BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN

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Of

MASTER OF DENTAL SURGERY

In

PEDIATRIC AND PREVENTIVE DENTISTRY

By

Dr. P. RENUKA

Under the guidance of

Dr. SUBASH SINGH
Reader

DEPARTMENT OF PEDIATRIC AND PREVENTIVE DENTISTRY

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES,

LUCKNOW, UTTAR PRADESH- 227105

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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled " **BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN"** is a bonafide and genuine research work carried out by me under the guidance of **Dr. Subash Singh**, Reader, and **Dr.Monika Rathore**, Professor, Department of Pediatric and Preventive Dentistry, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Date: 07 | 07 | 2021

Place: LUCKNOW

P. Renuka

Dr. P. RENUKA

<u>CERTIFICATE</u>

This is to certify that the dissertation entitled " **BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN"** is an original bonafide research work done by **Dr. P.RENUKA,** in partial fulfilment of the requirement for the degree of **MASTER OF DENTAL SURGERY (M.D.S)** in the speciality of **PEDIATRIC AND PREVENTIVE DENTISTRY** under our supervision.

GUIDE

Dr. Subash Singh

M.D.S

Reader

CO-GUIDE

Dr. Monika Rathore

M.D.S

Professor

Department of Pediatric and Preventive Dentistry

Babu Banarasi Das College of Dental Sciences,

BBDU, Lucknow (U.P.)

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES, LUCKNOW, UTTAR PRADESH

CERTIFICATE

This is to certify that the dissertation entitled " **BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN**" has been undertaken by the candidate **Dr.P.RENUKA**, herself in this department. The candidate fulfils all the conditions necessary for the submission of this thesis.

Recommendation of Head of Department

Dr. Neerja Singh
Professor & Head
Department of Pediatric and Preventive Dentistry
Babu Banarasi Das College of Dental Sciences.
BBDU, Lucknow (U.P.)

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES

LUCKNOW, UTTAR PRADESH

CERTIFICATE

This is to certify that the dissertation entitled " **BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN** " has been undertaken by the candidate **Dr.P.RENUKA**, under the direct supervision and guidance of **DR.SUBASH SINGH**, Reader in the Department of PEDIATRIC AND PREVENTIVE DENTISTRY, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Dr. B. Rajkumar

PRINCIPAL

Babu Banarasi Das College of Dental Sciences

BBDU, Lucknow (U.P.)

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Dr. P.RENUKA

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"Success is a journey, not a destination. The doing is often more important than the outcome"

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LIST OF ABBREVIATIONS

ASD	Autism Spectrum Disorders
CDC	Center for disease control and prevention
ADDM	Autism and developmental disabilities monitoring network
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
AAC	Alternative and Augmentative Communication
PECS	Picture Exchange Communication System

ABSTRACT

Background: Children diagnosed with autism spectrum disorder report higher rates of unmet dental needs and behavioural problems leading to poor oral health. Communication systems such as picture exchange communication system (PECS) helps to facilitate patient –professional communication for better oral health.

Aim: Behavioural Intervention by Picture Exchange Communication System (PECS) For Dental Management In Autistic Children.

Materials and Method: Children diagnosed with autism in the age range of 4-18 years were selected for the present study. Self-designed questionnaires were distributed amongst 60 parents of autistic children diagnosed with mild and moderate grades of autism to determine parental perceptions of autistic children regarding dental visits. Around 30 subjects were selected from the above mentioned sample size from the questionnaire part of the study for assessment of oral health status to evaluate the effectiveness of PECS in improving oral health over a period of 3 months.

Results: Definitely substantial correlation was seen between PECS and OHI – S. Commonly used communication system by the parents for non-verbal communication was Picture Exchange Communication System (45.2%). Around 90% (54) parents thought going to the dentist is important for their child's oral health. 57.4% (31) parents mentioned that their child's last dental visit was fair.

Conclusion: Gradual decrease was observed in OHI-S scores over a period of 3 months, indicating an improvement in the oral hygiene status of autistic children. Gradual progress in Phases of PECS proved to increase cognitive ability of autistic children towards understanding the dental setup related PECS cards. Picture exchange communication system (PECS) helps to facilitate patient- professional communication

INTRODUCTION

"We have no special needs children. Just children with special needs"
- Uwe Maurer

Individuals with special health care needs exhibit physical, developmental, sensory, behavioral, cognitive, and emotional impairments that require medical management, health care interventions, and use of specialized services or programs. One such disability affecting the world population at a dramatic rate is autism. Autism is a complex neurobehavioral condition that includes impairments in social interaction and communication skills combined with rigid, repetitive behaviour. It is also called as Autism Spectrum Disorder (ASD) as these individuals have a wide range of symptoms. About 1 in 54 children have been identified with ASD according to estimates from Center for Disease Control and Prevention (CDC), Autism and Developmental Disabilities Monitoring (ADDM) Network. It is 4 times more common among boys than girlsandno specific etiologyfor ASD has been identified yet[1].Diagnostic and Statistical Manual of Mental Disorders (DSM-5) published in 2013, provides the most current diagnostic criteria for individuals with ASD [2].

Due to high prevalence of children with autism, dentists are likely to have one or more children with this disorder in their practice. Most autistic children have problems with their day to day activities such as eating, drinking, sleeping, bathing and tooth brushing. Several factors contribute to poor oral health conditions in children with ASD which includes variable cognition levels; altered saliva levels in the mouth; poor dietary habits; oral habits such as bruxism or pica; poor oral hygiene; motor coordination defecit; and oversensitivity to sensory stimuli. Apparently, poor oral health can result in a negative effect on health and quality of life. Hence, information on oral health status of autistic children would enable pediatric dentists to plan and provide appropriate preventive protocol as well as effective treatment for these patients.

Children with ASD are visual learners and respond better to visual support. To increase communication with autistic children in a dental operatory the use of Alternative and Augmentative Communication (AAC) devices and programs can be implemented. One of the most widely used AAC intervention is Picture Exchange Communication System (PECS), it is a unique AAC training package for individuals

with autism and similar developmental disabilities.PECS has also been recognized by the American Academy of Pediatric Dentistry as a basic behavior guidance technique.[3] It is a communication technique developed for individuals with limited to no verbal communication abilities, to express requests or thoughts using symbolic imagery. The patient initiates communication, and no special training is required by the recipient. A prepared picture board may be present for the dental appointment so that the dentist can communicate the steps required for completion of treatment through pictures. (e.g., pictures of a dental mirror, handpiece).

Dental needs in ASD individuals is similar to those of other patients. Dental professionals might be unaware of difficulties with sensory processing, which is common to patients with ASD.PECS has been used in clinical and educational settings for children with ASD as it is relatively simple to use and teach, inexpensive, and is considered to be a promising intervention.Hence, we hypothesised that promoting healthy oral hygiene habits and routines in children with ASD can be achieved with PECS.

The rising prevalence of autism spectrum disorders (ASD) needs a greater level of clinical attention. The characteristics of ASD lead to impairment for both the child with the disorder and his/her family. To effectively treat children with ASD, parents need to be included in intervention efforts. Research suggests that parental involvement in treatment improves the communication skills and increases the amount of intervention the child receives. Furthermore, research has shown that parents can implement continuous treatment and can be effective interventionists. On including parents in the treatment process, they can continue to teach children with ASD skills in the home environment, which improves the parent-child interactions and increases the amount of intervention they receive.

The purpose of this study is to discuss the factors that influence treatment outcome; so that dental treatment in ASD patients can be performed successfully. Once the clinical manifestations of ASD such as behavioral changes, fear of noise, fear of the unknown, difficulty with relationships is figured out through the parents , implementing dental treatment would be easier .

Strong relationship between parents and the dental team is essential for establishing a family- centred care for treatment of children with autism. The rising prevalence of ASD warrants a greater level of clinical attention for effectively treating children with ASD by including parents in the intervention forunderstanding the challenges experienced during oral care in the dental office. The present study aims to involve the pediatric dental team into an autism friendly approach by understanding the challenges of autistic patients and also for assessing the effectiveness of using PECS as a behavioural intervention modalityfor evaluation of oral health status in children with ASD.

AIM & OBJECTIVES

AIM :

Behavioural Intervention by Picture Exchange Communication System (PECS) For Dental Management In Autistic Children.

OBJECTIVES :

1. To assess the oral health status of autistic children.
2. To assess effectiveness of Picture Exchange Communication System (PECS) for management in autistic children.
3. To determine parental perceptions of autistic children regarding dental visits.

REVIEW OF LITERATURE

Lowe O et al (1985)[4]conducted a study on assessment of an autistic patient's dental needs and the ability to undergo dental examination.A successful clinical examination was achieved on the first attempt for 50 percent of the autistic patients. Behaviour management techniques included positive reinforcement; tell, show and do; and negative reinforcement.It was concluded that autistic patients had a lower hygiene level than those in the control group, but a comparable caries index.

Davila JM et al (1988)[5] conducted a study on a 10-year longitudinal case report of an institutionalized autistic male dental patient. A potentially important finding was the apparent inverse relationship that was found between level of sedation and patient cooperation. The patient with autism represented an extremely difficult management problem for the dentist, and the authors were not able to develop a predictable sedation program for any of the patients with autism. The use of general anesthesia, with all the associated risks and costs, was the only solution to the problem of providing needed dental care.

J Shapira et al (1989)[6]conducted a study to assess the oral health status and dental needs of an autistic population of children and young adults .Two groups of patients with autism were evaluated: non institutionalized children with a mean age of 11 and institutionalized adults with a mean age of 22. It was concluded that the adult group had severe periodontal problems; almost half required periodontal surgery and were found to have lower decayed, missing, and filled teeth (DMFT) scores whereas children with autism had caries rates similar to peers.

Pierce KL et al (1994)[7]conducted a study on teaching daily living skills to children with autism in unsupervised settings through pictorial self-management. The efficacy of pictorial self-management was assessed by teaching daily living skills to 3 low-functioning children with autism. Stimulus and response generalization, stimulus control of self-management materials, and maintenance of behavior change were also assessed. Results showed that children with autism could successfully use pictures to manage their behavior in the absence of a treatment provider, generalize their behavior across settings and tasks, and maintain behaviors at follow-up.

C FahlvikPlanefeldt et al (2001)[8] conducted a case control study to compare oral health in autistic and healthy children within the non-specialized Public Dental Service, cases of autistic disorders aged 3-19 . It was concluded that the cases and controls had a similar prevalence of fillings, caries, gingivitis and degree of oral hygiene. However, the need of orthodontic treatment seemed to be greater among the autistic children, they were less cooperative in the dental treatment, and access to a paediatric dentist when necessary was difficult.

Jokovic A et al (2003)[9] conducted a study on measuring parental perceptions of child oral health-related quality of life to develop and evaluate the Parental-Caregiver Perceptions Questionnaire (P-CPQ) , a measure of parental/caregiverperceptions of the oral health-related quality of life of children. An item pool was developed through a review of existing child health questionnaires and interviews with parents/ caregivers of children with pedodontic, orthodontic, and orofacial conditions. The 31 items rated the most frequent and important were selected for the final questionnaire (P-CPQ). TheP-CPQ validity and reliability were assessed by a new sample of 231 parents. It was concluded that P-CPQ is valid and reliable.

Namal N et al (2007)[10] conducted a cross sectional study to assess whether the dental caries experience is higher in children with an autistic disorder (AD) than in normal children. Three schools for autistic children and three standard elementary schools in Istanbul, Turkey, were included and the subjects were orally examined. Sixty-two children with AD and 301 children without AD were examined in the age range between 6 and 12 years. It was concluded that children from families with high income with AD compared to those without AD had lower experience of caries. Also, children with AD had better caries status than children without AD at younger ages.

DeMattei R et al (2007)[11] conducted a study on oral assessment of children with an autism spectrum disorder .Oral assessments were conducted on 39 children with ASD and 16 children with other developmental disabilities (DD). Conditions assessed were bacterial plaque, gingivitis, dental caries, restorations, bruxism, delayed eruption/missing teeth, oral infection, developmental anomalies, injuries, occlusion, salivary flow,oral defensiveness and it was concluded that children with ASD appear to have oral conditions that might increase the risk of developing dental disease.

Ivy HaralambosBassoukou et al (2008)[12] conducted a study to evaluate saliva flow rate, buffer capacity, pH levels, and dental caries experience in autistic individuals, comparing the results with a control group. The study was performed on 25 non institutionalized autistic boys, divided in two groups G1 and G2 in the age range of 3-8 years and 9-13 years. Control Group was composed of 25 healthy boys, randomly selected and also divided in two groups: CG3 and CG4 in the age range of 4-8 years and 9-14 years . It was concluded that in autistic individuals there was no significant statistical difference in flow rate, pH, and buffer capacity. Also autistic individuals neither have a higher flow rate nor a better buffer capacity.

Kopycka- Kedzeierawski D et al (2008)[13] conducted a study on dental needs and status of autistic children from the National Survey of Children's Health to assess the oral health status and dental needs of a nationally representative sample of 1- to 17-year-old children with or without autism. In the 2003 National Survey of Children's Health, condition of the child's teeth, demographics, time since last dental visit, and dental needs were assessed in autistic children (N=495) and nonautistic children (N=95,059). It was concluded that 69% of nonautistic children and 52% of autistic children had their teeth in excellent or very good condition . Children with or without autism who had fair or poor teeth are faced with similar dental problems.

Loo Y Cheen et al (2008)[14]conducted a study on caries experience andbehaviour of dental patients with autism spectrum disorder. The patient charts were reviewed and a group of 395 patients with ASD and a group of 386 unaffected patients were assessed on the basis of primary diagnosis, age, sex, residence presence of seizure disorder, additional diagnosis such as mental retardation, cerebral palsy, self-injurious behavior or pica, medications, caries prevalence, caries severity and behavior. The authors concluded that people with autism spectrum disorder were more likely to be caries-free and had lower DMFT scores .Also patients with autism spectrum disorder were more uncooperative than the unaffected patients who required general anesthesia to undergo dental treatment.

Loo Y Cheen et al (2009)[15]conducted a study on factors associated with the behaviour of patients with ASD in a dental setting, use of general anaesthesia (GA), and protective stabilization .Dental charts of 395 patients with ASD ,386 unaffected patients were reviewed. Data analysis included ASD diagnosis, age, gender,

residence, seizure disorder, additional diagnosis (mental retardation, cerebral palsy, self-injurious behaviour or pica), medications, caries prevalence and severity, dental treatment history, behaviour, and behaviour guidance technique(s) used. It was concluded that Autism spectrum disorder patients with younger age and an additional diagnosis were more uncooperative. Factors associated with the use of GA and protective stabilization in patients with ASD were also identified.

Weil TN (2010)[16]conducted a study on Dental Education and Dentists' Attitudes and Behavior Concerning Patients with Autism. Data was collected from a random sample of general dentists who were members of the Michigan Dental Association (MDA). A total of 162 dentists responded to a survey mailed to 500 randomly chosen members of the MDA . In addition, 500 surveys were mailed to randomly selected members of the American Academy of Pediatric Dentistry (AAPD), and 212 members responded .The results showed that both groups of respondents did not perceive their predoctoral dental education as having prepared them well to provide care for patients with special needs or speciically with autism.

Flippin M et al (2010)[17]conducted a meta-analysis on Effectiveness of the Picture Exchange Communication System (PECS) on Communication and Speech for Children with Autism Spectrum Disorders. A systematic review of the literature on PECS written between 1994 and June 2009 was conducted and it was concluded that PECS may be more beneficial for promoting speech in children with a specific developmental profile (i.e., low joint attention, low motor imitation, and high object exploration) than some alternative approaches.

JaberMohamed Abdullah (2011)[18] conducted a study to investigate whether children with autism have higher caries prevalence, higher periodontal problems, or more treatment needs than children of a control group of non-autistic patients. 61 patients with autism aged 6-16 years (45 males and 16 females) attending Dubai and Sharjah Autism Centers were selected for the study. The control group consisted of 61 non-autistic patients with matched age, sex and socioeconomic status. Each patient received a complete oral and periodontal examination, assessment of caries prevalence, and caries severity. It was concluded that children with autism exhibited a higher caries prevalence, poor oral hygiene and extensive unmet needs for dental treatment than non-autistic healthy control group. Thus oral health program that

emphasizes on prevention should be considered of particular importance for children and young people with autism.

Lai B et al (2011)[19] conducted a study on unmet dental needs and barriers to dental care among children with autism spectrum disorders. Mail-in pilot-tested questionnaires were sent to a stratified random sample of 1,500 families from the North Carolina Autism Registry of 568 surveys returned (38%), 555 were complete and usable. Sixty-five (12%) children had unmet dental needs. It was concluded that out of 516 children (93%) who had been to a dentist, 11% still reported unmet needs and the main barriers were child's behavior, cost, and lack of insurance, also the type of Autism Spectrum Disorder did not have any effect on having unmet dental needs.

Hernandes P et al (2011)[20] conducted a study on Applied behavior analysis: behavior management of children with autism spectrum disorders in dental environments.The authors conducted a search of the dental and behavioral analytic literature to identify management techniques that address problem behaviors exhibited by children with ASDs in dental and other health-related environments. The authors found no evidence-based procedural modifications that address the behavioral characteristics and problematic behaviors of children with an ASD in a dental environment.

P Subramaniam (2011)[21]conducted a study to assess the oral health status of 106 autistic children aged 4 to 15 years in Bangalore city, India. Dental caries was recorded according to the WHO criteria; oral hygiene was assessed using the oral hygiene index-simplified (OHI-S) and its modification for deciduous dentition. The behavior of children towards dental treatment was also assessed using the Frankel's behavior rating scale. Data obtained was subjected to statistical analysis.It was concluded that caries experience among autistic children was lower; however they were found to have more debris and calculus deposits.Also negative behavior towards dental treatment was seen in autistic children.

Olszewaska et al (2011)[22]conducted a literature review on Orthodontic management of children and adolescents withAutism. It was concluded that the Waiting time should not exceed 10-15 minutes for an orthodontic appointment for

ASD children. Also an attentive routine is recommended, by maintaining the same days, times, and dental staff for each dental visit.

Leah Stein et al (2011)[23]conducted a study on oral care and sensory sensitivities in children with autism spectrum to examine the contribution of sensory processing problems in oral care for children with ASD. A questionnaire was sent to the parents of 206 children with disabilities to test the hypotheses that children with ASD, relative to children with other disabilities, experience greater difficulty with home-based and professional oral care. It was concluded that children with ASD had greater behavioral difficulties and sensory sensitivities that parents believed interfered with their child's oral care,which were associated with oral care difficulties in the home and dental office, and with behavioral difficulties in the dental office. Thus, modifying the sensory environment may help to facilitate oral care in children with ASD.

Weil NT et al (2012)[24] conducted a study on parents' perceptions of severity of symptoms, oral health, and oral health-related behaviour to explore the relationship between the level of functioning (listening/talking/reading/daily self-care/care at home/social skills) of three to 21-year-old patients with autism spectrum disorders (ASDs) and their oral health and oral health-related behavior (brushing, flossing, dental visits). Survey data were collected from 85 parents of ASD patients. Patients' level of functioning was determined with a short version of the Survey Interview Form of the Vineland Adaptive Behavior Scales (2nd edition).parents' comfort levels concerning brushing and flossing their children's teeth and taking their children to the dentist varied considerably and correlated with children's level of functioning. . It was concluded that understanding the relationships between level of functioning of children with ASDs and their oral health and oral health-related behavior could increase dentists' ability to provide the best possible care for these patients.

Stein LI et al (2012)[25]conducted a study on oral care experiences and challenges in children with autism spectrum disorders to investigate the differences between children with autism spectrum disorders (ASD) and their peers in relation to oral care. Participants included 396 parents of ASD children and typically developing 2- to 18-year-olds. Parents completed a 37-item questionnaire designed by authors about oral care in the home and dental office. Significantly more parents of ASD children

reported difficulty across almost all oral care variables explored, including oral care in the home, oral care at the dentist, and access to oral care. It was concluded that children with autism spectrum disorders experience greater difficulties and barriers to care in both the home and dental office settings than their typically developing peers.

Hernandez C et al (2012)[26]conducted a cross-sectional exploratory study onperceptions of autistic children's parents about dental care. Target population was 60 school children's parents. The measuring instrument was a survey with thirty closed questions and one open question. Of the 60 surveys sent out, 26 were recovered with different answers to each of the questions. Almost all children with AD had received dental care about once a year mainly by pediatric dentists. It was concluded that the issues identified by parents as most relevant for improving care were: specialized dental care (26.9%), more humane treatment (19.2%) and distracting techniques (11.5%). Only three parents (11.5%) reported being satisfied with care.

Bien Lai et al (2012)[27]conducted a study to assess the unmet dental needs and barriers to dental care among children with autism spectrum disorders . Questionnaires were sent to a stratified random sample of 1,500 families from the North Carolina Autism Registry. Of 568 surveys returned, Sixty-five (12%) children had unmet dental needs. Of 516 children (93%) who had been to a dentist, 11% still reported unmet needs. It was concluded that the main barriers were child's behavior, cost, lack of insurance , caregiver's last dental visit greaterthan 6 months. Type of ASD did not have an effect on having unmet dental needs.

C Vishnu Rekha et al (2012)[28]conducted a study to assess the oral health status of autistic children in Chennai. Oral health status was assessed for 483 children with autism from special education schools, autistic child centres and therapy centres. Conditions assessed were plaque accumulation, gingival health, dental caries, malocclusion, developmental anomalies, oral injuries and restorations. It was concluded that autistic children with primary dentition showed higher incidence of dental caries (24%), when compared to other oral conditions. Children with mixed dentition had more gingivitis (50%) and children with permanent dentition had gingivitis (48.96%) and malocclusion (71.15%). Autistic children had significantly

poor oral hygiene and higher incidence of malocclusion and dental caries when compared to other oral conditions.

Rai K et al (2012)[29] conducted a study to evaluate the oral health status of children with autism and to determine the salivary pH and total salivary antioxidant concentration (TAC). 101 subjects with autism between age group of 6 and 12 year were part of the study and 50 normal healthy siblings of same age group were taken as control group. Oral health status was analysed using oral hygiene index-simplified and dentition status index. The salivary total anti-oxidant level was estimated using phosphomolybdic acid using spectrophotometric method and the salivary pH using the pH indicating paper. It was concluded thatsimilar dental caries status was observed in children with autism and their healthy normal siblings. Oral hygiene was poor in children with autism whereas the Salivary TAC was significantly reduced in autistic children.

OrellanaL M (2012)[30] conducted a study on oral manifestations in a group of adults with autism spectrum disorder. A case-control study was done on a group of patients with ASD (n=30), with a gender-matched control group (n=30). Evaluation was made of the medical history,medication,oral hygiene habits and oral diseases,with determination of OHI-S oral hygiene scores. It was concluded that most of the patients in the ASD group used two or more drugs and were assisted in brushing 2-3 times a day. The most frequent manifestations were bruxism, self-inflicted oral lesions and certain malocclusions. Adults with autism and assisted dental hygiene presented fewer caries than the non-disabled population. However, bruxism and anterior open bite were frequent in the patients with ASD.

Delli K et al (2013) [31] conducted a literature review on management of children with autism spectrum disorder in the dental setting: concerns, behavioural approaches and recommendations. It was reviewed that most of the relevant studies indicate poor oral hygiene in ASD children whereas they are inconclusive regarding the caries incidence in autistic individuals. Dental management of an autistic child requires in-depth understanding of the background of the autism and available behavioural guidance theories. The dental professional should be flexible to modify the treatment approach according to the individual patient needs.

Pani SC et al (2013) [32]conducted a study on Parental perceptions of the oral health related quality of life of autistic children in Saudi Arabia. A total of 59 families of children with Autism who had an unaffected sibling were cross-matched for age and gender of the affected child with families with no autistic children. The parents were administered the Parental Perception Questionnaire (P-CPQ) and the Family impact scale (FIS) components of and Arabic version of the Child Oral Health Related Quality of Life questionnaire (COHRQL). The P-CPQ scores of Children with Autism were compared with those of their unaffected siblings and those of children from families with no autistic child, while the FIS scores were compared between families with and without an autistic child. It was concluded that childhood autism results in a reduced OHRQoL for both the affected child as well as the familyand there is an apparent reduced parental concern with unaffected siblings of autistic children, when compared to parental concern towards children in families with no autistic child .

Barry S et al (2014) [33]conducted a cross sectional study on barriers to dental care for children with autism spectrum disorder to examine the problems encountered by these children , when accessing dental care. A piloted questionnaire was developed to identify the main barriers to dental care experienced by patients with ASD. The study group was comprised of parents/caregivers of children with ASD, and the control group was comprised of parents/carers of age matched healthy, neurotypical children.112 subjects completed the questionnaire. It was concluded that there was no significant difference in accessing dental care between study and control groups although access was perceived as more difficult in the ASD group , also predicted negative behaviours were more frequent in the ASD group.

Zuckerman KE et al (2014) [34]conducted a study on latino parents' perspectives on barriers to autism diagnosis. Five focus groups and 4 qualitative interviews were conducted with 33 parents of Latino children previously diagnosed with an ASD. Sessions were audiorecorded and transcribed. Parents reported low levels of ASD information and high levels of mental health and disability stigma in the Latino community. Parents had poor access to care as a result of poverty, limited English proficiency, and lack of empowerment to take advantage of services. The ASD diagnostic process was slow, inconvenient, confusing, and uncomfortable for the child. These factors led many parents to normalize their child's early behaviors, deny

that a problem existed. It was concluded that educational outreach to Latino families, destigmatization of ASD, streamlining the ASD diagnostic process, and providing additional support to Latino parents of at-risk children may decrease delays in ASD diagnosis among Latino children.

Fakroon S et al (2014)[35]conducted a study on dental caries experience and periodontal treatment needsof libyan children with autistic spectrum disorder.Dental caries experience of 50 children with ASD was compared to 50 controls. DMFT for dental caries experience and CPITN for periodontal treatment needs were calculated according to WHO criteria by a calibrated examiner.It was concluded that the children with ASD were found to be more likely caries-free and have lower dmft scores and higher unmet periodontal treatment needs than the unaffected control children.

McKinney CM et al (2014) [36]conducted a national survey on unmet dental needs in children with autism spectrum disorder. Using data from the 2009–2010 National Survey of Children with Special Health Care Needs, the author analyzed 2,772 children 5–17 years old with ASD and theorized unmet dental need would be positively associated with not having a medical home and having characteristics of more severe ASD .Nationally, 15.1% of children with ASD had unmet dental need. Among children with ASD, those without a medical home were more apt to have unmet dental need than those with a medical home . Parent reported ASD severity was not associated with unmet dental need. It was concluded that children with ASD without a medical home and with characteristics suggestive of increased ASD-related difficulties are more apt to have unmet dental need.

Isong IA et al (2014) [37]conducted a randomised controlled pilot study on addressing dental fear in children with autism spectrum disorders using electronic screen media. Eighty (80) children aged 7 to 17 years with a known diagnosis of ASD and history of dental fear were enrolled in the study. Each child completed 2 preventive dental visits that were scheduled 6 months apart (visit 1 and visit 2). During both visits, the subject's level of anxiety and behavior were measured using the Venham Anxiety and BehaviorScales.It was concluded that certain electronic screen media technologies may be useful tools for reducing fear and uncooperative behaviors among children

with ASD undergoing dental visits. Further studies are needed to assess the efficacy of these strategies using larger sample sizes.

Richa et al (2014) [38] conducted a cross-sectional study on oral health status and parental perception of child oral health related quality-of-life of children with autism in Bangalore, India on 4-15-year-old children with autism (n = 135) and children without autism (n = 135). Oral health status was evaluated using Oral Hygiene Index-Simplified (OHI-S), itsMiglanis modification for deciduous teeth, Decayed missing and filled teeth (DMFT/dmft) and Decayed, missing and filled surface (DMFS/dmfs) indices. Parents answered the Parental-Caregivers Perception Questionnaire for assessing children' sOHRQoL.It was concluded that MeanOHI-S, DMFT, dmft scores were significantly high among children with autism when compared to children without autism respectively.

Rennan Y Du et al (2014) [39] conducted a case control study on oral health among preschool children with autism spectrum disorder to assess and compare the oral health status of preschool children with and without autism spectrum disorders.A random sample of 347 preschool children with autism spectrum disorder was recruited from 19 Special Child Care Centres in Hong Kong. An age- and gender-matched sample was recruited from mainstream preschools as the control group. Dental caries status, gingival health status, tooth wear, malocclusion, dental trauma and oral mucosal health were assessed and compared between the two groups. It was concluded that the children with autism spectrum disorder had better gingival health, less caries experience and had similar prevalence of tooth wear, malocclusion, dental trauma experience and oral mucosal lesions than children without autism spectrum disorder.

AbdAlgabbar E H (2015)[40]conducted a study on parental perception of oral health status for sudanese children with autistic spectrum disorder in khartoum state.A total of 45 autistic children (34 boys and 11 girls) participated in this study in a ratio of 3:1 respectively, and their age ranged from 2 to16 years old. The majority of participated parents of autistic children were mothers (73.3%) and (26.7%) were fathers .64.4% of parents described their autistic children as having phobias (e.g. Sounds, new situations and touch, especially on the face), 80% of them claimed that their autistic children were motivated by positive reinforcement. It was concluded that parents' education

level had no impact on dental access for their autistic children, majority of parents described general health of their autistic children as good ,more than two third of the parents were well aware of the oral health status of their autistic children ,also these autistic children encountered no previous history of visiting dentists.

Cermac SA et al (2015)[41]conducted a randomized controlled pilot study on sensory adapted dental environments to enhance oral care for children with autism spectrum disorders the study examined the impact of a sensory adapted dental environment (SADE) to reduce distress, sensory discomfort, and perception of pain during oral prophylaxis for children with autism spectrum disorder (ASD). Participants were 44 children ages 6–12 (n = 22 typical, n = 22 ASD). Each participant underwent two professional dental cleanings, one in a regular dental environment (RDE) and one in a SADE, administered in a randomized and counterbalanced order 3–4 months apart. Outcomes included measures of physiological anxiety, behavioral distress, pain intensity, and sensory discomfort. It was concluded that both groups exhibited decreased physiological anxiety and reported lower pain and sensory discomfort in the SADE condition.

Nelson TM et al (2015)[42]conducted a literature review on educational and therapeutic behavioral approaches to providing dental care for patients with autism .These approaches included parent involvement in identifying strengths, sensitivities, and goal setting; using stories or video modeling in advance of the appointment; dividing dental treatment into sequential components; and modification of the environment to minimize sensory triggers. It was concluded that Patients with ASD are more capable of tolerating procedures that they are familiar with, and therefore should be exposed to new environments and stimuli in small incremental steps.

Cagetti M G, et al (2015)[43]conducted a study on dental care protocol based on visual supports for children with Autism Spectrum Disorders (ASDs) .The aim of this study was to propose a dental care protocol based on visual supports to facilitate children with ASDs to undergo to oral examination and treatments. 83 children (age range 6-12 years) with a signed consent form were enrolled; intellectual level, verbal fluency and cooperation grade were evaluated. Children were introduced into a four stages path in order to undergo: an oral examination (stage 1), a professional oral

hygiene session (stage 2), sealants (stage 3), and, if necessary, a restorative treatment (stage 4). Each stage came after a visual training, performed by a psychologist (stage 1) and by parents at home (stages 2, 3 and 4). It was concluded that the use of visual supports has shown to be able to facilitate children with ASDs to undergo dental treatments even in non-verbal children with a low intellectual level, underlining that behavioural approach should be used as the first strategy to treat patients with ASDs in dental setting.

Sarnat H et al (2016)[44]conducted a study to assess the dental status of young children with Autistic Spectrum Disorder (ASD) .ASD group consisted of 47 children and control group was 44 normally developed children. Parents were asked to complete a questionnaire that included socio-demographic information, general medical condition, dental information (previous visit to a dentist, feeding habits, oral hygiene behavior, oral habits and the Vinland Adaptive Behavioral Scales (VABS). It was concluded that caries experience of autistic children was lower than in the control group, maintaining good oral hygiene is difficult for autistic children yet their gingival health was found to be good.

Pini DM et al (2016)[45]conducted a study to identify the prevalence of the main oral problems present in special needs children and to relate the underlying conditions with the clinical and demographic variables. For data collection, we used a self-administered questionnaire that included indices of dental caries and oral hygiene, Angle classification, malposition of dental groups and oral hygiene habits. It was concluded that there was a high decayed-missing-filled teeth index and malocclusion class I, as well as inadequate oral hygiene. The type of underlying condition of the participants influenced the act of brushing teeth by themselves.

M Abhishek et al (2016)[46]conducted a cross sectional survey for assessment of oral health status of children with special needs in Delhi, India. A study was conducted on 414 children with special needs belonging to four different disability groups i.e. Intellectually Disabled (ID), Physically Challenged, visually and hearing impaired. It was concluded that Oral health of children with special needs was poor and urgent attention is required to plan a comprehensive dental health care programme for them.

Adriana Gledys Zink et al (2016) [47]conducted a study on Use of a Picture Exchange Communication System for preventive procedures in individuals with autism spectrum disorder: pilot study In this study, 26 patients with ASD, between 5 and 19 years of age were divided into two groups: G1 with no previous experience of dental treatment, and G2 , with such previous experience. The initial approach followed the principles of the Son-Rise Program®. The seven PECSs presented the routine of the dental office: "room," "ground," "chair," "dentist," "mouth," "low," and "triple." Each PEC was used up to three times in order to acquire the skill proposed. It was verified that G2 required a greater number of times to achieve the acceptance of PECS "ground," "dentist," "mouth," and "triple". It was concluded that PECS facilitated patient-professional communication during preventive procedures, including for ASD patients with previous dental experience.

Thomas NA et al (2016)[48]conducted a cross sectional, case control questionnaire based study on barriers to dental care for children with autism spectrum disorder to evaluate the main hurdles to dental care experienced by children with ASD in Mangalore city. The study group comprised ofparents / care takers of children aged 3-12 years with ASD attending special schools in Mangalore city. The questionnaire comprised of closed ended questions, regarding individual barriers while accessing dental care and the proportions of individual barriers to dental care. 83.9% of the respondents reported difficulty in managing the behavior of the children with ASD. Otherbarriers reported were the child's inability to communicate and dentist's lack of knowledge and training children with ASD.It was concluded that specialized training of dentists and dental students to manage children withspecial needs and ASD should be mandatory.

Hafez M Diab et al (2016)[49]conducted a study on comparison of gingival health and salivary parameters amongst autistic and non-autistic school children in riyadh to evaluate the modified gingival index (MGI), plaque index (PI), salivary ph and buffering capacity of the saliva among autistic children compared to normal children in riyadh city for future planning of dental services for autistic children. 50 children diagnosed with autism (mean age 8.5 years) and a control group of 50 non-autistic school children (mean age 8.7 years) were selected and it was concluded that

children with autism appear to have higher gingival inflammation, poor oral hygiene and a slightly lower salivary ph as compared to healthy control group.

Witriana L. Wibisono et al (2016) [50]conducted a study on perception of dental visit pictures in children with autism spectrum disorder and their caretakers .Purposive sampling was used to recruit participants from a school for children with special needs in south Jakarta. Semi-structured interviews were conducted with 10 autistic children aged 13–17 years, 2 parents, and 2 teachers. Open-ended questions were asked to participants regarding pictures of dental clinic personnel and activity. Conversations were noted, tape recorded, and then categorized to extract a theme. Most respondents showed a positive perception of thedental visit pictures. Many of the pictures were easily recognized by children with ASD, but some failed to understand. It was concluded that dental visit pictures could be used as useful communication tools for children with ASD.

Mah and Tsang (2016)[51]conducted a randomised controlled trial on the efficacy of a visual schedule system (pictures, communication symbols, or cues) during dental appointments in Canada. It was concluded that this visual schedule system has the potential to help autisticchildren successfully complete each dentalprocedure step, with lower distress and inless time.

Marion et al (2016) [52]conducted a randomised controlled trial for the Use of dental stories consisting of photographs integrated with text and videos to prepare the autistic patient for the dental treatment in USA.It was concluded that the dental stories showed to be effective for preparing both children and families for dental visits.

Elmore et al (2016)[53]conducted a literature review in which articles assessing pictures, recent electronic technologies (videos and mobile applications), and socio-behavioural intervention were selected and it was concluded by the authors that the socio-communicative and behavioural techniques are the preferred approaches for reducing dental anxiety in autistic children. It was also seen that visual devices are potentially useful aids for this purpose.

Bartolomé-Villar et al (2016)[54]conducted a Systematic review on oral conditions of children with autism spectrum disorder and children with sensory impairments in Spain. No differences were found regarding the prevalence of dental caries, oral habits, malocclusions, and frequency of trauma; only oral-hygiene status was considered worse in autistic children.

Dangulavanich et al (2017)[55]conducted a cross-sectional study in Thailand to evaluate the cooperation rates in Thai ASD patients and analyse factors associated with cooperation levels in ASD patients during dental treatment. 95 subjects aged between 3–18 years diagnosed with ASD received dental treatment Data were collected from medical records and parental questionnaires as well as behaviour rating during dental treatment using the Frankl rating scale was done.It was concluded school-age ASD children who have been trained in special education programmes showed positive behaviour and a higher cooperation level before and during dental treatment .

Da Silva et al (2017)[56]conducted a systematic review to calculate the pooled prevalence of dental caries and periodontal disease in children or young adults with autism spectrum disorder in Brazil/UK. It was concluded that Seven included studies reported dental caries prevalence. Pooled prevalence was 60.6%. Pooled periodontal disease prevalence was 69.4%.

Sadia-Fakhruddin et al (2017) [57]conducted a randomised controlled trial in United Arab Emirates in which ASD children were introduced to dental non-invasive treatment sessions with or without the use cartoon movies, as visual distractors. Changes in blood oxygen saturation and heart rate were recorded. It was concluded that the use of audiovisual distraction significantly decreased the mean heart rate and there was no significant difference in oxygen saturation levels between groups.

Al-Sehaibany et al (2017)[58]conducted a Prospective cohort study .This study compared the prevalence of oral habits between patients with ASD and healthy children over a 14-month period Saudi Arabia. The prevalence in ASD children was 87.3% and in healthy patients 49.3%. The most common habits among autistic children werebruxism (54.7%), object biting (44.7%), andmouth breathing (26.7%).

Thomas N et al (2017) [59]conducted a study on Autism and primary care dentistry: parents' experiences of taking children with autism or working diagnosis of autism for dental examinations to gather dental experiences of UK parents of children with autism and explore how they feel primary caredental services can be improved.A total of 17 parents of children with a diagnosis or working diagnosis of autism, took part in semi-structuredinterviews. Key themes identified were flexibility of the dental team and environment, confidence of the parents to advocate for their children's needs, the dental chair, challenges of the waiting room, perceived medical authority and the importance of continuation of care. It was concluded that there is a strong relationship between parents and the whole dental team is essential for children with autism to access dental examinations and have satisfactory experience of care.

Zink AG et al (2018) [60]conducted a study on communication application for use during the first dental visit for children and adolescents with autism spectrum disorders to develop and evaluate an application (app) facilitating patient-professional communication among individuals with autism spectrum disorder (ASD) and compare it with the Picture Exchange Communication System (PECS). Forty nine- to 15-year-olds were randomly divided into two groups: G1 and G2. Pictures of a room, ground, chair, dentist, mouth, low-speed handpiece, and air-water syringe were presented to both groups. Each picture was shown up to three times per appointment to evaluate whether or not the child accepted the procedure. After dental prophylaxis, caries experience was recorded. It was found that the prevalence of dental caries was 37.5 percent. It was concluded that the app was more effective than the Picture Exchange Communication System for dentist-patient communication, decreasing the number of appointments required for preventive dental care and clinical examinations.

Eslami N et al (2018)[61]conducted a study on parents´ perceptions of the oral health-related quality of life of their autistic children in iran .70 families with at least one child with autism, and 70 families with normal children were enrolled. Parents' perceptions of the OHRQoL of children were assessed using pre-validatedPedsQL oral health scale questionnaire. PedsQL Family Impact Module questionnaire was also used toevaluate the impact of having an autistic child on the quality of life of

their families. It was concluded that oral health-related quality of life of autistic children was better than normal children. However, parents of autistic children had more problems in the social and communication issues.

Du YR et al (2018)[62]conducted a study on the oral health behaviours of preschool children with and without autism spectrum disorders and their barriers to dental care and evaluated dental knowledge and attitudes of their parents. 257 preschoolers with ASD and an age- and gender-matched control sample were recruited. children with ASD had less frequently performed tooth-brushing and used toothpaste, but more often required parental assistance in toothbrushing. Parents of children with ASD had higher scores in dental knowledge and attitudes than those without ASD. differences in oral health behaviours and barriers to dental care existed between preschool children withand without ASD.

Borte GO et al (2019)[63]conducted a study on factors affecting quality of life of caregivers of children diagnosed withautism spectrum disorder. The study was aimed to evaluate the effect of the variables related to both parents and children on the QoL scores of the parents of the children with ASD. Questionnaire on sociodemographic/disease-related variables, QoL in AutismQuestionnaire-Parent Version (QoLA-P), autism behavior checklist was assessedfor 162 patients with ASD. The severity of autism, the presence of psychiatric disorder in the mother/father, attendance of the child at school, duration since the diagnosis of autism, and the child's medication use were assessed. It was concluded that autism affects the QoL of caregivers. The intervention of treatment by considering the factors that affect the QoL positively or negatively may increase the QoL of caregivers.

Doichinova Lilia et al (2019)[64]conducted a study on the oral hygiene education of autistic children. 30 children with autism aged 6–11 years were trained using Picture Exchange Communication System (PECS) images for oral hygiene and tooth-brushing techniques were made. The oral hygiene level was assessed using the Silness&Loe Oral Hygiene Index. The children had poor oral hygiene due to hindered communication and motivation. The practical training of the children with autism included in the study lasted one year and was performed with the help of their parents. It was concluded at the end of the one-year educational programme in oral hygiene,

that there was improvement in the oral hygiene habits of the children. The PECS images helped to improve the communication and the oral hygiene habits in the children with autism.

AlBatayneh O.B et al (2019) [65]conducted a study on the effectiveness of a tooth-brushing using the picture exchange communication system (PECS) on gingival health of children with autism spectrum disorders. 37 children with ASD (31 males, 6 females) in age range of 4-16 years were trained using PECS as a pictures/cards series showing a structured toothbrushing method, and their parents/ caregivers were trained on tooth-brushing twice, 2 weeks apart. Most parents and caregivers rated PECS as hard, but useful. It was concluded that PECS though rated as hard was useful in improving gingival health in children with ASD.

Garcia B et al (2019) [66]conducted a study on the association between feeding problems and oral health status in children with autism spectrum disorder.Parents of 55 children with ASD and 91 children with typical development (TD) between 6 and 18 years of age completed the Brief Assessment of Mealtime Behavior in Children (BAMBIC) and a food consumption frequency questionnaire. A pediatric dentist performed an oral exploration of the participants according to the criteria of the World Health Organization (WHO) in which children with ASD show greater mealtime behavioral disorders and food selectivity than children with TD. A higher prevalence of dental disease was observed in the ASD group, though the caries indexes were low in both groups. An association was observed between food rejection and limited food variety, and an increased prevalence of malocclusions, altered Community Periodontal Index scores and bruxism was recorded among children with ASD versus children with TD of the same age.

Pi Xiaoqin et al (2020)[67]conducted a meta-analysis to assess the risks of caries and periodontal problems in autistic children as compared to healthy children.The literature search included PubMed, Embase, Web of Science, Cochrane, China National Knowledge Infrastructure (CNKI), Wan fang, and Chinese Scientific and Technological Journal (VIP) databases was conducted. The primary outcomes of interest included the DMFT index, Plaque index (PI), Gingival index (GI), and

Salivary pH.It was concluded that children with autism have pooreroral hygiene, higher risk of caries, and a lower salivary pH than healthy children.

QiaoYanan et al (2020)[68]conducted a study to assess and compare the oral health status of children with and without autism spectrum disorders (ASD) in China.The study recruited 144 children with ASD and 228 unrelated children with typical development (TD) aged 3–16 years from China. Oral problems (oral symptoms and habits), oral health measures (oral hygiene practice and dental care experience), and the impact on the child's quality of life (based on a modified version of the Parental-Caregiver Perception Questionnaire) were assessed and compared between the two groups. It was concluded that oral problems such as halitosis and bad oral habits are more prevalent among children with ASD.

Du Yanlin R et al (2020)[69]conducted an interventional study on the evaluation of visual pedagogy in improving plaque control and gingival inflammation among preschool children with Autism Spectrum Disorder. Among 122 autistic preschool children toothbrushing visual pedagogy (TBVP) was provided to parents for supervising their children with toothbrushing at home. The children's sociodemographicbackground, developmental profile, clinical parameters were obtained via parental questionnaire, standardised assessment form and clinical examination respectively. Significantly lower level of plaque and gingival inflammation were found at 3 months and 6 months than baseline. The oral health status of children with poorer baseline oral hygiene status and gingival health were more likely to improve with TPVP. It was concluded that TBVP is effective in promoting oral hygiene maintenance and improving the periodontal conditions among individuals diagnosed with ASD.

Lam PYP et al (2020) [70]conducted a systematic review and metanalysis on oral health status in autistic children andfound that the salivary pH of individuals diagnosed with ASD was significantly lower, but the results were not clinically significant such that it can increase their risks to tooth decay. Also weak evidence suggested a higher percentage of children and adolescents diagnosed with ASD had the habit of tooth grinding compared with their neurotypical counterparts. When comparing salivary flow rate, tooth decay, gum diseases, tooth malalignment and

tooth trauma; no significant differences were found between the two groups. The authors concluded that the findings did not suggest ASD as a predisposing factor to oral diseases even though other factors including sugary diet and inadequate oral hygiene may play a more important role.

Nameeda KS et al (2020)[71]conducted a study to evaluate the effectiveness of PECS on Dental plaque accumulation and oral health of autistic children. Based on PECS, a series of pictures that showed a structured method and technique of tooth brushing were used. These pictures were placed in the bathroom, at home and/or at the autism centre. OHI-S and PI were recorded at each clinical visit (pre and post). It was concluded that PECS can be a useful tool in helping children with autistic spectrum disorder to maintain oral hygiene and also to communicate before and during the preventive dental treatment procedures

Humaid JA et al (2020) [72]conducted a cross –sectional study on oral health of children with autism: the influence of parental attitudes and willingness in providing carestudy included 75 children with ASD attending the special needs schools in Eastern Saudi Arabia from 2015–2018. Parents responded to a self-administered questionnaire assessing their attitudes toward oral health and comfort in providing oral care for children. & clinical examination assessed dental caries (decayed, extracted, and filled: (DMF and def)), gingival disease, and plaque accumulation. It was concluded thatprevalence of dental caries was 76% and 68% in the in primary and permanent dentition respectively. 31 participants had gingival problems, Half of the parents supervised their children's brushing, which was significantly associatedwith plaque accumulation and gingival disease. Positive parental attitudes were associatedwith lower sugar consumption with gingival and plaque scores.

Ferrazzano GF et al (2020)[73]conducted a review on oral health status in autistic children. A search was conducted through MEDLINE/PubMed and Web of Science and Forty-six articles were selected. In order to evaluate the oral health status of children with ASD and the correlation between ASD and dental caries, periodontal disease, dental injuries, oral microbiota, as well as the different strategies, approach and treatments in ASD patients. It was concluded thatChildren with ASD are at higher risk of caries,alteration of the periodontal status, alterations of the oralmicrobiota and increased risk of traumatic injuries.

MATERIALS AND METHODS

The present study was conducted in the Department of Pediatric and Preventive Dentistry, BabuBanarasi Das College Of Dental Sciences, BBDU, Lucknow,approval from the Institutional Research Committee (ANNEXURE- I) and the Institutional Ethical Committee of BabuBanarasi Das College of Dental Sciences, Lucknow (ANNEXURE –II) was obtained . The study was conducted in collaboration with special healthcare schools with Autistic Children in Lucknowafter obtaining required consent (ANNEXURE –III). Special health schools in Lucknow were included in the study with an aim to evaluate the effectiveness of picture exchange communication system (PECS) for assessment of oral health status in autistic children; parental perceptions were also determined regarding dental visits.

PLACE OF STUDY:

The present study was conducted on a sample of 30 subjects including both males and females for assessment of oral health status inBabuBanarasi Das College of Dental Sciences , Lucknow. Parental Perceptions on dental visits was assessed for a sample of 60 parents. The subjects were randomly selected from four schools for special children in Lucknow.

The schools surveyed for the present study were as follows :

- Rosalin Child Development Center, Lucknow
- AshaJyoti School , Indiranagar, Lucknow
- Center for Autism , Indiranagar, Lucknow
- Rainbow Society for differently abled, Mahanagar, Lucknow

FORMALISED HYPOTHESIS :

To assess effectiveness of Picture Exchange Communication System (PECS) by assessment of oral health evaluation; a gradual decrease in oral hygiene scores indicates improvement of oral hygiene whereas, gradual progress in Phases of PECS i.e. higher value of PECS Phase would demonstrate better cognitive ability towards understanding dental setup related PECS Cards.

STUDY SUBJECTS : Autistic children in age group of **4 – 18 years.**

SAMPLE SIZE :

The sample size was calculated on the basis of the following formula :

$$N = Za^2 * p * (1-p)/L^2$$

Where,

N = Sample size,

Z a 2 = constant calculated at 1.96

P = Prevalence (taken from previous studies)

L = margin of error

Sample Size for assessment of oral health status through Picture Exchange

Communication System (PECS) = 30

Sample Size for assessment of parental perception = 60

CRITERIA FOR SAMPLE SELECTION / ELIGIBILITY CRITERIA :

❖ **INCLUSION CRITERIA :**

1) Participants in the age group of 4 to 18 years.
2) Children diagnosed with Autism Spectrum Disorder.
3) Children in which degree of severity according to Indian Scale for Assessment of autism (ISAA) was mild and moderate.
4) Parents / Caregivers who gave consent for questionnaire.

❖ **EXCLUSION CRITERIA :**

1) Children in which degree of severity according to Indian Scale for Assessment of autism (ISAA) was severe .
2) Caregivers/parents of autistic children from whom consent was not obtained for oral health evaluation of Picture Exchange Communication System and self- designed questionnaire.

ARMAMENTARIUM :

i. Mouth Mirror (Microlux Lighted mirror ADent Marked and ISO 9001:2008 Registered)

ii. Probe (GDC)

iii. Tweezers (GDC)

iv. Gloves (Medishield Health Care)

v. Mouth Mask (Medishield Health Care)

vi. Cotton (TRO ORTHOSOFT-TROGE)

vii. Kidney Tray (KR Dent)

viii. Toothbrushes for subjects (Colgate)

ix. PECS Board

A three-ring binder (15 cm by 23 cm) was used as a communication board to teach PECS. The binder contained several strips of Velcro (sentence strips), an ''I want'' card, an ''I see'' card, ''yes'' and ''no'' cards, and colourful pictures (2.5 cm by 2.5 cm) of preferred items. These cards were constructed from pictures of dental operatory. The sentence strip was a piece of strengthened paper with Velcro on the bottom and top. The strip was attached to the PECS book on the lower right corner.

INFORMED CONSENT :

Prior permission and consent was obtained from the parents by consent forms which were given one week before the clinical examination. Age and details of the subjects were obtained from school records.

METHODOLOGY :

In the present study the subjects between the age range of 4-18 years were randomly selected from different autism training centers in Lucknow. 30 subjects and 60 parents satisfying the inclusion criteria were a part of the study. The participating centers were informed and a prior notice was given to each center before the commencement of the study.

A detailed information was taken from all the above centers regarding the participants degree of autism i.e. mild, moderate or severe on the basis of Indian Scale for Assessment of Autism (ISAA) [74] as shown in ANNEXURE VI : The ISAA is a 40

item scale divided into six domains- Social Relationship and Reciprocity; Emotional Responsiveness; Speech — Language and Communication; Behavior Patterns ;Sensory Aspects and Cognitive Component. The following categories are recommended; mild AD: 70-107, moderate AD: 108-153, severe AD: 153. Based on the Indian scale for assessment of autism (ISAA) only mild and moderate grades of autism were evaluated, as children diagnosed with severe grade of autism were unable to follow PECS at the respective autism centers ,and were beyond the scope of the study.

EXAMINATION OF PARTICIPANTS :

1) First Visit (Baseline) :

After obtaining an informed consent from the centre, a verbal interactive session for the teachers, supervisors, parents and caregivers was conducted wherein they were educated about the maintainence of oral hygiene and home dental care. The parents and caregivers were trained about brushing technique using horizontal scrub method as it is easy to perform in special children and yields good results. This technique consists of performing gentle horizontal strokes on cheek, tongue and biting surfaces of all teeth and gums, the parents were also given a soft, multitufted nylon brush for the same. For children who were unwilling or physically unable to cooperate, the parents were guided to clean teeth twice a day by safely immobilising the child when necessary. Several positions for toothbrushing that permit firm control and support of the child, adequate visibility, convenient positioning of adult were demonstrated. It was further ensured that the teachers and parents/caregivers were able to carry out specific oral hygiene maintainence instructions themselves with the use of Picture Exchange Communication System (PECS), in order to reinforce the participants. PECS cards on oral hygiene maintainence were explained and handed over to both the teachers and parents/caregivers along with the self made validated questionnaire (ANNEXURE - VII) for assessment of parental perception regarding dental visits. Reliability of the questionnaires was assessed based on Cronbach's Alpha and the value obtained was 0.8. [75]

Each participant was made to sit comfortably on a chair facing the examiner. Demographic details of the children were recorded along with an attempt to establish a good rapport with them. An informed consent was obtained prior to the start of the

procedure and appropriate instructions were given. Participants were examined under natural daylight using a single sided mouth mirror and probe. Evaluation of baseline was done by a single examiner for oral hygiene status using selected indices. The subjects' level of oral hygiene was assessed using the simplified oral hygiene index (OHI-S) as shown in by Greene and Vermillion which was chosen because it was depicted as a "simple method for assessing group or individuals oral hygiene levels quantitatively [76, 77]." The OHI-S (ANNEXURE IX) was developed for the study of variations in gingival inflammation in relation to the degree of intellectual subnormality in children, but has proven useful as an epidemiological tool for evaluating oral health programs in both the general population and disabled groups [78] .The OHI-S has two components: the simplified debris index (DI-S) ; the simplified calculus index (CI-S). Each of these indices is based on numerical determinations representing the amount of debris or calculus found on six preselected tooth surfaces: the buccal/labial surfaces of the maxillary right first molar (tooth 16), the maxillary right central incisor (tooth 11), the maxillary left first molar (tooth 26),the mandibular left central incisor (tooth 31), and the lingual surfaces of the mandibular left first molar (tooth 36) and the mandibular right first molar (tooth 46). The criteria for the debris and calculus indices are shown in ANNEXURE VIII. OHI-S Index **:**Good -0 – 1.2; Fair– 1.3-3 ; Poor– 3-6 . The DI-S and CI-S scores were calculated separately by summing the scores and then dividing the results by the number of examined surfaces. Results obtained using the OHI-S are represented by DI-S and CI-S scores. For primary dentition, the modified version of the OHI-S by Miglani et al was used, in which the index teeth are: the maxillary right second molar (tooth 55), the maxillary right central incisor (tooth 51), the maxillary left second molar (tooth 65), the mandibular left second molar (tooth 75),the mandibular left central incisor (tooth 71), and the mandibular right second molar (tooth 85). The scoring system was similar to the original OHI-S. [79]

On completion of oral hygiene evaluation, each participant was individually educated about the maintainence of oral hygiene using the Picture Exchange Communication System (PECS) and brushing technique was explained with the help of a model and toothbrush to understand better through tactile senses. PECS Phases (ANNEXURE X) were repeated as required for each participant solely on the response received. Criteria for PECS Evaluation is as follows: Phase 1 - Initial Picture Exchange ;Phase

2 - Distance Phase And Generalisation; Phase 3- Picture Discrimination ; Phase 4-Sentence Structure ; Phase 5 -Answering Questions ; Phase 6 - Commenting Phase. The cognitive ability of each subject was assessed on the basis of the Phase of PECS the subject was about to reach at the baseline visit by the same examiner.At the end of the session every participant was given a standardized soft bristle toothbrush to use throughout the duration of the study. The subjects were also educated with the same set of PECS cards by the teachers at the center and parents/ caregivers at home about the maintainence of oral hygiene for 4 weeks.

2) On the 2ndvisit , after 4 weeks , re-evaluation of the oral health status of the same participants was done with the help of OHI-S and OHI-M . The PECS cards were repeated as required for each participant solely on the response received. And the progress in cognitive ability of the subject was re- assessed on the basis of the Phase of PECS (ANNEXURE IX) , to assess the Phase of PECS that the subject was about to reach after 4 weeks of training by the examiner, teachers and parents/caregivers.Questionnaires were collected from parents for assessment of Parental perception regarding dental visits.

3) On the 3rdvisit , 4 weeks post the 2nd visit again re-evaluation of the oral health status of the same participants was done. PECS cards were again repeated as required for each participant based on the response received. And the progress in cognitive ability of the subject was further re- assessed on the basis of the Phase of PECS (ANNEXURE IX), to assess the Phase of PECS that the subject was about to reach after 4 weeks of training by the examiner, teachers and parents/caregivers.

Each participant had a case sheet record which included the personal details, brushing habits, Indian Scale for Autism criteria and oral hygiene scores that were recorded and maintained at the baseline, 1st visit and 2nd visit. Records of Oral Hygiene Index and Phases of PECS was maintained throughout the study. The data collected was subjected to statistical analysis (ANNEXURE X).

ASSESSMENT OF PARENTAL PERCEPTION :
Parental perception was assessed through a self - designed questionnaire (ANNEXURE VIII) by distributing the questionnaire to 60 parents.   The

questionnaire was divided into five domains. **Domain1** : Patient information (child's name, age, gender, parents name and parents occupation) ; **Domain 2**: medical history (1.Has your child been diagnosed with Autism Spectrum Disorder (ASD)? 2. At what age was your child diagnosed with ASD? 3. Does your child have any additional medical condition? **Domain 3**: Communication and behaviour (1.Does your child use non-verbal communication? 3. Do you use any of these communication systems for your non- verbal child ? **Domain 4**: Oral Care and dental treatment history (1.Does your child use a Manual toothbrush or Powered Toothbrush 2. Does your child brush independently or with parent/guardian's assistance? 3. Does your child floss? 4. Do you think going to the dentist is important for your child's oral health ? 5. Has your child ever seen a dentist? 6. How was your childs last dental visit 7. What was the reason for you to take your child for his /her last dental visit ?8.What kind of dentist did your child see at his/her last visit?9.Difficulties faced by you and your child during the last dental visit? 11. Would you like the dentist to treat your child using behaviour modification, sedation or restraints? **Domain 5**: 1. Is your child more comfortable in a dim light? 2. Is your child sensitive to motion 3. Does your child have any specific oral sensitivities? 4. Do certain tastes bother your child?

The self - designed questionnaire was collected to assess the parental perception regarding dental visits. The data collected was subjected to statistical analysis.

Fig : 1 Self-Designed Picture Exchange Communication System (Pecs) Board.

**Fig : 2 Evalution of Oral Health Status in Autism Spectrum Disorder (ASD)
Using Exchange Communication System (Pecs) Board**

**Fig : 3 Demonstration of Brushing Technique in in Autism Spectrum Disorder
(ASD) Children**

Fig : 4 First Dental Visit (Baseline Visit)

Fig : 5 Second Dental Visit

Fig :6 Third Dental Visit

RESULTS AND OBSERVATIONS

Children diagnosed with autism in the age range of 4-18 years were selected for the present study. Based on the Indian Scale for Assessment of Autism (ISAA) children diagnosed with severe grade of autism were unable to follow PECS at the respective autism centers and were beyond the scope of the study. Hence, self-designed questionnaires were distributed amongst 60 parents of autistic children diagnosed with mild and moderate grades of autism to determine parental perceptions of autistic children regarding dental visits. Around 30 subjects were selected from the above mentioned sample size from the questionnaire part of the study for assessment of oral health status to evaluate the effectiveness of PECS in improving oral health.

A) Assessment of oral health status using PECS (Picture Exchange Communication System)

Oral health evaluation was done on 30 autistic children with the help of picture exchange communication system; from baseline (first visit) through second visit and third visit, a gradual decrease in OHI-M and OHI-S scores indicated improvement of oral hygiene and a gradual progress in Phases of PECS demonstrated better cognitive ability towards understanding dental setup related PECS Cards.

Statistical Analysis:

Data was analysed using SPSS 23.0 version (IBM; Chicago). Variables are expressed as mean, standard deviation, number and percentages. Analysis of Variance (ANOVA) was applied to find significant difference between PECS and OHI – S evaluation at baseline, 2nd and 3rd visit. Chi square test was run to find differences among various spectrum of autism and oral hygiene practices .P value lesser than 0.05 was considered statistically significant.

Table 1a andFigure 7 :shows in the gender distribution there were 23 (76.7%) males and 7 (23.3%) females**.**

Table 1b shows the age distribution of study population with the mean age 9.733 + 3.675

Table 2 shows degree of autism. Based on the Indian scale for assessment of autism (ISAA) Children diagnosed with severe grade of autism were unable to follow PECS at the respective autism centers and thus, were beyond the scope of the study. Mild and Moderate grades of autism were evaluated, 16(53.3%) were categorised as mild autism and 14(46.7%) were categorised as moderate autism.

Table 3 - PECS Phases showed a gradual rise from baseline to third visit, i.e, 2.500 + 1.106 to 3.800 + 1.323 which was statistically highly significant (p<0.001). Overall increase in the mean values indicates a gradual progress in Phases of PECS demonstrating better cognitive ability towards understanding dental setup related PECS cards which further led to overall improvement in OHI-M and OHI-S scores from baseline to third visit.

Table 4 demonstrates the comparison in PECS evaluation at each Phase among mild and moderate autism groups. In the Mild Autism group gradual rise in mean values was seen from the baseline 2.937 + 0.997 , first visit 3.125 + 0.806, and second visit 4.375 + 0.957 whereas in the moderate grade of autism mean values at baseline 2.000 + 1.037 , first visit 2.357 + 0.928 and second visit 3.142 + 1.406. Thus, more improvement was seen in the PECS Phases in mild autism group as compared to the moderate autism group. PECS at baseline, first and second visit showed significant differences at p <0.018, 0.022 and 0.008 respectively.

Table 5 shows OHI – S scores improved significantly from the baseline 2.566 + 0.504 to the first visit 2.433 + 0.504 and second visit 1.800 + 0.667 (p <0.001). A gradual decrease in OHI-M and OHI-S scores indicated improvement of oral hygiene.

Table 6 shows a definitely substantial correlation was seen between PECS and OHI – S. An increase of PECS led to a decrease in OHI – S scores which was highly significant (p <0.001). From baseline through the second visit a gradual decrease in OHI -M and OHI-S scores indicated improvement of oral hygiene whereas, gradual progress in Phases of PECS i.e. higher value of PECS Phase demonstrated better cognitive ability towards understanding dental setup related PECS Cards which further led to overall improvement in OHI-M and OHI-S scores.

B) Assessment Of Parental Perceptions During Dental Visits :

Table 7 - Validity of the questionnaire:

The questionnaire employed for the present study was pilot tested on 5 parents to assess the content and face validity, who were not a part of the final study. The questionnaire was not modified as it measured what was intended to be measured. Cronbach's alpha coefficient was 0.88 demonstrating good reliability of the questionnaire.

The validated questionnaire was further divided into 4 domains :

DOMAIN 1 : (PATIENT INFORMATION)

Table 8a shows the age distribution of the study participants where, mean age for mild and moderate autism group was 12.2031 and 11.8036. The overall mean was seen to be 12.0167.

Table 8b depicts Gender distribution of study population, 76.7% (46) male ASD individuals were present in which 41.7% (25) and 35%(21) were in the mild and moderate group respectively. 23.3%(14) females were present in the study in which 11.7% (7) and 11.7% (7) were a part of the mild and moderate groups respectively.

Table 8c shows that themost common occupation of parents was seen to be self-employment (41.7%) as shown in Table 8c and Graph 1.

DOMAIN 2 : (MEDICAL HISTORY)

Table 9 shows around 53.3% individuals in the questionnaire belonged to the mild ASD group whereas, 46.7% individuals were from the moderate ASD group on the basis of Indian Scale for Assessment of Autism. Mean age for diagnosis of mild ASD was $9.343 + 2.434$, and moderate ASD was $10.923 + 3.190$ accounting to a total mean age of $9.290 + 2.294$. Table 9 and Graph 2 depicts most common medical conditions associated with ASD were seizures (50%) followed by Sensory problems (26.7%), Sleep disturbances (13.3%), Allergies (6.7%), GIT disturbances (3.3%). No significant difference was noted for the variable additional medical conditions with a p value of 0.568.

DOMAIN 3 : (COMMUNICATION AND BEHAVIOUR)

Table 10 and Graph 3 shows non-verbal communication was used by 70% and the values obtained were significant (p=0.04). In Table 10 and Graph 4, significant difference (p=*0.02)* was noted for the variable commonly used communication system by the parents for non-verbal communication in which Picture Exchange Communication System (45.2%) followed by sign language (30.9%) and gestures (23.8%) were used.

DOMAIN 4 : (ORAL CARE AND DENTAL TREATMENT HISTORY)

Table 11a: Oral care and dental treatment history

- In Table11a and Graph 5 the type of toothbrush used wasaround 51.7% (31) in the mild autism and 45% (27) in the moderate autism group i.e. 96.7%(58) children used a manual toothbrush and 2 (3.3%) used an automatic toothbrush. No significant difference was noted (p = 1.000)

- Need for assistance in toothbrushing was seen in 50(83.3%) and it was equally seen in both the mild and moderate groups. Significant difference was noted (p=0.026)as shown in Table 11a and Graph 6

- In Table11a and Graph 7, around 50% (30) children in the mild ASD group and 46.7% (28) children in the moderate autism group i.e.96.7%(58) children did not use a dental floss.Significant difference was noted (*p = 0.035).*

- In Table11a and Graph 8 ,90% (54) parents thought going to the dentist is important for their child's oral health and had been to the dentist which consisted of around 48.3% (29) in the mild autism group and 41.7% (25) in the moderate autism group. In Table11a and Graph 9, 90%(54) parents mentioned that they had been to a dentist whereas 15% (6) parents had not visited the dentist. Hence, the rest of the questions were based on the response from these 54(90%) parents.

- 57.4% (31) parents mentioned that their child's last dental visit was fair in which 31.5%(17) belonged to the mild autism group and 25.9%(14) belonged to the moderate autism group. No significant difference was found (p = 0.992) as shown in Table11a

- Table 11a shows that around 46.3% parents mentioned that the most common reason for last dental visit was cavity out of which 27.8%(15) and 18.5%(10)

were in the mild and moderate autism groups.Other reasons included Dirty teeth in 33.3%(18) and cracked teeth 20.4%(11). No significant difference was present (p=0.807).

- Out of the 54 parents who had been to a dentist , 43 (79.6%) went to a general dentist in which 44%(24) and 35.2%(19) belonged to the mild and moderate autism group respectively. 20.4% had been to a pediatric dentist in which 11.1% (6) and 9.3% (5) belonged to the mild and moderate autism group respectively. Significant difference was seen (p=0.020)in Table 11a.

Table 11b : Difficulties faced during dental visits

- Waiting in the reception area for more than 5 minutes, Sitting on the dental chair, getting X-Rays done, having fluoride brushed on teeth was found to be very easy for 45% (27) in which 30% (18) and 15%(9) belonged to mild and moderate autism group respectively. Significant difference was noted (p=0.014).
- Tooth cleaning was found to be very easy for 45% (27) in which 30% (18) and 15%(9) belonged to mild and moderate autism group respectively. No significant difference was noted (p = 0.694)
- Having a cavity filled was found to be very difficult for 45% (27) in which 31.66% and 15% belonged to mild and moderate autism group respectively. Significant difference was noted (*p = 0.014*).
- Having an injection or invasive treatment was very difficult for 45% (27) in which 26.66% (16) and 18.33% (11) belonged to the mild and moderate autism group respectively. Significant difference was noted (p=0.038)
- 93.4% (54) parents wanted their child's dental treatment to be done by behaviour management techniques in which 51.7% (31) and 41.7%(25) were in the mild and moderate autism groups respectively. No significant difference was seen (p=0.303)
- 70% (42) parents denied for sedation in which 15%(9) belonged to mild autism group and 15%(9) belonged to moderate autism group. No significant difference was noted(0.305)

- 75% (45) parents denied for restraints in which 40% (24) were a part of mild autism group and 35% (21) were a part of moderate autism group.No significant difference was seen (p=7.267)

DOMAIN 5 : (SENSORY ISSUES)

Table 12 : Sensory Issues

- In Table 12 and graph 13, 46.3%(28) parents mentioned that their child was comfortable in dim light in which 26.7% (16) and 20%(12) were in the mild and moderate autism group respectively. No significant difference was noted (p=0.613)

- In Table 12 and graph 14, 60% (36) parents mentioned that their child was not sensitive to motion in which 31.7% (19) and 28.3% (17) belonged to mild and moderate autism group respectively. No significant difference was seen (p= 1.000)

- In Table 12 and graph 15, 73.3% (44) parents did not agree to the presence of oral sensitivities in their children. 38.3%(23) and 35% (21) belonged to mild and moderate autism group respectively. No significant difference was seen (p=0.629)

- In Table 12 and graph 16, 76.7% (16) parents mentioned that no tastes bother their child in which 41.7%(25) and 35%(21) belonged to mild and moderate autism groups.No significant difference was seen (p=1.000)

Table 13 : The mean scores of individual domain is summarised in Table 13. Communication domain accounted to 1.633 + 0.389, medical history had a mean of 1.375 + 0.226, Oral care and dental treatment history had an average score of 1.574 + 0.148, and sensory issues presented with a score of 1.658 + 0.220.

Table 14 : A point biserial correlation was run to determine the relationship between parent's occupation and overall means of all domains. There was no correlation seen, suggesting occupation did not change the perception of the parent towards autism.

Figure 7: Gender distribution of study participants
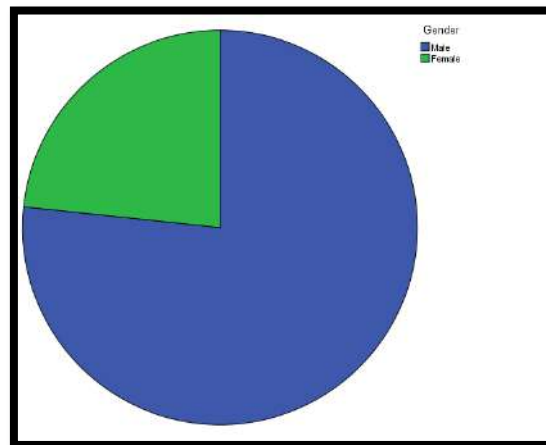
Table 1a: Gender distribution of study population:

Gender	Frequency	Percentage
Males	23	76.7
Females	7	23.3
Total	30	100

Table 1a andFigure 7 :shows in the gender distribution there were 23(76.7%) males and 7 (23.3%) females**.**

Table 1b :Age distribution of study population:

Variable	**N**	**Mean + S.D**	**Minimum**	**Maximum**
Age	30	9.733 + 3.675	16.00	9.733

Table 2 : Category of autism distribution of study population:

Autism category	**Frequency**	**Percentage**
Mild	16	53.3
Moderate	14	46.7
Total	30	100

Table 3 :Overall PECS Phase Evaluation for communication from Baseline (First Visit) to Third Visit.

Evaluation – time periods	N	Mean $\pm$ S.D	Std. Error Mean	ANOVA statistic	P value
PECS – Baseline	30	2.500 $\pm$ 1.106	0.202	11.020	<0.001**
PECS – Second visit	30	2.766 $\pm$ 0.935	0.170		
PECS – Third visit	30	3.800 $\pm$ 1.323	0.241		

* =Significant; ** = Highly Significant; NS – Not significant

Table 4 :Comparison of Mild VS Moderate Grades of autism during PECS Phase Evaluation :

PECS – (BASELINE - Ist visit)							
Autism category	N	Mean $\pm$ S.D	Std.Error	Lower bound	Upper bound	ANOVA statistic	P value
Mild Autism	16	2.937 $\pm$ 0.997	0.249	2.405	3.469	6.350	0.018*
Moderate Autism	14	2.000 $\pm$ 1.037	0.277	1.400	2.599		
PECS – 2nd VISIT							
Mild Autism	16	3.125 $\pm$ 0.806	0.201	2.695	3.554	5.880	0.022*
Moderate Autism	14	2.357 $\pm$ 0.928	0.248	1.820	2.893		
PECS – 3rd VISIT							
Mild Autism	16	4.375 $\pm$ 0.957	0.239	3.864	4.885	8.043	0.008*
Moderate Autism	14	3.142 $\pm$ 1.406	0.375	2.330	3.954		

* =Significant; ** = Highly Significant; NS – Not significant

Table 5: Evaluation of OHI – S from Baseline to Third visit

Evaluation – time periods	N	Mean ± S.D	Std. Error Mean	ANOVA statistic	P value
OHI – S Baseline-First visit	30	2.566 ± 0.504	0.920	14.827	<0.001**
OHI – S Second visit	30	2.433 ± 0.504	0.920		
OHI - S Third visit	30	1.800 ± 0.667	0.667		

* =Significant; ** = Highly Significant; NS – Not significant

Table 6 : Correlation of PECS with OHI – S

Variable	Mean + S.D	Correlation coefficient (r)	P value
PECS Phase	3.022 + 1.254	- 0.450	<0.001**
OHI – S	2.266 + 0.667		

* =Significant; ** = Highly Significant; NS – Not significant

Table 7: Validity of Questionnaire using Cronbach's Alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.808	.884	25

Table 8a : Age distribution of study participants:

Autism	N	Mean	Std. Deviation	Minimum	Maximum
Mild	32	12.2031	3.74566	5.00	18.00
Moderate	28	11.8036	3.66752	5.00	18.00
Total	60	12.0167	3.68341	5.00	18.00

Anova statistic = 0.173l; df = 1 ; p value = 0.679

Table 8b : Gender distribution of study population

Gender	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Males	**25 (41.7)**	**21 (35.0)**	**46 (76.7)**
Females	**7 (11.7)**	**7 (11.7)**	**14 (23.3)**
Total	**32 (53.3)**	**28 (46.7)**	**60 (100**

Chi square statistic = 0.802; df = 2; p = 0.775(NS)

Table 8c: Parent's Occupation

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Does your child use a?			
Salaried	8 (13.3)	1 (1.7)	9 (15.0)
House wife	4 (6.7)	3 (5.0)	7 (11.7)
Professional	8 (13.3)	11 (18.3)	19 (31.7)
Self employed	12 (20.0)	13 (21.7)	25 (41.7)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 5.880 ;df = 3; p = 0.119(NS)

Table 9 : Domain 2 (Medical History)

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
1) Has your child been diagnosed with ASD?			
Yes	32 (53.3)	28 (46.7)	60 (100)
No	0 (0)	0 (0)	0 (0)
Chi square statistic = NA			
2) At what age was your child diagnosed with ASD ?			

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Age	9.343 + 2.434	10.923 + 3.190	9.290 + 2.294
F statistic = 2.015 ;df = 3; p = 0.153(NS)			

3) Does your child have any additional medical condition?			
No	14 (23.3)	14 (23.3)	28 (46.7)
Seizure	6 (10)	6 (10)	12 (20.0)
Sensory	9 (15.0)	4 (6.7)	13 (21.7)
Sleep	3 (5.0)	2 (3.3)	5 (8.3)
Allergy	0 (0.0)	1 (1.7)	1 (1.7)
GIT	0 (0.0)	1 (1.7)	1 (1.7)
Chi square statistic = 3.874;df = 5; p = 0.568 (NS)			

NS = Nothing Significant; * = Significant; ** = Highly significant

Table 10 : Domain 3 (Communication and Behaviour)

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Does your child use non-verbal communication?			
Yes	23 (38.3)	19 (31.2)	42 (70)
No	9 (15.0)	9 (15.0)	18 (30)

| Total | 32 (53.3) | 28 (46.7) | 60 (100) |

*Chi square statistic = 1.015 ;df = 1; p = 0.04**

Do you use any of these communication systems?			
PECS	12 (28.57)	7 (16.6)	19 (45.2)
Sign language	8 (19.1)	5 (11.9)	13 (30.9)
Gestures	5 (11.9)	5 (11.9)	10 (23.8)
Total	25 (59.5))	17 (40.5)	42 (100)

*Chi square statistic =4.62 ;df = 2; p = 0.02**

NS = Nothing Significant; * = Significant; ** = Highly significant

Table 11a: Oral care and dental treatment history

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
a) Which toothbrush does your child use ?			
Manual tooth brush	31 (51.7)	27 (45.0)	58 (96.7)
Powered toothbrush	1 (1.7)	1 (1.7)	2 (3.3)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 0.009 ;df = 1; p = 1.000(NS)

b) Does your child brush independently or with parents assistance ?			
Independent	7 (11.7)	3 (5.0)	10 (16.7)
Assistance	25 (41.7)	25 (41.7)	50 (83.3)
Total	32 (53.3)	28 (46.7)	60 (100)

*Chi square statistic = 1.339 ;df = 1; p = 0.026**

c) Does your child floss?			
Yes	2 (3.3)	0 (0.0)	2 (3.3)
No	30 (50.0)	28 (46.7)	58 (96.7)

Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 1.810 ;df = 1; p = 0.035*

d) Do you think going to the dentist is important to your child's oral health?

Yes	29 (48.3)	25 (41.7)	54 (90.0)
No	3 (5.0)	3 (5.0)	6 (10.0)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 0.030 ;df = 1; p = 1.000 (NS)

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
e) Has your child ever seen a dentist?			
Yes	29 (48.3)	25 (41.7)	54 (90.0)
No	3 (5.0)	3 (5.0)	6 (10.0)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 0.030 ;df = 1; p = 1.000 (NS)

f) How was your child's last dental visit?

Excellent	0 (0.0)	0 (0.0)	0 (0.0)
Good	9 (16.7)	7 (13.0)	16 (29.6)
Fair	17 (31.5)	14 (25.9)	31 (57.4)
Poor	4 (7.4)	3 (5.6)	7 (13.0)
Total	30 (55.6)	24 (44.4)	54 (100)

Chi square statistic = 0.017;df = 2; p = 0.992(NS)

g) What was the reason for last dental visit?

Dirty teeth	9 (16.7)	9 (16.7)	18 (33.3)
Cavity	15 (27.8)	10 (18.5)	25 (46.3)
Cracked teeth	6 (11.1)	5 (9.3)	11 (20.4)

Total	30 (55.6)	24 (44.4)	54 (100)

Chi square statistic = 0.430 = 2; p = 0.807(NS)

h) What kind of dentist did your child see?

General dentist	24 (44.4)	19 (35.2)	43 (79.6)
Pediatric dentist	6 (11.1)	5 (9.3)	11 (20.4)
Total	30 (55.6)	24 (44.4)	54 (100)

Chi square statistic = 6;df = 1; p = 0.020*

Table11b :Difficulties faced in dental clinic

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Waiting in reception area for more than 5 minutes?			
Very easy	18 (30.00)	9 (15.0)	27 (45)
Difficult	10(16.6)	9 (15.0)	19 (31.66)
Very difficult	2 (3.33)	5 (8.33)	7 (11.66)
Unsure	2 (3.33)	5 (8.33)	7 (11.66)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 2.015 ;df =2; p = 0.014*			
Sitting on dental chair			
Very easy	18 (30.00)	9 (15.0)	27 (45)
Difficult	10(16.6)	9 (15.0)	19 (31.66)
Very difficult	2 (3.33)	5 (8.33)	7 (11.66)
Unsure	2 (3.33)	5 (8.33)	7 (11.66)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 2.015 ;df =2; p = 0.014*			

Tooth cleaning			
Very easy	19 (31.66)	8 (13.33)	27 (45)
Difficult	9(15.0)	10 (16.66)	19 (31.66)
Very difficult	4 (6.66)	3 (5.00)	7 (11.66)
Unsure	3 (5.00)	4 (6.66)	7 (11.66)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 1.587 ;df = 1; p = 0.694 (NS)

Getting X rays done			
Very easy	18 (30.00)	9 (15.0)	27 (45)
Difficult	10(16.6)	9 (15.0)	19 (31.66)
Very difficult	2 (3.33)	5 (8.33)	7 (11.66)
Unsure	2 (3.33)	5 (8.33)	7 (11.66)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.015 ;df =2; p = 0.014*

Having fluoride brushed on teeth			
Very easy	18 (30.00)	9 (15.0)	27 (45)
Difficult	10(16.6)	9 (15.0)	19 (31.66)
Very difficult	2 (3.33)	5 (8.33)	7 (11.66)
Unsure	2 (3.33)	5 (8.33)	7 (11.66)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.015 ;df =2; p = 0.014*

Having a cavity filled			
Very easy	2 (3.33)	4 (6.66)	6 (10.00)
Difficult	8 (13.33)	7 (11.66)	15 (25.00)
Very difficult	19 (31.66)	15 (25.0)	27 (45.00)

Unsure	3(5.00)	2(3.33)	5 (8.33)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.015 ;df =2; p = 0.014*

Having an injection or invasive treatment

Very easy	3(5.00)	2(3.33)	5 (8.33)
Difficult	11(18.33)	11(18.33)	22 (36.66)
Very difficult	16 (26.66)	11 (18.33)	27 (45.00)
Unsure	2 (3.33)	4 (6.66)	6 (10.00)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 4.0783 ;df =2; p = 0.038*

Would you like your dentist to treat your child with – Behaviour Management

Yes	31 (51.7)	25 (41.7)	56 (93.4)
No	1 (1.7)	3 (4.8)	4 (6.6)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.387;df = 2; p = 0.303(NS)

Would you like your dentist to treat your child with - Sedation

Yes	9 (15.0)	9 (15.0)	18 (30.0)
No	23 (38.3)	19 (31.7)	42 (70.0)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.375;df = 2; p = 0.305(NS)

Would you like your dentist to treat your child with – Restraints

Yes	8 (13.3)	7 (11.6)	15 (25.0)
No	24 (40.0)	21 (35.0)	45 (75.0)
Total	32 (53.3)	28 (46.7)	60 (100)

Chi square statistic = 2.637;df = 2; p = 7.267(NS)

NS = Nothing Significant; * = Significant; ** = Highly significant

Table 12: Sensory issues

Variables	Mild autism N (%)	Moderate autism N (%)	Total (N%)
Is your child comfortable in dim light			
Yes	16 (26.7)	12 (20.0)	28 (46.7)
No	16 (26.7)	16 (26.7)	32 (53.3)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 0.306;df = 1; p = 0.613(NS)			
Is your child sensitive to motion?			
Yes	13 (21.7)	11 (18.3)	24 (40.0)
No	19 (31.7)	17 (28.3)	36 (60.0)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 0.117;df = 1; p = 1.000(NS)			
Does your child have oral sensitivities?			
Yes	9 (15.0)	7 (11.7)	16 (26.7)
No	23 (38.3)	21 (35.0)	44 (73.3)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 0.075;df = 1; p = 0.629(NS)			
Do certain taste bother your child?			
Yes	7 (11.7)	7 (11.7)	14 (23.3)
No	25 (41.7)	21 (35.0)	16 (76.7)
Total	32 (53.3)	28 (46.7)	60 (100)
Chi square statistic = 0.082;df = 1; p = 1.000(NS)			

NS = Nothing Significant; * = Significant; ** = Highly significant

Table 13: Mean scores of all domains:

| Domains	Mean Score
Communication	1.633 ± 0.389
Medical history	1.375 ± 0.226
Oral care and dental treatment history	1.574 ± 0.148
Sensory issues	1.658 ± 0.220
Overall scores	1.556 ± 0.230

Table 14 :Correlation between Occupation of the parent and overall domains for assessment of parental perception

		Overallmean	Occupation
Overallmean	Pearson Correlation	1	.138
	Sig. (2-tailed)		.291
	N	60	60
Occupation	Pearson Correlation	.138	1
	Sig. (2-tailed)	.291	
	N	60	60

Graph 1 :Parent's Occupation
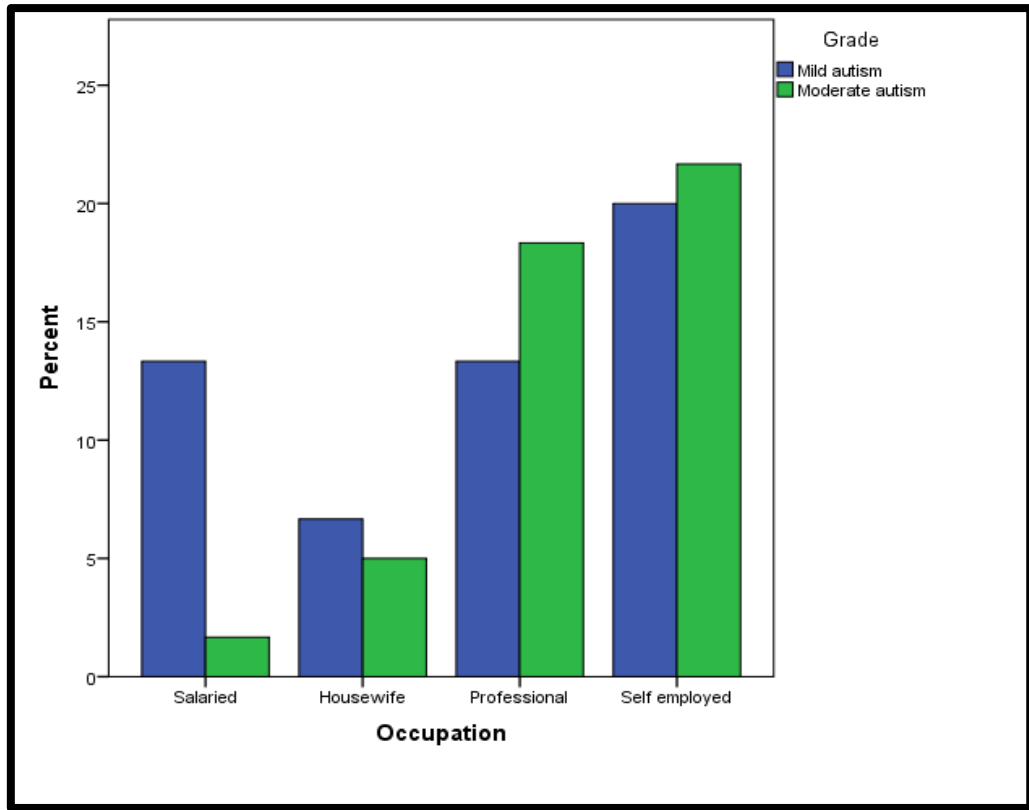
Graph 2: Distribution of medical condition as per degree of severity
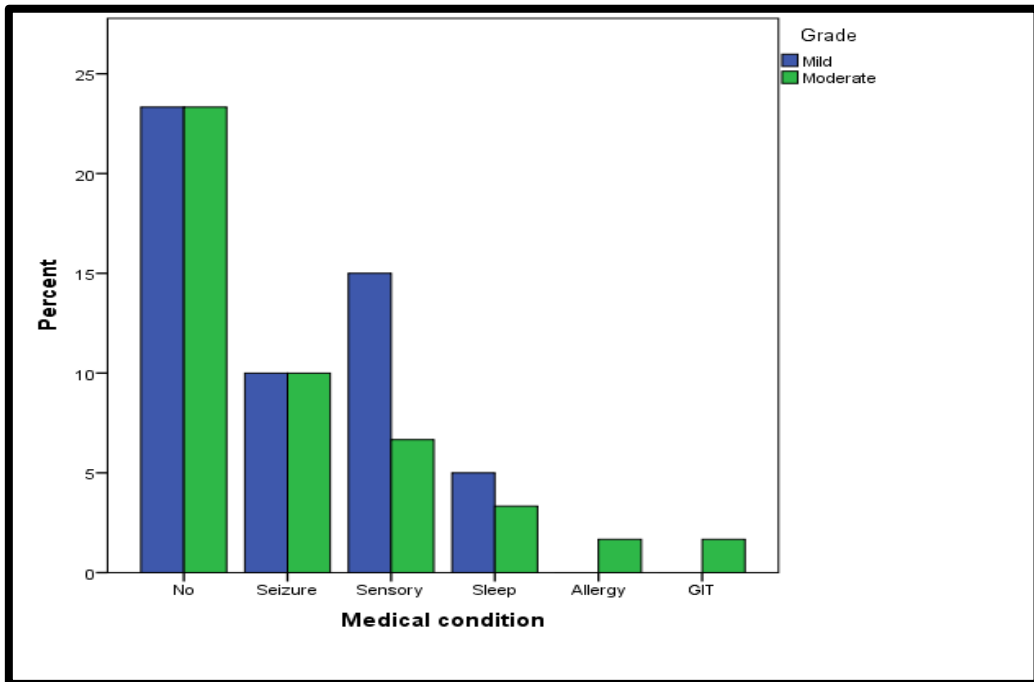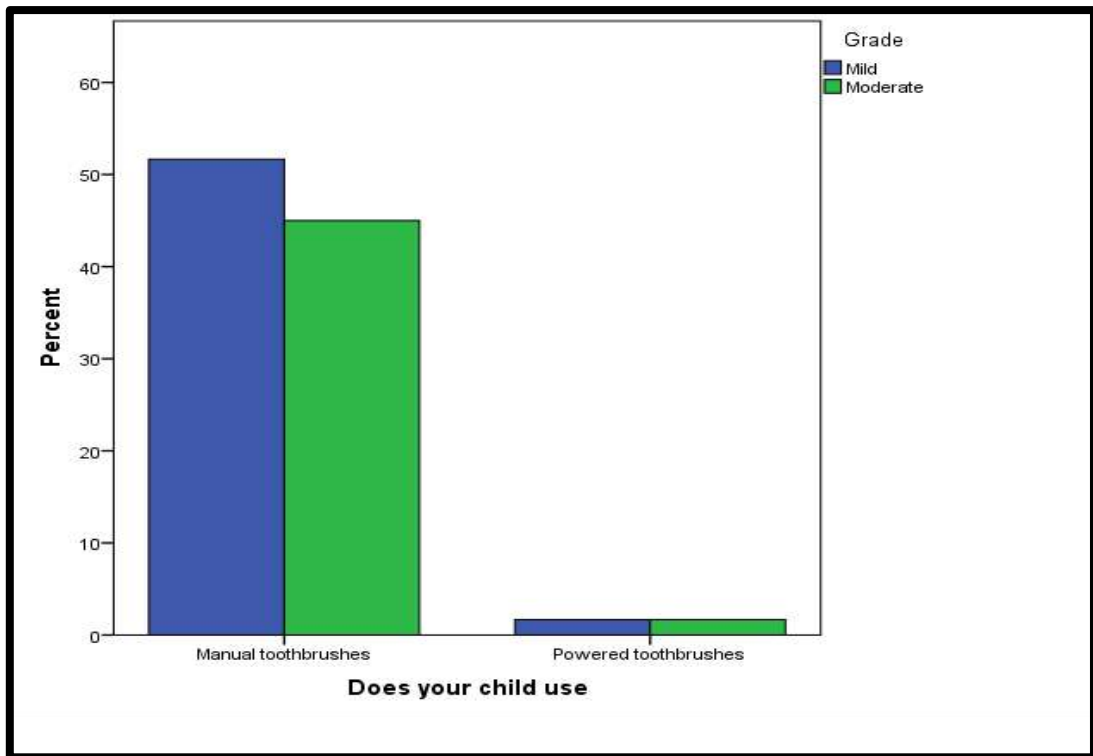
Graph 3: Do you use non – verbal communication
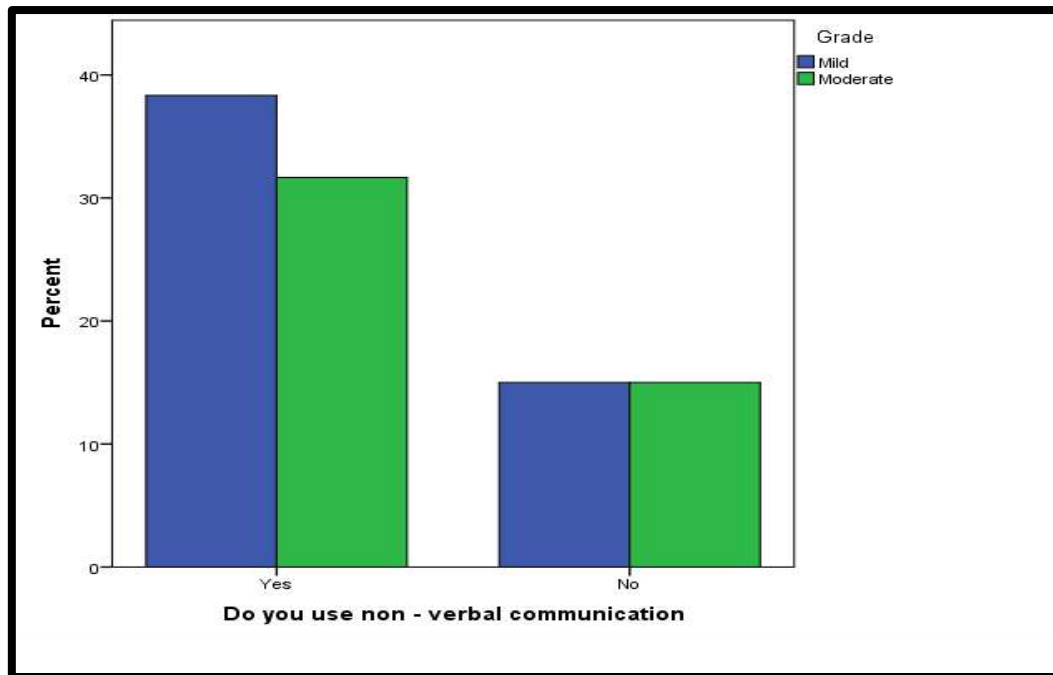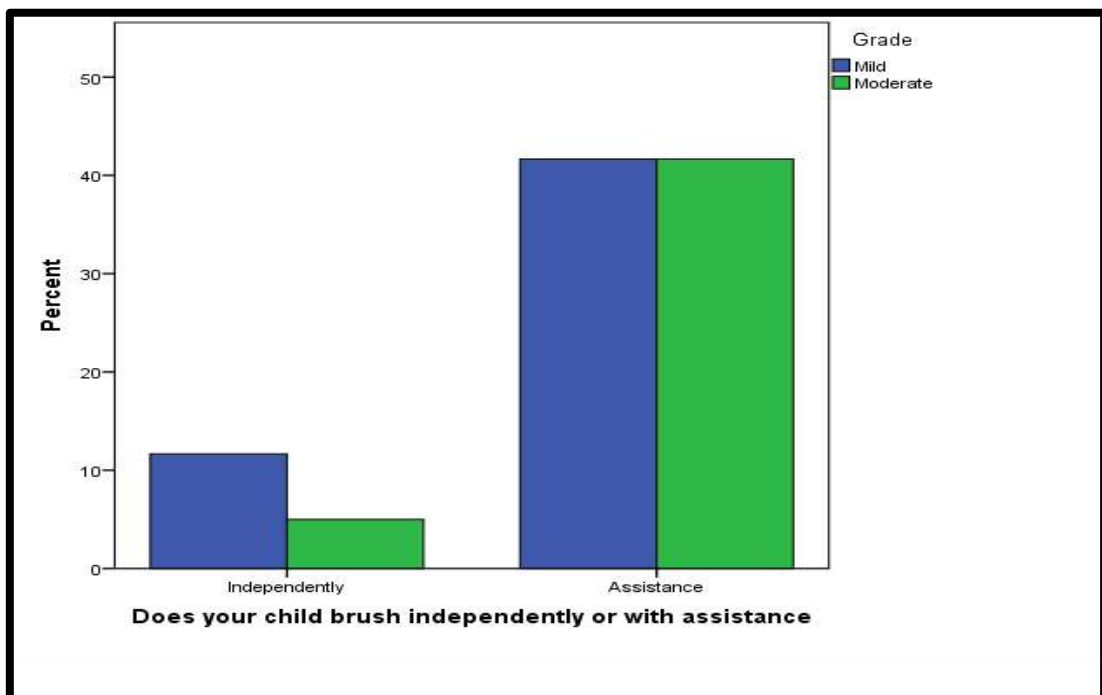

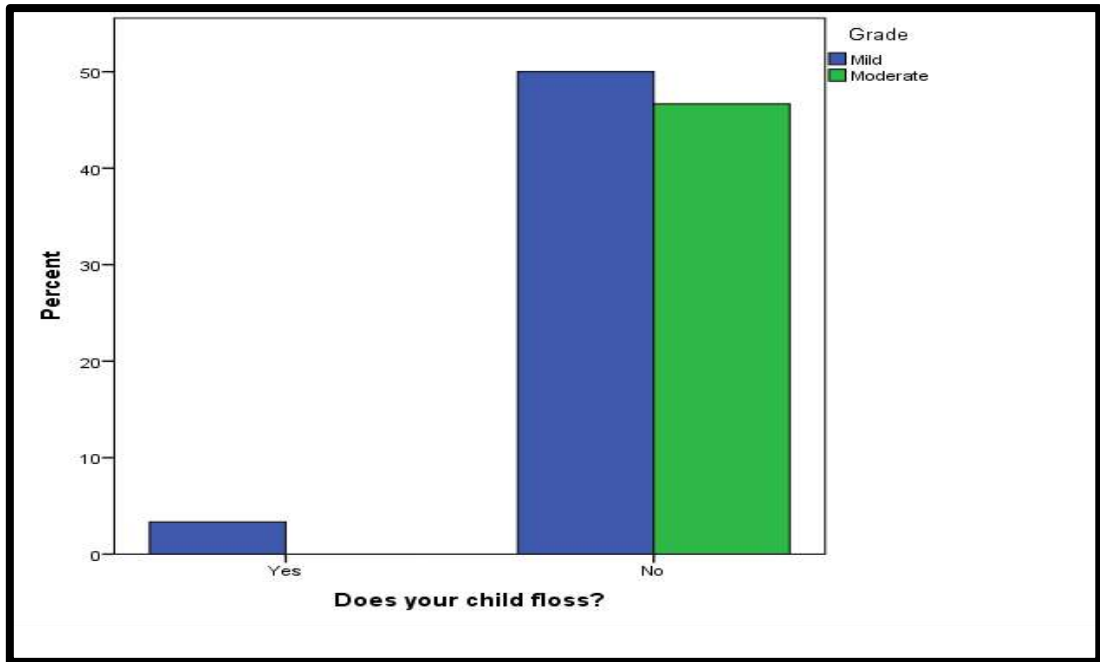**Graph 4: Do you use any of these communication systems for your non-verbal child**
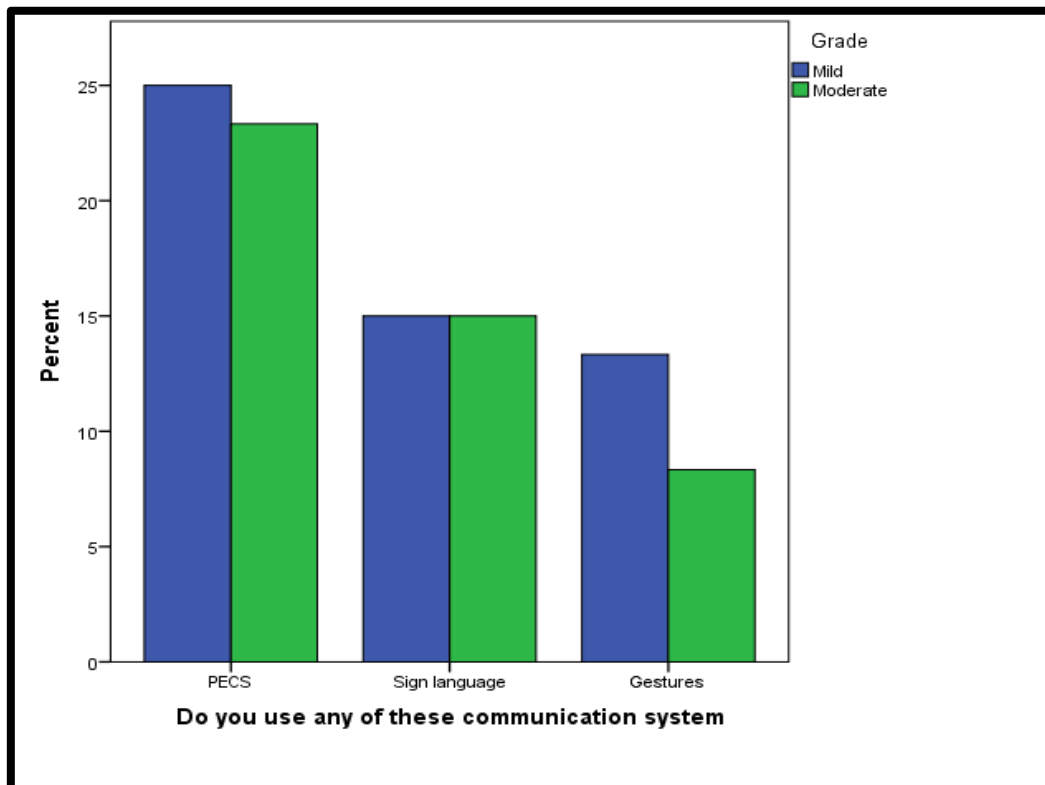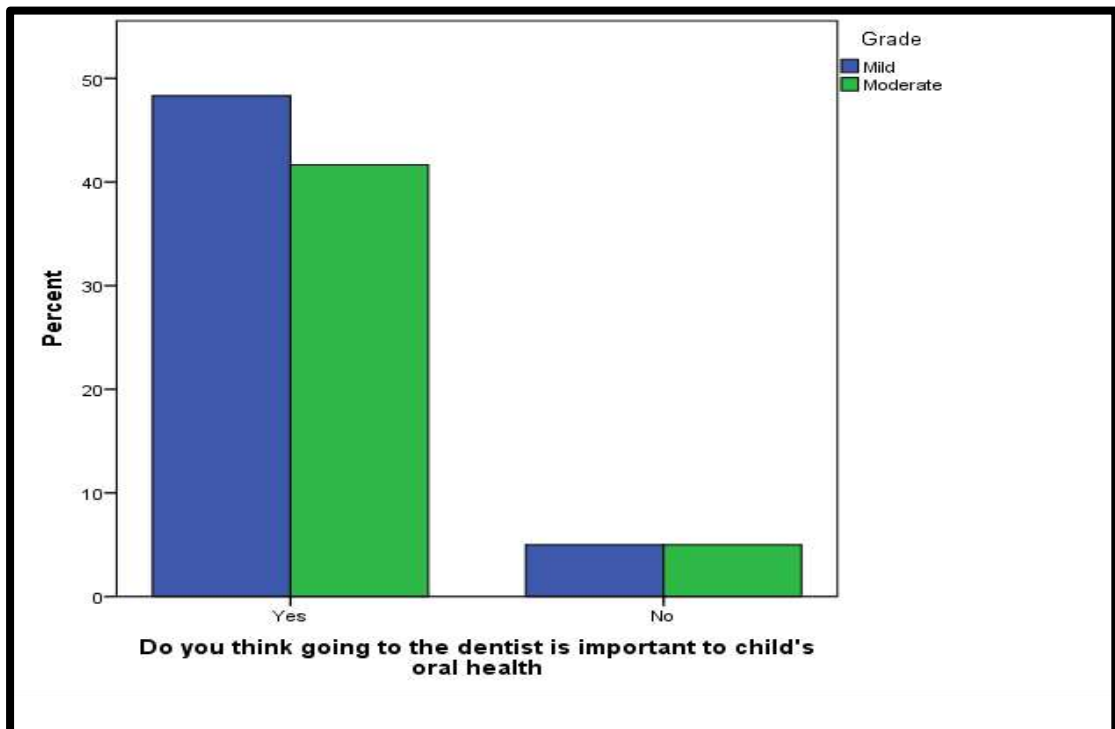
Graph 5: Does your child use

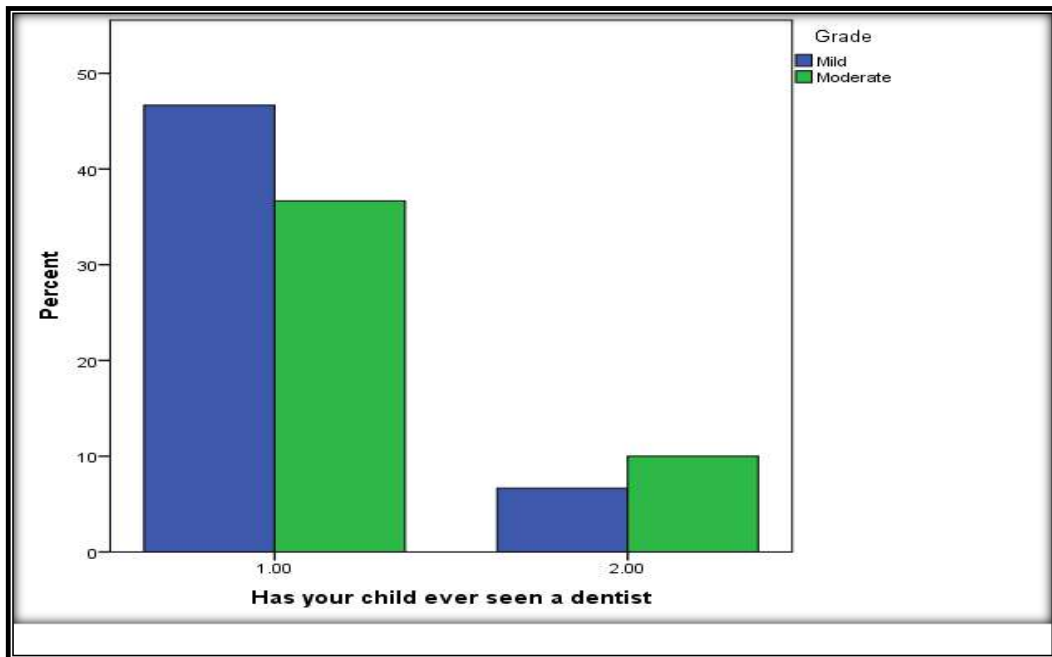**Graph 6: Do your child brush independently or with assistance**
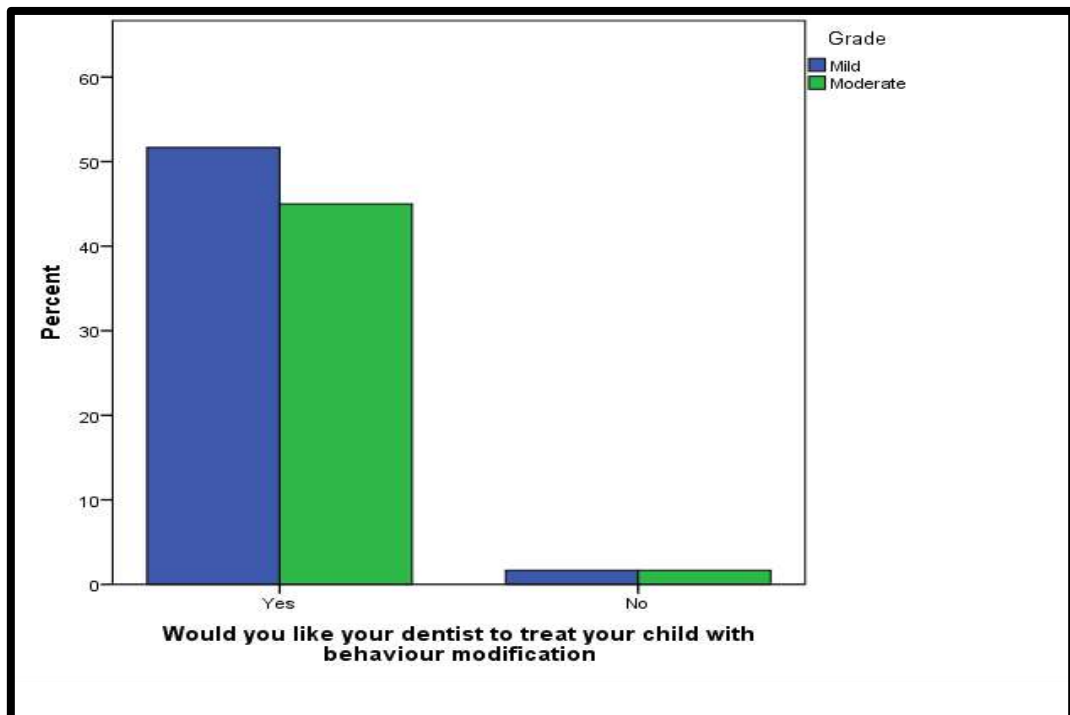
Graph 7: Does your child floss?

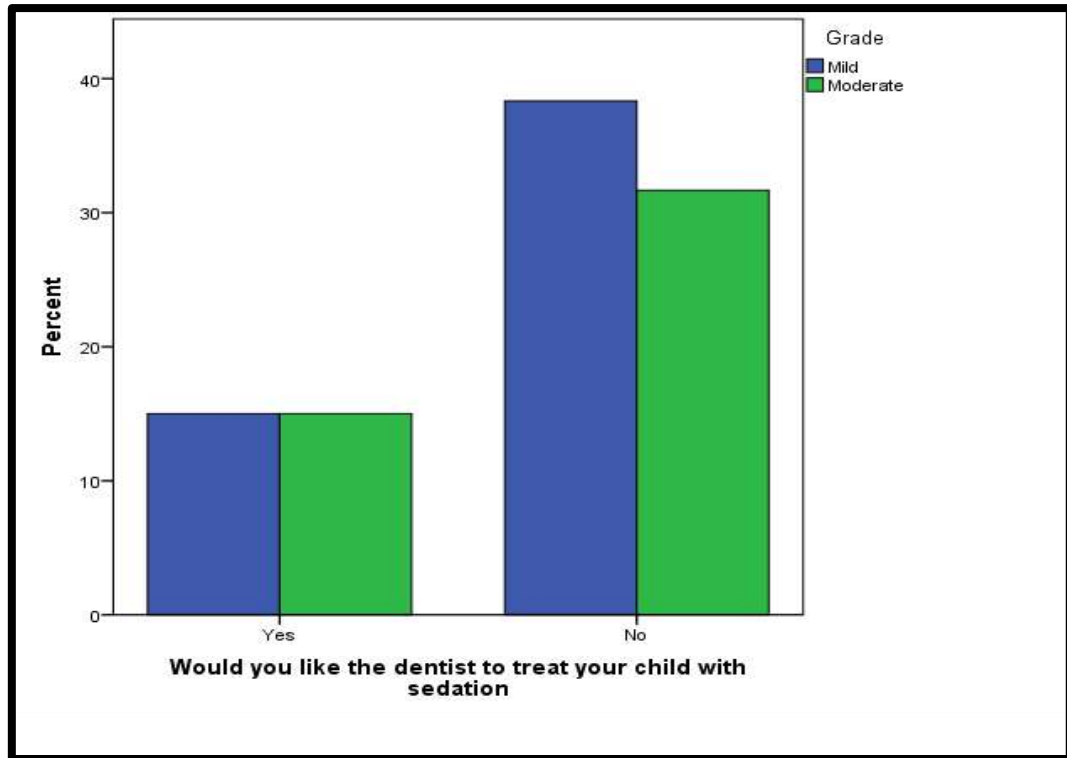**Graph 8: Do you think going to the dentist is important to child's oral health**

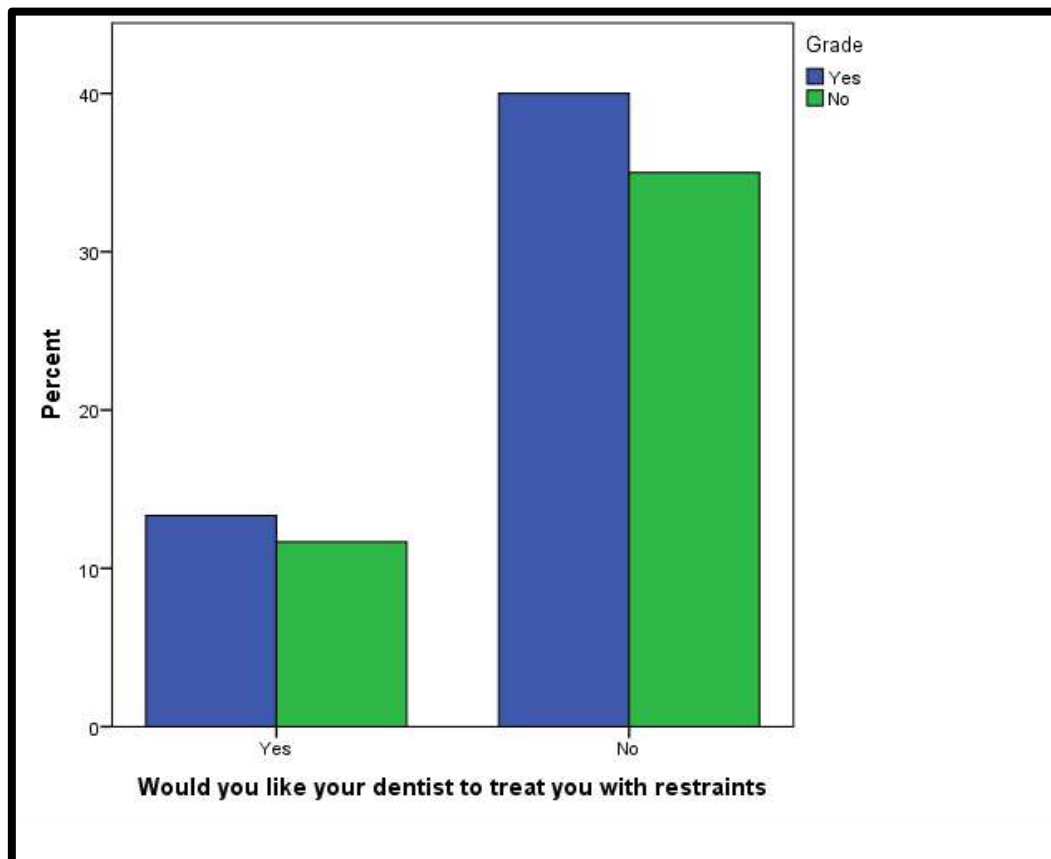**Graph 9: Has your child ever seen a dentist**

Graph 10 : Would you like the dentist to treat your child with behavioural modification

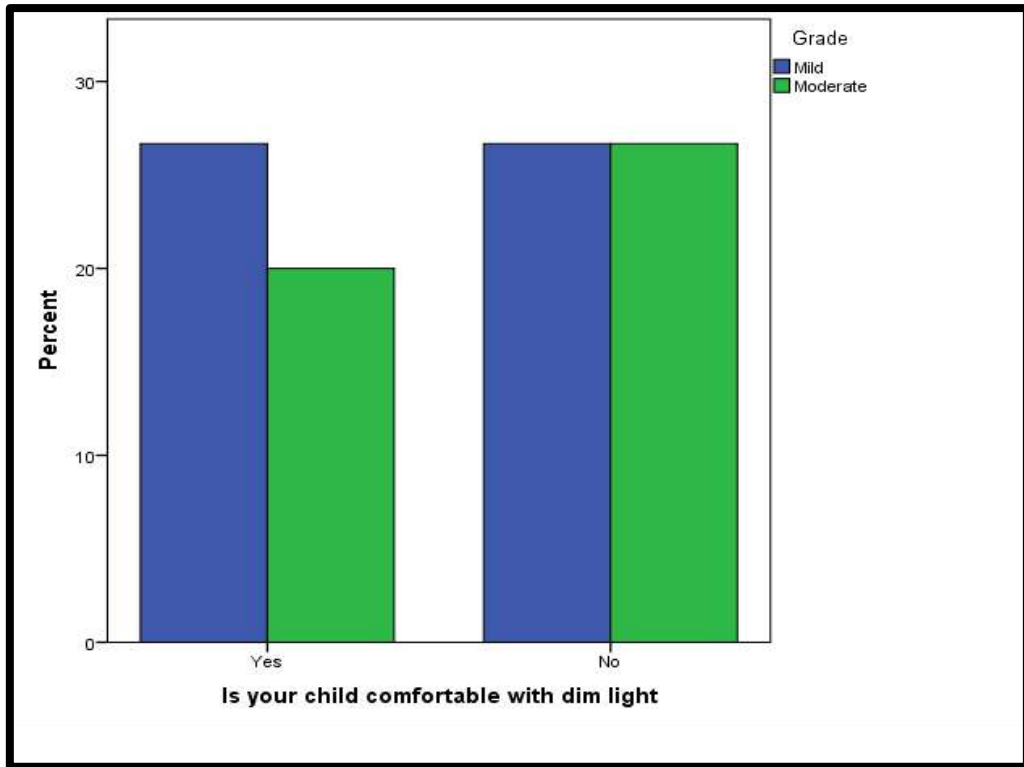**Graph 11: Would you like the dentist to treat your child with sedation**
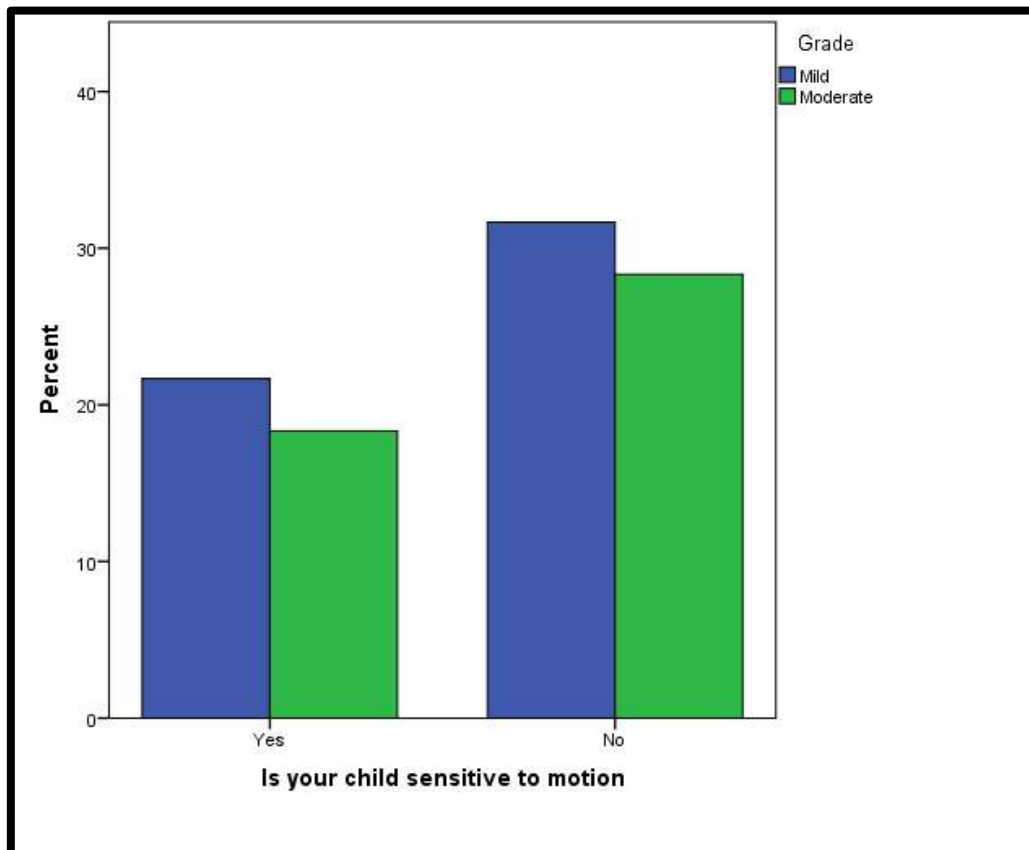

Graph 12: Would you like the dentist to treat your child with restraints
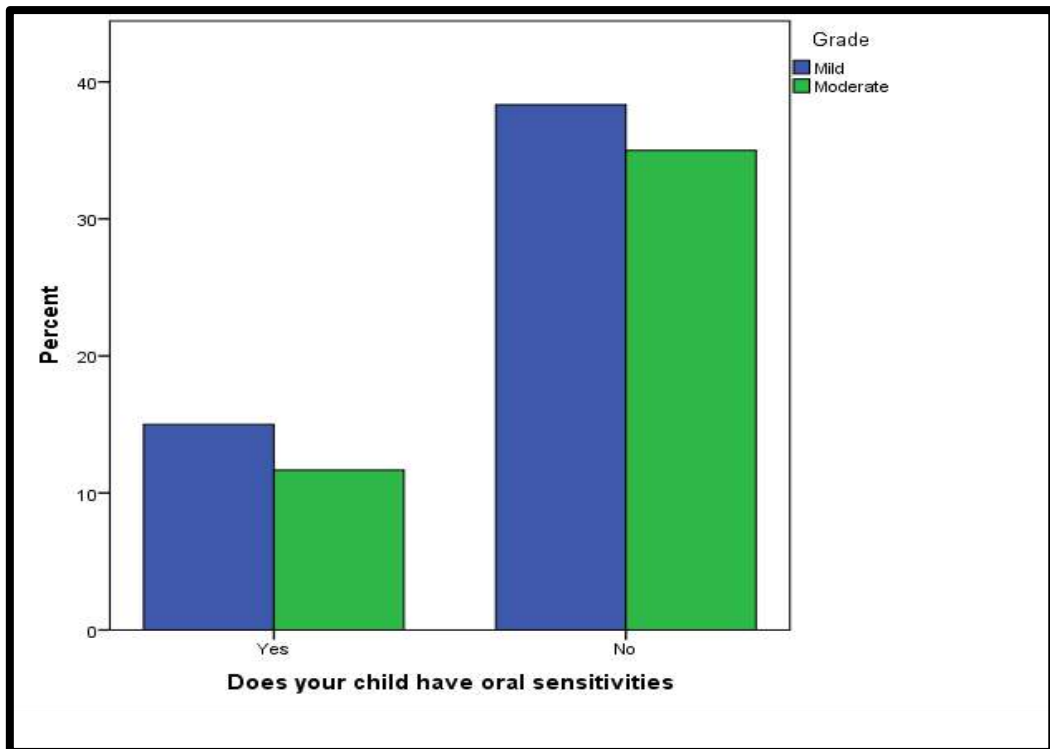
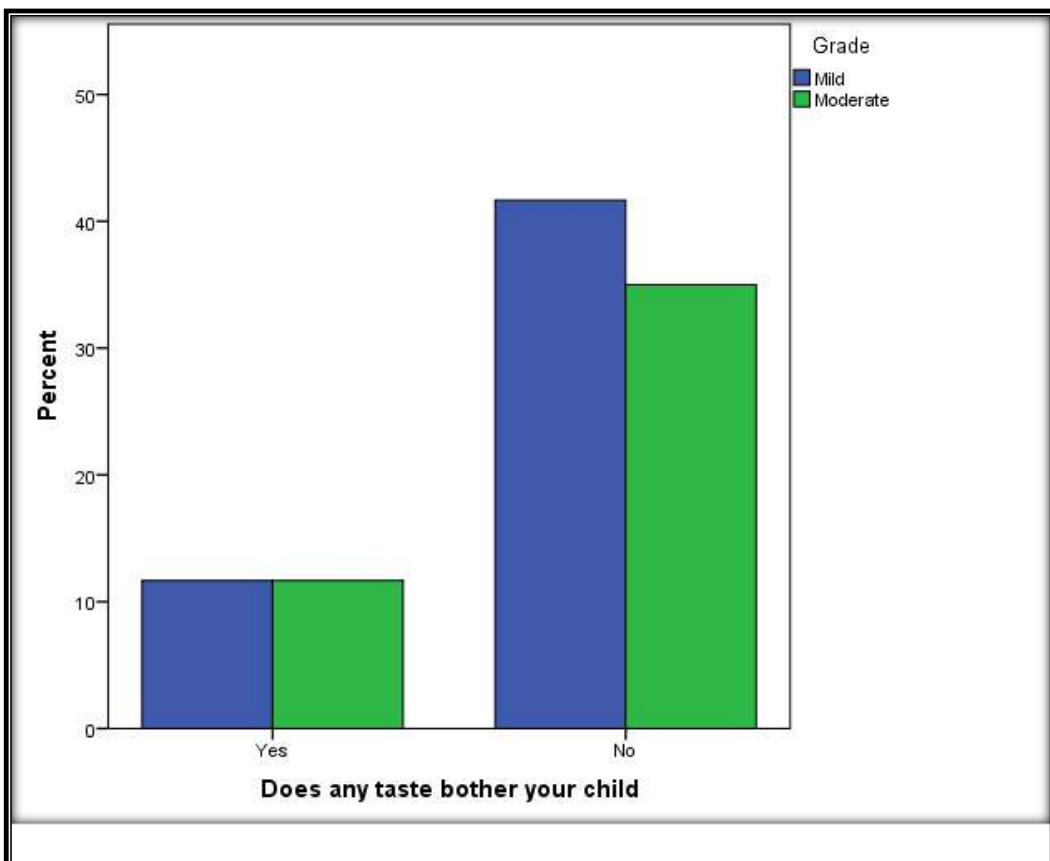**Graph 13 : Is your child comfortable with dim light**

Graph 14: Is your child comfortable sensitive to motion?

Graph 15 : Does your child have oral sensitivities?

Graph 16 : Do certain taste bother your child?

DISCUSSION

It is an established fact that oral health has a significant impact on the overall health and well being of an individual. Skills for a healthy living are developed in normal individuals over a period of time but, ASD individuals require rigorous practice through teaching and early interventions to carry out daily activities. ASD children have cognitive profiles that impact their learning, social, and communicative behaviours. Children diagnosed with autism suffer from emotional, psychological and neurobiological aspect of the disease, due to which dealing with these children makes clinical research more challenging. It is often seen that early intervention and reinforcing desired behaviour improves cognition and adaptive behaviour in ASD individuals.

Due increase in the prevalence of ASD, efforts should be directed towards prevention of oral disease. Areas of social communication are globally impacted in children with ASD. Hence, the present study was planned to improve awareness for oral health status in ASD individuals with the help of PECS which is used as a mode of communication to supplement verbal communication.

Abhishek Mehta et al 2016 [46] mentioned in his study that urgent attention is required to plan a comprehensive dental health care programme for indian children with special needs. **Pini DM et al 2016**[45] in his study stated there were high decayed-missing-filled teeth index, as well as inadequate oral hygiene in children with special health care needs.

Dental care is the most common unmet need among the special needs population. Due to a lot of barriers, the child himself may pose various problems to get dental treatment done such as inability to understand the importance of procedure and behave aggressively. Most of the children diagnosed with ASD become uncooperative during treatment as the dental environment poses various challenges such as discomfort, and loss of control in an unfamiliar environment, sensory-stimulating activities.

A clear male predilection was noted in the present study with over 70% (23) boys versus 23.3% (7) girls as seen in Table 1a and Figure 1. This finding is similar to the study by **Adriana Gledys Zink et al (2016)**[47] which shows male ASD individuals were more as compared to females, similar to the findings described by the American Autism Association which reported a prevalence of 4:1 for males in ASD.

Age range of the present study was 9.733 $\pm$ 3.675 years (Table 1b) for a sample population of 30 individuals for evaluating PECS Phases. This is in concordance with the study of **Adriana Gledys Zink et al (2016)**[47] evaluating 26 individuals with ASD, between having an average age of 10 $\pm$ 3.3 years. Although our study did not focus on the distribution of age of diagnosis, the age 4 years old was selected as it is a cut off age of significance in autism diagnosis. Although a study by **Filipek et al (1999)**[80] argued that ASD displays its signs before the age of three, an American national study in 2005 found that the average age of diagnosis was 3.1 years for children with autistic disorder, and 3.9 years for pervasive developmental disorders not otherwise specified. [81]

Table 2 shows degree of autism. Based on the Indian scale for assessment of autism[74] (ISAA) Children diagnosed with severe grade of autism were unable to follow PECS at the respective autism centers and thus, were beyond the scope of the study. Mild and Moderate grades of autism were evaluated, 16(53.3%) were categorised as mild autism and 14(46.7%) were categorised as moderate autism.

In the present study PECS showed a gradual rise from baseline to third visit, which was statistically highly significant at $p<0.001$ (Table 3). PECS utilization helped to improve oral hygiene status with oral hygiene level improving from poor to far and good levels. Scientific evidence supporting the effectiveness of PECS is growing, and general positive outcomes include improved communication between participants and adults across settings, generalized improved communication across new settings, and decreased disruptive behavior.

Table 4 shows that PECS score improved from baseline to third visit, demonstrating a significant change in picture comprehension of the ASD children. P value at baseline,

second and third visit for both mild and moderate groups was 0.018, 0.022, 0.008 respectively. PECS facilitated child - dentist communication during dental procedures in the current study. **Adriana Gledys Zink et al (2016)[47]**also reported similarities with preventive treatment facilitation in their study participants.

The present study assessed the improvement in OHI – S for children diagnosed with ASD using PECS ; Table 5shows OHI – S scores improved significantly from the baseline to the second visit and third visit (p <0.001). A gradual decrease in OHI-M and OHI-S scores indicated improvement of oral hygiene. **O. B. Al-Batayneh et al (2019)[65]**in their study also reported better gingival health with gingival scores decreasing from baseline to final evaluation. While Gingival Index scores decreased significantly, Plaque Index scores remained the same in their study. Significant changes in meanPlaque Index between first and second evaluation visits were present whereas, no changes were seen in gingival Index for children less than 10 years, this could be explained by the fact that the Plaque Index can be changed over a very short period of time depending on toothbrushing while gingival Indexcould be changed, but it requires a relatively longer time duration, due to other predisposing factors for gingivitis such as medications, decreased salivary flow, immune response and oral habits characteristic in children with ASD such as bruxism, tongue thrusting, picking at the gingiva and lip biting . The same factor can be used to explain for the OHI -S scores changing from poor to fair only, as the calculus component in the study will take a long time to bring in difference. Hence, longer evaluation period will be recommended obtaining better scores in OHI - S and Gingival Index.

A definite correlation was found between PECS and OHI – S (Table 6) . Oral hygiene of autistic children improved with PECS training. Considerable reduction in OHI S scores was noted in the study of **Nameeda KS et al (2020) [71]** assessed during repeated evaluations.

Table 7 depicts the questionnaire employed for the present study, the questionnaire was pilot tested on 5 parents to assess the content and face validity, who were not a part of the final study. The questionnaire was not modified as it measured what was

intended to be measured. Cronbach's alpha [75] coefficient was 0.88 demonstrating good reliability of the questionnaire.

Table 8a shows the age distribution of the study participants where, mean age for mild and moderate autism group was 12.2031 and 11.8036. The overall mean was seen to be 12.0167. In Gender distribution of study population, 76.7% (46) male ASD individuals were present in which 41.7% (25) and 35% (21) were in the mild and moderate group respectively. 23.3%(14) females were present in the study in which 11.7% (7) and 11.7% (7) were a part of the mild and moderate groups respectively as depicted in Table 8b.Most common occupation of parents was seen to be self employment (41.7%) as shown in Table 8c and Graph 1.

Table 9 shows around 53.3% individuals in the questionnaire belonged to the mild ASD group whereas, 46.7% individuals were from the moderate ASD group on the basis of Indian Scale for Assessment of Autism. Mean age for diagnosis of mild ASD was 9.343 + 2.434, and moderate ASD was 10.923 + 3.190 accounting to a total mean age of 9.290 + 2.294. Table 9 and Graph 2 depicts most common medical conditions associated with ASD were seizures (50%) followed by Sensory problems (26.7%), Sleep disturbances (13.3%), Allergies (6.7%), GIT disturbances (3.3%). No significant difference was noted for the variable additional medical conditions with a p value of 0.568.

Non-verbal communication was used by 70% and the values obtained were significant (p=0.04) as shown in Table 10 and Graph 3. In the Table 10 and Graph 4, Significant difference (p=*0.02)* was noted for the variable commonly used communication system by the parents for non-verbal communication in which Picture Exchange Communication System (45.2%) followed by sign language (30.9%) and gestures (23.8%) were used. Even parents accepted that PECS helped in better comprehension of their wards.**O. B. Al-Batayneh et al (2019)**[65] also reports their parents of ASD individuals agreed that PECSwas a helpful tool and that they would continue to use it.This may be related to the use of pictures, which complementthe visual learning style of autistic individuals, as picturesrequired a minimal response effort and

symbolic abilityon the part of participants that may explain acquisition ofPECS by persons with different disabilities.

Oral care and dental treatment history is depicted in Table 11a:, the type of toothbrush used was around 51.7% (31) in the mild autism and 45% (27) in the moderate autism group i.e. 96.7%(58) children used a manual toothbrush and 2 (3.3%) used an automatic toothbrush as shown in Table 11a and Graph 5. No significant difference was noted (p = 1.000).Need for assistance in toothbrushing was seen in 50(83.3%) and it was equally seen in both the mild and moderate groups as shown in Table 11a and Graph 6. Significant difference was noted (p=0.026).Table 11a and Graph 7 shows that around 50% (30) children in the mild ASD group and 46.7% (28) children in the moderate autism group i.e.96.7%(58) did not use a dental floss .Significant difference was noted (*p = 0.035).*In Table11a and Graph 8 ,90% (54) parents thought going to the dentist is important for their child's oral health and had been to the dentist which consisted of around 48.3% (29) in the mild autism group and 41.7% (25) in the moderate autism group. In Table11a and Graph 9, 90%(54) parents mentioned that they had been to a dentist whereas 15% (6) parents had not visited the dentist. Hence, the rest of the questions were based on the response from these 54(90%) parents.

About 57.4% (31) parents mentioned that their child's last dental visit was fair in which 31.5%(17) belonged to the mild autism group and 25.9%(14) belonged to the moderate autism group. No significant difference was found (*p = 0.992)* as depicted in Table 11a. In our study, 85% of the parents interviewed had taken their children to a dentist while only 31.4% rated their dentist appointment as good and 54.9% as fair. This is much lesser than the numbers of **Taryn N. Weil et al (2012)[24]** wherein 57% of parents were comfortable taking their children to the dentist, while 8% were very uncomfortable and 19% were uncomfortable with this task. Thus, it might be important to engage parents, even before they come to the office, in a conversation about how the dentist and staff can make the appointment as comfortable and easy as possible for the family. Having a child visit the dentist visit early on, especially if he or she is at higher risk for poor oral health, better ensures that child's chances to achieve good oral health in the future.

In Table 11a it is shown that around 46.3% parents mentioned that the most common reason for last dental visit was cavity out of which 27.8%(15) and 18.5%(10) were in the mild and moderate autism groups. Other reasons included Dirty teeth in 33.3%(18) and cracked teeth 20.4%(11). No significant difference was present (p=0.807). Out of the 54 parents who had been to a dentist , 43 (79.6%) went to a general dentist in which 44%(24) and 35.2%(19) belonged to the mild and moderate autism group respectively. 20.4% had been to a pediatric dentist in which 11.1% (6) and 9.3% (5) belonged to the mild and moderate autism group respectively. Significant difference was seen (p=0.020) The present study findings showed majority of the ASD children (85%) had been to a dentist. On the contrary, **O. B. Al-Batayneh et al (2019)[65]** stated that children with ASD received less oral care than theirnormal counterparts for reasons such as difficultyin finding dentists who are and willing to provideoral care services for their children.

Table 11b shows the difficulties faced in dental clinic that included waiting in the reception area for more than 5 minutes, Sitting on the dental chair, getting X-Rays done, having fluoride brushed on teeth was found to be very easy for 45% (27) in which 30% (18) and 15%(9) belonged to mild and moderate autism group respectively. Significant difference was noted (p=0.014).Tooth cleaning was found to be very easy for 45% (27) in which 30% (18) and 15%(9) belonged to mild and moderate autism group respectively. No significant difference was noted (p = 0.694).Having a cavity filled was found to be very difficult for 45% (27) in which 31.66% and 15% belonged to mild and moderate autism group respectively. Significant difference was noted (*p = 0.014*). Having an injection or invasive treatment was very difficult for 45% (27) in which 26.66% (16) and 18.33% (11) belonged to the mild and moderate autism group respectively. Significant difference was noted (p=0.038).

Table 11b and Graph10 shows that 93.4% (54) parents wanted their child's dental treatment to be done by behaviour management techniques in which 51.7% (31) and 41.7%(25) were in the mild and moderate autism groups respectively. No significant difference was seen (p=0.303). In Table 11b and Graph11, 70% (42) parents denied for sedation in which 15%(9) belonged to mild autism group and 15%(9) belonged to moderate autism group. No significant difference was noted(0.305) . In Table 11b and

Graph 12, 75% (45) parents denied for restraints in which 40% (24) were a part of mild autism group and 35% (21) were a part of moderate autism group.No significant difference was seen (p=7.267)

Table 12 and Graph 13 shows 46.3% (28) parents mentioned that their child was comfortable in dim light in which 26.7% (16) and 20%(12) were in the mild and moderate autism group respectively. No significant difference was noted (p=0.613). Table 12 and Graph 14 depicted60% (36) parents mentioned that their child was not sensitive to motion in which 31.7% (19) and 28.3% (17) belonged to mild and moderate autism group respectively. No significant difference was seen (p= 1.000). Table 12 and Graph 15, 73.3% (44) parents did not agree to the presence of oral sensitivities in their children. 38.3% (23) and 35% (21) belonged to mild and moderate autism group respectively. No significant difference was seen (p=0.629). Table 12 and Graph 16, 76.7% (16) parents mentioned that no tastes bother their child in which 41.7%(25) and 35%(21) belonged to mild and moderate autism groups. No significant difference was seen (p=1.000)

The mean scores of individual domain is summarised in Table 13. Communication domain accounted to 1.633 ± 0.389, medical history had a mean of 1.375 ± 0.226, Oral care and dental treatment history had an average score of 1.574 ± 0.148, and sensory issues presented with a score of 1.658 ± 0.220.

Table 14 shows correlation between occupation of the parent and overall domains for assessment of parental perception . There was no correlation seen, suggesting occupation did not change the perception of the parent towards autism.

Picture comprehension in the study population, progressed from "I see" to "I want" for the visuals of toothbrush, toothpaste, applying toothbrush on toothpaste, tap on, water on toothbrush, brush teeth, spit, rinse toothbrush, dental chair, dental light, dental checkup, mouthmirror, food for teeth foods and bad for teeth foods.

A good professional-patient relationship through PECS in the dental environment for ASD individuals can prevent the need to refer such individuals for more extensive procedures in a hospital environment, minimizes the stress and costs of the procedure.

Thus, the need to simplify the work environment and create opportunities for communication with ASD patients should be emphasized.

The present study was a prospective interventional where the participants were regarded as their own controls, and were evaluated at the baseline of the study and in two other occasions during a period of three months.

Limitation:

A limitation was the lack of information about other interventions and treatments for improvement in communication skills that may have been implemented. Participants may have experienced improvement in communication skills due to other interventions or individual factors.

CONCLUSIONS

The present prospective interventional study was conducted in the Department Of Pediatric and Preventive Dentistry, BabuBanarasi Das College of Dental Sciences, Lucknow in collaboration with special healthcare schools with Autistic Children in Lucknowafter obtaining required consent. Ethical clearance was reviewed and approved by the Institutional Ethical Committee of BabuBanarasi Das College of Dental Sciences, Lucknow (ANNEXURE –I). Special health schools in Lucknow were included in the study with the aim to evaluate the effectiveness of picture exchange communication system as a behavioural interventional modality for dental management in autistic children.

On the basis of the results, observations and statistical analysis of the present study the following conclusions were drawn:

Improvement in oral hygiene status of autistic children was depicted by decrease in OHI- M and OHI-S scores. Progress in Phases of PECSrevealedbetter cognitive ability of autistic children towards understanding the dental setup related PECS Cards.

Questionnaire based assessment of parental perceptions regarding dental visits, revealed that PECSwas the most commonly used form of non-verbal communication system.ASD individualsin the mild and moderate autism group used a manual toothbrush, needed assistance during toothbrushing and never used a dental floss.The study also revealed past dental visit history and it was seen that parental perceptions regarding past dental visits was fair.The most common reason for visit to the dentist was cavity filling (46.3%).

General dentists (79.6%) had been consulted more often as compared to Pediatric Dentists.Diffiiculties faced during dental treatment included cavity fillings, injections and invasive treatment procedures. It was seen that waiting in the reception area, sitting in the dental chair ,getting X-Rays, fluoride application and tooth cleaning done was found to be very easy for the parents.

Around 93.4% parents wanted their child's treatment to be done by basic behaviour management techniques, sedation and restraints were not the preferred choice of

dental treatment. The study also reveals sensory issues in which, ASD individuals were comfortable in dim light, no sensitivity to motion, absence to oral sensitivitiesand specific tasteswas seen.

A good professional-patient relationship through PECS in the dental environment for ASD individuals can prevent the need to refer such individuals for more extensive treatment protocols in a hospital environment, and also minimizes the stress and costs of the procedure. Thus, the need to simplify the work environment and create opportunities for communication with ASD patients should be emphasized.

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ANNEXURE I

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES (FACULTY OF BBD UNIVERSITY), LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled **"Behavioural Intervention by Picture Exchange Communication System (PECS) for Dental Management in Autistic Children."** submitted by **Dr P. Renuka** Post graduate student from the **Department of Paedodontics & Preventive Dentistry** as part of MDS Curriculum for the academic year 2018-2021 with the accompanying proforma was reviewed by the Institutional Research Committee present on **27th November 2018** at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.

Prof. Vandana A Pant
Co-Chairperson

Prof. B. Rajkumar
Chairperson

ANNEXURE II

ETHICAL CLEARANCE FORM

Babu Banarasi Das University
Babu Banarasi Das College of Dental Sciences,
BBD City, Faizabad Road, Lucknow – 226028 (INDIA)

Dr. Lakshmi Bala
Professor and Head Biochemistry and
Member-Secretary, Institutional Ethics Committee

Communication of the Decision of the VIIth Institutional Ethics Sub-Committee

IEC Code: 20   **BBDCODS/01/2019**

Title of the Project: Behavioural Intervention by Picture Exchange Communication System (PECS) for Dental Management in Autistic Children.

Principal Investigator: Dr. P. Renuka   **Department:** Paedodontics & Preventive Dentistry

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr. P.Renuka,

The Institutional Ethics Sub-Committee meeting comprising following four members was held on 10th January 2019.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry, BBDCODS, Lucknow
2.	Dr. Amrit Tandan Member	Prof. & Head, Department of Prosthodontics and Crown & Bridge, BBDCODS, Lucknow
3.	Dr. Rana Pratap Maurya Member	Reader, Department of Orthodontics & Dentofacial Orthopedics, BBDCODS, Lucknow
4.	Dr. Sumalatha M.N. Member	Reader, Department of Oral Medicine & Radiology, BBDCODS, Lucknow

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.
The comments were communicated to PI thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

Lakshmi Bala
22/01/19

(Dr. Lakshmi Bala)
Member-Secretary
IEC BBD College of Dental Sciences
BBD University
Faizabad Road, Lucknow-226028

(DIGHA Rajkumar)
PRINCIPAL
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University) BBDCODS
BBD City, Faizabad Road, Lucknow

ANNEXURE III

CONSENT FORM – ENGLISH

BabuBanarasi Das College of Dental Sciences
(BabuBanarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Consent Form

(English)

Title of the Study:

BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN

Study Number……..
Subject's Full
Name………. Date of
Birth/Age ………

Address of the Subject…………………….

Phone no. and e-mail address………………

Qualification ………………………………

Occupation: Student / Self Employed / Service / Housewife/

Other (Please tick as appropriate)

Annual income of the Subject………………

Name and of the nominees(s) and his relation to the subject……………… (For the purpose of compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Documentdated ……..for the above study and have had the opportunity to ask questions. **OR** I have been explained the nature of the study by the Investigator and had the opportunity to ask questions.

2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.

3. I understand that the sponsor of the project, others working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my

permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.

4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

5. I permit the use of stored sample (tooth/tissue/blood) for future research. **Yes [ ] No [ ] Not Applicable [ ]** 6.   I agree to participate in the above study. I have been explained about the complications and side effects, if any, and have fully understood them. I have also read and understood the participant/volunteer's Information document given to me. Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:……………..

Signatory's Name…………….   Date ……….

Signature of the Investigator…………………   Date………..

Study Investigator's Name...........................   Date………..

Signature of the witness……………………   Date………..

Name of the witness…………………………

Received a signed copy of the PID and duly filled consent form

Signature/thumb impression of the subject or legally   Date……..

 Acceptable representative

ANNEXURE IV

PATIENT INFORMATION DOCUMENT-ENGLISH

Babu Banarasi Das College of Dental Sciences
(A Constituent Institution of Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

PARTICIPANT / LEGALLY ACCEPTABLE REPRESENTATIVE INFORMATION DOCUMENT

1. **Study Title**

BEHAVIOURAL INTERVENTION BY PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS) FOR DENTAL MANAGEMENT IN AUTISTIC CHILDREN .

2. **Invitation Paragraph**

   You are being invited to take part in a research/trial study. Before you decide it is important for you to understand why the research/study is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your treating physician/family doctor if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

3. **What is the purpose of the study?**

To evaluate the effectiveness of Picture Exchange Communication System as a behavioural intervention modality for dental management in autistic children.

4. **Why have I been chosen?**

 A high percentage of autistic children visit the dentist but do not receive dental treatment due to impairment in communication which makes interacting with the dental team challenging , and leads to poor oral health in autistic children . To increase the communication with autistic children use of Alternative and Augmentative Communication (AAC) devices and programs can be implemented. One of the most widely used AAC intervention is Picture Exchange Communication System (PECS), 34 Autistic Children from special healthcare schools will be chosen in the age group of 4 to 18 years to assess the oral health status and the effectiveness of Picture Exchange Communication System (PECS) .Parental perceptions of autistic children regarding dental visits will also be assessed to conclude the major reasons behind neglected oral health in autistic child

5. **Do I have to take part?**

   It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If

you decide to take part you are still free to withdraw at any time without giving a reason.

6. What will happen to me if I take part?

Oral screening on autistic children will be done at the special health care schools as per standardized guidelines for behavioral intervention. Children from whom parental consent would be obtained will be brought to the department for dental management.

7. What do I have to do?

No lifestyle or dietary restrictions

8. What is the procedure that is being tested?

To increase the communication with autistic children use of Alternative and Augmentative Communication (AAC) devices and programs can be implemented. One of the most widely used AAC intervention is Picture Exchange Communication System (PECS), it is a unique AAC training package for individuals with autism and similar developmental disabilities. PECS requires the subject to exchange a picture representing a preferred item for the physical item, expressive communication skills are focused on throughout the training of PECS by making requests and later commenting.

9. What are the interventions for the study?

Behavioural intervention would be carried out.

10. What are the side effects of taking part?

No side effects can be ensured .

11. What are the possible disadvantages and risks of taking part?

On detecting or finding a condition of which the patient is unaware. It would be diagnosed and treated after parental consent.

12. What are the possible benefits of taking part?

This study would possibly bring a change in the overall oral health status of an autistic child by promoting the same through carrying out non – invasive dental procedures .

13. What if new information becomes available?

Sometimes during the course of a research project, new information becomes available about the research being studied. If this happens, you will be told about it and it is up to you whether you want to continue in the study. If you decide to withdraw arrangements will be made for your withdrawal. If you decide to continue in the study, you may be asked to sign an updated consent form.

14. What happens when the research study stops?

If the study finishes/stops before the stipulated time, it shall be explained to the patient/volunteer.

15. What if something goes wrong?

Assurance for safety of volunteers as only non-invasive procedures will be carried out. On detecting or finding a condition of which the patient is unaware. It would be diagnosed and treated after parental consent.

16. Will my taking part in this study be kept confidential?

All information collected about you during the course of the research will be kept strictly confidential.

17. What will happen to the results of the research study?

In results of the research patient information will be kept confidential and the patients will not be identified in any report / publication.

18. Who is organizing the research?

The present study will be conducted in the Department of Pedodontics and Preventive Dentistry, BBDCODS, BBDU in collaboration with special healthcare schools with Autistic Children in Lucknow after obtaining required consent. Patients will be treated free of cost for all the non-invasive procedures.

19. Will the results of the study be made available after study is over?

Results will be made available on request.

20. Who has reviewed the study?

The study has been reviewed by the Head of the Department , Department of Pedodontics and Preventive Dentistry , Institutional Research Committee and Institutional Ethical Committee , BBDCODS, BBDU .

21. Contact for further information

NAME : Dr. P.Renuka

ADDRESS : Department of Pedodontics and Preventive Dentistry

BBDCODS ,BBDU

EMAIL ADDRESS : renuka.pasupuleti.07@gmail.com

MEMBER SECRETARY OF ETHICAL INSTITUTION :

NAME :Dr.Lakshmi Bala

EMAIL ADDRESS : bbdcods.iec@gmail.com

Thank you for your cooperation and patience !

Signature of PI………………………………

Name………………………………………………..

Date…………………………………………………..

ANNEXURE- V

PATIENT INFORMATION DOCUMENT-HINDI

Babu Banarasi Das College of Dental Sciences
(A Constituent Institution of Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

रोगी सूचना पत्र

1.अध्ययन शीर्षक

दंत चिकित्सा प्रबंधन के लिए चित्र प्रदर्शनी संचार प्रणाली (पी ई सी एस) द्वारा व्यवहारिक अंतर्ग्रहण।

2. निमंत्रण अनुच्छेद

आपको एक शोध / परीक्षण अध्ययन में भाग लेने के लिए आमंत्रित किया जा रहा है। इससे पहले कि आप तय करें कि आपके लिए यह समझना महत्वपूर्ण है कि शोध / अध्ययन क्यों किया जा रहा है और इसमें क्या शामिल होगा। कृपया निम्नलिखित जानकारी को ध्यान से पढ़ने और दोस्तों, रिश्तेदारों और अपने इलाज करने वाले चिकित्सक / परिवार के डॉक्टर से चर्चा करें। हमसे पूछें कि क्या ऐसा कुछ है जो स्पष्ट नहीं है या यदि आप अधिक जानकारी चाहते हैं। यह निर्णय लेने के लिए समय निकालें कि आप भाग लेना चाहते हैं या नहीं।

3. अध्ययन का उद्देश्य क्या है?

ऑटिस्टिक बच्चों में दंत चिकित्सा प्रबंधन के लिए एक व्यवहार हस्तक्षेप हस्तक्षेप के रूप में पिक्चर एक्सचेंज कम्युनिकेशन सिस्टम की प्रभावशीलता का मूल्यांकन करने के लिए।

4. मुझे क्यों चुना गया है?

ऑटिस्टिक बच्चों का एक उच्च प्रतिशत दंत चिकित्सक का दौरा करता है, लेकिन संचार में कमजोरी के कारण दंत चिकित्सा उपचार प्राप्त नहीं करता है जो दंत टीम के साथ बातचीत को चुनौती देता है, और ऑटिस्टिक बच्चों में खराब मौखिक स्वास्थ्य की ओर जाता है। ऑटिस्टिक बच्चों के साथ संचार को बढ़ाने के लिए वैकल्पिक और ऑगमेंटेटिव कम्युनिकेशन (एएसी) उपकरणों और कार्यक्रमों का उपयोग किया जा सकता है। मौखिक रूप से इस्तेमाल किए जाने वाले AAC हस्तक्षेप में से एक पिक्चर एक्सचेंज कम्युनिकेशन सिस्टम (PECS) है, विशेष स्वास्थ्य विद्यालयों के 34 ऑटिस्टिक बच्चों को मौखिक स्वास्थ्य की स्थिति और पिक्चर एक्सचेंज कम्युनिकेशन सिस्टम की प्रभावशीलता का आकलन करने के लिए 4 से 18 वर्ष की आयु में चुना जाएगा। (पीईसीएस)। दंत दौरे के संबंध में ऑटिस्टिक बच्चों की प्रमुख धारणाएं भी

आत्मकेंद्रित बच्चे में मौखिक स्वास्थ्य की उपेक्षा के पीछे प्रमुख कारणों का निष्कर्ष निकालने के लिए मूल्यांकन किया जाएगा।

5. क्या मुझे भाग लेना है?

यह आपको तय करना है कि आपको हिस्सा लेना है या नहीं। यदि आप भाग लेने का निर्णय लेते हैं तो आपको रखने के लिए यह सूचना पत्र दिया जाएगा और सहमति पत्र पर हस्ताक्षर करने के लिए कहा जाएगा। यदि आप भाग लेने का निर्णय लेते हैं तो आप बिना कारण बताए किसी भी समय वापस लेने के लिए स्वतंत्र हैं।

6. अगर मैं भाग लेता हूं तो मेरा क्या होगा?

ऑटिस्टिक बच्चों पर मौखिक स्क्रीनिंग विशेष स्वास्थ्य देखभाल स्कूलों में व्यवहार हस्तक्षेप के लिए मानकीकृत दिशानिर्देशों के अनुसार किया जाएगा। जिन बच्चों से माता-पिता की सहमति प्राप्त होगी, उन्हें दंत प्रबंधन के लिए विभाग में लाया जाएगा।

7. मुझे क्या करना होगा?

   कोई जीवन शैली या आहार प्रतिबंध नहीं।

8. क्या प्रक्रिया है जो परीक्षण की जा रही है?

 ऑटिस्टिक बच्चों के साथ संचार को बढ़ाने के लिए वैकल्पिक और ऑगमेंटेटिव कम्युनिकेशन (एएसी) उपकरणों और कार्यक्रमों का उपयोग किया जा सकता है। सबसे व्यापक रूप से इस्तेमाल किए जाने वाले AAC हस्तक्षेप में से एक पिक्चर एक्सचेंज कम्युनिकेशन सिस्टम (PECS) है, यह ऑटिज्म और समान विकास संबंधी विकलांग व्यक्तियों के लिए एक अद्वितीय AAC प्रशिक्षण पैकेज है। PECS को भौतिक वस्तु के लिए एक पसंदीदा वस्तु का प्रतिनिधित्व करने वाले चित्र का आदान-प्रदान करने के लिए विषय की आवश्यकता होती है, अभिव्यंजक संचार कौशल अनुरोध और बाद में टिप्पणी करके PECS के प्रशिक्षण पर केंद्रित होते हैं।

9. अध्ययन के लिए हस्तक्षेप क्या हैं?

   व्यवहार हस्तक्षेप किया जाएगा।

10. भाग लेने के साइड इफेक्ट्स क्या हैं?

कोई दुष्प्रभाव सुनिश्चित नहीं किया जा सकता है।

11. भाग लेने के संभावित नुकसान और जोखिम क्या हैं?

ऐसी स्थिति का पता लगाने या खोजने पर जिससे रोगी अनभिज्ञ हो। माता-पिता की सहमति के बाद इसका निदान और उपचार किया जाएगा।

12. भाग लेने के संभावित लाभ क्या हैं?

यह अध्ययन संभवतः गैर-इनवेसिव दंत प्रक्रियाओं को पूरा करने के माध्यम से एक ऑटिस्टिक बच्चे के समग्र मौखिक स्वास्थ्य की स्थिति में बदलाव लाएगा।

13. यदि नई जानकारी उपलब्ध हो जाए तो क्या होगा?

कभी-कभी एक शोध परियोजना के दौरान, अध्ययन किए जा रहे शोध के बारे में नई जानकारी उपलब्ध हो जाती है। यदि ऐसा होता है, तो आपको इसके बारे में बताया जाएगा और यह आपके ऊपर है कि क्या आप अध्ययन जारी रखना चाहते हैं। यदि आप वापस लेने का निर्णय लेते हैं तो आपकी निकासी के लिए व्यवस्था की जाएगी। यदि आप अध्ययन जारी रखने का निर्णय लेते हैं, तो आपको एक अद्यतन सहमति पत्र पर हस्ताक्षर करने के लिए कहा जा सकता है।

14. क्या होता है जब शोध अध्ययन रुक जाता है?

यदि अध्ययन निर्धारित समय से पहले समाप्त / बंद हो जाता है, तो इसे रोगी / स्वयंसेवक को समझाया जाएगा।

15. क्या हो यदि कुछ गलत हो जाए?

स्वयंसेवकों की सुरक्षा के लिए आश्वासन केवल गैर-इनवेसिव प्रक्रियाओं को पूरा किया जाएगा। ऐसी स्थिति का पता लगाने या खोजने पर जिससे रोगी अनभिज्ञ हो। माता-पिता की सहमति के बाद इसका निदान और उपचार किया जाएगा।

16. क्या इस अध्ययन में भाग लेने वाले को गोपनीय रखा जाएगा?

अनुसंधान के दौरान आपके बारे में एकत्र की गई सभी जानकारी को कड़ाई से गोपनीय रखा जाएगा।

17. शोध अध्ययन के परिणामों का क्या होगा?

शोध की जानकारी के परिणामों में जैसे कि मरीजों का नाम गोपनीय रखा जाएगा और किसी भी रिपोर्ट / प्रकाशन में रोगियों की पहचान नहीं की जाएगी।

18. अनुसंधान का आयोजन कौन कर रहा है?

वर्तमान अध्ययन आवश्यक सहमति प्राप्त करने के बाद लखनऊ में ऑटिस्टिक बच्चों के साथ विशेष स्वास्थ्य देखभाल स्कूलों के सहयोग से पेडोडॉंटिक्स और प्रिवेंटिव डेंटिस्ट्री, बीबीडीसीओडीएस, बीबीडीयू विभाग में आयोजित किया जाएगा। सभी गैर-इनवेसिव प्रक्रियाओं के लिए मरीजों का नि: शुल्क इलाज किया जाएगा।

19. क्या अध्ययन समाप्त होने के बाद अध्ययन के परिणाम उपलब्ध कराए जाएंगे?

परिणाम अनुरोध पर उपलब्ध कराए जाएंगे।

20. अध्ययन की समीक्षा किसने की?

अध्ययन की समीक्षा विभाग के प्रमुख, बाल रोग विभाग और निवारक दंत चिकित्सा विभाग, संस्थागत अनुसंधान समिति और संस्थागत नैतिक समिति, बाबू बनारसी दास दंत संग्रह , बाबू बनारसी दास विश्वविद्यालय द्वारा की गई है।

21. अधिक जानकारी के लिए संपर्क करें

नाम : डॉ। पी। रेणुका
पता: पेडोडोंटिक्स और निवारक दंत चिकित्सा विभाग
     बाबू बनारसी दास दंत संग्रह , बाबू बनारसी दास विश्वविद्यालय
ईमेल पता: renuka.pasupuleti.07@gmail.com

सदस्य संस्थान के शैक्षणिक संस्थान:
नाम : डॉ। लक्ष्मी बाला
ईमेल पता: bbdcods.iec@gmail.com

आपके सहयोग और धैर्य के लिए धन्यवाद!

पीआई का हस्ताक्षर ……………………………

नाम ……………………………………… ..

दिनांक……………………………………..

ANNEXURE- VI

INDIAN SCALE FOR ASSESSMENT OF AUTISM

INDIAN SCALE FOR ASSESSMENT OF AUTISM

Name of the child:........................ Gender:.......... Date:...............

D.O.B............................ Age: .... Examiner:................

National Institute for the Mentally Handicapped
(Ministry of Social Justice & Empowerment, Govt. of India)
An ISO 9001-2000 Institution
Manovikas Nagar
Secunderabad – 500 009

Directions:

Below are given 40 statements which are divided under six domains, please tick (√) mark the appropriate rating for each item of the scale by observing the child and by interviewing the parents in order to assess Autism

	Items	Rarely Upto 20% Score 1	Sometimes 21 – 40 % Score 2	Frequently 41 – 60% Score 3	Mostly 61- 80 % Score 4	Always 81-100% Score 5
I.	**SOCIAL RELATIONSHIP AND RECIPROCITY**					
1	Has poor eye contact					
2	Lacks social smile					
3	Remains aloof					
4	Does not reach out to others					
5	Unable to relate to people					
6	Unable to respond to social/ environmental cues					
7	Engages in solitary and repetitive play activities					
8	Unable to take turns in social interaction					
9	Does not maintain peer relationships					
II.	**EMOTIONAL RESPONSIVENESS**					
10	Shows inappropriate emotional response					
11	Shows exaggerated emotions					
12	Engages in self-stimulating emotions					
13	Lacks fear of danger					
14	Excited or agitated for no apparent reason					
III.	**SPEECH-LANGUAGE AND COMMUNICATION**					
15	Acquired speech and lost it					
16	Has difficulty in using non-verbal language or gestures to communicate					
17	Engages in stereotyped and repetitive use of language					
18	Engages in echolalic speech					
19	Produces infantile squeals/ unusual noises					
20	Unable to initiate or sustain conversation with others					

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	Items	Rarely Upto 20% Score 1	Sometimes 21 – 40 % Score 2	Frequently 41 – 60% Score 3	Mostly 61- 80 % Score 4	Always 81-100% Score 5
21	Uses jargon or meaningless words					
22	Uses pronoun reversals					
23	Unable to grasp pragmatics of communication (real meaning)					
IV. BEHAVIOUR PATTERNS						
24	Engages in stereotyped and repetitive motor mannerisms					
25	Shows attachment to inanimate objects					
26	Shows hyperactivity/ restlessness					
27	Exhibits aggressive behavior					
28	Throws temper tantrums					
29	Engages in self-injurious behavior					
30	Insists on sameness					
V. SENSORY ASPECTS						
31	Unusually sensitive to sensory stimuli					
32	Stares into space for long periods of time					
33	Has difficulty in tracking objects					
34	Has unusual vision					
35	Insensitive to pain					
36	Responds to objects/people unusually by smelling, touching or tasting					
VI. COGNITIVE COMPONENT						
37	Inconsistent attention and concentration					
38	Shows delay in responding					
39	Has unusual memory of some kind					
40	Has 'savant' ability					

Classification	No Autism < 70	Mild Autism 70 to 106	Moderate Autism 107 to 153	Severe Autism > 153
Total score				

Test Manual

ANNEXURE-VII

QUESTIONNAIRE FOR ASSESSMENT OF PARENTAL PERCEPTION

Questionnaire For Parental Perception

I) PATIENT INFORMATION :

1. Child's Name :   4. Parent's Name :

2. Age :   5. Parent's Occupation :

3. Gender :

II) MEDICAL HISTORY :   *(Please Tick the options)*

1. Has your child been diagnosed with Autism Spectrum Disorder (ASD) ?

   ☐ Yes

   ☐ No

2. At what age was your child diagnosed with ASD ?

   Please specify _____

3. Does your child have any additional medical condition ?

   ☐ No

   ☐ Yes , If yes please specify :   Seizures

                                           Sleep problem

                                           Stomach or gastrointestinal problems

                                           Sensory problems

                                           Allergies

III) COMMUNICATION AND BEHAVIOUR   *(Please Tick the options)*

1. Does your child use non-verbal communication?

   ☐ Yes

   ☐ No

2. Do you use any of these communication systems for your child ?

   ☐ Picture Exchange Communication System (PECS)

   ☐ Sign Language

   ☐ Mayer Johnson Symbols

   ☐ Gestures

IV) ORAL CARE AND DENTAL TREATMENT HISTORY

1 .Does your child use a

☐ Manual toothbrush

☐ Powered Toothbrush

2. Does your child brush independently or with parent/guardian's assistance?

☐ Independent

☐ Assistance

3. Does your child floss ?

☐ Yes

☐ No

4. Do you think going to the dentist is important for your child's oral health ?

☐ Yes

☐ No

5. Has your child ever seen a dentist ?

☐ Yes

☐ No

6. How was your child's last dental visit ?

☐ Excellent

☐ Good

☐ Fair

☐ Poor

7. What was the reason for you to take your child for his /her last dental visit ?

☐ Dirty teeth

☐ Cavities

☐ Injured / Cracked tooth

8. What kind of dentist did your child see at his/her last visit ?

☐ General dentist

☐ Pediatric dentist

9. Difficulties faced by you and your child during the last dental visit ? *(Please tick in the boxes given below)*

	VERY EASY	DIFFICULT	VERY DIFFICULT	UNSURE
Waiting In Reception Area For More Than 5 Minutes				
Sitting On Dental Chair				
Tooth Cleaning				
Getting X-Rays Done				
Having Fluoride Brushed On Teeth				
Having A Cavity Filled				
Having An Injection Or Invasive Treatment				

10. Would you like the dentist to treat your child using the following ? *(Please tick in the boxes given below)*

Behaviour modification	Yes	No
Sedation	Yes	No
Restraints	Yes	No

V) SENSORY ISSUES

1. Is your child more comfortable in a dim light ?

☐ Yes

☐ No

2. Is your child sensitive to motion (i.e. the dental chair moving up and down or to a reclining position)?

☐ Yes

☐ No

3. Does your child have any specific oral sensitivities (gagging, gum sensitivities, etc.)?

☐ Yes

☐ No

4. Do certain tastes bother your child ?

☐ Yes

☐ No

ANNEXURE-VIII

DEBRIS INDEX CRITERIA FOR THE SIMPLIFIED ORAL HYGIENE INDEX

SCORE	DESCRIPTION
0	Absence of debris or extrinsic stain
1	Soft debris covering not more than one third of the exposed tooth surface being examined, or the presence of extrinsic stains without debris regardless of the surface area covered
2	Soft debris covering more than one third, but not more than two thirds of the exposed tooth surface, regardless of the presence of extrinsic stain
3	Soft debris covering more than two thirds of the examined tooth surface

CALCULUS INDEX CRITERIA FOR THE SIMPLIFIED ORAL HYGIENE INDEX

SCORE	DESCRIPTION
0	Absence of supragingival or subgingival calculus
1	Presence of supragingival calculus covering not more than one third of the examined surface, or the presence of small portions of subgingival calculus
2	Presence of supragingival calculus covering more than one third, but not more than two thirds of the examined surfaces, or presence of small portions of subgingival calculus around the cervical area of the tooth
3	Presence of supragingival calculus covering more than two thirds of the examined surface or a continuous region of subgingival calculus along the cervical area of the tooth, or both

ANNEXURE- IX

PHASES OF PICTURE EXCHANGE COMMUNICATION SYSTEM

PHASE 1	INITIAL PICTURE EXCHANGE	Student trained to hand a picture to trainer in exchange for a desired item .
PHASE 2	DISTANCE PHASE AND GENERALISATION	Student trained to retrieve a picture from communication book / pecs board and deliver it to trainer .
PHASE 3	PICTURE DISCRIMINATION	Student trained to discriminate amongst multiple pictures on PECS board → child chooses from six/more preferred and non – preferred items .
PHASE 4	SENTENCE STRUCTURE	The phrase " i want " followed by the desired item is used to begin teaching sentence structure .
PHASE 5	ANSWERING QUESTIONS	Previously taught skills are used to answer questions from the communicative partner .
PHASE 6	COMMENTING PHASE	The use of sentence strips is expanded by adding additional phrases such as " i hear " , " i see "

ANNEXURE-X

STATISTICAL TOOLS EMPLOYED

Arithmetic Mean

The most widely used measure of central tendency is arithmetic mean, usually referred to simply as the mean, calculated as

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Standard deviation and standard error

The standard deviation (SD) is the positive square root of the variance, and calculated as

$$SD = \sqrt{\frac{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}{n-1}}$$

where, n= no. of observations. The and SE (standard error of the mean) is calculated as

$$SE = \frac{SD}{\sqrt{n}}$$

Minimum and Maximum

Minimum and maximum are the minimum and maximum values respectively in the measure data and range may be dented as below

Range = Min to Max

and also evaluated by subtracting minimum value from maximum value as below

Range = Maximum value-Minimum value

Median

The median is generally defined as the middle measurement in an ordered set of data. That is, there are just as many observations larger than the median as there are smaller. The median (M) of a sample of data may be found by third arranging the measurements in order of magnitude (preferably ascending). For even and odd number of measurements, the median is evaluated as

$$M= [(n+1)/2]^{th} \text{ observation- odd number}$$

$$M= [n(n+1)/2]^{th} \text{ observation – even number}$$

Student's t Test

Student's t-test was used to calculate the differences between the means of two groups

$$t = \frac{\bar{X_1} - \bar{X_2}}{SE}$$

where,

$$SE = \sqrt{S^2 \times \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}$$

S^2 is the pooled variance and n_1 and n_2 are number of observations in group 1 and 2 respectively. The degrees of freedom (DF) is calculated as

$$DF = n1 + n2 – 2$$

Chi-square test

The chi-square (χ^2) test is used to compare the categorical data as

$$\chi^2 = \Sigma\Sigma \frac{(Fij – fij)^2}{fij}$$

where, Fij is the observed frequency while fij the expected frequency. The degrees of freedom (DF) is calculated as

$$DF= (r-1) (c-1)$$

Analysis of Variance

Analysis of variance (ANOVA) is used when we compare more than two groups simultaneously. The purpose of one-way ANOVA is to find out whether data from several groups have a common mean. That is, to determine whether the groups are actually different in the measured characteristic. One way ANOVA is a simple special case of the linear model. For more than two independent groups, simple parametric ANOVA is used when variables under consideration follows Continuous exercise group distribution and groups variances are homogeneous otherwise non parametric alternative Kruskal-Wallis (H) ANOVA by ranks is used. The one way ANOVA form of the model is

$$Y_{ij} = \alpha_{.j} + \varepsilon_{ij}$$

where;

- Y_{ij} is a matrix of observations in which each column represents a different group.

- $\alpha_{.j}$ is a matrix whose columns are the group means (the "dot j" notation means that α applies to all rows of the jth column i.e. the value α_{ij} is the same for all i).

- ε_{ij} is a matrix of random disturbances.

The model posits that the columns of Y are a constant plus a random disturbance. We want to know if the constants are all the same.

Statistical significance

Level of significance "*P*" is the probability signifies level of significance. The mentioned P in the text indicates the following:

$P > 0.05$ - not significant (ns)

$P < 0.05$ - just significant (*)

$P < 0.01$ - moderate significant (**)

$P < 0.001$ - highly significant (***)

ANNEXURE-XII

PLAGIARISM REPORT

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Submitted by	Dr. P. Renuka
Submitter email	1180327003@bbdu.ac.in
Similarity	5%
Analysis address	1180327003.bbduni@analysis.urkund.com

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