeding. The risk of irregularities in the eruption of permanent teeth increased significantly if the person suffered from diseases of the gastrointestinal tract in the first year of life [60]. According to M. S. Kochetova children from families of a prosperous social level experienced the eruption of permanent teeth faster compared to children from families of average and low social well-being. Thus, among the exogenous factors, a considerable impact is created by social, while regional and climatic factors lag behind in the degree of influence. Here are taken into account the living conditions, as well as the degree of financial expenses of the family for children. Similarly, the relationship was given to assessing the indicators of biological age with the state of health of the maternal organism, adverse factors in the period of early childhood [31]. In the works of other authors, there is also a connection between the timing of the eruption of permanent teeth in children and the level of financial well-being of the family: children had an earlier eruption in families with good income levels [7].

Children from a high socioeconomic class had earlier average periods of eruption of incisors of the upper and lower jaw compared with peers from another class in the study of Nigerian schoolchildren. Where also the earlier terms of eruption are generally found in comparison with children from other countries of the world (USA, Australia, Belgium, Iran), not taking into account Pakistan, where boys have an earlier eruption of premolars and the second molar of the upper jaw. However, the indicators of Nigerian children are ahead of those of more developed countries - USA, Australia [40].

A sufficient amount of work was aimed at studying the effects of lifestyle factors. In particular, the influence of the nature of food on the timing of the change of permanent teeth in children and adolescents [50, 57]. In a study conducted among Filipino schoolchildren, it was found that children with low body mass index had a delayed change of permanent teeth. In underweight boys, compared with boys of the same age, but with a normal weight index, it was determined one tooth less. However, in girls, the body mass index had no effect on tooth changes [24]. The Hai Ming Wong study in Hong Kong identified a direct link between body mass index (BMI) and the number of permanent teeth: among children who were obese, permanent teeth erupted earlier. As well as the influence of sociodemographic factors on the number of permanent teeth erupted: the higher such indicators as the level of education of parents and monthly income, the lower the average number of teeth erupted [52]. Also, the R. Šindelářová (2018) study highlights the significant difference in teething in children with an increased BMI. [48].

J. O. Alvarez noted the late change of central incisors and the first permanent molars with a lack of polypeptides in the diet in children in early childhood [1]. Weight at birth also affects the number of teeth erupted in children 12 years old in Hong Kong [58].

From the above, we can conclude that a systematic study of the indicators of biological maturity among children's population at the population level is of great importance, which is due to the diversity of the region's population and climatic, geographical, socio-economic influences and environmental factors. [3, 6, 14, 19].

Thus, today the question of studying regional and age peculiarities of tooth change in

children as the main indicator of a child's health and biological age is relevant. Biological development reflects the speed of individual growth, as well as the health of the child's body as a whole. Teething is in close connection with the general state of health, while more accurately reflecting age as opposed to skeletal development. Knowledge of the timing of the eruption of permanent teeth is important when creating and conducting programs and measures to prevent developmental pathologies of the child's body.

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Received 08.11.2018

*А. Ж. Бакирова*

*ТҰРАҚТЫ ТІСТЕРДІҢ ШЫҒУЫНЫҢ ЖАЛПЫ ҮРДІСТЕРІ ЖӘНЕ ЕРЕКШЕЛІКТЕРІ*

*Қарағанды мемлекеттік медицина университеті (Қарағанды, Қазақстан)*

Баланың денесінің биологиялық жасын және морфофункционалды жағдайын бағалау үшін белгілі бір жас кезеңдерінде белгілі бір топтардың тіс жарып шығуының уақытын білу баға жетпес көмек беру мүмкін. Балаларда популяция деңгейде биологиялық кемелденуі көрсеткіштерін жүйелі түрде зерттеу маңызы зор, ол аймақтың ұлттың алуан түрлілігіне және климатогеографиялық, әлеуметтік-экономикалық әсерімен және қоршаған орта факторларымен негізделген. Дегенмен, тістің жедел ауыстыруы үрдісі бар, артта жарып шығу мәселе маңызды қалады, бұл баланың даму және қоғамдық денсаулығын бағалау кезінде маңызды болып табылады

*Кілт сөздер:* жарып шығу, тұрақты тістер, балалар

*А. Ж. Бакирова*

*ОБЩИЕ ТЕНДЕНЦИИ И ОСОБЕННОСТИ ПРОРЕЗЫВАНИЯ ПОСТОЯННЫХ ЗУБОВ*

*Карагандинский государственный медицинский университет (Караганда, Казахстан)*

В определенные возрастные периоды для оценки биологического возраста и морфофункционального состояния детского организма знание сроков прорезывания отдельных групп зубов может оказать неоценимую помощь. Имеет большое значение системное изучение показателей биологической зрелости у детского населения на уровне популяции, что обусловлено многообразием народностей региона и климатогеографическим, социально-экономическим влиянием и факторами окружающей среды. Хотя существует тенденция к ускоренной смене зубов, остаются значимыми проблемы отставания в прорезывании, что важно при оценке развития ребенка и общественного здоровья.

*Ключевые слова:* прорезывание, постоянные зубы, дети