

Down syndrome

Ambarkova Vesna^{1*}, Ana Sotirovska Ivkowska¹ and Natasa Stavreva²

¹University St. Cyril and Methodius, Faculty of Dental Medicine, Department of Paediatric and Preventive Dentistry, Skopje, Republic of Macedonia

²University St. Cyril and Methodius, Faculty of Dental Medicine, Department of Prosthodontics, Skopje, Republic of Macedonia

Down syndrome (trisomy 21) is the most common autosomal chromosome aberration in human. The incidence of the syndrome varies in 1:700 and 1:1000 live births according to various studies, with 20% of cases. In aborted material proportion is even higher, with 60% of cases. While 20% of cases with Down syndrome are stillborn.

In these patients, there is a strong predisposition to cardiovascular disease, seizures [1], leukemia [2,3], infections with hepatitis B virus (especially within institutionalized men) [4], upper respiratory tract infections [5], Alzheimer's disease [6], obesity [7], thyroid diseases [8], cardiac anomalies [9] and obstructive sleep apnea [10, 11]. Disruption of the proteostasis network and accumulation of misfolded proteins occur as a result of an abnormality in the number of chromosome 21 [12]. Errors in protein homeostasis could contribute to the observed pathology and decreased cell viability in children with Down syndrome [13].

The systematic review and meta-analysis by Saghazadeh A *et al.*, conducted in 2016, concluded that findings of different micronutrient levels in people with Down syndrome raise the question whether these differences are related to the different metabolic profiles, the common comorbidities or merely reflect Down syndrome [14].

Clinical characteristics

The changes in body of the children with Down syndrome are manifest through the short stature, short legs and arms, slow skeletal maturation, poor muscle development, always with the presence of obesity, poorly developed male genitalia, short and wide neck, dry and rough skin, straight and smooth hair. The changes in the head and face are characterized by brachycephaly, microcephaly, undeveloped vertex bone (os parietale) of the skull that gives the appearance as if the back of the skull is flattened. Also nasal bones are hypoplastic, with flat nasal bridge. The combination of minor and major abnormalities characterize this syndrome that give typical phenotypic appearance of the head and face: hypertelorism, small and oblique eyes, spots on the iris, strabismus in 30% of patients, deformed and small ears. The limbs are short, the typical appearance of the hands with ruffle and short fingers and transverse crease on the palms present in about 80% of cases. Figure 1 (own material)

Oral manifestation

Open mouth with protrusion of the hypotonic and fissured tongue, macroglossia, hypoplastic upper jaw, short and hard palate, pseudoprognathic bite, delay eruption of the teeth [15], persistence of some deciduous tooth up to 15 years, the order of eruption of teeth is disturbed [16], hypodontia, microdontia, atypical form of dental crowns and taurodontism [17]. Also patients with Down syndrome can present periodontal disease, premature tooth loss, reduced salivary flow, crowding of teeth in both arches, and decreased occlusal vertical dimension. Increased frequency of periodontal disease, reduced

incidence of dental caries [18], often spilling of saliva from the mouth. In these patients, cleft lip, cleft lip and palate or palate only occurs 3 times more often than in the general population. The findings by van der Linden MS *et al.* showed that dental development in children with Down syndrome is similar to the development of control children and that a relationship exists between hypodontia and dental development [18,19].

Altintas NY *et al.* in their case report article emphasized that implant-retained overdentures with Locator attachment system could be good therapeutic option even for patients with Down syndrome. This therapy can be implemented only for patients with mild mental impairment. The prosthodontist, first of all have to educate patients and caregivers about importance of optimum oral hygiene and also carefully to select patients, which is essential for successful and safe implant treatment of Down syndrome patients [20]. Alqahtani NM *et al.* presented 44-year-old male patient with Down syndrome with moderate intellectual disability. The treatment approach of this patient with congenital and acquired tooth loss and significant occlusal discrepancies is used of a single dental implant [21].



Figure 1. Boy with Down syndrome (own material)

Correspondence to: Vesna Ambarkova, Ph.D., MSc, DDS, University St. Cyril and Methodius, Faculty of Dental Medicine, Department of Paediatric and Preventive Dentistry, Mother Theresa 17 University Dental Clinic Center Sv. Pantelejmon Skopje 1000, Republic of Macedonia, Tel: ++38970686333; E-mail: vesna.ambarkova@gmail.com

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Orthodontic treatment

Before starting of the implementation of the orthodontic treatment within the patients with Down syndrome, it is necessary to restore all decay teeth. If the patient is unable for clinical work, orthodontic treatment can be initiated with a mobile device [22], which usually carried extension of the upper jaw and, if necessary, "pull" of the front teeth due to the presence of the pseudoprognathia [23]. Treatment can be continued with a fixed appliance that compensates dental chains, regulates the placement of the teeth in the dental chains and adjust dental bite [24]. Of course, given that there is some degree of disability in these patients, we must often make trade-offs in the orthodontic therapy [25]. Miyazaki H *et al.* describe orthodontic treatment in a patient with Down's syndrome with unilateral cleft lip and alveolus. After surgical intervention and further mental and physical growth of the patient, the orthodontic treatment was indicated with multi-bracket. Reverse occlusion was corrected by labial inclination of the incisors [26].

Fakhrudin KS *et al.* from their clinical study involving 22 children with Down syndrome concluded that routine psychological (Tell-Show-Do) intervention along with visual distraction using video eyewear and use of CDS-IS (computerized delivery system-intrasulcular) system for anesthetic delivery is effective behavior management technique during invasive dental treatment [27].

Considering the great emotional, psychological and material goods that require such member of a family and the modest effects of the expensive therapy, enormous efforts to the prenatal diagnosis are invested nowadays [28-31]. Prenatal diagnosis of a mother who previously gave birth to a child with trisomy, and in women who give birth after the age of 35 years, significantly reduces the number of children born with the disease. However most of children with Down syndrome remain undetected prenatally.

Resently it's believed that with the analysis of certain ultrasonic parameters associated with the combination of determining α fetal-protein, estriol and β HCG (beta-chorionic gonadotropin) in the mother's blood at the 14th week of pregnancy can be assign degrees of urgency to certain group of pregnant women with the increased risk of delivering a child with trisomy 21. Kochova and its associates [32] considered that this group should undergo prenatal diagnosis by amniocentesis. In this manner 75-80% of pregnancies with a Down syndrome fetus can be detected.

Treatment

In the treatment of children with Down syndrome, the following health professionals are included: pediatricians, family medicine physicians, internists, pediatric dentists, but also the following specialists: a speech-language pathologist [33,34], a physical therapist, an occupational therapist and special education teachers play important role. The main priority of all centers for children with Down syndrome in the world is to provide adequate rehabilitation to these children and their training for independent survival.

Adults with disabilities in our country are employed at a significantly lower rate than adults without disabilities. The situation of the unemployed persons with disabilities is also similar in other countries of the world, even in the United States [33].

Today in many research centers all over the world, the potential pathological mechanisms that cause altered cell physiology in Down syndrome are still under exploration. We hope that they will contribute

to the design of better therapeutic strategies that will improve the quality of life [35] of people with Downs syndrome.

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