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DENTAL DIAGNOSTIC TECHNIQUES IN PAEDIATRIC ATIENTS WITH SPECIAL HEALTH CARE NEED

***Dr. Anshul Mogta Dr. Seema Thakurdr and Deepak Chauhan**

HP Govt Dental College and Hospital Shimla

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ABSTRACT

Paediatric population suffering of systemic pathologies and/or with different stages of disability are to be considered at high risk for dental caries development. According to recent guidelines for oral health prevention in childhood, individual additional strategies for a preventive care should be applied for these patients. Hence; we planned the present review to assess various diagnostic techniques used in paediatric patients with special health care needs.

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INTRODUCTION

Children with special health care need: Defining "disability" is complex and controversial. During the decades, several terminologies have been used for people with physical, intellectual or mental conditions who also require health care and services of a type or quantity beyond the common requirements: handicapped, special, exceptional, disabled, special needs. A person is considered disabled when a long-term mental or physical disorder or condition affects the ability of performing daily activities with a real difficulty, as well as consideration is paid to possible recurrences, progressive impairing conditions, cancer, HIV infection, multiple sclerosis, blindness and former suffering from disabilities. Recently, the main trend is to consider disability as the outcome of the interaction between the individual impaired condition and the environmental barriers (behavioral, social, physical, intellectual, etc.) that "limit their complete and effective participation in the society in relation to feeling different from all the others". Disparity in social acceptation and sustain are the main obstacles that should be avoided.

Corresponding author:* **Dr. Anshul Mogta
HP Govt Dental College and Hospital Shimla

In the UN Convention on the Rights of Persons with Disabilities, held in New York in 2006, the right of disabled people to be equal with other persons has been declared, along with "support for their specific cultural and linguistic identity, as well as for their signs language and deafs' culture" and "the right to get the highest standard of health without any kind of discrimination", whereas States should guarantee access – either social, professional and logistic – to sanitary services (Newacheck, 2000; Bethell, 2002; Bethell, 2005 and Lewis, 2005).

Children Who Do Not Take Food or Fluids Orally: Children who are unable to meet their fluid and nutritional needs orally and who depend on gastrostomy tube feedings are at significantly increased risk of poor oral health, particularly a build-up of tartar and subsequent gingivitis. The increased calculus formation that is seen in children who are primarily fed via a gastrostomy tube may result from the lack of normal clearance of the oral cavity that takes place when food is chewed and swallowed. Children with quadriplegic cerebral palsy often have increased periodontal disease as a result of poor oral hygiene, in part because of dependence on caregivers. The risk of dental caries is increased by enamel hypoplasia, poor nutritional status, and medicines that reduce

saliva or contain sugar. Children with oral dysphagia often pocket food and fluids, further promoting dental decay. Pureed foods may adhere to the teeth longer than regular foods. Gagging, choking, and reflux can expose teeth to acidic gastric contents. The lack of oral experiences and severe motor impairments can result in hyperactive bite and gag reflexes, which can interfere with not only oral hygiene but also with the dentist's access to the child's mouth (Lewis, 2007; Flores, 2013 and Fulda, 2013).

Children with Oral Aversion: Increasing numbers of children with oral aversions are being seen in pediatricians' and dentists' offices. Some children have developed oral aversions as a result of being born preterm and having had prolonged intubation and other noxious experiences to the mouth. Children with autism spectrum disorders often have oral aversions characterized by hypersensitivities to textures, smells, tastes, and colors, thus significantly limiting the foods they will eat. Resultant nutritional deficiencies can affect oral health. Deficiencies of vitamins A and C can result in poor healing and increased gum bleeding. Vitamin D deficiency can result in soft teeth. Malnutrition can affect the immune system and result in increased gingivitis and other oral infections. Preferences for soft foods can lead to increased food adherence to teeth. Oral aversion can interfere with oral hygiene such as brushing or flossing. Poor oral hygiene may be the most influential risk indicator associated with new caries in children with autism. Children with oral aversion may need to be sedated or be provided general anaesthesia so that dentists can adequately examine, clean, and restore their teeth (Lewis, 2009).

Children with Functional Limitations in Self-care

Self-care skills in children with intellectual disability and neurodevelopmental disabilities are compromised because of delays in motor and cognitive abilities, which leads to an increased reliance on others for health and oral health care activities. Children with functional limitations in self-care are at increased risk of dental caries and periodontal disease as a result. It is not uncommon for children with intellectual disability to also have oral aversions and to have behavioural problems in the traditional dental office setting. Behavioural problems create an additional barrier to care, because parents are hesitant to bring the child to the dentist and because many dentists are not comfortable managing difficult behavior (Fulda, 2013). Children with Down syndrome have dental issues similar to those in other children with intellectual disabilities, but in addition, they are more likely to have crowding of teeth, making it more difficult to perform oral hygiene, and are more susceptible to periodontal disease. Because there is a large range in the functional status of children with Down syndrome, generalizations about behaviour in the dental office have minimal value. There is the perception that children with Down syndrome are at decreased risk of dental caries, possibly because of factors related to salivary function; however, scientific evidence is lacking (Lewis, 2009).

Children with Craniofacial Anomalies: Children with structural anomalies of the face and mouth (eg, cleft lip, cleft palate, Crouzon syndrome, Apert syndrome, and Pierre Robin sequence) frequently require multiple surgeries and experience disturbances in dental and speech development. They may have extra teeth located in or around the cleft, missing teeth, or malformed teeth. The position of the teeth can make it difficult to thoroughly remove plaque and increases the risk of dental caries. In addition, these children often have oral aversions and resist home oral hygiene activities. Orthodontic care is commonly required to correct dental malocclusions in these patients, and orthodontic appliances significantly increase the risk of dental caries. Failure of palate repair and bone grafting is more likely in the presence of unhealthy gingival tissues, making oral hygiene particularly important in these children (Lewis, 2005). One example of a disorder with craniofacial anomalies is Goldenhar syndrome. Children with Goldenhar syndrome have distinctive clinical features, including mandibular hypoplasia, facial asymmetry, vertebral anomalies, microtia, and central nervous system anomalies. In some cases, cleft lip and palate are present, and the oral manifestations can range from malocclusion to complete lack of the mandibular ramus. Intellectual disability is also a common finding in children with Goldenhar syndrome, and therefore their ability to perform oral hygiene and other self-care activities is compromised. Also, because children with Goldenhar syndrome can have limited oral opening and/or a malocclusion, oral hygiene is more difficult, putting them at increased risk of both dental caries and gingivitis (Lewis, 2005).

Children with Chronic Dental Erosions Secondary to Maladaptive Behaviours

Children with neurodevelopmental disabilities may have increased maladaptive behaviours that can affect oral health, such as bruxism (teeth clenching or grinding) and repetitive biting on non food objects. However, there is little information in the literature on these issues, especially biting on non food objects. One study showed significantly more physical signs of bruxism in children who had autism spectrum disorders. Bruxism is more common during sleep and is one of the most common sleep disorders. Bruxism can result in occlusal trauma, such as abnormal wear patterns and even teeth fractures. It can result in gum recession and tooth loss. Some risk factors for bruxism are common in individuals with disabilities such as sleep disorders and malocclusion. The usual approaches to bruxism that require the ability to cooperate with and tolerate appliances may not be successful (Liao, 2010). Oral symptoms may be the first or only manifestation of a mental health problem e.g. facial pain, preoccupation with dentures, excessive palatal erosion or self-inflicted injury. Burning mouth syndrome includes anxiety and depression as an aetiological factors (Mayer, 2004).

Adequate maintenance of the oral cavity in most individuals is dependent on effective brushing and this in the mentally handicapped people is a tough task and also the natural cleansing by the oral musculature may be impaired. The poor oral hygiene leads to periodontal problems and dental caries. In the study decayed teeth were seen in 79.2% of the individuals (Sallis, 2008). Most studies assessing oral health status among people with mentally handicapped subjects reported poor periodontal status which is in accordance with the findings of this study, in the present study the maximum number of study subjects were reported to have calculus 39 (54.2%) followed by bleeding 23 (31.9%) which is due to improper cleaning of teeth, maximum numbered the subjects didn't used tooth brush to clean their teeth while 25% of the subjects were found to have periodontal pocket of 4-5mm (Van Cleave, 2006). This diverse and changing population

experiences similar oral and dental problems, and barriers to oral health as the general population. Whether institutionalized or in the community, they are entitled to the same standards of care as the rest of the community. There is a complex interrelationship between socio-economic factors, illness, its treatment and oral health. Cost and fear are the most commonly cited barriers to dental care. Illness whether physical or mental may lead to deterioration in self-care, and oral care may already have a low priority. Risk factors are inter-related and are often barriers to oral health. It is important to ensure that individuals have sufficient information and support in order to live independent lives including oral self care and access to appropriate dental care services (Vichayanrat, 2012). It was observed that three subjects had the habit to consume tobacco (chewable form) as stated by the warden of the institute, it was stated that steps are being taken and one of the subject had already stopped the habit. This habit it very rapidly developed from the peers, same is the condition in this study seeing the things the institute authorities started tobacco counseling of the subjects so that no other subject develop the habit (World Health Organization, 2008). Many dentofacial anomalies were also observed such as high arched palate, malocclusion, delayed eruption of teeth, macroglossia and abnormal TMJ movements all these factors collectively leads to poor periodontal health and a cause of dental caries. Lymphadenopathy was observed in 76.3% of the subjects followed by Malocclusion (62.5%) (World Health Organization, 2008). Griffiths J showed 44.3% of malocclusion. Abnormal TMJ movement was observed in 13.8% of the subjects whereas in the study carried out by Bhowate R et al., 35.7% of the subjects had abnormal TMJ movements it may be due to hypotonia and hyperextensibility of joints uncoordinated and uncontrolled movements of jaw (Yu, 2009). General and oral health of these special group children has always been neglected, steps should be taken to provide basic medical and dental care facilities. More of such studies should be carried out so that the problem which these children are facing can be brought into limelight and they can be met with seriousness. Dental facilities such as oral prophylaxis, periodic screaning for dental caries, restoration for decayed teeth should be provided regularly. Special oral health programs to motivate and educate the children and their guardians should be carried out at regular intervals (Yu, 2009).

Computer aided advanced diagnostic techniques: The use of Computer-aided diagnosis (CAD) of disease is well-established in medical radiology, having been utilized since the 1980's at the University of Chicago and other medical centers for assistance with the diagnosis of lung nodules, breast cancer, osteoporosis and other complex radiographic tasks (McCubbin, 1983). A major distinction has been made in the medical community between automated computer diagnosis versus computer-aided diagnosis. The main difference is that in automated computer diagnosis, the computer does the evaluation of the diagnostic material, i.e., radiographs, and reaches the final diagnosis with no human input. In computer-aided diagnosis; both a medical practitioner and a computer evaluate the radiograph and reach a diagnosis separately. Depending on the practitioner's confidence level, he or she will then either make the final diagnosis or use the computer's diagnosis, if it is different from the practitioner's (McPherson, 1998). The Logicon® system (Carestream Dental LLC, Atlanta, GA) is an example of CAD caries detection technology[100]. The software contains within its database, teeth with matching clinical images, radiographs and histologically known patterns of caries. As a tooth is radiographed and an interproximal region of interest is selected for evaluation, this database is accessed for comparison purposes. The software will then, in graphic format, give the dental professional a tooth density chart and calculate a probability displayed on a scale of 0 to 1.0 that the area in question is a sound tooth, decalcified or carious and if a restoration is required. In addition, the level of false positives can be adjusted, or specificity, that the clinician is willing to accept (Miedema, 2008). In a 2011 study, Tracy et al described the use of CAD caries detection technology whereby twelve blinded dentists reviewed 17 radiographs from an experienced practitioner who meticulously documented the results that he obtained from the use of CAD technology.

Over a period of three years, he followed and treated a group of patients and photographed the teeth that required operative intervention for documentation purposes. He also documented teeth showing no evidence of caries and teeth with no evidence of caries confined only to the enamel which did not require restoration. The study included a total of 28 restored surfaces and 48 non-restored surfaces in the 17 radiographs. His radiographic and clinical results were then compared to the radiographic diagnoses of the 12 blinded dentists on these 17 radiographs. The true positive, or actual diagnosis of caries when present, is where the CAD system proved to be of benefit. With routine bitewing radiographs and unadjusted images, the dentists diagnosed 30% of the caries. When the images were sharpened, only 39% of the caries were diagnosed. When using CAD, the caries diagnosis increased to 69%, a very significant increase in the ability to diagnose carious lesions. The other side of the diagnostic coin is specificity, or ability to accurately diagnose a sound tooth. Both routine bitewing and CAD images were equally accurate, diagnosing at a 97% and a 94% rate (Montes, 2008). These results offer evidence that by using the CAD caries detection technology, dentists are able to confidently double the numbers of carious teeth that they are diagnosing without affecting their ability to accurately diagnose a tooth as being free from decay. CAD technology essentially serves as a reliable second opinion (Newacheck, 2000).

Applications of cbct in various branches of dentistry: CBCT is majorly used in oral and maxillofacial surgery for surgical evaluation and planning. CBCT is largely used diagnostic technique in assessment of mid-face and orbital fractures. It allows easy detection of non-displaced, inter-articular fractures of the condylar head. Artefacts from metal objects are lower on CBCT images, hence it provides better information in cases involving gun-shot wounds. However, in cases of trauma to the cervical vertebrae, use of CBCT is contraindicated, as the patient is unable to be in an upright position which is required for CBCT imaging (Newacheck, 2000). Detailed visualization of the inter-occlusal relationship of 3-D virtual skull model makes CBCT a valuable tool in orthognathics surgery planning. It allows for morphological analysis and spatial relationship of the neighbouring structures during follow-ups to evaluate growth, development and function. It provides pre-surgical information when planning for sinus floor augmentation in preparation for implant placement (Newacheck, 2004). CBCT has been used for measuring the thickness of the glenoid fossa. It often reveals the possible dislocation of the disk in the joint by defining the true position of the condyle and the extent of translation of the condyle in the fossa. It has also been used for an image guided

puncture technique of the TMJ which is a treatment modality for TMJ disk adhesion. CBCT provides a dose and cost-effective alternative to helical CT for the diagnostic evaluation of osseous abnormalities of the TMJ (Newachec, 2004). CBCT has been extensively used in Endodontics. Numerous studies have reported its usefulness in diagnosis of periapical lesions. CBCT enables in the differential diagnosis of cyst from granulomas by measuring the density from the contrasted images of the periapical lesion. Authors in one of the past study found that CBCT detected 62% more periapical lesions on individual roots when compared with periapical X-ray examinations. Vertical root fractures are better evaluated with CBCT images compared to periapical radiographs. CBCT can determines fractures in bucco-lingual or mesio-distal directions (Witt-Sherman, 1998). In a previous review of literature, authors found CBCT to be efficacious in endodontic surgery planning and identification of root canals not seen on 2-D images. Authors reported it to be useful in cases such as inflammatory external and internal resorption. CBCT not only detects the presence of resorption, but also determines its extent. They also found CBCT useful in determining root morphology; to measure the number of roots, canals, and accessory canals and to establish their working lengths, angulations and in the location of separated instrument in the canal (Vickers, 2000). For most endodontic applications, limited volume CBCT is preferred over large volume CBCT for the following reasons: (1) Increased spatial resolution to improve the accuracy of endodontic-specific tasks such as the visualization of accessory canals, root fractures, apical deltas, calcifications, etc.; and decreased radiation exposure to the patient (Vickers, 2000) CBCT images have been used in orthodontic assessment and cephalometric analysis. CBCT helps to determine root angulations, although variations are seen from the true anatomy. CBCT is valuable tool to assess the facial growth, age, airway function and disturbances in tooth eruption, (Vickers, 2000). CBCT evaluates the success of alveolar bone grafts in patients with cleft lip and palate by determining the bucco-palatal width and allowing the visualization of the 3-D morphology of the bone bridge. CBCT has proved to be a practical clinical tool for providing detailed morphologic description of the bone with minimal error margins (Vickers, 2000).

Summary and Conclusion

Diagnosis involves development of a comprehensive and concise database of pertinent information, sufficient to understand the patient's problem as well as answer questions arising in the treating clinician's mind. It is an accomplished art to develop a communication with the child and elicit relevant information from him. Thus, the signs and symptoms elicited on the basis of patient's experiences and clinician's knowledge forms the elementary framework of a good prognosis. Currently available technology and improvements in the future will enhance accuracy in detection of caries improving the oral health of the public.

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