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Review Article

Dental Management and Behavioural Modifications of Children with Autism Spectrum Disorders (ASD)

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Abstract

The focus of behavior guidance techniques (BGTs), as recognized by the American Academy of Pediatric Dentistry, is on "the continuum of interaction involving the dentist and the dental team, the patient, and the parent directed toward communication and education." Patients with special needs present complexity in selection and application of these techniques. Behavior that is not conducive to examination or treatment in a dental setting is more likely to be seen in children with autism than in non affected peers. Dental professionals are likely to encounter patients with autism on a regular basis. Understanding the factors in the dental office that can influence the behavior and cooperation of patients with autism and the best approach to take with these patients will help the dental professional be able to successfully treat patients with autism.

Keywords: *Behavioural modification; Dental management; Autistic children*

Introduction

Millions of children with special needs are born every year. These special children with different kinds of abnormalities are called "god's own children" [1]. Their needs are very different from a normal child and they are affected by wide spectrum of disabilities, disease and disorders. In these special children, various mental functions like thinking, emotions, memory, intelligence, decision making gets disturbed and the inability to work satisfactorily is impaired [2]. At least 2% of India's population are said to be suffering from some kind of mental disability [1]. Among all the developmental disabilities, 'Autism' is said to be the second most common developmental disability next to mental retardation [3]. Epidemiological studies of Autism Spectrum Disorders (ASD) showed a prevalence of 0.5 per 1000 in 1960s and 1970s, which was gradually increased to 1 per 1,000 in 1980s [4]. According to ADDM networks combining data it has been concluded that there was an increase in prevalence of about 6 per 1000 in 2000, which almost showed a drastic increase of 14 per 1000 in 2002 followed by 8 in 2004, 11 in 2006 and 14 in 2008 respectively [5].

Autism spectrum disorder and autism are both general terms for a group of complex disorders which are characterized, in varying degrees, by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors. They include autistic disorder, Rett syndrome, childhood disintegrative disorder, pervasive developmental disorder - not otherwise specified and Asperger's syndrome. They are otherwise known as pervasive developmental disorders [6] (PDD).

Autism spectrum disorders are more common in pediatric population than are some better known disorders such as diabetes, spinal bifida or Down's syndrome [7]. In 1943, an American child psychiatrist Dr. Leo Kanner of the John's Hopkins Hospital studied a group of children and introduced the label "Early infantile autism" into the literature. At the same time a German scientist, Dr. Hans Asperger, described a milder form of the disorder that became known as Asperger's syndrome. Autism was described by various names like Kanner's

syndrome, early infantile autism, infantile psychosis or childhood schizophrenia. Using the term 'Autistic child' is derogatory which has been now replaced with 'Child with autism' [3].

Nowadays the term 'Autism' is used to describe an incapacitating disturbance of mental and emotional development that causes problem in learning, communicating and relating with others. It usually manifests in the first 3 years of life and effects males more commonly than females. They look like normal children and have normal life spans. However, they have a limited capacity to communicate, socialize, and learn [8].

Oral health is an important aspect of health for all children, and more so for the children with special care needs, where prevention is more advantageous as treatment often incurs high cost and more risky than usual [9]. Children with autism spectrum disorders have multiple medical and behavioral problems that make the dental treatment difficult. Obsessive routines, repetitive behaviors, unpredictable body movements, and self-injurious habits may all be the symptoms that complicate dental care. Their oral health care needs are compounded by their disorders, medications and lack of oral hygiene at home. So providing oral care to people with autism requires adaptation of the skills you use every day. In fact most people with autism can be treated successfully in the general practice setting. Parents and caregivers need to be educated on the need to supervise tooth brushing irrespective of age, especially given that oral hygiene was shown to decrease or become poorer with age. While poor dental care may or may not affect mortality, it certainly affects morbidity and adds to the poor health burden of those already suffering from an array of health concerns. Better oral hygiene and dental care would lead to an improved quality of life for those with autism spectrum disorders. Making a difference in the oral health of a person with autism may go slowly at first, but determination can bring positive results and invaluable rewards [10].

History of Autism

Autism has been referred to a range of psychological conditions from the early 1990s. The root of the word autism is derived from the Greek word

- autos - Self
- ismos - A state of being absorbed by one's self" [11].

This makes sense today because people with autism often seem to be lost in them. They are certainly removed from social interaction and isolated in that way [11].

Important key dates in autism history

1912: According to the American Psychological Association, the term was first coined by Swiss psychiatrist Paul Eugen Bleuler, who also coined the term schizophrenia[12].

1943: Based on a study of 11 socially withdrawn children, child psychiatrist Leo Kanner identified autism as "lack of affective contact, fascination with objects, desire for sameness and non-communicative language before 30 months of age [13].

1944: German scientist Hans Asperger described a "milder" form of autism, known today as Asperger's syndrome. Over time, experts had placed Asperger's and other autism-related conditions on a spectrum ranging from mild to severe dysfunction [13].

1965: U.S. psychologist Bernard Rimland established the Autism Society of America, one of the first advocacy groups for parents of children with autism [13].

1967: Autism is classified under schizophrenia in the International Statistical Classification of Diseases and Related Health Problems [12].

1970: The first autistic classes with special education were started in Sweden by Erica foundation [12].

1971: Eminent psychologist Bruno Bettelheim promoted the "refrigerator mother" theory, which holds that "cold," nurturing parents, especially moms, are to blame for autism [12].

1980: Research on autism was accelerated and more and more researchers became convinced that the basic reasons were to be found in neurological disturbances, sometimes combined with hereditary illnesses like tuberous sclerosis, metabolic disturbances like phenyl ketonuria or chromosomal aberrations such as fragile X-chromosome [13].

1980: Autism is categorized as a developmental disorder separate from schizophrenia in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III), the reference book used by health-care professionals to diagnose mental health disorders [13].

1994: Asperger's syndrome is officially added to the DSM-IV as a pervasive developmental disorder. Two nonprofit groups, the "National Alliance for Autism Research" and "Cure Autism Now" were founded to stimulate autism research and raise awareness about the disorder [13].

2000: In response to broad government concerns, vaccine makers removed Thimerosal, a mercury-based preservative, from all routinely given childhood vaccines. Public fears grew that exposure to the preservative may be tied to autism. The National Institute of Health estimated autism affects 1 in 500 children [13].

2001: The NIH estimated autism affects 1 in 250 children.

2004: The Institute of Medicine, which advises the government on scientific matters, found no credible evidence of a link between Thimerosal and autism or between the Measles-Mumps-Rubella vaccine and autism [13].

2007: The Centers for Disease Control and Prevention reported autism affects 1 in 150 children. Medical experts say the changed number reflects better detection, broader diagnostic criteria and increased public awareness -- not a spike in the disease [13].

Myth on Autism

Children with autism feel love, happiness, sadness and pain just like everyone else. Just because some of them may not express their feelings in the same ways others do, doesn't mean that they do not have any feelings-THEY DO!! So it is crucial that the myth-children with autism have no feelings is destroyed. That myth is a result of ignorance, not some conspiracy. Hence, it is important to educate people who carry this myth in a helpful and informative way [14].

Etiology of Autism

Neurological abnormalities

Major etiologic factor that is responsible for Autism is neurological abnormalities, which include marked increase in cell densities in the limbic and cerebellar systems, reduced number of purkinje and granular cells, abnormal cell size, immature neuronal circuitry, Gyrial malformation in the cerebral cortex, Distorted, over - or under - amplified, filtered out sensory inputs, fewer functional associations between frontal and parietal lobes of the brain, decreased functional association between thalamus, head of caudate nucleus and lenticulate nucleus and decreased synthesis and/or increased breakdown of membrane phospholipids and increased utilization of ATP in autistic brains. In the later years, authors named Lotspeich and Ciaranello claimed that the brains of the subjects with autism showed a marked increase in cell densities in the limbic and cerebellar regions. Furthermore, they were found to have lot less Purkinje and Granular cells. The brains of subjects with autism also showed abnormal cell size and defective circuitry in the limbic region, cerebellum and brainstem [15], gyrial malformation in the cerebral cortex [16].

Genetics

Since the 1970s, there has been general agreement that autism may be caused by genetic vulnerability. The concordance rate of autism among monozygotic twins was found to be much higher than the dizygotic twins [17]. Autism does not appear to be inherited in a simple mendelian fashion; many other factors, such as incomplete penetrance, mutation, and heterogeneticity play important roles [18].

One study stated that there was 50 times higher than expected chance of having a sibling with autistic traits among affected children [19].

Prenatal insults

Prenatal insults may increase the risk of autism [20]. Strom land and co-workers evaluated a population of mentally retarded patients as a result of thalidomide in toxicity. Thalidomide was an anti-nausea medicine that was used in 1950s but was later banned owing to its embryonic toxicity. A few of these unfortunate subjects met the criteria of autism. Hence, autism appears to be combination of genetic vulnerability and perinatal injury [17]. It seems reasonable to conclude that genetics also plays an important role in the etiology of autism [20].

Others

Early investigators of autism like Leo Kanner believed that the condition could be attributed to some environmental, social [21] and family factors [22]. Later another psychiatrist named Ornitz considered that neither social-psychological nor intra-psychological were implicated in the etiology of the autism.

Classification of Autism

Autism is an umbrella term used for a wide spectrum of disorders, sometimes referred to as "Pervasive Developmental Disorders" or "Autism Spectrum Disorders." The term "spectrum" is crucial for understanding autism, because of the wide range of intensity, symptoms, behaviors, types of disorders and considerable individual variation. Children with autism spectrum disorders may be non-verbal and asocial, as in the case of many with "Classic" autism, or Autistic Disorder. On the other end of the spectrum are children with a high-functioning form of autism characterized by idiosyncratic social skills and play, such as Asperger's Syndrome [23]. Hence, autism spectrum disorders are classified into five different types of disorders.

Types of autism spectrum disorders, or Pervasive developmental disorders, include:

a. Autistic Disorder.
b. Asperger's Syndrome.
c. Rett Syndrome.
d. Childhood Disintegrative Disorder.
e. Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) [24].

Autistic disorder

It is also known as the "Classic Autistic Disorder" Or "Kanner's Syndrome", named after Dr. Leo Kanner, who described it as the most severe form of autism spectrum disorders [11]. It is characterized by a qualitative impairment in social interaction, impairment in communication and repetitive and stereotype patterns of behavior [25]. These children are very routine-based wants everything to be the same including: clothing, food, music and they are deeply affected by noise, bright lights and smell and they are generally considered to be low-functioning, but how well their mind work is unknown due to their poor social and communication skills [26].

Asperger's syndrome

Asperger's syndrome is a milder form of autism, which is a lifelong disability that affects how a person makes sense of the world, processes information and relates to other people. It is mostly a 'hidden disability' meaning you can't tell that someone has the condition from their outward appearance. It appears to be more common in males than the females. People with this condition have difficulties in three main areas, which are often referred to as 'The Triad of Impairments'

a. Social communication
b. Social interaction
c. Social imagination

Children with Asperger's syndrome have fewer problems with speaking and are often of average, or above average intelligence. They usually do not have the accompanying learning disabilities associated with autism, but they may have specific learning difficulties. These may include dyslexia and dyspraxia or other conditions such as attention deficit hyperactivity disorder and epilepsy. The characteristic of Asperger's syndrome vary from one person to another but has the three main areas of difficulty, such as:

a. Love of routines
b. Special interests
c. Sensory difficulties

With the right support and encouragement, people with Asperger's syndrome can lead full and independent lives [27].

Rett syndrome

Rett syndrome is a relatively rare condition of autism spectrum disorders affecting almost exclusively females, one out of 10,000 to 15,000. It occurs after a period of normal development, autism - like symptoms begin to appear. Children have normal early development followed by the loss of purposeful use of the hands, distinctive body movements, slowed brain and head growth, gait abnormality, seizures and intellectual disabilities.

There are a number of other problems common among those who have Rett syndrome. But having these problems is not necessary to get a diagnosis of Rett syndrome. These problems can include:

a. Scoliosis, a curving of the spine that occurs in approximately 80 percent of girls with Rett syndrome
b. Seizures
c. Constipation and gastro-esophageal reflux
d. Cardiac or heart problems, specifically problems with the rhythm of their heartbeat
e. Problems feeding themselves, trouble swallowing and chewing
f. Problems with sleep, specifically disrupted sleep patterns at night and an increase in total and daytime sleep [28].

Usual course of Rett syndrome

Health care providers view the onset of Rett syndrome symptoms in four stages:

a. **Early Onset Phase:** Development stalls or stops.
b. **Rapid Destructive Phase:** The child loses skills (regresses) quickly. Purposeful hand movements and speech are usually the first skills lost.
c. **Plateau Phase:** Regression slows, and other problems may seem to lessen or improve. Most people with Rett syndrome spend most of their lives in stage 3.
d. **Late Motor Deterioration Phase:** Individuals may become stiff or lose muscle tone; some may become immobile.

Most girls with Rett syndrome live until adulthood. They will usually need care and assistance throughout their lives.

Scientists sponsored by the National Institute of Child Health and Human Development have discovered that a mutation in the sequence of a single gene can cause Rett syndrome. This discovery may help doctors slow or stop the progress of the syndrome and it may also lead to methods of screening for Rett syndrome, thus enabling doctors to start treating these children much sooner, and improving the quality of life. Some of the problems associated with Rett syndrome can be treated. Physical, occupational and speech therapy can help with problems of coordination, movement, and speech [28].

Childhood disintegrative disorder (CDD)

It is a rare condition that resembles autism, but only after a relatively prolonged period of normal development. An estimate based on four surveys of autism spectrum disorders found that fewer than 2 children per 100,000 with autism spectrum disorders are classified as having childhood disintegrative disorder. This suggests that childhood disintegrative disorder is a very rare form of autism spectrum disorders and it has a strong male preponderance [29]. There is no known cause for childhood disintegrative disorder. There

likely a genetic basis for autism spectrum disorders. The theory is that an abnormal gene is switched on in the early stages of development, before birth, and that this gene affects other genes that coordinate a child's brain development.

Environmental exposures such as to a toxin or infection, may contribute to these effects. It is also possible that an autoimmune response may play a role in the development of childhood disintegrative disorder. In an autoimmune response, your body's immune system perceives normal body components as foreign and attacks them.

Childhood disintegrative disorder often occurs along with other conditions, including:

1. **Tuberous sclerosis:** In this condition, noncancerous (benign) tumours grow in the brain.
2. **Lipid storage diseases:** In this rare group of inherited metabolic disorders, a toxic build up of excess fats (lipids) occurs in the brain and nervous system.
3. **Subacute sclerosing panencephalitis:** This chronic infection of the brain is caused by a form of the measles virus that results in brain inflammation and the death of nerve cells.

It's unknown whether these conditions play a part in triggering childhood disintegrative disorder or share genetic or environmental risk factors [30].

Symptoms may appear by age 2, but the average age of onset is between 3 and 4 years. Until this time, the child has age-appropriate skills in communication and social relationships. The long period of normal development before regression helps differentiate childhood disintegrative disorder from Rett syndrome. The loss of skills such as vocabulary is more dramatic in childhood disintegrative disorder than they are in classical autism. The diagnosis requires extensive and pronounced losses involving motor, language, and social skills [30]. Childhood disintegrative disorder is also accompanied by loss of bowel and bladder control.

Pervasive developmental disorder-not otherwise specified

Pervasive developmental disorder - not otherwise specified is also known as atypical autism. As such, it is diagnosed, when the children with autism spectrum disorder do not fully meet the criteria for neither autistic disorder nor Asperger's syndrome [31].

This category should be used when there is a severe and pervasive impairment in the development of reciprocal social interaction or verbal and nonverbal communication skills, or when stereotyped behavior, interests, and activities are present, but the criteria are not met for a specific Pervasive Developmental Disorder, Schizophrenia, Schizotypical Personality Disorder, or Avoidant Personality Disorder. For example, this category includes "atypical autism"-presentations that do not meet the criteria for Autistic Disorder because of late age of onset, atypical symptomatology, or sub-threshold symptomatology, or all of these [32].

Signs and Symptoms

Autism is a spectrum of closely related disorders which share a core of symptoms [33]. Autism spectrum disorders appear in infancy and early childhood, causing delays in many basic areas of development such as learning to talk, play and interact with others [34]. The signs and symptoms of autism vary widely, as do its effects.

They say "if you've met one person with autism, you've met one person with autism" and they are absolutely right!

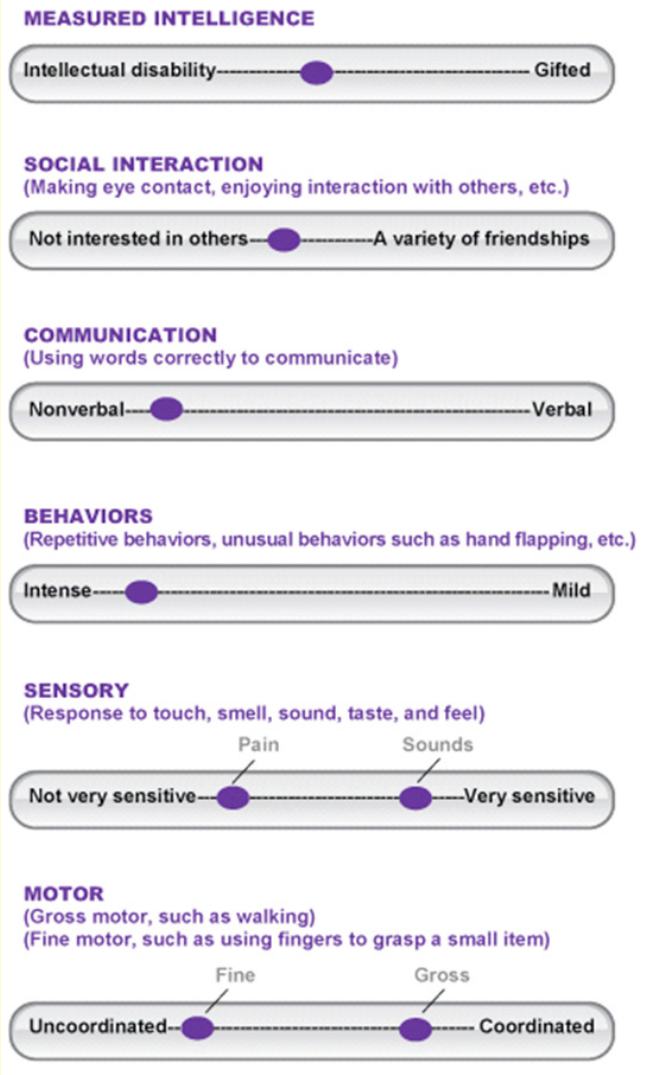
That's because the appearance of autism can vary from person to person. One person with autism may be very verbal, bright and engaged, while another is non-verbal, intellectually challenged and almost entirely self-absorbed. In addition, people with autism seem to be more prone to other problems which are not listed in the diagnostic criteria (discussed in the next chapter). These problems include sensory dysfunction, sleep disorders, self-abusive behavior and more [34].

Example of Range of Symptoms

The chart below explaining of a child might have average intelligence, have little interest in other people, use limited verbal language,

experience intense self-stimulatory behaviors such as hand-flapping, under-react to pain and over-react to sounds, have very good gross motor skills and have weaknesses in fine motor skills. These symptoms may vary widely from person to person [34].

The only symptoms all people with autism do have in common across the spectrum are challenges, disabilities, or delays in the area of social skills, social communication and other unusual behaviors and interests which are listed below under each heading.



Social skills

Social issues are one of the most common symptoms in all of the types of autism spectrum disorders. People with autism do not have just social "difficulties" like shyness. The social issues they can cause serious problems in everyday life.

Examples of social issues related to autism are:-

a. Do not respond to name by 12 months of age.
b. Avoids eye-contact.
c. Prefers to play alone.
d. Do not share interests with others.
e. Only interacts to achieve a desired goal.
f. Have flat or inappropriate facial expressions.
g. Do not understand personal space boundaries.
h. Avoids or resists physical contact.
i. Is not comforted by others during distress.
j. Has trouble understanding other people's feelings or talking about own feelings [35].

Communication

Each person with autism has different communication skills. Some children can speak well. Others can't speak at all or only very little.

1. About 40% of children with autism do not talk at all.
2. About 25%-30% of children have some words at 12 to 18 months of age and then lose them.
3. Others might speak, but not until later in childhood [36].

Examples of communication issues:

a. Delayed speech and language skills.
b. Echolalia - Repeats words or phrases over and over.
c. Reverses pronouns (Eg: says "you" instead of "I").
d. Gives unrelated answers to questions.
e. Does not point or respond to pointing.
f. Uses few or no gestures (Eg: does not wave goodbye).
g. Talks in a flat, robot-like, or sing-song voice.
h. Does not pretend in play (Eg: does not pretend to "feed" a doll).
i. Does not understand jokes, sarcasm, or teasing [36].

Unusual Interests and Behaviors

Many people with autism have unusual interest or behaviors.

Examples of unusual interests and behaviors related to autism spectrum disorders:

1. Lines up toys or other objects.
2. Plays with toys the same way every time.
3. Likes parts of objects (Eg: wheels).
4. Is very organized.
5. Gets upset by minor changes.
6. Have obsessive interests.
7. Has to follow certain routines.

8. Flaps hands, rocks body or spins self in circles.

Other symptoms

Some people with an autism spectrum disorders have other symptoms. These might include:

a. Hyperactivity (very active).
b. Impulsivity (acting without thinking).
c. Short attention span.
d. Aggression.
e. Causing self injury.
f. Temper tantrums.
g. Unusual eating and sleeping habits.
h. Unusual mood or emotional reactions.
i. Lack of fear or more fear than expected.
j. Unusual reactions to the way things sound, smell, taste, look or feel [36].

The Symptoms of autism starts between 12 and 36 months of age. The difference in the way, they react to people and other unusual behavior becomes apparent. The following possible indicators of autism were identified by the National Institute of Mental Health.

Indicators of Autism

Very early indicators that require evaluation by an expert include:

a. No babbling or pointing by age 1.
b. No single words by 16 months or two-word phrases by age 2.
c. No response to name.
d. Loss of language or social skills.
e. Poor eye contact.
f. Excessive lining up of toys or objects.
g. No smiling or social responsiveness.

Later indicators include:

a. Impaired ability to make friends with peers.
b. Absence or impairment of imaginative and social play.
c. Stereotyped, repetitive or unusual use of language.
d. Restricted patterns of interest those are abnormal in intensity or focus.
e. Preoccupation with certain objects or subjects.
f. Inflexible adherence to specific routines or rituals.

It is important to understand that one or two of these symptoms alone do not lead to the diagnosis of autism. There is also the possibility that some of these symptoms can be caused by physical issues; for example: not responding to a name could very well be a symptom of a hearing impairment. In order to properly diagnose autism, professionals use a set of specific tests that actually measure a child's symptoms. They may also decide that your child should undergo testing for hearing impairment or speech issues that are unrelated to autism. For that reason, parents who are concerned about their child should take their concerns to their pediatrician. If their pediatrician is not able to help, and parents still have worries, it may be time to make an appointment with a developmental paediatrician [37].

Oral Health Status

The oral status and the manifestations of the autism disorder vary depending on the developmental level and chronological age of the individual35. Autism should be viewed as an indicator of high risk for caries. Children with autism are often cited as having certain behavioral factors which may lead to an increased risk for caries. Behavior factors include:

1. Medications causing xerostomia
2. Dietary choice (preference or soft/sweet foods)
3. Poor oral hygiene
4. Requiring help with tooth brushing

This will apparently lead to the increased risk for dental caries in these children. There is a significant difference in the oral health status of children with autism when comparing primary, mixed and permanent dentition.

i. Children with primary dentition - Showed more prevalence for dental caries
ii. Children with mixed dentition - Significantly more gingivitis
iii. Children with permanent dentition - Gingivitis and malocclusions

Children of 7 yrs or younger were the only group to have significantly more new caries lesions. Although the reasons are unknown, it should be the reminder of the importance of establishing a dental home early and providing routine care [38].

The other oral manifestations which are common in children with autism are:

1. Bruxism (20-25%)
2. Non-nutritive chewing
3. Tongue thrusting.
4. Self-injury (picking at gingiva, biting lips) creating ulcerations.
5. Erosion (many parents report regurgitation, medical consult may be indicated).
6. Caries-similar to general population, however some children receive sweet foods as behavioral rewards (suggest sugar-free substitutes).
7. Poor oral hygiene since home care measures is exceedingly difficult for many children/parents [39].

Oral habits

Children with autism have commonly occuring oral habits such as tongue thrusting, bruxism, self injurious habits, lip biting and PICA [40].

Bruxism

It has a higher than normal prevalence in children with autism and can result in excessive dental wear, temporomandibular pain, avulsion of the teeth and other problems. These children are also affected by sleep disorders and parasomnias such as sleepwalking and nightmares. The treatment options for bruxism (Eg: The use of splints or behavioral modification techniques) are limited in children with autism due to their poor mental capacity and difficulties in communication [41].

Self-injurious behaviors

Self injurious behaviors and aggression are the two major destructive and devastating behaviors in individuals with autism. The U.S. National Institutes of Health (1989) considers that self-injurious behavior is a serious and chronic disorder that may result in significant physical, social and educational risks. Although the Diagnostic and Statistical Manual of Mental Disorders does not indicate self-injurious behaviors as specific to autism, probably due to the limited research data available on self injurious behaviors in autism, there is extensive literature on self injurious behaviors in individuals with autism [51].

According to Tate & Baroff self-injurious behaviors are defined as multiple or heterogeneous responses directed toward one's own body that result in tissue damage. In autism, self-injurious behaviors are one of the most concerning forms of lower-level repetitive stereotypic behaviors. The most common forms of these behaviors include:

a. Head banging (on floors, walls or other surfaces).
b. Hand or arm biting.
c. Hair pulling.
d. Face or head slapping.
e. Skin picking, scratching or pinching.
f. Forceful head shaking.

Self injurious behaviors results in the physical harm such as presence of bruises and abrasions of the head and face. Traumatic ulcerations of the oral cavity also are likely to be noted [40].

Acid erosions

It is the loss of tooth surface, caused by the dissolving action of acids over time. This results in the gradual thinning and loss of enamel and can progress to the underlying dentine layer causing sensitivity, increasing the risk of tooth decay and possibly death of the tooth nerve.

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Common causes of erosion are:

1. **Diet:** Acids such as phosphoric, citric, malic and ascorbic found in fruits and fruit juices, sweets, fizzy drinks.
2. **Stomach acid:** Hydrochloric acid from the stomach during gastric reflux, vomiting, regurgitation.
3. **Medication:** aspirin ingestion.

Ways to reduce acid erosion:

a. Limit the frequency of acidic drinks/foods and consume them at meal times. Drink milk and water as a substitute.
b. Use a straw when drinking the acidic drinks and discourage swishing round the mouth before swallowing.
c. Milk and cheese can help neutralize the acid.
d. Avoid brushing the teeth for at least an hour after consuming any acidic drinks/food.
e. The use of fluoride mouthwash can help strengthen enamel and reduce sensitivity.
f. Visit the dentist, as they can provide topical fluoride treatments/high fluoride toothpaste to help reduce the sensitivity and strengthen enamel.
g. Consult your general physician if your child is suffering from gastric reflux or if medications are causing vomiting [42].

Eating habits

The typically developing child often has finicky tastes when it comes to meal time. In the case of autism children they may limit themselves to just a handful of food items which they will accept and they usually avoid eating, if food items of their comfortable for unavailable. Diet issues do not necessarily affect all children on the autism spectrum, but it is certainly a common trait. Dietary choice in children with autism is the preference of sweet/soft or crunchy foods and limited diet.

There are certain methods which the parents can use to make sure the child has a balanced diet. Liquid vitamins can be added to meals provided the taste-sensitive child does not detect them or find them disagreeable. This depends on the brand and the amount given. Much of this information applies to young children on the autism spectrum. As the child matures, he may be willing to experiment with new foods and discover new favorites. While this may seem quite similar to the finicky tastes of any child, diet plays a unique role in planning meals and family activities with the autism child [43].

Dietary choice [42]

Foods and Drinks containing sugar

Chocolate, sweets, cakes, biscuits, pastries, fruit pies, puddings, table sugar, sugared breakfast cereals, jams, honey, ice cream, fruit in syrup, dried fruits, fresh fruit juices, sugared soft/fizzy drinks, sugared milk based drinks, syrups and sweet sauces.

Safe healthy snacks

Milk, water, pitta bread, bread sticks, whole meat toast, cheese, cheese on toast, rice cakes, bagels, crumpets, unsalted nuts, lean meats, tuna, egg, plain yoghurt, chopped fruit, carrot, celery, cucumber sticks, apples, grapes and bananas.

Oral Manifestations Associated with Medications

There are no medications that can cure autism or treat the core symptoms. However, there are medications that can help some people with autism function better. For example, medication might help manage high energy levels, inability to focus, depression, or seizures. Also, the U.S. Food and Drug Administration have approved the use of Risperidone and Aripiprazole (antipsychotic drugs) to treat children with autism who experience severe tantrums, aggression, and self-injurious behaviors. Medications might not affect all children in the same way. It is important to work with a health care professional who has experience in treating children with autism. Parents and health care professionals must closely monitor a child's progress and reactions while he or she is taking a medication to be sure that any negative side effects of the treatment do not outweigh the benefits [37].

a. Xerostomia
b. Sialorrhea
c. Dysphagia
d. Sialadenitis
e. Dysgeusia
f. Stomatitis
g. Gingivitis
h. Glossitis
i. Tongue Edema
j. Discolored Tongue
k. Bruxium
l. Miscellaneous [44-46]

Management of Child With Autism

Children with autism should have a medical home that provides accessible, continuous, comprehensive, family centered, coordinated, compassionate and culturally effective care [47]. Some parents of children with autism report dissatisfaction with the service

provided by their child's physician and physicians report major barriers and low self-perceived competency in providing these services [48]. In addition to listening to family members and understanding their needs, physicians should be knowledgeable about autism and community resources. The goals of long-term management are to increase independent functioning, improve community engagement and provide family and caregiver support. A successful long-term management plan requires coordinating the efforts of educators, therapists, physicians and mental health professionals [49].

Treatment Strategies

The treatment strategies of children with autism include:

1. Behaviour management
2. Dental management
3. Parental Counselling

Behaviour management

The goal of behavioral management is to reinforce desirable behaviors and reduce undesirable ones [50]. Behavioral therapy using several approaches is the primary management strategy for behavioral deficits and excesses. It can be provided by an early intervention program, a school special education program, or by therapists in private practice. Intensive behavioral therapy (i.e., at least 25 hours per week) initiated at a young age is more likely to lead to improved cognitive, language and adaptive skill outcomes. Although access to comprehensive treatment programs is currently limited, advocacy by parents and physicians has started to increase public awareness and improve access [51-53].

Among many methods available for treatment and education of people with autism, Applied Behavior Analysis has become widely accepted as an effective treatment [54]. Applied behavior analysis is the process of applying interventions that are based on the principles of learning derived from experimental psychology research to systematically change behavior and to demonstrate that the interventions used are responsible for the observable improvement in behavior [55]. An effective treatment program will build on the child's interests

a. Offer a predictable schedule
b. Teach tasks as a series of simple steps
c. Actively engage the child's attention in highly structured activities
d. Provide regular reinforcement of behaviour [37].

Behavior management can be classified into 2 methods:

1. Non Pharmacological
2. Pharmacological

Non pharmacological

Given its prevalence, it is likely that dental practitioners will encounter at least one patient with autism during their career. Therefore, it is important that dental clinicians have an understanding of the variety of clinical characteristics those children with an autism spectrum disorders present with, and issues they might encounter when treating such a patient. Autism spectrum disorders are quite complicated both in its diagnosis and in its classification. Autism spectrum disorders are challenging for the specialist to diagnose and treat so it is not necessary for dentists to become expert, but being aware of common challenges and how to adapt to them will go a long way in improving dental care received by children with autism spectrum disorders [10]. Children with autism spectrum disorders who display difficult behavior are less likely to see a dentist for routine care and more likely to have longer intervals between dental appointments and to receive care only when issues arise. Dental professionals are routinely unaware of the specific needs that a patient with autism will require and therefore are likely to avoid treating these patients. With education and understanding, any dental professional can treat this special group [56,57].

a. "Best practice" protocol for new dental patients with autism:
b. Front office staff knowledgeable about the practice's philosophy.
c. Obtain supplemental documentation on specific needs, challenges, skills and capacities.
d. Review of supplemental documentation by all dental team members.
e. Assess the patient's level of physical function during the initial interview.
f. Assess the patient's level of communication during the initial interview.
g. Maintain a positive environment.
h. Tailor treatment to suit the patient's abilities.
i. Treat the patient with respect and thoughtfulness.
j. Allow the patient time to adjust to new sights and sounds.
k. Continually praise appropriate behaviors.
l. As much as possible, ignore 'bad' behaviors.
m. Arrange for the same treating clinician to see the patient each time.
n. Minimize the number of dental team members interacting with the patient.
o. Use accepted behavior guidance techniques to aid treatment [58].

Behavior Guidance Techniques:

Behavior guidance is based on science and requires skills in communication and empathy. In many cases, dental professionals are initially unfamiliar with behavior guidance, but once it becomes standard practice while working with patients with autism, it can provide tremendous rewards. Goals of behavior guidance are to establish communication, alleviate anxiety and provide quality dental treatments while building a trusting and positive relationship for a lifetime between the professional and patient. The use of behavior guidance is based on the benefit vs. risk for the patient and professional, with the parent/caregiver involved in the overall process. Behavior guidance may include

1. Communication guidance
2. Positive reinforcements
3. The use of distractions
4. Parental/caregiver presence in the treatment operatory [59]

Communication guidance

Communication guidance is universally used in pediatric dentistry with both cooperative and uncooperative child (Chamber, 1976). It comprises the fundamental form of behavior management in that it is the basis for establishing a relationship with the child which may allow a successful completion of dental procedures and at the same time may help the child develop positive attitude towards the dental care [50].

Communication is important in developing a relationship with the autism spectrum disorders patient. Many patients, however, lack critical communication skills. Communication guidance helps establish a trusting relationship and builds needed cooperation. Each dental team member can use the methods that best suit the patient and the provider's comfort level. These techniques include but are not limited to "Tell, Show and Do" (TSD), voice control, nonverbal communication, positive reinforcement and distraction. The functioning level and developmental age of the patient should be considered when the dental professional and parent/caregiver decide on the appropriate communication guidance method. Chronological age is not an appropriate measure of skills [58].

Tell, show and do

"Tell, show and do" is the hallmark of working with the pediatric population. It is the method popularly used nowadays for modifying the behavior by desensitization in children. This concept was first introduced by Addleston. The Tell, Show and Do concept is to tell and show every step and instrument and explain what is going to be done. It is done continuously and in grades from the least fear

promoting object or procedure to higher grades of fearful objects [60]. Pediatric autism patients benefit tremendously from the "tell, show and do" method of communication guidance. Verbal clues and explanations geared to the patient's abilities are discussed, demonstrations of the procedure for the patient with visual, auditory, olfactory and tactile information are given and then the procedure is performed on or with the patient. The autism patient is provided constant positive reinforcement throughout the "tell, show and do" method, regardless of the amount of cooperation that is achieved. Patients may need to have this method of behavior guidance practiced several times before an actual procedure is completed; therefore the positive reinforcement is used to continue to progress in the process. The objectives of "tell, show and do" are to familiarize the patient with the dental operatory and prepare the patient to accept various aspects of dental treatment. "Tell, show and do" can be used with both pediatric and adult autism patients, with no contraindications [58].

In actions similar to the "tell, show and do" demonstrations is the picture exchange communication system, it is nothing but a book which contains the pictures of objects, places, people and emotions that the child is familiar with. The child will use this book as his/her mode of communication to others. So the dentist can assist the parent/caregiver to introduce the pictures of the dental materials prior to the visit, so that the child will get familiarize with the instruments and will show cooperative behavior during the dental treatment [58]. These include radiographic film, disposable plastic mouth mirrors, mouth props or rests, saliva ejectors/suction tips. This method is mainly used in children with autism as they usually follow obsessive routines [58].

Voice control

Voice control is the modification of intensity and pitch of one's own voice in an attempt to dominate the interaction between the dentist and the child. It is used in conjunction with some form of physical restraints and hand-over-mouth exercise [HOME]. The change in tone from gentle to firm is effective in gaining the child's attention and reminding him that the dentist is an authority figure to be obeyed. The parent/caregiver must be informed of the use of voice control, to prevent any misunderstandings during treatment. The objective of voice control is to increase cooperation and attention while decreasing any negative behaviors [50]. It can be used with any autism spectrum disorder patient, although patients who experience hearing deficits would not be good candidates. Phrases such as "eyes to me," "look at me," "hands on tummy" or "feet straight out" can be used to elicit appropriate behaviors. David Tesini, has developed a program, D-Termined Program of Repetitive Tasking and Familiarization in Dentistry, for dental professionals using these techniques. Many autism spectrum disorder patients do not "read" nonverbal communication well. The level of function of the autism spectrum disorder patient must be assessed initially prior to using nonverbal communication guidance. If the patient is able to understand nonverbal communication, the use of nonverbal cues is a good way of eliciting appropriate behavior [58].

Positive reinforcement

In combination with other behavior guidance activities, positive reinforcement can greatly enhance the autism spectrum disorders patient's cooperation. Positive reinforcement is the process of establishing desired and appropriate behaviors. It rewards desired behaviors and thus strengthens the recurrence of the behavior. Verbal praise and the appropriate demonstrations of affection, along with tokens or toys, can be used as positive reinforcers. Each individual responds to a different reinforce. What works for one patient at one point may not work for another patient or for the same patient at a later time. It is often recommended that the parent/caregiver bring an appropriate reward for the patient so that the dental team member can reward the patient with the current appropriate reinforcer [61]. Positive reinforcements can be used for any patient, with no contraindications [58].

Distractions

The use of distraction helps divert the patient's attention from inappropriate behaviors or from a procedure that may be viewed as unpleasant. It allows the patient to take a short break (with a specific count in time) during stressful periods or if a behavior is not appropriate. An autism spectrum disorder patient can count or sing/hum during this time. For patients who are diagnosed with higher-functioning levels of autism, another distraction technique involves having patients close their eyes, think of something pleasant (place, person, object), and imagine the object or place with them at that moment. By focusing on the positive, pleasant aspects of something,

patients are often soothed and relaxed enough to undergo a procedure. The use of distraction, however, can be used only with patients who have a trusting relationship with the dental team member [58].

Presence of parents/caregivers

The presence of the parent/caregiver in the operatory can be a positive reinforcement for treatment. The importance of communication is critical to achieving success. The parent/caregiver must be instructed to only maintain a presence and not to interfere in the treatment process unless requested. With the parent/caregiver in the operatory, communication should be directed to the patient as appropriate, not to the parent/caregiver. The parent/caregiver presence is used to gain the patient's attention and increase compliance, decrease negative behaviors, establish appropriate roles during treatment, provide effective communication between dental provider and patient, and provide a positive dental experience [58].

Pharmacological management

Principles to guide the approach to psychopharmacologic management of autism in clinical practice have been proposed by several authors in recent years, and an approach is outlined below. When medications are used, potential benefits and adverse effects should be explained, informed consent should be obtained, baseline data regarding behaviors and somatic complaints should be collected, and potential strategies for dealing with treatment failure or partial response should be reviewed [62].

Clinical Approach to Psychopharmacologic Management [63]

Identify and assess target behaviors:

1. Parent/caregiver interview
2. Intensity
3. Duration
4. Exacerbating factors/triggers (time, setting/location, demand situations, denials, transitions, etc)
5. Ameliorating factors and response to behavioral interventions
6. Time trends (increasing, decreasing, stable)
7. Degree of interference with functioning
8. Consider baseline behavior-rating scales and/or baseline performance measures/direct observational data
9. Include input from school staff and other caregivers

Assess existing and available supports:

a. Behavioral services and supports
b. Educational program, habilitative therapies
c. Respite care, family psychosocial supports

Search for medical factors that may be causing or exacerbating target behavior(s):

1. Consider sources of pain or discomfort (infections, gastro-intestinal, dental, allergic, etc)
2. Consider other medical causes or contributors (sleep disorders, seizures, menstrual cycle, etc)

Complete any medical tests that may have a bearing on treatment choice.

Consider psychotropic medication on the basis of the presence of:

1. Evidence that the target symptoms are interfering substantially with learning/academic progress, socialization, health/safety (of the patient and/or others around him or her), or quality of life.
2. Suboptimal response to available behavioral interventions and environmental modifications.
3. Research evidence that the target behavioral symptoms or coexisting psychiatric diagnoses are amenable to pharmacologic intervention.

Choose a medication on the basis of:

1. Likely efficacy for the specific target symptoms
2. Potential adverse effects
3. Practical considerations such as formulations available, dosing schedule, cost, and requirement for laboratory or electrocardiographic monitoring
4. Informed consent (verbal or written) from parent/guardian and, when possible, assent from the patient

Establish plan for monitoring of effects:

1. Identify outcome measures.
2. Discuss time course of expected effects.
3. Arrange follow-up telephone contact, completion of rating scales, reassessment of behavioral data, and visits accordingly.
4. Outline a plan regarding what might be tried next if there is a negative or suboptimal response or to address additional target symptoms.
5. Change to a different medication.
6. Add another medication to augment a partial or suboptimal therapeutic response to the initial medication (same target symptoms).
7. Add a different medication to address additional target symptoms that remain problematic.
8. Obtain baseline laboratory data if necessary for the drug being prescribed and plan appropriate follow-up monitoring.

Explore the reasonable dose range for a single medication for an adequate length of time before changing to or adding a different medication.

Monitor for adverse effects systematically.

Consider careful withdrawal of the medication after 6-12 months of therapy to determine whether it is still needed [64-66].

Medications used in treatment

Medications are often used to treat behavioral problems, such as aggression, self injurious behavior, and severe tantrums that keep the children with autism from functioning more effectively at home or school. The medications used are those that have been developed to treat similar symptoms in other disorders. Many of these medications are prescribed "off-label." This means they have not been officially approved by the FDA for use in children, but the doctor prescribes the medications if he or she feels they are appropriate for the child. Further research needs to be done to ensure not only the efficacy but the safety of psychotropic agents used in the treatment of children and adolescents. A child with autism may not respond in the same way to medications as typically developing children. It is important that parents work with a doctor who has experience with children with autism. A child should be monitored closely while taking a medication. The doctor should prescribe the lowest dose possible to be effective. The parents should ask the doctor about any side effects the medication may have and keep a record of how the child responds to the medication. It will be helpful to the parents to read the "patient insert" that comes with their child's medication. Some people keep the patient inserts in a small notebook to be used as a reference. This is most useful when several medications are prescribed [37].

Anxiety and depression

The selective serotonin reuptake inhibitors (SSRI's) are the medications most often prescribed for symptoms of anxiety, depression, and/or obsessive-compulsive disorder (OCD). Only one of the selective serotonin reuptake inhibitors, Fluoxetine, (Prozac®) has been approved by the FDA for both obsessive-compulsive disorder and depression in children age 7 and older. The following three medications that have been approved for obsessive-compulsive disorder are,

1. Fluvoxamine (Luvox®), age 8 and older;
2. Sertraline (Zoloft®), age 6 and older and;
3. Clomipramine (Anafranil®), age 10 and older.

Treatment with these medications can be associated with decreased frequency of repetitive, ritualistic behavior and improvements in eye contact and social contacts. The FDA is studying and analyzing data to better understand how to use the selective serotonin reuptake inhibitors' safely, effectively and at the lowest dose possible [67].

Behavioral problems

Antipsychotic medications have been used to treat severe behavioral problems. These medications work by reducing the activity in the brain of the neurotransmitter dopamine. Among the older, typical antipsychotics, such as haloperidol (Haldol®), Thioridazine, Fluphenazine and Chlorpromazine, haloperidol was found to be more effective than a placebo in treating serious behavioral problems [68]. However, haloperidol, while helpful for reducing symptoms of aggression, can also have adverse side effects such as sedation, muscle stiffness and abnormal movements. Placebo-controlled studies of the newer "atypical" antipsychotics are being conducted on children with autism. The first such study, conducted by the National Institute of Mental Health supported Research Units on Pediatric Psychopharmacology Autism Network, was on Risperidone (Risperdal) [56]. Results of the 8-week study were reported in 2002 and showed that Risperidone was effective and well tolerated for the treatment of severe behavioral problems in children with autism. The most common side effects were increased appetite, weight gain and sedation. Further long-term studies are needed to determine any long-term side effects. Other atypical antipsychotics that have been studied recently with encouraging results are Olanzapine (Zyprexa®) and Ziprasidone (Geodon®) [37].

Seizures

Seizures are more prevalent in children with autism, effecting 1 out of 4 children, most often in those who have low IQ (intelligent quotient). They are treated with one or more of the anticonvulsants.

These include medications such as

1. Carbamazepine (Tegretol®)
2. Lamotrigine (Lamictal®)
3. Topiramate (Topamax®)
4. Valproic acid (Depakote®) [66].

The level of the medication in the blood should be monitored carefully and adjusted so that the least amount possible is used to be effective. Although medication usually reduces the number of seizures, it cannot always eliminate them [66].

Inattention and hyperactivity

Stimulant medications such as Methylphenidate (Ritalin®), used safely and effectively in persons with attention deficit hyperactivity disorder, have also been prescribed for children with autism. These medications may decrease impulsivity and hyperactivity in some children, especially in those with higher functioning children. Several other medications have been used to treat autism symptoms; amongst them are other antidepressants, Naltrexone, lithium and some of the benzodiazepines such as Diazepam (Valium®) and Lorazepam (Ativan®). The safety and efficacy of these medications in children with autism has not been proven. Since people may respond differently to different medications, your child's unique history and behavior will help your doctor decide which medication might be most beneficial[66].

Advanced procedures

The use of nitrous oxide/oxygen inhalation is an appropriate treatment option for many autism spectrum disorder patients. Nitrous is safe and effective in reducing anxiety, with its rapid onset and recovery. It provides a degree of analgesia, amnesia and reduction in the gag reflex. Due to its occupational health hazards, scavenger systems and monitoring devices need to be used and evaluated routinely. Despite the dental team's best efforts with minimal behavior guidance techniques, there are times when more advanced procedures such as sedation and general anaesthesia will be needed. Dental professionals should seek guidance from their state dental practice acts before using any advanced procedure and only when all other attempts at behavior guidance have been exhausted.

Each has benefits and risks that must be weighed prior to usage. Usage of sedation or general anaesthesia is viewed as a "last resort" measure to be used when other behavior guidance modalities have not been successful. Each is used with consideration of the dental needs of the patient and the quality of care that can be provided in a safe environment for both the dental professional and the patient. Consideration as to the patient's emotional and physical development is also an important component [69].

Providing special care in the general dentistry practice

Care for autism patients requires dental skills that are up to date. Services should be delivered with even more patience and empathy. The following tips illustrate that the practitioner needs special equipment less than compassion and tolerance.

1. Use of pediatric care training.
2. Typical appointment
3. Take your time.
4. Do a little of the procedure at a time.
5. Speak the patient's language
6. Practice show, tell and do.
7. Establish a relaxed atmosphere.
8. Establish a comfortable work area [61]

Parental Guidance

Parental questionnaires prior to treatment

Guidelines used by the Autism Society of America include the following questions parents can ask about potential treatments

1. Will the treatment result in any harm to my child?
2. How will failure of the treatment affect my child and family?
3. Has the treatment been validated scientifically?
4. Are there assessment procedures specified?
5. How will the treatment be integrated into my child's current program? [37]

The National Institute of Mental Health suggests a list of questions parents can ask when planning for their child treatment:

a. How successful has the program been for other children?
b. How many children have gone on to placement in a regular school and how have they performed?
c. Do staff members have training and experience in working with children and adolescents with autism?
d. How are activities planned and organized?
e. Are there predictable daily schedules and routines?
f. How much individual attention will my child receive?
g. How is progress measured? Will my child's behavior be closely observed and recorded?
h. Will my child be given tasks and rewards that are personally motivating?
i. Is the environment designed to minimize distractions?
j. Will the program prepare me to continue the therapy at home?
k. What is the cost, time commitment and location of the program? [37]

Parental involvement has emerged as a major factor in success of treatment. Parents should work with teachers and therapists to identify the behaviors to be changed and the skills to be taught. Recognizing that parents are the child's earliest teachers, more programs are beginning to train parents to continue the therapy at home. As soon as a child's disability has been identified, instruction regarding the treatment should begin. Effective programs will teach early communication and social interaction skills [37].

Educational strategies from birth to adolescence:

In children younger than 3 years, appropriate interventions usually take place in the home or a child care center. These interventions target specific deficits in learning, language, imitation, attention, motivation, compliance, and initiative of interaction. Included are behavioral methods, communication, occupational and physical therapy along with social play interventions. Often the day for child will begin with a physical activity to help develop coordination and body awareness (children string beads, place puzzles together, paint) and participate in other motor skills activities. At snack time, the teacher should encourage social interactions. The children learn by doing it under positive reinforcement [70].

Children older than 3 years usually have school-based, individualized, special education. The child may be in a segregated class with other autism children or in an integrated class with children without disabilities for at least a part of the day. Different localities may use differing methods but all methods should provide a structure that will help the children learn social skills and functional communication. In these programs, teachers often should involve the parents, giving useful advice in how to help their child use the skills or behaviors learned at school when they are at home [71].

In elementary school, the child should receive help in any skill area that is delayed and at the same time, be encouraged to grow in his or her areas of strength. Ideally, the curriculum should be adapted to the individual child's needs. Many schools today have an inclusion program in which the child is in a regular classroom for most of the day, with special instruction for a part of the day. This instruction should include skills such as learning how to act in social situations and in making friends. Although higher-functioning children may be able to handle academic work, they too need help to organize tasks and avoid distractions [72].

During middle and high school years, instruction should begin to address such practical matters as work, community living, and recreational activities. This should include work experience, using public transportation and learning skills that will be important in community living. All through your child's school years, parents should be an active participant in his or her education program [72].

Adolescence is a time of stress and confusion; and it is no less so for teenagers with autism. While some behaviors improve during the teenage years, some get worse. Increased autistic or aggressive behavior may be one way some teens express their newfound tension and confusion. The teenage years are also a time when children become more socially sensitive. At the age that most teenagers are concerned with acne, popularity and grades, teens with autism may become painfully aware that they are different from their peers. They may notice that they lack friends and unlike their schoolmates, they aren't planning for a career. For some, the sadness that comes with such realization motivates them to learn new behaviors and acquire better social skills [37].

Conclusion

Dental care providers should know that parents of individuals with autism are the best source of information. Providers need to listen to what parents have to say about their child's interests and behaviors. For instance, using a standardized screening questionnaire to obtain the child's sensory sensitivities or level of language prior to the dental visit can help inform dental care providers and lead to the better management of patients with autism. Some children will be extremely sensitive to touch around the face and mouth. Children should be warned in advance about the use of instruments that are noisy. Dental care providers can use visual aids such as pictures or a movie of dental procedures to help these individuals to understand what to expect during dental treatment. Any procedure should be done very smoothly and gently. Positive reinforcements can be very good motivation for these individuals and each child will have unique preferences that parents are usually aware of. Some of those reinforcements can be offered in dental offices as a reward for the child's co-operative behavior.

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