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## **ORAL HEALTH CHALLENGES FACING THE AUTISTIC CHILD IN DUBAI A SURVEY**

By

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Presented to the Hamdan Bin Mohammed College of Dental Medicine of  
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in Partial Fulfilment of the Requirements for the Degree of  
Master of Science in Paediatric Dentistry  
2016

## **ABSTRACT**

### **ORAL HEALTH CHALLENGES FACING THE AUTISTIC CHILD IN DUBAI: A SURVEY**

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#### **Aims:**

The aim of this study was to investigate the challenges faced by the autistic children and their families in Dubai from three different perspectives of dental care: oral care at home, oral care at the dentist and access to oral care, and to compare the results to their normally developing peers.

#### **Materials and Methods:**

This is a case control comparative study, of 84 autistic and 53 healthy 2 to 18 year old children who were recruited from autistic children attending special needs centers in Dubai and from schools in the same geographic areas including siblings of the autistic children whenever available. Data collection was by way of a survey questionnaire sent to the parents or guardians through the centers and school administrations. The data analysis was done using SPSS statistical system using frequency distributions, descriptive analysis and T-test analysis for comparison.

#### **Results:**

Significantly more parents of autistic children compared to parents of healthy children reported difficulty across almost all oral care variables explored, including oral care at home, oral care at the dentist and access to oral care. The autistic children experienced more difficulty in tooth brushing at home and needed to be physically restrained for it. Their uncooperative behavior and sensory sensitivities increased more during their dental visits, which discouraged their parents from taking them for regular dental checkups. More autistic children had never been to a dentist before due to their uncooperative behavior.

**Conclusion:**

This study indicates that autistic children in Dubai experience more challenges and barriers to oral care than their typically developing healthy peers.

## DEDICATION

*This thesis is dedicated to my dear husband  
For his endless support and encouragement  
Throughout the past three years of this Masters Program*

## **DECLARATION**

I declare that all the content of the thesis is my own work. There is no conflict of interest with any other entity or organization.

Name: Dina Mansoor Ahmed

Signature:

## ACKNOWLEDGMENTS

After an intense period of three years, today is the day: writing this note of thanks is the finishing touch on my thesis. It has been a period of intense learning for me and I would like to reflect on the people who have supported and helped me so much throughout this period.

I would first like to thank my parents and brothers for encouraging me to pursue a Masters degree. Your prayers and usual answer of “ don’t worry you can do it” has encouraged me a lot and lifted my spirits whenever I needed it. A special heartfelt thank you goes to my husband for giving me the support and encouragement that enabled me to finish this journey. Thank you for being a great husband and father to my children.

A big thank you note goes to the Paediatric Dentistry Faculty at Hamdan Bin Mohammad College of Dental Medicine, Dr Manal, Dr Mawlood and Dr Iyad, your guidance and sharing of knowledge has made me the confident paediatric dentistry specialist that I am now.

To my Masters thesis supervisors, Dr Mawlood Kowash and Dr Manal Al Halabi, your valuable guidance has definitely provided me with the tools that I needed to choose the right direction and successfully complete my thesis. A special thank you goes to Dr Amar Hassan for his immense knowledge and help in the statistical data analysis in this thesis.

Finally there are my friends, Dr Ghada Hussain, Dr Shaikha Al-Raeesi, Dr Haifa Al-Hashimi, Dr Eman Al-Nuaimi and Dr Batool Gaith, thank you for all the happy moments and memories we built together in the past three years. I will always cherish your friendship and support.

Thank you very much everyone!

Dina Mansoor Ahmed

## TABLE OF CONTENTS

### Contents

ABSTRACT .....	II
DEDICATION .....	III
DECLARATION .....	IV
ACKNOWLEDGMENTS .....	V
List of Tables .....	1
List of figures .....	2
1. INTRODUCTION .....	4
2. LITERATURE REVIEW .....	8
2.1 Definition .....	8
2.2 Epidemiology .....	8
2.3 Aetiology .....	9
2.4 Onset and Prognosis .....	10
2.5 Clinical Features and Diagnosis .....	11
2.6 Differential Diagnosis .....	12
2.7 Medical Problems .....	13
2.8 Treatment Of Autism .....	15
2.9 Autism Misconceptions .....	16
2.10 Autism From The Dental Perspective .....	17
1.2 Aims .....	25
3. MATERIALS AND METHODS .....	26
3.1 Research Design .....	26
3.2 Sample Population .....	26
3.2.1 Study Sample Inclusion Criteria .....	26
3.2.2 Control Sample Inclusion Criteria .....	27
3.3 Survey Instrument .....	27
3.4 Survey Procedure .....	28
3.4.1 Participating Special Needs Centers .....	28

3.4.2 Schools That Participated .....	29
3.5 Statistical Analysis .....	29
3.6 Ethical Considerations .....	31
4. RESULTS .....	32
4.1 Study Sample Characteristics .....	32
4.2 Oral Care At Home.....	33
4.3 Oral Care At The dentist .....	36
4.4 Access to Oral Care .....	38
5. DISCUSSION .....	42
5.1 Oral Care At Home.....	43
5.2 Oral Care at the Dentist.....	44
5.3 Access to Oral Care .....	45
4.4 Study Limitations .....	47
• Conclusions and Rrecommendations.....	49
• Bibliography .....	52
• Appendix .....	56

## **List of Tables**

Table 1: Demographic characteristics of gender, age, parental education and work status for children with Autism and healthy subjects

Table 2: Oral care at home

Table 3: Logistic regression to explain factors associated with autistic children's mothers behavior toward oral care at home.

Table 4: Oral care at the dentist

Table 5: Oral care at the dentist, children's fears, dislikes and complaints

## **List of figures**

Figure 1: Study methodology summary flowchart

Figure 2: Dental visits

Figure 3: Reasons for visiting a dentist

Figure 4: Children visiting the dentist by age group

Figure 5: Reasons for not visiting a dentist

Figure 6: Distribution of case and control by nationality and their experience of visiting a dentist

## List of Abbreviations

MMR	Measles, Mumps, and Rubella
MTHFR	Methylenetetrahydrofolate reductase
DNA	Deoxyribonucleic acid
CPP-ACP	Casein phosphopeptide amorphous calcium phosphate
UAE	United Arab Emirates
SPSS	Statistical Package for Social Sciences
GCP	Good Clinical Practice
RERC	Dubai Healthcare City Authority Research Ethics Review Committee
Nr	Number
DMFT/dmft	Mean number of decayed, missing or filled teeth index
UK	United Kingdom
USA	United States Of America
ASD	Autism Spectrum Disorder
PDD	Pervasive Developmental Disorder
WHO	World Health Organization
GABA	Gamma-Amino Butyric acid
IQ	Intelligence quotient
DSM-IV	5 <sup>th</sup> Edition of the Diagnostic and Statistical Manual of Mental Disorders
GI	Gastrointestinal
GERD	Gastroesophageal Reflux Disease

## 1. INTRODUCTION

Autism is defined as a complex developmental disability that typically appears during the first 3 years of life as a result of a neurological disorder that affects the normal functioning of the brain, impacting development in the areas of social interaction and communication skills <sup>1</sup>. It is characterized by impairment in social interaction, impaired communication and restricted, repetitive, or stereotyped behaviors (1). Aberrant development of social skills and impaired ability to engage in reciprocal social interactions are hallmark symptoms of Autism (2).

Autism is known as one of the pervasive developmental disorders. Pervasive developmental disorders are disturbances of brain development with genetic underpinnings, these include: Autistic, Aspergers, childhood disintegrative, Retts, and pervasive developmental disorders not otherwise specified. With the publication of the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental Disorders in May 2013, all Autism disorder subtypes were merged under one definition of Autism Spectrum Disorder (ASD) or Autism.

Children with Autism have the inability to attain expected social, communication, emotional, cognitive and adaptive abilities (2). Overt symptoms gradually begin after the age of six months, become established by age two or three years (3) and tend to continue through adulthood, although often in more muted forms (4). Some individuals with the condition are able to lead independent and fulfilling lives, whereas for others, the impact can be severe, interfering significantly with quality of life (5).

Autism prevalence is four times higher in males than in females; however females are more likely to show signs of more severe mental retardation (6). The number of people diagnosed with Autism has increased dramatically since the 1980s, partly due to changes in diagnostic practice, referral patterns, availability of services, age at diagnosis, and public awareness (7).

According to the systematic review of epidemiological surveys of autistic disorder and pervasive developmental disorders (PDDs) worldwide conducted in 2011 by Mayada Elsabbagh et al under the commission and support of WHO, the Global prevalence estimate of Autism disorder since the year 2000 is a median of 17/10,000, the prevalence estimate in Europe is a median of 19/10000, America 22/10000, and Western Pacific 12/10000 (8). There were no estimates found for South East Asia, Eastern Mediterranean and Africa. Prevalence estimates for pervasive developmental disorders which can give an idea about Autistic disorders are available as follows: 100/10000 in Sri Lanka (9), 6.3/10000 in Iran (10), 1.4/10000 in Oman (11), 20/10000 in the United Arab Emirates (12).

Autisms characteristics of impaired social interaction, abnormalities in communication, restricted interests, and repetitive and stereotyped behaviors have the potential to make oral care difficult in a variety of ways thus increasing the risk of dental caries and periodontal disease (6). Difficulties with social interactions could prove challenging when parents/caregivers teach or perform oral hygiene techniques to their autistic children. If these techniques are not part of the children's daily routine and performed by the same caregiver, they might reject doing so due to their aversion to change. In addition to that, lack of necessary manual dexterity, lack of eye contact, resulting in communication failure compounds the problem (13,14). Impaired communication can hinder children's ability to tell dentists if they are uncomfortable during treatment and limit the dentist's ability to use many basic behavioral guidance techniques during treatment (15). Stereotypical and repetitive actions can also complicate dentist's ability to safely and effectively provide oral care (16). Finally, visiting a dental office for the first time or irregularly can be a challenge because children with Autism might not be able to cope with this change of their routine or with the different sounds, tastes and smells they may experience due to their oversensitivity to sensory stimuli (13).

Primary caregivers play a central role in the supervision and guidance of these children's oral hygiene activities (17) thus it's important for the dentist to provide them with the necessary information needed about oral hygiene and its implications and to understand the barriers to care from the perspective of the primary caregivers.

There are studies in the Gulf region describing oral health and dental needs of children with Autism. These studies reported high prevalence of caries, gingivitis and poor oral hygiene in comparison with non-autistic individuals (18). But there are no studies conducted in this region addressing the challenges and barriers faced by the autistic children and their families in providing oral care for their children. International studies from the UK (19) and USA (13,20,21) regarding barriers to dental care are available but their results may not be applicable to the United Arab emirates population due to the differences in the rules and procedures governing the dental sector such as the dental referral routes, dental appointments, waiting list, payment methods and the travel distances to the dental clinics which cannot be compared to the USA and the UK which are larger countries with larger remote areas and more internal travel distances. The cultural differences and differences in dental knowledge and awareness might also necessitate conducting regional and local studies to investigate this very important topic.

In the United Arab Emirates the only research available about autistic children and their dental status was published in 2011 by Jaber et al. This study described the oral health and dental needs of children with Autism and concluded that children with Autism exhibited higher caries prevalence, poor oral hygiene and extensive unmet needs for dental treatment than non-autistic healthy control group (17). But there has not been any research conducted to address the issue of presence or absence of barriers to dental care for children with Autism, thus this study was intended to address this issue and help the Dentists in the United Arab Emirates as they are having to care for more autistic patients since the prevalence of Autism has increased in the

recent years. Therefore, it is important for the dental professionals to have knowledge of the oral health characteristics of the autistic child, understand the experiences and challenges encountered by autistic children as they access and engage in oral care both at home and in the dental clinic. The dentists should possess proper understanding of the characteristics and needs of families with autistic children as well as the barriers they face that limit their ability to provide proper oral care to their autistic children.

Thus, due to the lack of available studies in the United Arab emirates addressing the dental challenges and dental barriers faced by the autistic children and their families we conducted a study to investigate these challenges faced by the autistic children and their families in gaining access to oral care and compared to normal healthy children and their families in the United Arab Emirates.

## **2. LITERATURE REVIEW**

### **2.1 Definition**

Autism spectrum disorder (ASD) or Autism is a group of neurodevelopmental disorders, affecting the normal development and functioning of the brain in three core domains; reciprocal social interactions, verbal and non verbal communication and the presence of restricted or repetitive behaviors (22).

Autism was previously known as one of the pervasive developmental disorders. Pervasive developmental disorders are disturbances of the brain development with undermining genetic causes, these include: Autistic, Aspergers, childhood disintegrative, Retts, and pervasive developmental disorders not otherwise specified disorders. But with the publication of the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders in May 2013, all Autism disorder subtypes were merged under one definition of Autism Spectrum Disorder (ASD) or Autism (6).

### **2.2 Epidemiology**

Autism is four times more common in boys than in girls, in 2002 the prevalence estimate was 7 in 10000 and in 2014 it has been estimated to be 1 in 68 (23). This rise can be due to the improvement in the medical understanding of the disorder, broadening of the diagnostic criteria, improved diagnostic tools, increase in awareness leading to early screening and the increased exposure to environmental factors which might contribute to the development of autism such as food preservatives and environmental toxins. Furthermore, increase in the advanced maternal age and stress triggers during pregnancy such as trauma, illness and substance abuse have increased the fetal risk of developing autism. Advances in medical technology has led to decline in neonatal deaths and higher survival rates of those diagnosed with Autism (24).

Twin and family studies have strongly revealed that some people are more genetically predisposed to having Autism. Identical twin studies showed that if one twin is affected, there is a 90 percent chance of the other twin having Autism also. Compared with a family with healthy children, a family with an autistic child is more at risk, with a 5% chance or 1 in 20, of having a second autistic child. This is greater than the risk for the general population. Researchers are currently trying to identify the specific genes that cause Autism and also the genes responsible for increased susceptibility in families with an autistic child. In some cases, parents and other relatives of a child with ASD show mild impairments in social and communicative skills and repetitive behaviors have been found in some families and relatives of an autistic child. Furthermore, there is evidence of the frequent occurrence of emotional disorders such as bipolar disorder in the families of autistic children (25).

### **2.3 Aetiology**

Results of neurochemical, neuro-pathological, neuroimaging and genetic studies all show that Autism spectrum disorder (Autism) are disorders of neuronal-cortical organization, connectivity and brain structure. These disorders are most probably influenced by genetic and environmental factors where the environmental factors affect the biological process in the body or modulate gene expression within the nervous system (23).

Documented causes of Autism include genetic mutations and/ or deletions, viral infections, and encephalitis following vaccination. Therefore, Autism is the result of genetic defects and/or inflammation of the brain. A defective placenta, undeveloped blood-brain barrier, and the immune response of the mother to infection while pregnant could cause the inflammation. Other risk factors can be advanced parental age, fetal exposure to valproate, a premature birth, and encephalitis in the child after birth, or a toxic environment (26).

Several studies have consistently revealed that the abnormal brain region in humans suffering from Autism compared to healthy humans is the cerebellum. The abnormalities were seen in the cerebellar size, morphology and function. The irregular cerebellar growth patterns begin from early infancy and continue into adolescence. 21 of 29 postmortem studies have found a reduction in the number of the primary cerebellar efferent neuron, the Purkinje neurons, which are responsible for most of the electrochemical signaling in the cerebellum. They release the neurotransmitter GABA that inhibits or reduces the firing rate of the neurons, which negatively affect body motor function. They are also necessary for coordinating late gestation and postnatal cerebellar development, therefore any genetic or biochemical insults affecting early Purkinje neuron development could disrupt cerebellar growth and function, contributing to the development of autism (27).

## **2.4 Onset and Prognosis**

The onset of Autism can occur in three different ways, the congenital pattern where behavioral abnormalities are present within the first year of life; normal early development pattern which is followed by a developmental plateau and failure to reach developmental milestones; and the autistic regression pattern which is characterized by abrupt or gradual loss of previously acquired abilities.

The autistic child's IQ and language development level may predict outcome. Prognosis will be poor if the IQ level is less than 50, but even if the IQ is high the autistic child may still need substantial support from family and other support systems (28).

## 2.5 Clinical Features and Diagnosis

Autistic children exhibit three clinically significant features, which are impairment in their social interactions, impairment in communication and restricted or repetitive actions or behaviors. The most noticeable feature is the impaired social interaction where they may resist cuddling in infancy, avoid making friends and engaging in social activities. In the preschool children the most noticeable features are delayed or total absence of development of spoken language and lack of pretend play which should normally be present in children by 12 to 15 months of age (16).

Wing and co-workers (29) categorized children with Autism into three groups which are aloof and passive; reachable but socially alienated unless actively engaged; and active but odd and can initiate interactions but in an awkward and inappropriate ways.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (6) lists specific criteria for diagnosing Autism which are:

### A. Qualitative impairment in reciprocal social interaction

1. Marked lack of awareness of the existence or feelings of others.
2. No or abnormal seeking of comfort at times of distress.
3. No or impaired imitation.
4. No or abnormal social play.
5. Gross impairment in ability to make peer friendships.

### B. Qualitative impairment in communication and imagination

1. No mode of communication.
2. Markedly abnormal nonverbal communication.
3. Absence of imaginative activity.
4. Marked abnormalities in the production of speech.
5. Marked abnormalities in the form of content of speech.
6. Marked impairment in the ability to initiate or sustain a conversation, despite adequate speech.

C. Markedly restricted repertoire or activities and interests

1. Stereotyped body movements.
2. Persistent preoccupation with parts of objects or attachment to unusual objects.
3. Marked distress over changes in trivial aspects of the environment.
4. Unreasonable insistence on following routines in precise detail.
5. Markedly restricted range of interests.

## 2.6 Differential Diagnosis

There are several medical conditions similar to Autism and it is important to know the difference between them such as Attention-deficit/hyperactivity disorder; Stereotypic movement disorder where motor stereotypies can be one of the characteristics of autism, but when it starts to cause self-injury and become a focus of treatment then it can be diagnosed as a separate disorder not related to Autism; Rett syndrome where during the regressive phase of Rett syndrome (typically between 1-4years of age) disruption of social interaction can be noticed; and Schizophrenia

which can also develop in childhood after a period of normal or near normal development is associated with hallucinations and delusions which are not features of Autism. Furthermore, other differential diagnosis can be selective mutism which differs from Autism because the only clinical feature present is that the child doesn't speak; some forms of language disorder where there may be isolated problems of communication and some secondary social difficulties; and intellectual disability which might be difficult to differential it from autism in very young children.

## **2.7 Medical Problems**

### *Psychiatric Illness*

Psychiatric illnesses are commonly associated with Autism. It has been found in 72% of children diagnosed with autism, the most common being obsessive-compulsive disorder, attention-deficit hyperactivity disorder, separation anxiety, and specific phobias. Mental retardation is present in approximately 26–30% of children with autistic spectrum disorders (28).

### *Epilepsy*

The prevalence of epilepsy in Autism ranges from 8% to 42%. In Autism accompanied by severe intellectual disability and motor deficits the prevalence of seizures is (42%) whereas in autistic children without these problems the prevalence of seizures is 6% to 8%. All types of epilepsy can occur in autism the most common is the partial complex seizures (30).

### *Sleep Disturbances*

The prevalence of sleep disturbances in Autism ranges from 44% to 83%. Their causes are due to abnormality of melatonin, which is elevated during daytime, and significantly lower nocturnal

melatonin. The sleep disturbance usually starts at the age of 2 years with the most common types being sleep onset insomnia, night awakenings and irregularities of the sleep wake cycle, including early morning awakenings (31).

### *Feeding Problems*

The prevalence of feeding problems and food intolerance in Autism ranges from 20% to 60%. Children with Autism breastfeed at the same rate as the healthy children, but the difference are in the slow feeding, difficulty in accepting solids and food selectivity. The slow feeding in infancy could be considered as early symptoms of an autistic child's difficulty in accepting change. The restriction in the type of foods eaten by the autistic child is apparent by 15 months of age and become progressively more apparent. It must be noted that these feeding problems do not impair the child's energy intake or growth and it doesn't lead to specific vitamin or mineral deficiencies. The causes of feeding problems in autism can be due to oral-motor dysfunction; medical conditions such as gastro oseo-pharangeal reflux, constipation, food allergies/intolerance, and colic disease; and the influence of medication on appetite such as psychotropic medications and anti-epileptic drugs (32).

### *Gastrointestinal Problems*

The prevalence of GI problems in autistic children is 9% to 70%, which is higher than in the healthy controls, and due to lack of prospective well-controlled studies the cause of this is not known yet but some clinical research suggests that some genes involved in autism can affect other systems in the body also. The most common GI symptoms in autistic children are chronic constipation, abdominal pain with or without diarrhea, GERD, abdominal bloating and disaccharidase deficiencies (33).

### *Voiding Problems*

The prevalence of voiding problems in Autism is 11% to 25%. It can be very difficult to toilet train an autistic child. Their bladder storage and emptying function is normal but their response to the bladder filling sensation is unpredictable. Some children have sensory issues and find the sensation of bladder contraction unbearable thus they might require anticholinergic medications to increase the interval between voiding. Others can completely ignore the signals from their full bladder and wet themselves because their attention is focused somewhere else. Voiding dysfunction and incontinence is higher in autistic children with intellectual disabilities (23).

## **2.8 Treatment Of Autism**

Autism cannot be cured, but the earlier the intervention the better the results. Therapies and behavioral interventions can only alleviate symptoms and cause substantial improvement. The ideal treatment plan should be tailored around the specific needs of the individual child (25).

### *Educational/Behavioural Interventions*

Therapists use individualized structured skill-oriented training sessions to help children develop social and language skills, such as Applied Behavioral Analysis. The therapists also provide family counseling to help the families adjust to living with an autistic child (25).

### *Medications*

Medications are prescribed not to treat Autism but rather for treatment of Autism-related symptoms, such as anxiety, depression, or obsessive-compulsive disorder. Antipsychotic medications are used to treat severe behavioral problems. Anticonvulsant medications are used

to treat seizures. Attention deficit disorder medications can be used to decrease impulsivity and hyperactivity (25).

### *Other Therapies*

There still are no studies supporting the use of some medications or interventions said to treat or relieve the symptoms of Autism such as dietary interventions.

## **2.9 Autism Misconceptions**

### *Autism is a Single Condition*

Autism was previously considered as one of 5 pervasive developmental disorders, but in 2013 the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental disorders (6) redefined it and now Autism is a spectrum disorder that includes Autism, Asperger syndrome, pervasive developmental disorder not otherwise specified, childhood disintegrative disorder and Rett syndrome (6).

### *Only Symptomatic Children Should Be Screened For Autism*

There are no specific universal guidelines yet but the American Academy of pediatric dentistry recommends universal screening (34). This recommendation is due to the presence of early childhood interventions, which could be beneficial for the children who are identified early.

### *Since Autism Cannot Be Cured, Early Intervention Offers No Benefit*

Randomized controlled trials results have indicated that early developmental and behavioral therapy can decrease symptoms associated with Autism and improve communication and social interactions. These therapies can improve the autistic child quality of life, adaptability to being enrolled in schools and eventual employability and independence (35).

### ***Individuals With Autism Are Intellectually Disabled And Cannot Function Independently***

Less than one in five ASD children (19%) has an intellectual disability, but they do have difficulty living independently and they are more socially isolated compared to other disability groups. Only 53% of young adults with Autism have been employed and this is considered to be the lowest rate among disability groups (35).

### ***Thimersol Vaccines Cause Autism***

The controversy and concern about a correlation between mercury and Autism began in 1999, when Wakefield published his study (36), and in 2002 strengthened by a further study by Uhlmann, to link Thimerosal containing vaccines to the increasing incidence of Autism (37). The 1999 study by Wakefield AJ identified associated gastrointestinal disease and developmental regression in a group of previously normal children, which was associated with possible environmental triggers such as MMR vaccine, measles infection and otitis media. Furthermore, the 2002 study by Uhlmann RV confirmed the association between the presence of measles virus and gut pathology in children with developmental disorders. Since then the correlation has been disproven by a number of studies and further review of the initial studies proved their result to be false. Despite the lack of evidence connecting Thimerosal to Autism, since July 1999 it has been removed from most childhood vaccines as a precautionary measure (38).

## **2.10 Autism From The Dental Perspective**

Children with autism have a difficulty in maintaining good oral hygiene thus they are at an increased risk of developing caries and periodontal disease. This difficulty can be due to co-existing medical disorders like GERD and regurgitation; increased or decreased saliva secretion

due to medications; poor dietary habits; damaging oral habits such as bruxism or pica; lack of proper oral care at home and the dental clinic due to behavioral and sensory difficulties (16).

### *Caries Prevalence*

Data on the incidence of dental caries among autistic children is inconclusive. Some studies show that they have a lower caries rate than their healthy counterparts, such as the study by Shapira and co-workers (39) where they concluded that institutionalized and non institutionalized autistic children had a lower caries rate than unaffected children. While other studies show that they have an increased caries rate, such as the study by Lowe and Lindermann (40) where they found the autistic patients had higher caries index but on recall there was no increase in caries rate compared to their control group.

### *Periodontal Status*

Autistic children and adolescents have more food accumulation around the teeth, larger amount of plaque accumulation and poorer periodontal health compared to their healthy counterparts (16). A study by Klein and Nowak (41) reported that autistic patients had 39.5% healthy gingiva, 51.2% localized gingivitis and 9.2% had generalized gingivitis.

### *Controversial Issues In Treating The Dental Patient With Autism*

Robert E. Rada conducted a literature review in medical and alternative medical literature (42) to investigate the concerns that parents of autistic children may have when dental care is provided to their children. He identified six area of concern that the parents have and some are considered as areas of controversy between the alternative medicine and dental perspective.

### *A. Mercury*

Alternative medical literature suggests that children with Autism are genetically predisposed to an inability to clear the body of heavy metal contaminants such as aluminum and mercury due to their low level of glutathione which plays a part in the bodies detoxification system. Robert E. Rada found a 2007 study, which concluded the presence of excess mercury in the dental pulps of primary teeth of children with autism, which suggested their inability to clear mercury from their bodies.

### *B. Fluoride*

It is suspected of inhibiting critical antioxidant enzymes and has been linked to excite toxic reactions within the brain, thus parents are trying to avoid its use (42). Although from the dental perspective fluoride plays an important preventive role and can decrease the risk of caries in the medically compromised patients who are more prone to plaque accumulation and poor oral hygiene.

### *C. Gastrointestinal Problems*

Autistic patients suffer from gastrointestinal problems such as abdominal bloating, abdominal discomfort, diarrhea and gastro esophageal reflux. Thus many parents have started to remove from their child's diet any suspected GI irritants by putting them on gluten free or casein free diet. These parents have reported that when the GI problems were treated they noticed that their child's behavior also improved. The theory behind this from the alternative medicine perspective which states that when the body is unable to metabolize gluten and casein, the intestine will release peptides into the blood stream which will cross the blood brain barrier and

bind to opioid receptors within the brain leading to abnormal behavior associated with Autism. But from the medical perspective there is not enough scientific evidence to support this theory (42). This diet can affect the preventive dental treatment because parents will ask for gluten free prophylaxis paste and will not want to use products such as casein phosphopeptide amorphous calcium phosphate (CPP-ACP), which is recommended to enhance remineralization because its active ingredient is milk derived.

#### *D. Antibiotics*

The over usage of antibiotics has been related to an increase in the autistic symptoms due to change in the intestinal flora thus alternative medicine practitioners prescribe antifungal agents and probiotics (42).

#### *E. Acetaminophen*

One study results suggested that acetaminophen use after receiving the measles mumps rubella vaccine could be associated with autistic disorder, where as this association was not found in children given ibuprofen. This can be due to the fact that some autistic children can not metabolize acetaminophen due to deficient sulfation process, which will result in the accumulation of a toxic metabolite that can interfere with the immune system or have direct neurotoxic effects (42).

#### *F. Nitrous Oxide*

Nitrous oxide inhibits the enzyme methylene-tetrahydrofolate reductase (MTHFR), which is involved in the metabolism of folate; this can limit the synthesis of DNA severely causing megaloblastic changes in blood cells and bone marrow. There are no articles in the literature that

specifically state against the use on nitrous oxide in autistic children. However, some autistic children's parents may be wary of sedating their children with nitrous oxide because some of these children may have biochemical abnormalities in folic acid metabolism, vitamin B12 deficiencies and the dysfunction of MTHFR (42).

### *Dental Care*

Autisms characteristics of impaired social interaction, abnormalities in communication, restricted interests, and repetitive and stereotyped behaviors have the ability to make oral care difficult in a variety of ways thus increasing the risk of dental caries, periodontal disease, delayed tooth eruption, bruxism and trauma to teeth (16).

Difficulties with social interactions could be challenging when parents or caregivers teach oral hygiene techniques to the autistic child. The child might get uncomfortable being in close proximity to someone else. If the brushing and flossing is not part of their daily routine, they might reject it due to their aversion to change. There might be lack of proper communication between the autistic child due to lack of eye contact between the autistic child and providers (13,14).

Impaired communication can make the autistic child unable to express his/herself if he/she is uncomfortable during treatment and also the dentist can't implement the basic behavioral guidance techniques during treatment (15).

Stereotypical and repetitive actions can also complicate dentist's ability to safely and effectively provide oral care due to the child's constant movement and inability to sit still during dental treatment (17).

Visiting a dental office for the first time can also be a challenge because children with Autism don't like change of their routine and can be oversensitive to the different sounds, tastes and smells they may experience due to their oversensitivity to sensory stimuli (14).

Other factors that can also influence their oral health is lack of necessary manual dexterity thus their inability to brush properly. In general, children with Autism prefer soft and sweetened foods, and they tend to pouch food inside the mouth instead of swallowing it due to poor tongue coordination, thereby increasing their susceptibility to caries. Also some of the autistic children are prescribed psychoactive drugs or anticonvulsants, which can cause xerostomia and delayed tooth eruption (16).

Primary caregivers are the main supervisors of the autistic child's oral hygiene thus it is important for the dentist to provide them with the necessary information needed about oral hygiene and its implications and to understand the barriers to care from the perspective of the primary caregivers.

There has been several published articles globally addressing the issue of the presence of barriers to dental care for children with Autism. In the United states a 2012 case control research by Leah I. Stein concluded that children with Autism experience great difficulties and barriers to care in both home and dental office settings than their typically developing peers (43). In addition to that in 2011 Leah I Stein also conducted a research which concluded that compared with children with other disabilities, those with Autism had greater behavioral difficulties and sensory sensitivities that parents believed interfered with their children's oral care, the sensory sensitivities were associated with oral care difficulties in the home and dental office and with behavioral difficulties in the dental office (44).

In the United Kingdom S. Barry published in 2014 a cross sectional case-control research which reported that difficulties exist for children with Autism in accessing dental care in the Hull and East Riding area (19).

In India, Richa published a research in 2014, which concluded that the presence of functional limitations may have a negative impact on oral health status that might influence the child's oral health related quality of life (45).

In the Middle East, a research published in 2005 in Saudi Arabia by Murshid et al concluded that in Riyadh 65% of autistic children have been to the dentist but half of these children had only minimal treatment done due to their difficult behavior in the dental office. The parents of the 35% of autistic children who have never visited a dentist attributed this to their children's difficult behavior and lack of compliance even during homecare (18).

In the United Arab Emirates the only research available about autistic children and their dental status is the 2011 research by Jaber et al which described the oral health and dental needs of children with Autism and concluded that children with Autism exhibited higher caries prevalence, poor oral hygiene and extensive unmet needs for dental treatment than non-autistic healthy control group (17). To the present time, there has not been any research conducted to address the issue of presence or absence of barriers to dental care for children with Autism, thus this study detailed in this paper addressed this issue and hopefully will be helpful to the Dentists in the United Arab Emirates. As the prevalence of Autism has increased in the recent years, the dentists are facing more patients with Autism seeking dental treatment. Therefore, it is important for the dental professionals to have adequate knowledge about the oral health characteristics of the autistic child, understand the experiences and challenges encountered by autistic children as they access and engage in oral care both at home and in the dental clinic. Dentists should

understand the characteristics of families with autistic children and the barriers they face that limit their ability to provide proper oral care to their autistic children.

## **1.2 Aims**

The aim of this study was to investigate the challenges faced by the autistic children and their families in relation to three aspects of dental care which are, oral care at home, oral care at the dentist and access to oral care, and to compare the results to their normally developing peers.

## **3. MATERIALS AND METHODS**

### **3.1 Research Design**

This is a case control study, which measured the dental care challenges of the autistic and normally developing children and compared the frequency of dental care challenges in the two groups.

### **3.2 Sample Population**

This study sample population was the children attending special needs centers and Autism centers in Dubai. The methodology for this study was census sampling where every autistic child attending the special needs centers in Dubai was given the opportunity to participate in the survey and controls were selected from the same centers. The control group was chosen from school children in the same geographic areas of the centers and included the siblings of autistic children whenever available. The estimated sample size was 78 autistic children which was calculated using Cochran sample size that was based on the oral hygiene status of autistic children from the (Jaber, 2011) study titled “Dental caries experience, oral health status and treatment needs of children with autism” which was conducted in Dubai and Sharjah (17). Power sample was 92%.

#### **3.2.1 Study Sample Inclusion Criteria**

- Children previously examined and diagnosed medically as autistic patients according to the centers’ medical records.
- Ages 2 to 18 years.

- Males and females.
- UAE nationals and non-UAE nationals.
- The following Autism severity levels was included :
  1. Level 1 “requiring support”. (mild)
  2. Level 2 “requiring substantial support”. (moderate)
  3. Level 3 “requiring very substantial support”. (severe)

### **3.2.2 Control Sample Inclusion Criteria**

- Healthy children from the schools in the same geographic areas including siblings of autistic children whenever available.
- Age 2 to 18 years.
- Males and females.
- UAE nationals and non-UAE nationals.

### **3.3 Survey Instrument**

The survey instrument used for this study was a questionnaire (Appendix I, II). The content of the questionnaire was designed according to other questionnaires used in similar published studies (13,21,43). A pilot study to test the feasibility of the questionnaire was conducted among 20 parents.

The questionnaire consisted of four sections, the first section was related to the child’s age and nationality; the parents age, working status and educational level. The other sections were

related to oral care at home, oral care at the dentist and access to oral care. These included a total of twenty close and open-ended questions.

### **3.4 Survey Procedure**

Permission was obtained from the United Arab Emirates Ministry of Social Affairs to contact the special needs and Autism centers to invite the parents to participate in the research survey (Appendix III). The questionnaires were printed into hard copies, inserted into individual folders where each folder included one questionnaire for the autistic child and one for their healthy sibling or relative and then given to the administrations of the centers in order to send to the parents.

Another approval letter was also obtained from the Ministry of Health in Dubai to access the control group in the public and private schools in Dubai (Appendix IV). The questionnaires were printed into hard copies and inserted into individual folders and then given to the administrations of the schools in order to send them to the parents. The schools were chosen from the same demographic areas where the special needs centers were located.

Each questionnaire included an introductory front page (Appendix V, VI), which included information about the purpose of the research, the relevance of the study, how responses would be anonymous, how participation is voluntary, and the contact information of the principal investigator and Hamdan Bin Mohammad College of Dental Medicine. A filled questionnaire, which is submitted back to the centers and schools, was considered as consent to participate. A flow chart demonstrating the study methodology is shown in figure 1.

#### **3.4.1 Participating Special Needs Centers**

- Al Noor Training Centre for Children with Special Needs

- Dubai Rehabilitation Centre
- Dubai Autism Center
- Senses Residential Care Home for Children with Special Needs
- Sheikha Maitha Bint Rashid Almaktoom Center for Special Needs

#### **3.4.2 Schools That Participated**

- Jumeirah Model Girls School
- Al Maaref Private School

### **3.5 Statistical Analysis**

The data analysis consisted of choosing the surveys that matched the inclusion criteria, coding the sheets and keying the data into a computerized database in the Statistical Package for Social Sciences (SPSS, version 20, Chicago, SPSS Inc), performing key analysis according to frequency distributions and descriptive analysis, then using the T-test to compare the results of the Autism children to the results of healthy children.

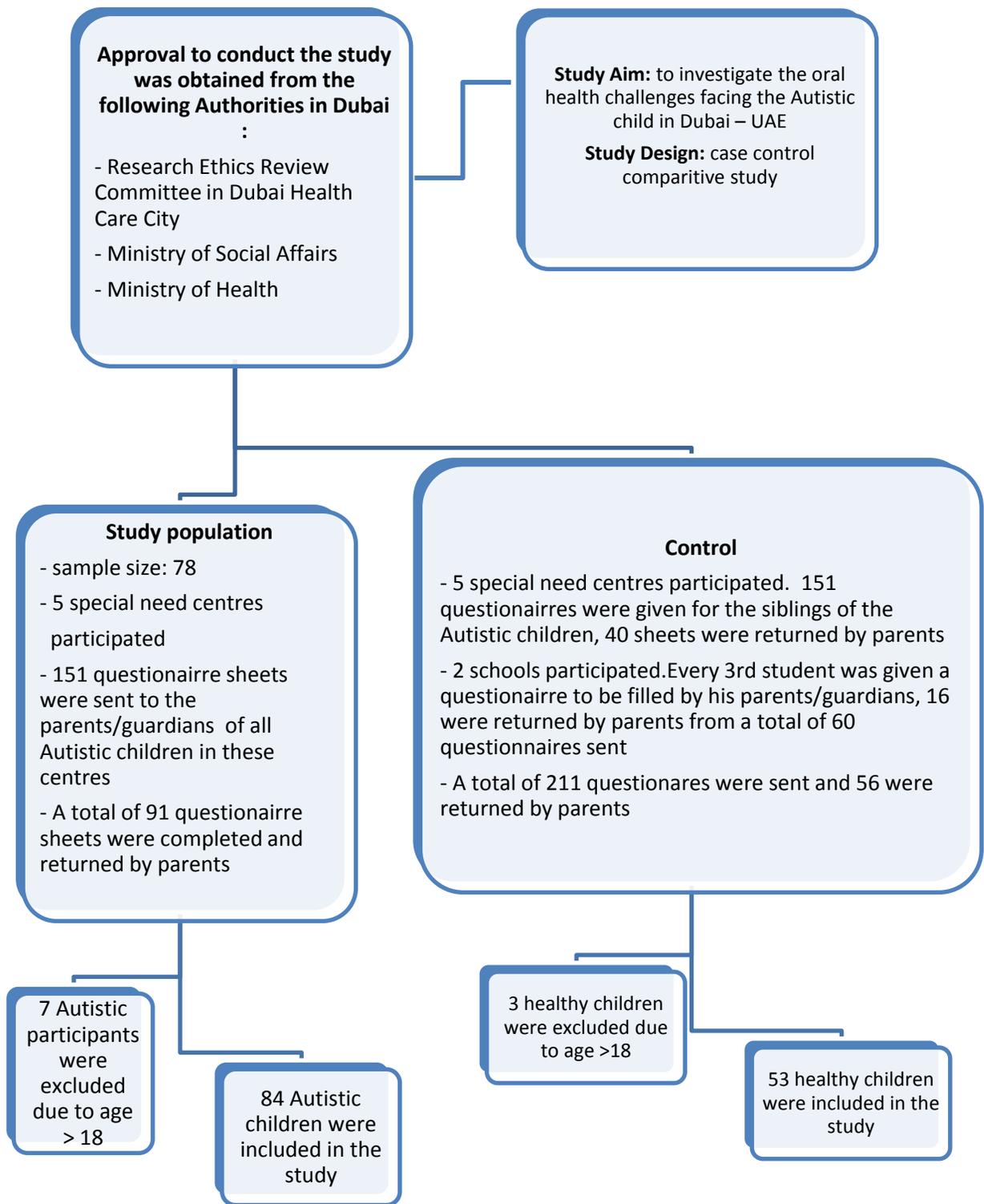


Figure 1: Study methodology summary flowchart

### **3.6 Ethical Considerations**

This study was conducted in full conformance with the principles of the “Declaration of Helsinki”, Good Clinical Practice (GCP), and within the laws and regulations of the United Arab Emirates and Dubai HealthCare City. Dubai Healthcare City Authority-Research Ethics Review Committee (RERC) approved this research project on 17th of March 2014 (Appendix VII).

## 4. RESULTS

### 4.1 Study Sample Characteristics

The characteristics of the respondent parents along with those of the 84 children with Autism and 53 healthy controls are shown in Table 1.

Gender distribution varied significantly between the 83 children with Autism (one child with unspecified gender) compared with the 53 healthy controls, high proportion of males 67 (80.7%) among autistic children compared with 29 (54.7%) males among healthy controls, with p-value < 0.001. This reflects the characteristics of the autistic population in general where Autism is four times more common in boys than in girls(23). Age is also significantly higher among the autistics group 10.87 (3.85%), compared with healthy controls 8.83 (3.67%), with p-value = 0.003. Age of the mother, mother occupation were not statistically different between autistics children and healthy controls. There was a statistically significant difference in the status of mothers' education in the autistic and control group. A significantly higher percentage of mothers with university degrees or higher in the control group compared to the Autism group of mothers, p value = 0.012.

No statistically significant difference was found between the two groups regarding the father's age, occupation and education. No statistically significant correlation existed between the mothers' and father's ages and having an autistic child. Considering the nationality, the proportion of autism was higher among the non-UAE nationals 63 (75.0%) compared with the UAE nationals 21 (25.0%), with p-value = 0.034.

Table 1: Demographic characteristics of gender, age, parental education and work status for children with Autism and healthy subjects

Variables	Control Nr (%)	Autism Nr (%)	P-value
<b>Gender</b>			
Male	29 (54.7)	67 (80.7)	0.001
Female	24 (45.3)	16 (19.3)	
<b>Mother occupation</b>			
Not working	34(66.7)	56 (70)	0.416
Working	17(33.3)	24 (30)	
<b>Mother education</b>			
Higher secondary & less	4 (7.8)	20 24.4)	0.012
University & more	47 (92.2)	62 (75.6)	
<b>Father occupation</b>			
Not working	2 (4.0)	4 (5.6)	0.524
Working	48 (96.0)	68 (94.4)	
<b>Father education</b>			
Higher secondary & less	9 (17.6)	22 (27.2)	0.148
University & more	42 (82.4)	59 (72.8)	
<b>Nationality</b>			
UAE	22 (41.5)	21 (25.0)	0.034
Non-UAE	31 (58.5)	63 (75.0)	
<b>Child age</b>	8.83 ± 3.67	10.87 ± 3.85	0.003
<b>Mother age</b>	37.88 ± 5.09	39.15 ± 6.62	0.251
<b>Father age</b>	42.14 ± 5.37	43.28 ± 6.26	0.290

## 4.2 Oral Care At Home

Table 2 demonstrates that, as expected, a higher proportion of autistic children experienced difficulty with oral care at home compared with the healthy children. Parents of 62(75.5%) autistic children reported that their children occasionally or rarely resisted tooth brushing,

significantly more than 45(100%) of parents of healthy children. While parents of 20(24.4%) autistic children reported that their children always resisted tooth brushing compared with non from the healthy children. Disliking of both the feeling of the toothpaste and toothbrush in the mouth were reported significantly more often in the autistic group vs the healthy group with (p-value < 0.001) for both.

The average time spent on tooth brushing per day was not significantly different between children with Autism and the healthy controls, (p = 0.206). For the Autism group 70(83.3%) of the parents reported that their children need assistance in brushing their teeth compared with 8(15.4%) of the healthy controls (p-value < 0.001). For both children with autism and healthy controls group the assistance for brushing teeth is most likely from parents.

The response regarding the use of fluoride indicated that most of the autistic and healthy children use fluoridated toothpaste but do not drink fluoridated water because the parents do not support water fluoridation (Table 2).

Table 2: Oral care at home for children with Autism and healthy subjects

Variables	Control Nr (%)	Autism Nr (%)	P-value
<b>On average how many times a day does your child brush his/ her teeth?</b>			
1 time and less	19 (36.5)	38 (45.2)	0.206
Two times and more	33 (63.5)	46 (54.2)	
<b>Is your child assisted in brushing his/her teeth?</b>			
No	44 (84.6)	14 (16.7)	< 0.001
Yes	8 (15.4)	70 (83.3)	
<b>If so, who usually assists with tooth brushing?</b>			
Parent	10 (100)	57 (81.4)	0.151
Other & parents	0	13 (18.6)	
<b>Your child resists having his/her teeth cleaned at home?</b>			
Always	0 (0)	20 (24.4)	< 0.001
occasionally or rarely	45 (100)	62 (75.6)	
<b>Does your child dislike the feeling of the toothpaste in his mouth?</b>			
No	46 (88.4)	45 (54.0)	0.001

Yes	6 (11.5)	38 (45.8)	
<b>Does your child dislike the feeling of the toothbrush in his mouth?</b>			
No	49 (94.2)	39 (45.4)	< 0.001
Yes	3 (5.7)	45 (53.0)	
<b>Does your child use fluoridated toothpaste?</b>			
No	6 (11.3)	17 (20.5)	
Yes	41 (77.4)	58 (69.9)	0.379
Sometimes	6 (11.3)	8 (9.6)	
<b>Is your child's drinking water fluoridated?</b>			
No	40 (75.5)	53 (63.1)	
Yes	9 (17.0)	21 (25.0)	0.318
I don't know	4 (7.5)	10 (11.9)	
<b>Do you support water fluoridation?</b>			
No	23 (44.2)	32 (38.6)	
Yes	14 (26.9)	21 (25.3)	0.672
I don't know	15 (28.8)	30 (36.1)	

Table 3, shows that 75.5% of the autistic mother behaviors towards oral care at home is influenced by her education, age of the child, and need of assisting the child in brushing adjusted over gender, nationality and dislike of the feeling of the toothbrush and toothpaste. Furthermore, healthy children mothers are 13 times more educated than autistic children mothers

Table 3: Logistic regression to explain factors associated with autistic children's mother's behavior toward oral care at home.

	Significance	Odds Ratio	95% Confidence Interval	
			Lower	Upper
Age	<0.001	1.439	1.189	1.74
Gender	0.12	0.337	0.086	1.325
Mother education	0.011	0.076	0.01	0.556
Assistance in tooth brushing	<0.001	70.092	12.323	398.665
Dislike toothpaste	0.339	2.373	0.403	13.965
Dislike toothbrush	0.338	2.747	0.347	21.728
Nationality	0.21	2.472	0.601	10.163

Constant	0.686	0.418		
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*Fitting of the model was significant chi-square was 103.69 (df. 7) and p-value was <0.001*

### 4.3 Oral Care At The dentist

Table 4 demonstrates that when parents were asked about their child’s experience in the last dental visit, significantly more parents among the autistic group rated their child’s experience as negative 20 (37%) compared with 4(9.5%) among the parents of children without Autism (p-value=0.006). The parents of the children with Autism reported significantly more difficulty having the dentist clean their child’s teeth 32(59.3%) compared with 4(9.5%) of parents of healthy controls (p-value <0.001). Moreover, more parents of autistic children 36(66.6%) reported that their children’s uncooperative behavior increases at the dentist compared with the parents of healthy children, 36(66.6%) and 7(16.7%) respectively with p-value < 0.001. Additionally, significantly more parents of Autism children reported that their children’s sensory sensitivities increases at the dentist compared with parents of the healthy controls 31(56.4%) and 3(7.5%) respectively with p-value <0.001. Use of restraint to routinely clean a child’s teeth or child have ever required general anesthesia, sedation or other drugs were not significantly different between the two groups, p-value was 0.076 and 0.091 respectively. Twenty-one (38.9%) of autistic children had general anesthesia for dental treatment. Also, significantly more parents of children with Autism versus healthy controls reported that if their child had to go to the dentist tomorrow he or she would be afraid or extremely afraid (16.4 % vs 15% and 32.7% vs 7.5%), p-value was 0.009 for the extremely afraid answer. Lastly, significantly more parents of autistic children reported their children’s reaction to the dentist will not encourage them for taking he / she to regular dental checkups compared with parents of the healthy controls, 21 (38.2%) compared with 7 (16.7%), p-value was 0.023.

Table 4: Oral care at the dentist for children with Autism and healthy subjects

Variables	Control Nr (%)	Autism Nr (%)	p-value
<b>Your child's experience during last visit</b>			
Positive	33 (78.6)	26 (48.1)	
Negative	4 (9.5)	20 (37.0)	0.006
Neutral	5 (11.9)	8 (14.8)	
<b>Having the dentist clean child's teeth is</b>			
Not difficult	20 (47.6)	5 (9.3)	
Mildly difficult	11 (26.2)	9 (16.7)	< 0.001
Moderately difficult	5 (11.9)	4 (7.4)	
Very difficult	4 (9.5)	32 (59.3)	
<b>Your child's Un co-operative behaviour increases at the dentist</b>			
No	23 (54.8)	10(18.5)	
Yes	7 (16.7)	36 (66.7)	< 0.001
Sometimes	12 (28.6)	8 (14.9)	
<b>Your child's sensory sensitivities increases at the dentist</b>			
No	28 (70)	12 (21.8)	
Yes	3 (7.5)	31 (56.4)	< 0.001
Sometimes	7 (17.5)	7 (12.1)	
<b>Has a dentist ever used restraint to treat your child's teeth</b>			
No	39 (92.9)	40 (75.5)	0.076
Yes	3 (7.1)	13 (25.5)	
<b>Has the child ever required dental treatment under general anaesthesia, sedation or other drugs</b>			
No	32 (80)	33 (61.1)	0.091
Yes	8 (20.0)	21 (38.9)	
<b>If the child had to go to dentist tomorrow would he feel</b>			
Little uneasy	13 (32.5)	9 (16.4)	
Afraid	6 (15)	9 (16.4)	
Extremely afraid	3 (7.5)	18 (32.7)	0.009
Happy	9 (22.5)	4 (7.3)	
Don't know	9 (22.5)	15 (27.3)	
<b>Your child's reaction to the dentist encourage you from taking him/her to regular dental checkups</b>			
No	7 (16.7)	21 (38.2)	
Yes	23 (54.8)	16 (29.1)	0.023
Sometimes	11 (26.2)	13 (23.6)	

Table 5, shows the univariate analysis for items of the oral care at the dentist that the child is afraid of, dislikes or complains about. Dentist drill and smell were almost the same between the two groups of children. But data shows that the autistic group had more dislikes at the dentist compared to the healthy group. The autistic children mostly disliked in a descending manner: dentist drill and leaning back in the dental chair, loud sounds, bright light, and smell.

Table 5: Oral care at the dentist, children’s fears, dislikes and complaints

Variables	Control Nr (%)	Autism Nr (%)	Odds Ratio(95% CI)	p-value
Number	41	54		
Dentist drill	17 (41.5)	25 (46.3)	1.22 (0.54 - 2.76)	0.397
Bright light	1 (2.4)	15 (27.8)	15.39 (1.94 - 122.13)	0.001
Loud sound	5 (12.2)	17 (31.5)	3.31 (1.10 - 9.92)	0.023
Leaning back in dentist chair	3 (7.3)	25 (46.3)	10.92 (1.78 - 15.74)	0.001
Smell	2 (4.9)	5 (9.3)	1.99 (0.36 - 10.82)	0.374
Having instruments in mouth	14 (34.1)	31 (57.4)	2.60 (1.12 - 6.03)	0.02
None	15 (36.6)	5 (9.6)	0.184 (0.060 - 0.565)	0.002

#### 4.4 Access to Oral Care

Data showed that 65% of autistic children have visited a dentist compared to 79.2% of healthy children. Surprisingly, the autistic children have mostly visited the general dental practitioner rather than a pediatric dentist, (38.8%) and (22.5%) respectively. On the other hand the healthy children have mostly visited a paediatric dentist rather than a general dental practitioner, (41.5%) and (32.1%) respectively. P-value = 0.074 (figure 2). The autistic children had visited a dentist

mostly for extractions followed by fillings and checkups. While the healthy children mostly visited the dentist for fillings followed by extractions then checkups (figure 3).

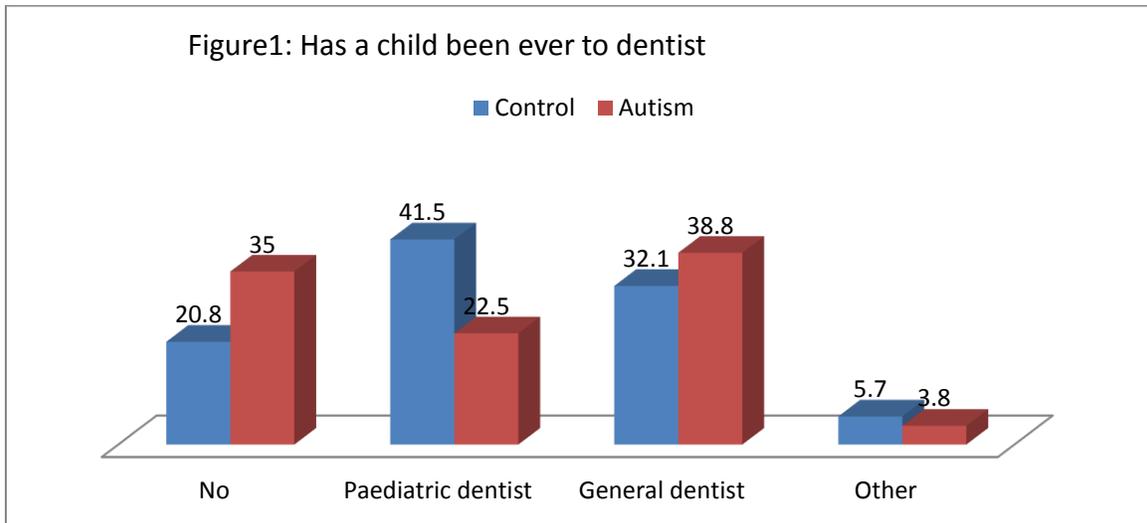


Figure 2: Dental visits for children with Autism and healthy subjects

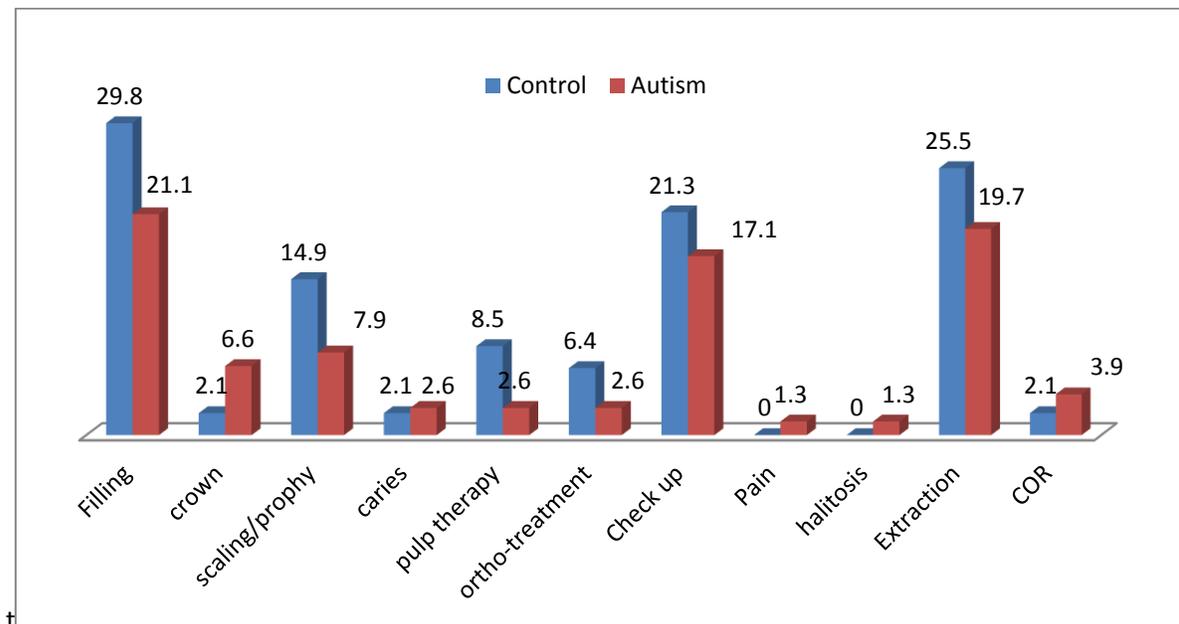


Figure 3: Reasons for visiting a dentist for children with Autism and healthy subjects

Figure 4 Data shows that the most common age group to visit the dentist was the pre-pubertal age group (7 to 12 years) for both the autistic and healthy children, (59.5%) and (52.7%) respectively.

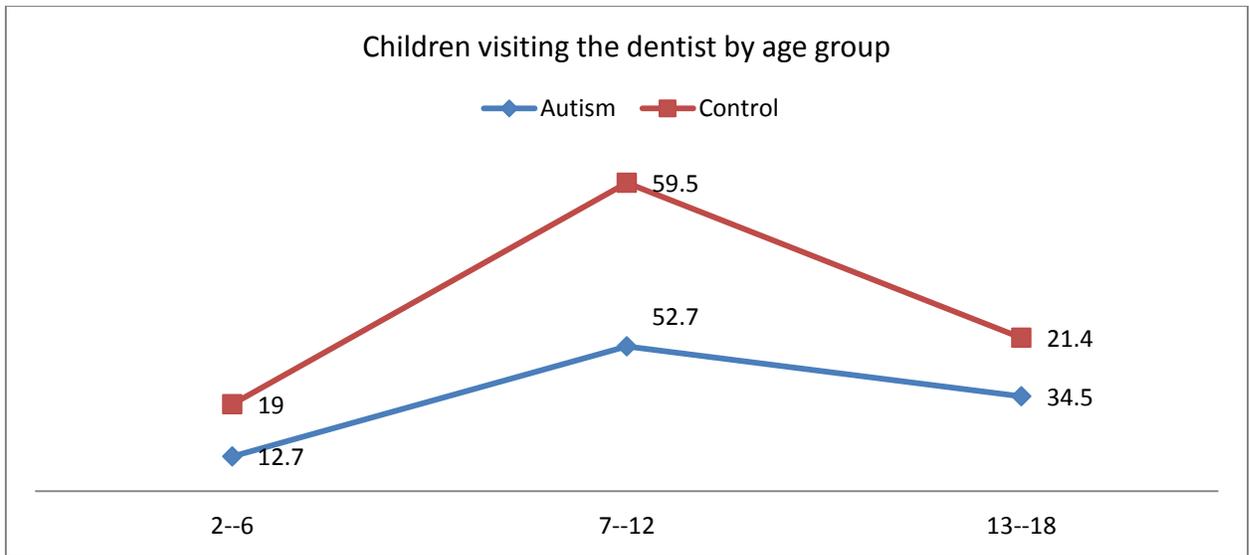


Figure 4: Autistic and healthy children visiting the dentist by age group

Figure 5 demonstrates that 35% of autistic children have not been to a dentist before; the most common reason reported by 5.3% of parents was due to their child being uncooperative. The other parents all equally reported that their child did not go to the dentist due to being afraid, having no complaint and they cannot find a specialist that can handle treating them, (2.6%) (2.6%) (2.6%) respectively.

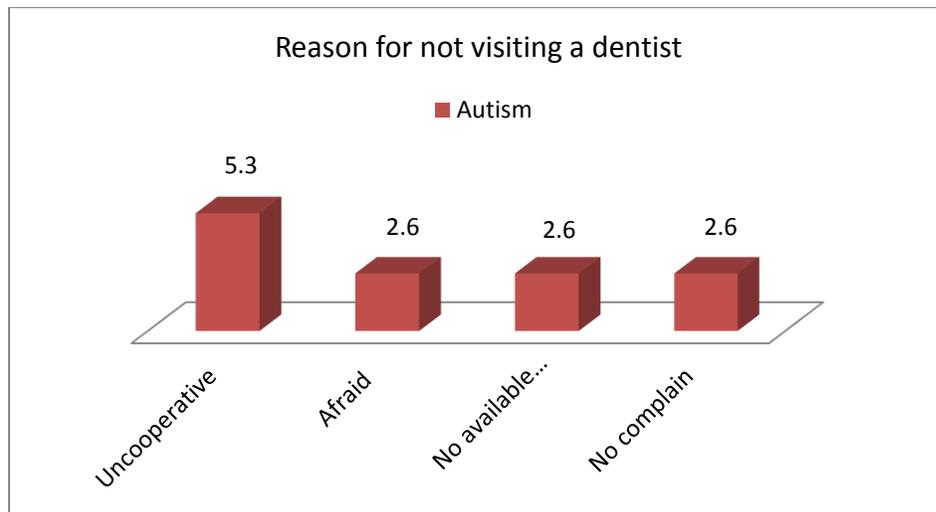


Figure 5: Reasons for not visiting a dentist for children with Autism and healthy subjects

Figure 6: shows that no significant difference was found between autistic children and their healthy counterparts regarding visiting a dentist, adjusted over nationality, (P-value = 0.059).

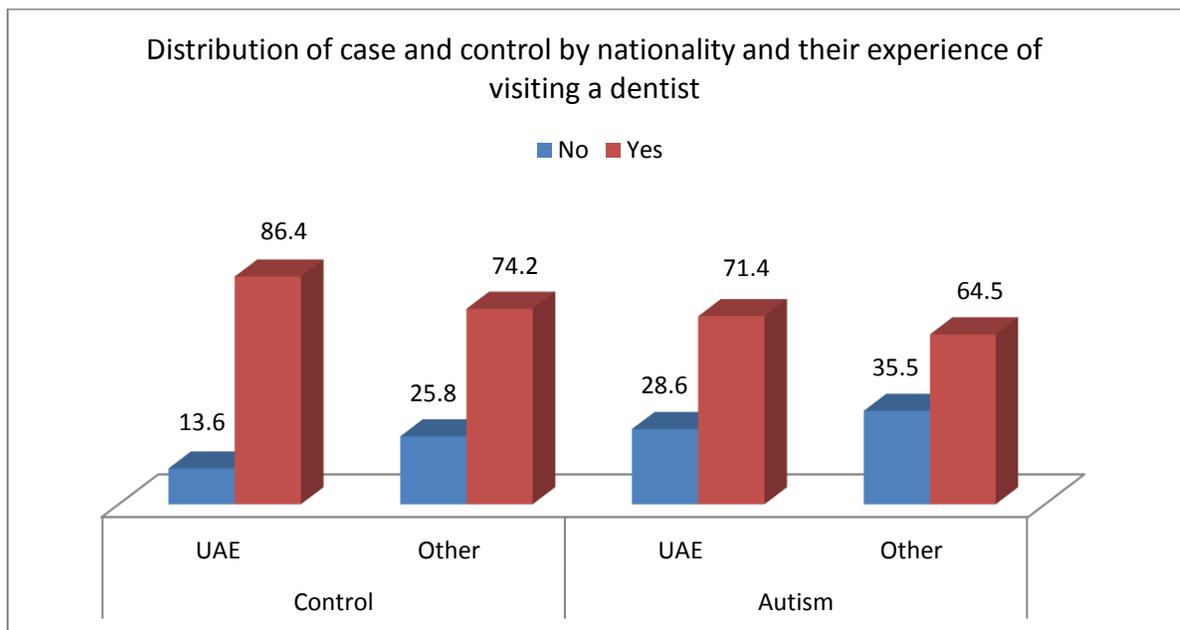


Figure 6: Distribution of case and control by nationality and their experience of visiting a dentist

## 5. DISCUSSION

In the United Arab Emirates the only published research about autistic children and their dental status is the 2011 research by Jaber et al which described the oral health and dental needs of children with Autism and concluded that children with Autism had exhibited higher caries prevalence, poor oral hygiene and extensive unmet needs for dental treatment than the non-autistic healthy control group. The autistic groups mean DMFT/dmft was 2.4 compared to 0.9 in the healthy group, 59% of autistic patients had poor oral hygiene and their extensive unmet needs for dental treatment was 0.3 (17). This study showed that this pediatric group had a problem with their oral health status. To put an effective action plan to eliminate this problem, we need to know to the reasons leading to its occurrences. We hypothesized that the autistic children might be facing more barriers to dental care at home, at the dentist or have difficulties in accessing oral care compared to the non-autistic healthy children. Questionnaires were distributed to parents of autistic and healthy children in Dubai and the results demonstrated that difficulties and barriers to dental care do exist for children with Autism in Dubai and these difficulties are manifested throughout the dental experience. These results are in agreement with studies reported in the dental literature. Charlotte et al 2015 qualitative analysis study reported that autistic children in the USA experience various barriers to optimal dental and oral care (46). Barry et al 2014 reported that difficulties exist for children with Autism in accessing dental care in the Hull and East Riding area in UK (19). Stein Leah's 2012 study indicated that children with Autism in California experience greater difficulties and barriers to care in both the home and dental office settings than their typically developing peers (20). Marshal et al 2010 study in the USA reported that up to 25% of parents experienced difficulty in accessing dental care for their child with Autism (47).

## 5.1 Oral Care At Home

The autistic children in Dubai have difficulty in their daily oral care at home compared to healthy children. The results in this study addressing the difficulties faced with oral care at home is consistent with other study results present in the literature (20,21,46), the only difference was found in the autistic children's use of fluoride.

The parents of autistic children in our study experienced more difficulty in tooth brushing and a greater need in physically assisting their children compared to the parents of normal children. This is due to the presence of difficulties in social interactions and lack of manual dexterity, which present a challenge to the parents or caregivers when providing oral care to the autistic child. Some parents might be more focused on their child's other problems and needs and inadvertently neglect the daily home oral care (46). If the brushing and flossing is not part of their daily routine, they might be more likely to reject it due to their aversion to change (13,14,46).

The autistic child's oversensitivity to sensory stimuli such as different sounds, tastes and smells which has been reported in the literature (14) might explain why their dislike of the feeling of the toothpaste and dental brush was reported in this study significantly more than the healthy children, 83.3% compared to 15.4% respectively.

Ways to overcome these difficulties have been suggested by parents of autistic children in the 2015 study by Charlotte Lewis (46). From their daily experience with their children they noticed that having a specific routine as to the time of day they brush the child's teeth made it easier for the child to accept brushing and by time some children started to brush their own teeth under

their parents supervision. Other suggestions given by parents are the use of electrical toothbrush whose vibrating motion is more tolerated by some children more than a manual toothbrush. Another way to overcome the sensitivity towards the toothpaste taste or texture is dipping the toothbrush in fluoride mouthwash for the children who dislike the feeling of toothpaste (46).

Lauren's study in 2012 revealed that in the USA, the autistic children were using less fluoridated toothpaste compared to the healthy children and they did not drink fluoridated water although their parents reported their support for water fluoridation (21). If we compare our results in Dubai with this USA study, we would observe a difference in the autistic children's parents' views towards the use of fluoride. In Dubai there was no difference in the response between the autistic and healthy children's use of fluoride, both groups used fluoridated toothpaste and didn't drink fluoridated water because parents did not support it.

## **5.2 Oral Care at the Dentist**

The Basic behavioral management technique which is tell-show-do is usually used for any pediatric patient to familiarize them to the dental surroundings and treatments anticipated, but it is difficult to utilize this simple and effective technique for the autistic children due to their impaired receptive and expressive language. Our study revealed that significantly more parents of autistic children reported that dental visits are a very challenging task where their child's sensory sensitivity to their surroundings and uncooperative behavior increases (66.6% of parents). This has impacted their child's dental experience which 37% of parents have rated as being negative and has discouraged them from going for regular dental checkups negatively impacting their dental health.

Behavioral difficulties during dental visits is more common in autistic children so non-pharmacological and pharmacological behavioral management techniques, such as restraint or

dental treatment under general anesthesia, might be more often required for providing a proper dental treatment safely and effectively. Our Study showed that there is no significant difference between the use of restraint or general anesthesia between the groups of autistic and healthy children. This could be due to the parents showing an increased acceptance to different options available for providing dental treatment to their children (48,49). These result were contrary to the ones demonstrated by Stein et al who found that autistic children had significantly higher incidence of the use of physical restraint and more dental treatment provided under general anesthesia than the healthy children (20). Differences in these results might be due to cultural attitudes towards restraint and more parental awareness and availability of resources for providing dental treatment under general anesthesia. A point worth noting here is that the age of the control group in our study was significantly lower than the autistic group. This undoubtedly might have had an effect on the behavior management techniques employed in dental treatment.

### **5.3 Access to Oral Care**

Our study demonstrated a significant difference in visiting a dentist between the two groups of children. It was found that the healthy children visited a dentist more than the autistic children, 79.2% of healthy children versus 65% of autistic children. But in the UK no significant difference was reported in visiting a dentist between the two groups although numerically more healthy children visited a dentist compared to autistic children (19). Even in The Kingdom of Saudi Arabia, a research published in 2005 by Murshid et al (18) concluded that in Riyadh 65% of autistic children have been to the dentist but half of these children had only minimal treatment done due to their difficult behavior in the dental office

Autistic children have mostly visited the general dental practitioner rather than a pediatric dentist, (38.8%) and (22.5%) respectively. This might have led to the reported negative

experience and increased behavioral difficulties by the autistic child during their dental visit because the general dental practitioners are not trained like the pediatric dentist specialists in the management of the oral health of the patient with special healthcare needs. This might be due to the lack of general awareness about the important role the pediatric dentist plays in the management of children with special needs in general and autistic children in particular. Another reason might be that according to the governmental dental clinic system all children have to be referred to a pediatric dentistry specialist by the general dentist, so maybe the general dentist did refer the autistic child due to difficulty in managing but the parents did not go to the referral due to the negative dental experience their child had at the general dentist clinic. Also as the previously mentioned fact in our study is that the age of the control group was significantly lower than the autistic group.

Autistic children in our study visited a dentist mostly for extractions then fillings and checkups. While the healthy children mostly visited the dentist for fillings then extraction then checkups. This might indicate that the autistic children visited the dentist with non-restorable teeth due to being irregular attenders to the dental clinic or being too uncooperative to facilitate the process of tooth restorations so extraction can be the only available long-term option. Interestingly, it was found that autistic children had their teeth crowned more than their healthy controls, this might be due to having more carious teeth surfaces which required the teeth to be crowned rather than filled or that the dentists preferred to restore the carious teeth with a crown which has longer durability and is more effective in high risk uncooperative patients such as the autistic children (50).

Of the 35% of autistic children in our study group who had never been to a dentist before, the most common reported barrier by their parents was that their child was too uncooperative to go to a dentist, although other literature such as Lai et (2012) (51) reported the most common reason

to be difficulty in finding a dentist with the skills for treating an autistic child. The other parents all equally reported that their children had never been to the dentist due to being afraid, having no complaint and because they cannot find a dental specialist that can handle treating them, (2.6%) (2.6%) (2.6%) respectively. The parents who reported that their child was too uncooperative to go to a dentist might have based their assumption on the child's behavior during his visits to the medical practitioner or that they had tried to go to a dentist but their child's behavior prevented it. Literature reports that's parents experience difficulty with their child's behavior when it came to physically convincing him/her to enter the dental clinic facility, child cannot tolerate waiting in the waiting room area and gets agitated and anxious, child won't sit still in the waiting room if he sees something he might be obsessed with, and lastly parents reported that its too embarrassing to go through all this in front of other parents and they had a fear of being judged as bad parents who cannot handle their child's behavior (46).

No significant difference were found between autistic children and their healthy counterparts regarding visiting a dentist, adjusted over nationality because in Dubai most of the UAE nationals and non-UAE nationals have health insurance which covers dental treatment, and also the UAE nationals are treated free of charge in the governmental dental clinics of the Ministry of Health and Dubai Health Authority, while the non-UAE nationals with special needs are treated free of charge in the Ministry of health dental clinics. Free treatment is available in Dubai for all autistic children and other special needs children regardless of their nationality.

#### **4.4 Study Limitations**

Although the research satisfactorily reached its aims there were certain unavoidable limitations, which were:

- There is no central Autism registry data in the United Arab Emirates, hence only autistic children attending special needs schools and centers were invited to participate in the study. Autistic children who are raised at home are out of reach and cannot be tracked. This might have affected the results.
- Significant differences in age and gender existed between the two groups but findings remained significant following multivariate analysis to control for age and gender. These differences might have influenced the study by giving a more conservative estimate of the differences between the autistic and healthy groups.
- This is a case control study that captured the population in a single point in time and might produce different results if another time frame had been chosen.
- Information gathered was through a questionnaire and not face to face interview. The problems encountered with mailed questionnaires include refusal or delay in replying. Also, the truthfulness of the respondent could not be verified and could have been affected by different interpretation of the questions.

## • **Conclusions and Rrecommendations**

Based on the results of this study the following conclusions could be made:

- Significantly more children with Autism experienced difficulty in oral care at home compared to healthy children. Their parents experienced more difficulty in tooth brushing and needed to use physical restraint to accomplish the task. Due to their sensory sensitivities, they disliked the feeling of the toothbrush and toothpaste more than their healthy counterparts.
- Significantly more children with Autism experienced difficulty in oral care at the dentist. More parents of autistic children reported that dental visits are a very challenging task where their child's sensory sensitivity to his surroundings and uncooperative behavior increased and this has impacted their child's dental experience where parents have rated it as being negative and has discouraged them from going for regular dental checkups.
- Significantly more children with Autism experienced difficulty in accessing oral care. Children with Autism visited a dentist less than the healthy children and parents reported that the cause was their child's uncooperative behavior. Surprisingly, autistic children had mostly visited the general dental practitioner rather than a pediatric dentist.

In general, the dental experiences of the autistic children in Dubai did not differ from the autistic children's experience in other parts of the world. But there were certain differences found in Dubai study of autistic children that are different than what was reported in the literature from other parts of the world. These differences were:

- The average time spent tooth brushing per day was not significantly different between children with Autism and the healthy controls. Although literature reports that autistic children brush less than the healthy children.

- There was no difference in the response between the autistic and healthy children's use of fluoride, both groups used fluoridated toothpaste and didn't drink fluoridated water because parents didn't support it. Literature reports that autistic children used less fluoridated toothpaste and drank less fluoridated water although their parents supported water fluoridation.
- There was no significant difference between the use of restraint or general anesthesia between the groups of autistic and healthy children. But literature reports that autistic children had experienced more physical restraint and dental treatment under general anesthesia than the healthy children.
- Autistic children visited a dentist significantly less than the healthy children, whereas literature reports no significant difference in visiting a dentist between the two groups.
- Of the 35% of autistic children who have not ever been to a dentist before, the most common reported barrier by their parents was that their child was too uncooperative to go to a dentist, although literature reported the most common reason was difficulty in finding a dentist with the skills for treating an autistic child.

Looking at the outcome of this study, the following recommendations are suggested:

- To establish a data registry for autistic children in the United Arab Emirates that is run by the government. This will help in epidemiological studies and the provision of comprehensive oral healthcare plans for these children.
- To establish an Autism Association that is run by the government and is the main reference for autistic children parents for providing all necessary information they might need concerning their child's wellbeing such as healthcare and education and to provide access to these resources that specialize in dealing with autistic children.

- To raise the awareness of the workers at the special needs centre's to the importance of maintaining the autistic child's dental health and should give the dental hygiene and annual dental check-ups as much importance as the autistic child's behavioural and medical condition.
- Since the medical practitioners are the first and most frequent doctors children visit, it is imperative to increase the awareness of the medical practitioners about the importance of oral health and going to the pediatric dentist for regular checkups. The pediatric dentist is trained in handling the different ways autistic children can be treated in the dental clinic even if they are uncooperative.
- Dentists should spend more time educating parents and involving them in the task of maintaining their child's oral hygiene at home and to put realistic achievable goals with the parents concerning their child's oral health.
- To establish in the Governmental hospitals a paediatric dental clinic that is only dedicated to children with special needs, where these children can directly take an appointment without the need of being referred by a general dentist. This will ensure that these high-risk patients will be seen on a regular basis and the dentist will spend enough time with them and their parents without being rushed by other waiting patients.
- To conduct a similar study in other cities in the UAE to compare the results and put a nationwide health program targeting this group of children.

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- **Appendix**

Appendix I, II: Survey tool (Questionnaire)

Appendix III: Letter of approval from the Ministry of Social Affairs - Dubai

Appendix IV: Letter of approval from the Ministry of Health - Dubai

Appendix V, VI: Introductory front page of the questionnaire

Appendix VII: Ethical approval from the Research Ethics Review Committee in Dubai  
Healthcare City, Dubai, UAE

## Appendix I

Kindly circle the appropriate answer:

❖ **Child name:**.....

❖ Child age: \_\_\_\_\_ Gender: M / F Nationality: \_\_\_\_\_

❖ Mother age: \_\_\_\_\_ working: N/Y

❖ Educational level:

- Illiterate
- Primary
- Secondary
- High school
- University and above

❖ Father age: \_\_\_\_\_ working: N/Y

❖ Educational level:

- Illiterate
- Primary
- Secondary
- High school
- University and above

### Oral care at home

1. On average how many times a day does your child brush his/her teeth?

- Less than 1 time
- 1 time
- 2 time
- More than 2 times
- Don't know

2. Is your child assisted in brushing his/her teeth?

- Yes
- No
- Don't know

3. If so, who usually assists with tooth brushing?

- Parent
- Other, specify: \_\_\_\_\_
- Don't know

4. Does your child resist having his/her teeth cleaned at home?

- Always
- Often
- Occasionally
- Rarely
- Don't know

5. Does your child dislike the feeling of the toothpaste in his mouth?

- Yes
- No
- Sometimes
- Don't know

6. Does your child dislike the feeling of the toothbrush in his mouth?

- Yes
- No
- Sometimes
- Don't know

7. Does your child use fluoridated toothpaste?

- Yes
- No
- Don't know

8. Is your child's drinking water fluoridated?

- Yes
- No
- Don't know

9. Do you support water fluoridation?
- Yes
  - No
  - No opinion

**Access to oral care**

10. Has your child ever been to a dentist?
- Yes Describe for what treatments:.....
  - No Explain why not:.....

11. Was the dentist a
- General dentist
  - Paediatric dentist
  - Other, specify: \_\_\_\_\_

***If your child has been to the dentist kindly answer the following questions.***

**Oral care at the dentist**

12. Your child's experience during last visit was
- Positive
  - Negative
  - Neutral
  - Don't know
13. Having the dentist clean your child's teeth is
- Not difficult
  - Mildly difficult
  - Moderately difficult
  - Very difficult
  - Don't know
14. Your child is afraid of, dislikes, or complains about: (you can choose more than one answer)
- Dentist drill
  - Bright lights
  - Loud sounds
  - Don't know
  - Smells
  - Having instruments in the mouth
  - None
  - Leaning in dentist chair
15. Your child's Un co-operative behaviour increases at the dentist
- No
  - Yes
  - Sometimes
  - Don't know

16. Your child's sensory sensitivities (sensitivity to the dental clinic and personal or other patients in the clinic) increases at the dentist
- No
  - Yes
  - Sometimes
  - Don't know
17. Has a dentist ever used restraint to treat your child's teeth
- No
  - Yes
  - Don't know
18. Has your child ever required dental treatment under general anaesthesia, sedation or other drugs
- No
  - Yes, specify type: \_\_\_\_\_
  - Don't know
19. If your child had to go to the dentist tomorrow would he feel
- Little uneasy
  - Afraid
  - Extremely afraid
  - Happy
  - Don't know
20. Your child's reaction to the dentist encourages you from taking him/her to regular dental check ups
- No
  - Yes
  - Sometimes
  - Don't know

THANK YOU FOR PARTICIPATING IN THIS SURVEY

This data might be used for future research projects provided that your child's identity will not be revealed. Approval by Research Ethics Review Committee in Dubai healthcare City will be obtained for any future use of your child's information.

I agree to have my child's data used for future researches.

I do not agree to have my child's data used for future researches

## Appendix II

### البيانات الشخصية لطفلك:

- ❖ اسم الطفل: .....
- ❖ عمر الطفل: .....
- ❖ الجنس: ذكر / انثى
- ❖ الجنسيه: .....
- ❖ عمر الأم : ..... تعمل : لا / نعم
- ❖ المستوى التعليمي للأم: (1) غير متعلم (2) ابتدائي (3) إعدادي (4) ثانوي (5) جامعي فما فوق
- ❖ عمر الأب : ..... يعمل : لا / نعم
- ❖ المستوى التعليمي للأب: (1) غير متعلم (2) ابتدائي (3) إعدادي (4) ثانوي (5) جامعي فما فوق

### العنايه بالاسنان في البيت:

- (1) كم مره يقوم طفلك بتنظيف اسنانه في البيت؟
- اقل من مره في اليوم
  - مره واحده
  - مرتين
  - اكثر من مرتين
  - لا اعرف
- (2) هل يقوم احد بمساعدة طفلك لتنظيف اسنانه؟
- لا
  - نعم
  - لا اعرف
- (3) اذا كان جواب السؤال السابق بنعم فمن يقوم بمساعدة طفلك؟
- الابوين
  - غير, حدد: .....
  - لا اعرف
- (4) هل يقوم الطفل بالمقاومه و الامتناع عن تنظيف الاسنان في المنزل؟
- دائما
  - غالبا
  - احيانا
  - نادرا
  - لا اعرف

(5) هل يتضايق طفلك من معجون الاسنان؟

- لا
- نعم
- احيانا
- لا اعرف

(6) هل يتضايق طفلك من فرشاة الاسنان؟

- لا
- نعم
- احيانا
- لا اعرف

(7) هل يحتوي معجون اسنان طفلك على الفلورايد؟

- لا
- نعم
- لا اعرف

(8) هل يشرب طفلك ماء مدعم بالفلورايد؟

- لا
- نعم
- لا اعرف

(9) هل تدعم تعزيز الماء بالفلورايد؟

- لا
- نعم
- لا رأي لدي

(10) هل قام طفلك بزيارة طبيب الاسنان؟

- لا, لماذا:

.....

- نعم, ما العلاج الذي تلقاه:

.....

(11) هل كان طبيب الاسنان:

- طبيب اسنان عام
- طبيب اسنان اطفال
- غير, حدد: .....

.....

❖ إذا قام طفلك بزيارة طبيب الاسنان لطفا قم بالاجابه على الاسئله التاليه:

(12) تقييمك لآخر زياره لطفلك لطبيب الاسنان:

- ايجابي
- سلبي
- حيادي
- لا اعرف

(13) قيام طبيب الاسنان بتنظيف اسنان طفلك أمر:

- سهل
- صعب قليلا
- صعب
- صعب جدا
- لا اعرف

❖ عند طبيب الاسنان:

(14) طفلك لا يحب أو يخاف من (تستطيع اختيار اكثر من اجابه) :

- جهاز حفر الاسنان
- الاضاءه العاليه
- الاصوات العاليه
- الروائح
- احساس ادوات الاسنان في فمه
- الاستلقاء على كرسي الاسنان
- لا شيء
- لا اعرف

(15) سلوك طفلك الغير متعاون يزداد عند طبيب الاسنان:

- لا
- نعم
- احيانا
- لا اعرف

(16) تزداد حساسية طفلك لمحيطه ( عيادة الاسنان و العاملين فيها) عند زيارة طبيب الاسنان:

- لا
- نعم
- احيانا
- لا اعرف

17) هل استخدم طبيب الاسنان القوه لعلاج اسنان طفلك؟

- لا
- نعم
- لا اعرف

18) هل تلقى طفلك علاج الاسنان تحت التخدير العام, او ادويه مهدئه؟

- لا
- نعم, حدد النوع:.....
- لا اعرف

19) لو ذهب طفلك لطبيب الاسنان غدا سوف يكون:

- غير مرتاح
- خائف
- خائف جدا
- سعيد
- لا اعرف

20) رد فعل طفلك الى طبيب الاسنان يشجعك لأخذه لفحوصات الاسنان الدوريه:

- لا
- نعم
- احيانا

شكرا على حسن تعاونكم.....

يمكن ان تستخدم المعلومات التي سيتم رصدها في الدراسات البحثيه في المستقبل مع الاحتفاظ بسريه هويه طفلك, و يرجى العلم بانه ستؤخذ موافقه اخرى من قبل لجنة مراجعة اخلاقيات البحوث الطبيه في مدينة دبي الطبية لاي من هذه الدراسات المستقبلية.

او افق على استخدام معلومات طفلي في اي دراسه مستقبلية.

لا او افق على استخدام معلومات طفلي في اي دراسه مستقبلية.

## Appendix III

UNITED ARAB EMIRATES  
MINISTRY OF SOCIAL AFFAIRS



الإمارات العربية المتحدة  
وزارة الشؤون الاجتماعية

التاريخ: 06/يناير/2015  
المرجع: ر/ت/م/03/2015

السادة / مراكز المعاقين الحكومية والخاصة المحترمين “

تحية طيبة وبعد،،،

### الموضوع: دراسة التحديات التي تواجه طفل التوحد للمحافظة على صحة الفم

تهديكم إدارة رعاية وتأهيل المعاقين أطيب التمنيات ، وبالإشارة إلى الموضوع أعلاه ، تقوم الطبيبة دينا منصور بإجراء دراسة علمية للوقوف على مشاكل صحة الفم والأسنان التي تواجه طفل التوحد، من أجل وضع الحلول المناسبة من خلال برنامج طبي متكامل وتلبية احتياجاتهم العلاجية والوقائية وزيادة الوعي لدى الأهالي وتشجيعهم على العناية بصحة الفم والأسنان لأطفالهم .

يرجى التكرم بتسهيل المهمة للطبيبة المذكورة أعلاه، وتوفير كافة ما تحتاج إليه من معلومات لتحقيق أهداف الدراسة المرجوة ، والارتقاء بالخدمات الطبية المقدمة للمعاقين في هذا المجال.

شاكرين لكم حسن تعاونكم الدائم معنا

وتفضلوا بقبول فائق الاحترام والتقدير ،،،

وفاء حمد بن سليمان  
مدير إدارة رعاية وتأهيل المعاقين

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## Appendix IV

UNITED ARAB EMIRATES  
MINISTRY OF HEALTH

الإمارات العربية المتحدة  
وزارة الصحة

التاريخ: 2014/04/14  
الرقم: 64/2014  
قسم المتابعة والتسيق

المحترم  
السيد/ د. ديفيد راى

عميد وپرفسور طب الفم - كلية دبي لطب الأسنان

تحية طيبة وبعد ..

**الموضوع : الموافقة لإجراء دراسة  
حول صحة الفم والأسنان في المدارس الحكومية بأمانة دبي**

تهديكم أطيب التمنيات ونتمنى لكم دوام التوفيق والتقدم.

كما أننا نشكر لكم سعيتكم في إجراء دراسة للبحث عن مشاكل صحة الفم والأسنان في المدارس الحكومية، وبما أن هذه الدراسة سيكون لها الأثر الإيجابي لمعرفة أسباب ونسبة انتشار مشاكل صحة الفم والأسنان ووضع برنامج طبي متكامل لصحة الفم والأسنان يتضمن الإجراءات العلاجية والوقائية ومساعدة الأهالي على تفهم أهمية الجانب الوقائي وتشجيع أطفالهم على العناية بصحة الفم والأسنان فإنه لا مانع لدينا من إجراء هذه الدراسة على أن يتم تزويد إدارة الصحة المدرسية بنتائج البحث العميداتي والإحصائيات وتحليل النتائج للاستفادة منها لوضع لائحة المستقبلية للصحة المدرسية وخاصة قسم صحة الفم والأسنان.

الرجاء التواصل مع الدكتورة ماجدة - نائب مدير إدارة الصحة المدرسية على هاتف 6770169-050.

شاكركم لكم حسن تعاونكم معنا ..  
وتفضلوا بقبول فائق الاحترام والتقدير ...

ناصر خليفة البتور  
مدير منطقة دبي الطبية بالإتابة

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## **Appendix V**

**(Autistic children)**

**Research Title: Oral Health Challenges Facing The Autistic Child In Dubai (A Survey)**

**Dear Parents,**

**Oral health is an important aspect of the child's growth and development since it is the pathway for proper nutrition. This survey is to uncover the challenges that the Autistic children and their families might be facing in providing proper oral health at home and having appropriate access to Dental Clinics.**

**The results will be of importance for the dental professionals. These results will provide additional knowledge of the characteristics of the autistic child, understanding the experiences and challenges encountered by ASD children as they access and engage in oral care both at home and dental office. The results will also aid in understanding the characteristics of families with Autistic children and the barriers to care from the perspective of the parents or caregiver. Eventually, the results aim at providing a valuable comfortable dental experience to them when they visit the dental clinic and improve their access to care.**

**The UAE Government has lately emphasized on the importance of providing easy access to Health facilities for the special needs people living in the UAE and this survey will be help explore the challenges and recommend solutions.**

**Your kind co-operation in filling up the questionnaire will be of great value and highly appreciated.**

**Kindly note that you can withdraw your participation in the survey at any time without any liability on your part and your child's information will be destroyed.**

**For any inquiries kindly call:**

**Dr Dina Mansoor**

**Dubai HealthCare City**

**0504549098**

**This research study has been approved by the Research Ethics Review Committee in Dubai Healthcare City, Dubai, and UAE**

## Appendix VI

(طفل التوحد)

عنوان البحث: صحة الفم والاسنان لاطفال التوحد في مدينة دبي

عزيري ولي الامر,

صحة الفم هي واحدة من الجوانب الهامة لنمو الطفل السليم لأنه الطريق للتغذية السليمة. هذا الاستطلاع هو لمعرفة التحديات التي تواجه طفل التوحد و أسرته في توفير و المحافظه على صحة الفم في المنزل و سهولة زيارة طبيب الاسنان.

وسوف تكون النتائج ذات أهمية للمختصين في طب الأسنان. حيث ستمكنهم من معرفة خصائص الأطفال المصابين بالتوحد وفهم التجارب و التحديات التي تواجههم في العناية بصحة الفم و الاسنان في المنزل او عند زيارة طبيب الاسنان. و ايضا ستمكن المتخصصين في طب الاسنان من فهم خصائص الأسر التي لديها أطفال يعانون من التوحد و المعوقات التي تواجههم للحصول على الرعاية من وجهة نظر الوالدين أو مقدمي الرعاية، وبالتالي توفير تجربة مريحة قيمة لهم عند زيارتهم لطبيب الأسنان و ازالة المعوقات التي تحد من وصولهم لعيادات الاسنان.

وقد أكدت حكومة دولة الإمارات العربية المتحدة في الآونة الأخيرة حرصها على فئة ذوي الاحتياجات الخاصه و أهمية توفير سبل الرعاية الصحية لهذه الفئة من المجتمع. وسيتم عن طريق هذه الدراسة لقاء الضوء على التحديات واقتراح الحلول.

تعاونكم القيم في ملئ هذا الاستبيان هو خطوه فعاله نحو مجتمع واعي و صحي لاطفال التوحد.

يرجى الملاحظة أنه يمكنك سحب مشاركتكم في الاستبيان في أي وقت دون أي مسؤولية من جانبكم وسيتم تدمير معلومات ابنكم.

لاي استفسار الرجاء الاتصال بالدكتور:

دينا منصور

مدينة دبي الطبية

0504549098

تمت الموافقة على هذه الدراسة البحثية من قبل لجنة مراجعة أخلاقيات البحث العلمي في مدينة دبي الطبية ، دبي ، الامارات العربية المتحدة

## Appendix VII



March 26<sup>th</sup> 2014

Dr. Dina Mansoor Ahmed  
Dental Trainee-Pediatric Dentistry  
Dubai School of Dental Medicine  
Dubai Healthcare City  
Dubai, United Arab Emirates

**Subject: Ethical Approval for Research Protocol**

Dear Dr. Ahmed,

This is with reference to the initial protocol application for the research study entitled, "Oral Health Challenges Facing the Autistic Child in the UAE- A Survey" which was submitted to the Dubai Healthcare City Authority-Research Ethics Review Committee (RERC) for review and approval.

It is hereby confirmed that the RERC has reviewed the above application on March 17<sup>th</sup> 2014, and has **approved the final submission on March 26<sup>th</sup> 2014**. Therefore, you may now commence your research project in line with the submission made on March 26<sup>th</sup> 2014 as the final version.

Please note however, that this ethical approval is conditional to the following:

1. It is at the discretion of the principal investigator to ensure that all the scientific details and background information contained within the protocol are validated and substantiated with evidence to ensure credibility of the research outcome.
2. Other regulatory approval/s, needed to conduct the study is/are to be obtained and submitted to the RERC for record keeping.
3. No deviations from or changes to the protocol are to be implemented without prior review and documented approval of the RERC.
4. The research study documentation shall be periodically subject to RERC audit.
5. Upon completion of the study, a "Final Research Study Report" will be required for submission to RERC. Consequently, any abstract/publication should also be brought to the attention of the RERC.

We congratulate you and wish you continued success in DHCC.

Best Regards,

Laheeb Al-Mutwalli  
Director-Licensing Department  
Center for Healthcare Planning and Quality  
Dubai Healthcare City Authority



مركز التخطيط والجودة للخدمات الطبية  
CENTER FOR HEALTHCARE PLANNING & QUALITY

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[www.dhcc.ae/cpq](http://www.dhcc.ae/cpq)

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