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Research Article

ORAL HEALTH HABITS ASSESSMENT OF AUTISTIC CHILDREN: A SURVEY OF PARENTS WITH MOROCCAN CHILDREN ON THE AUTISM SPECTRUM

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ABSTRACT

In order to determine the frequency, the means used and the people involved in oral hygiene in children with Autism Spectrum Disorders (ASD), a descriptive cross-sectional survey was conducted among 152 parents of children with ASD between 9 and 14 years old and attending three associations of children with specific mental needs in Casablanca as well as the Center for Consultations and Dental Treatments (CDCT) in Casablanca. The main results of the present study showed a male predominance of 73.7%; an average socio-economic level at 55.3%; institutionalization of 92.1% of children; use of cariogenic food reinforcers in 57.2% of cases, and tooth brushing for 80.3% of the children (supervised or carried out by a parent or educator in most cases). As for the frequency of brushing, it was only once a day in 45.9% of the children, and this before sleeping for 87.7% of them. The use of toothpaste was noted in 97.5% of children, with an irregular method in 51.8%. The use of oral hygiene adjutants was noted in 10.7% (the adjuvant being mouthwash). A visit to the dentist was made for 59.9% of the sample less than 6 months before the date of the interrogation. 51.6% of the children were referred by their attending physician. Most of the results of the present study agree with those found in the literature, with some differences which remain specific to the population studied. Also, measures must be introduced for the development of an oral prevention program adapted to the Moroccan autistic child, intended both for the child but also for the people who take care of him, with in-depth training in benefit of oral health professionals.

Keywords: Oral hygiene, Autism Spectrum Disorders, Pedodontics.

INTRODUCTION

Autism Spectrum Disorders (ASD) are defined according to the 5th edition of the World Health Organization's Diagnostic and Statistical Manual of Mental Disorders, as neuro developmental disorders characterized by the inability to initiate and maintain reciprocal social interaction on the one hand, social communication disorders, but also restricted, repetitive and inflexible behaviors on the other. [1] These symptoms appear in early childhood, but they may not become fully manifested until later, when the social demands are beyond the limited capabilities of the child with autism. [2] This disorder is often accompanied by many other nonspecific manifestations such as phobias, sleep and eating disturbances, temper tantrums and self-harm. [3] People with ASD often have co-morbidities, which include epilepsy, depression, anxiety, and attention deficit hyperactivity disorder. [4] However, the level of intellectual functioning is extremely variable and can range from profound impairment to superior cognitive abilities. [5] The oral cavity has a heavy symbolism in children with ASD. Indeed, they find it difficult to define the limits of their body, the mouth is an opening between the body and the outside world. Children can interpret any act involving their oral cavity, including the act of oral hygiene, as an assault on their bodily integrity. [6] According to some authors, children with ASD also have fine motor problems. This lack of dexterity has a direct influence on the quality of tooth brushing among children with ASD. These children also present muscle hypotonia causing insufficient tongue movements and swallowing disorders. Some children with autism have an aversion to the taste and texture of certain toothpastes.

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Moreover, ineffective chewing and a tendency to store food in the mouth rather than swallow it is also a frequent behavior.[6] Consequently, poor oral hygiene has been described by several authors. [7] [8] [9] [10] In addition, children with ASD do not have any oral characteristics specific to their pathology. However, their disorders affect their oral cavity and their oral health: the latter is worse than that of the general population. [10] [11] Also, some of their characteristic behaviors or disorders such as communication limitations, personal neglect, self-injurious behavior, eating habits (anarchic and restrictive diet), side effects of drugs, opposition to dental care, hyposensitivity to dental pain, hypersensitivity to external stimuli and poor oral hygiene are often responsible for the deterioration of the oral health of children with ASD. [12] [13] Oral health prevention in these children is therefore essential given their pre-exposure to oral pathologies and the difficulty of accessing specialized care. Therefore, a study was conducted among children with ASD supported and treated in specialized associations as well as in the Center for Dental Consultations and Treatments in Casablanca (CDCT). Its objectives are to determine the frequency, the means used and the people involved in oral hygiene in these children.

MATERIALS AND METHODS

This is a descriptive cross-sectional epidemiological survey, involving children with ASD consulting and treated at the pedodontics-prevention service at the CDCT in Casablanca, as well as those supported by the AMAL association for children with specific needs, at the level of its three branches in Casablanca (Maarif, Ain Chock, Al Fida). The interview was conducted with the parents of autistic children under the age of fourteen. A parent is any person responsible or taking care of the child. To collect the data necessary for this study, a survey sheet composed of three parts was developed.

Table 1. Representative table of the variables studied

Identification of the parent	Institutionalization of the child		Eating and oral hygiene habits	
	- The education method		Eating habits	- The nature of the eating habits - Consistency of food - The use of cariogenic food as positive reinforcement.
- Gender - Family link - Place of residence - Marital status - Socioeconomic level	If the child is institutionalized	- The nature of the institution - The presence or the absence of a personal school assistant (PSA)	Oral hygiene	- Brushing - Reasons for lack of brushing - Source of motivation - People involved in the brushing routine - Tooth brushing starting age - Tooth brushing frequency - Brushing schedule - Brushing tools (Toothbrush, toothpaste, adjutants) - Brushing method
	If he is not	- The arrangements for taking care of the child.	Visit to the dentist	- Frequency of visits to the dentist - Reason for the visit.

The first part relating to the identification of the parent of the autistic child; the second concerning the institutionalization of the autistic child; and the third on children's eating and oral hygiene habits. All the variables are described in Table 1. The data processing was carried out in the epidemiology and bio-statistics laboratory of the faculty of dentistry in Casablanca, using SPSS software. The results of the qualitative variables were expressed in numbers and percentages, and those of the quantitative variables by their means and standard deviation (SD).

RESULTS

The ages of the children studied in this study ranged from 3 to 14 years with an average age of 8.93 ± 2.793 years. 73.7% of them were male. 94.1% of the children were from an urban background. Concerning the parents interviewed; 65.8% were mothers, 84.2% were married, 55.3% were of average socio-economic level. As for the level of education, 36.8% of those taking care of these children had a university level, and 36.8% had a high school level. (Table 2).

Table 2. Representative table of the socio-demographic variables of the studied population

	Variables	Number (N)	Percentage (N)
Gender	Feminine	40	26.3
	Masculine	112	73.7
Family link	Mother	100	65.8
	Father	48	31.6
	Other	4	2.6
Place of residence	Urban	143	94.1
	Rural	9	5.9
Marital status	Married parents	128	84.2
	Divorced parents	14	9.2
	Widowed	10	6.6
Socioeconomic Level	High	12	7.9
	Medium	84	55.3
	Low	56	36.8
Education level	University	56	36.8
	High-school	56	36.8
	Elementary school	24	15.8
	Illiterate	16	10.4

Regarding the institutionalization of children with ASD, it was observed that 92.1% of them were institutionalized, of which 88.6% attended a specialized institution. Also, the ABA method was the educational method adopted for 80% of the children. Finally, all non-institutionalized children (who represented 7.9% of the sample) did not receive any form of care. (Table 3).

As for eating habits, the daily diet of 40.1% of children with ASD in the study population was rich and diverse and 57.2% of parents used cariogenic foods as a positive reinforcement tool for their autistic child. 94.7% of children at whole foods. In addition, 80.3% of the children in the present study brushed their teeth, and 59% started brushing between the ages of 3 and 6.

Table 3. Representative table of the institutionalization of children with ASD

	Variables	N	%
Institutionalization	Yes	140	92.1
	No	12	7.9
The nature of the institutionalization	Specialized autism institution	124	88.6
	Ordinary school with ordinary classes without PSA	9	6.4
	Ordinary school with ordinary classes with PSA	2	1.4
	Ordinary school with special classes	5	3.6
The education method	ABA	112	80
	PECS	10	7.1
	TEACCH	0	0
	MAKATON	0	0
	None	3	2.1
	Unknown	15	10.8
The non institutionalized child	Educator / assistant at home	0	0
	No specialized care	12	100

According to their parents, the reasons for abstaining from brushing are either the difficult nature of the child (83.3%) or the difficulty in accepting brushing (30%). Also, 37.8% of autistic children had the ability to brush their teeth on their own. When brushing required the intervention of an adult, it was supervised by a parent or an educator in 49.4% of the cases, and completely carried out by a parente in 19.8% of the cases. The majority of children (45.9%) brushed their teeth less than twice a day, with a clear preference for the evening at bedtime for 87.7% of the cases, for a period of one to three minutes for 73.3%, and with the help of a pedodontics toothbrush in all of the cases. The toothbrush was changed monthly in 99.2% of children with ASD, and toothpaste use was widely present in our sample with a rate of 97.5%, of which 98.3% was fluoridated. Failure to use fluoridated toothpaste was linked to the inability to spit out the paste. 51.8% of children brushed their teeth with irregular movements. As for the use of adjuvants for oral brushing as well as the regularity of the visit to the dentist, the results are summarized in Table 4.

Table 4. Representative table of eating habits and oral hygiene in the children with ASD of this study

		Variables	N	%
LINKED TO EATING HABITS	NATURE OF THE EATING HABITS	Rich and diverse	61	40.1
		Unbalanced	47	30.9
		Both	44	29
	CONSISTENCY	Whole foods	144	94.7
		Mixed food	8	5.3
	CARIOGENIC FOOD AS POSITIVE REINFORCEMENT	Yes	87	57.2
		No	65	42.8
	BRUSHING	Yes	122	80.3
		No	30	19.7
	REASONS FOR LACK OF BRUSHING	Lack of motivation from the parents	1	3.3
		Lack of means	0	0
		Lack of time	2	6.6
		Motor disability of the child	3	10
		Very difficult child	25	83.3
		Brushing not appreciated by the child	9	30
		Refusal of the taste and/consistency of toothpaste	3	10
	SOURCE OF MOTIVATION	Personal	78	64
		The child's educator	24	19.6
		A healthcare professional	20	16.4
	PEOPLE INVOLVED IN THE BRUSHING ROUTINE	The child alone	41	27
		The child supervised by a parent	38	25
		The child supervised by an educator	37	24.4
		The child supervised by another person	1	0.6
		Brushing carried out by a parent	30	19.8
		Brushing carried out by an educator	4	2.6
		Brushing carried out by another person	1	0.6
LINKED TO ORAL HYGIENE	TOOTH BRUSHING STARTING AGE	6 months to 3 years	1	0.8
		3 to 6 years	72	59
		6 to 12 years	45	36.9
		12 years and above	4	3.3
	TOOTH BRUSHING FREQUENCY	≥ 2 times /day	43	35.2
		< 2 times/day	56	45.9
		Irregular	23	18.9
	BRUSHING SCHEDULE	Before breakfast	1	0.8
		After breakfast	16	13.2
		After lunch	44	36.1
		Before sleeping	107	87.7
		After any food intake	1	0.8
		After taking medication (syrup)	0	0
	BRUSHING TOOLS	Manual pedodontic toothbrush	122	100
		Manual orthodontic toothbrush	0	0
		Other manual toothbrush	0	0
		Electric toothbrush	0	0
		Soaked compress	0	0
	BRUSHING DURATION	< 1 minute	28	23
		Between 1 and 3 minutes	90	73.7
		> 3 minutes	4	3.3
	TOOTHBRUSH REPLACEMENT	≤ a month	1	0.8
		More than a month	121	99.2
		Never been replaced	0	0
	BRUSHING METHOD	Horizontal movements	24	19.6
		Circular movements	19	15.5
		Vertical movements from the gums to the teeth	15	12.3
		Vertical movements from the teeth to the gums	1	0.8
		Irregular movements	62	51.8
	USE OF TOOTHPASTE	Yes	119	97.5
		No	3	2.5
	TYPE OF TOOTHPASTE	Fluoride toothpaste	117	98.3
		Non-fluoridated toothpaste	2	1.7
		Toothpaste for sensitive teeth	0	0
		Whitening toothpaste	0	0
		Foaming toothpaste	0	0
		Non-foaming toothpaste	0	0
LINKED TO THE USE OF ADJUVANTS	TASTE OF TOOTHPASTE	Any taste is tolerated by the child	116	97.6
		The child appreciates a special taste	2	1.6
		The child hates a special taste	1	0.8
	REASON FOR NOT USING TOOTHPASTE	Taste not appreciated by the child	1	33.3
		Consistency not tolerated by the child	0	0
		Inability to spit out the paste	3	100
		Gag reflex	0	0
	USE OF ADJUVANTS	Yes	13	10.7
		No	109	89.3
	TYPE OF ADJUVANTS	Fluoride mouthwash	13	100
		Non-fluoridated mouthwash	0	0
		Flavored mouthwash	0	0
		Other mouthwash	0	0
		Interdental brushes	0	0
		Silk	0	0
		Tongue scraper	0	0
		Spray	0	0
LINKED TO THE VISIT TO THE DENTIST	VISIT TO THE DENTIST	Yes	91	59.9
		No	61	40.1
	LAST VISIT	< 6 months	54	59.2
		Between 6 and 12 months	7	7.8
		> A year	30	33
	REASON FOR THE CONSULTATION	Emergency	38	41.8
		Referred by a doctor	47	51.6
		Routine consultation	6	6.6

Table 5. Representative table of the level of education of guardians of children with ASD according to certain studies

Title of the study	Year	Authors	Level of instruction
THE PRESENT STUDY Oral health habits assessment of autistic children: A survey of parents with Moroccan children on the Autism Spectrum			→36.8% university level →36.8% high school level.
Caries-risk Assessment and Caries Status of Children with Autism [16]	2010	MARSHALL J., SHELLER B., MANCL L.	→72% university level →11% high school level
Socioeconomic status and childhood autism: A population-based study in China. [19]	2018	PING H, CHAO G, ZHENJIE WANG, GC, NING L, XIAOYING Z	→ 46.5% university level → 6.2% high school level

Table 6. Representative table of the people involved in the brushing routine of children with ASD according to certain studies

Title of the study	Year	Authors	People involved in the brushing routine
THE PRESENT STUDY Oral health habits assessment of autistic children: A survey of parents with Moroccan children on the Autism Spectrum			→27 %of the children would brush their teeth on their own. →50% of the children were supervised when brushing →19.8%of the parents brushed their children's teeth
Caries-risk Assessment and Caries Status of Children with Autism [16]	2010	Marshall J., Sheller B., Mancl L.	→23%of the children would brush their teeth on their own. →26% of the children were supervised when brushing →47%of the parents brushed their children's teeth
Autistic children: experience and severity of dental caries between 1980 and 1995 in Kagoshima City [37]	2001	Morinushi T, Ueda Y, Tanaka C.	→35.3%of the children would brush their teeth on their own. → Educators would brush the child's teeth in 64.7% of the cases
Evaluation of Oral Health Status and Influential Factors in Children with Autism [17]	2018	Onol S., Kirzioğlu Z.	→ 4.8% of the children would brush their teeth on their own → 41.3% of the parents brushed their children's teeth →Educators would brush the child's teeth in 24.6% of the cases
The impact of dietary and tooth-brushing habits to dental caries of special school children with disability [30]	2010	Hsiu-Yueh L., Chun-Chih C., Wen-Chia H., Ru-Ching T., Cheng-Chin C., & et al.	→ 64.84% of the children would brush their teeth on their own → Educators or parents would brush the child's teeth in 35.16% of the cases.
Oral health status and behaviours of children with Autism Spectrum Disorder: a case–control study [31]	2014	Elkhatib A., M El Tekeya M., A El Tantawi M., Omar T.	→ 78.2% of the children needed supervision for brushing.

Table 7. Representative table of the type of toothbrushes used by children with ASD according to certain studies

Title of the study	Year	Authors	Type of toothbrush
The Present Study Oral health habits assessment of autistic children: A survey of parents with Moroccan children on the Autism Spectrum			All the children used a manual pedodontic toothbrush
Caries-risk Assessment and Caries Status of Children with Autism, Pediatric Dentistry [16]	2010	MARSHALL J., SHELLER B., MANCL L.	26% of the children used an electric toothbrush
Teaching oral hygiene to children with autism. [40]	2005	PILEBRO C., BÄCKMAN B.	14.2% of the children used an electric toothbrush

Table 8. Summary table of the frequency of dental visits of children with ASD according to certain studies

Title of the study	Year	Authors	Results
The Present Study Oral health habits assessment of autistic children: A survey of parents with Moroccan children on the Autism Spectrum			40.1% of the children have never visited the dentist.
Oral Health Behaviours of Preschool Children with Autism Spectrum Disorders and Their Barriers to Dental Care. [39]	2019	Yanlin DU R., K Y Yiu C., M King N.	70.5% of the children have never visited the dentist.
Effectiveness of audiovisual modeling on the behavioral change toward oral and dental care in children with autism [14]	2013	M.Sallama A.Sherine B.Y.Badrbmervat A.Rashedc	50% of the children have never visited the dentist.
Oral health challenges facing Dubai children with Autism Spectrum Disorder at home and in accessing oral health care. [15]	2018	Mansoor D. , M. AL Halabi , A. H. Khamis , M. Kowash	65% of the children have visited the dentist.
Dental knowledge of educators and healthcare providers working with children with autism spectrum disorders [44]	2015	Z. Murshid E.	26.7% of the educators have referred a child with ASD for a visit to the dentist.

DISCUSSION

The size of our sample was 152 parents of autistic children, 48 of whom were interviewed at the CDCT level and 104 at the level of three associations in Casablanca. This number remains higher than the majority of work carried out on the subject, which has led to fairly conclusive results. [6] [14] [15] [16] [17]. Male predisposition was found in the present study with a percentage of 73.3%. This predisposition is unanimous in all the studies which have looked at the epidemiological factors of this syndrome. In fact, boys are 3.1 times more affected by autism than girls. [18]The correlation between socioeconomic level and the onset of autism is controversial. The results are very different depending on the country where the studies are carried out. [19].

On the other hand, this parameter rather affects the quality of care of the child which requires constant financial charges between the costs of institutions and associations, medical care, school life auxiliaries etc. The level of education of tutors was compared to several countries and noted in Table 5. The results show us that there is no proven correlation between level of instruction and the onset of autism spectrum disorder. Regarding the institutionalization of children with ASD in the present study, a percentage of 92.1% of institutionalized children was noted. This high percentage can be explained by the fact that the survey was conducted in three associations in addition to children institutionalized in other associations who were referred to the dental center for specialized care. The French Health Authority (FHA) (2012) recommendations indicate that children with autism and other pervasive developmental

disorders should receive scientifically validated structured behavioral and developmental interventions as early as possible. Some methods can be cited such as the ABA method [20], the PECS: Picture Exchange Communication System [21], the TEACCH method [21] or the MAKATON [22]. The three associations included in this study used the ABA method. 10.8% of parents did not manage to name the method used in the institution attended by their children, this can be explained by the level of education of some parents, or the lack of communication between the institution and the parents. Eating problems are common in children with ASD. Caregivers of children with ASD often describe family meals as stressful, chaotic, and energy draining. [23] A meta-analysis indicated that children with ASD have five times more feeding problems compared to children in the control population. [24] Food selectivity (eating a narrow variety of foods or rejecting one or more food groups) is the most widely documented feeding problem in ASD. [25] [26] Common eating habits in children with ASD include a strong preference for processed foods, snacks, and sweets, along with a rejection of fruits and vegetables. [27] [28] Some children refuse to eat foods based on sensory characteristics (texture, taste or smell), require high consumption of a single food (eat the same food several times a day), insist on wanting to eat in a specific place, or require certain utensils. [24] [25] [29] The consumption of sweets as the main diet in the population in the present study was 30.9%, while an association between a healthy and cariogenic diet was 29%. The same has been noted in other studies. Indeed, in Taiwan, 36.3% of children consumed sweets at least once a week in 72.8% of the cases [30]. The same is true in Niger, where children seemed to consume more cariogenic and unhealthy foods [17], and in Egypt, where 67% of autistic children used to snack, with 35.8% of them having a preference for cariogenic foods [31]. Hypersensitive children find it difficult to ingest certain crunchy or creamy foods, for example, raw carrots or soft cheese. These different textures cause tongue or teeth noises when chewing, which tend to be unpleasant for them and annoy them. These same hypersensitive children may meet praxis difficulties. In fact, the chewing step changes certain information related to the food such as its taste, smell or even its structure. As a result, children, with each new bite, are forced to process a new number of stimuli, which requires a lot of effort. [32] For some children, chewing can be long and tiring, causing them to swallow food without going through this step. [33] The reward strategy is often used in children with a functional limitation whether they have ASD or another neurotypical pathology. These rewards can be used to reinforce a behavior, to encourage the child, to comfort him or to obtain peace in certain uncontrollable situations. [33] The ABA method (Applied Behavior Analysis), which is a method of educational and behavioral management of autistic children, uses the notion of reinforcer to set up in the autistic child a cause-and-effect relationship, and to allow the child to experience success. The three associations interested in this study use this method. In this study, 57.2% of parents used cariogenic foods as positive reinforcement tools. It is the same internationally as in the United States where 46% of parents using a food reward favored sweets [16], or in Taiwan with 37.85% [30]. Educators as well as parents should be aware of the adverse effects of dietary boosters which need to be replaced with nonfood boosters, such as affection, congratulations, points, diplomas, or listening to music, etc.… As for oral hygiene, 80.3% of the children in the present study brushed their teeth. A very encouraging percentage which does not differ much from studies carried out in developed countries. Indeed, 98% of the children included in a study carried out in the United States, brushed their teeth [16]. It is the same in Saudi Arabia where 96.2% of children brush their teeth [34]. However, 19.7% of the children in the present study did not brush their teeth for assorted reasons. Comparable results were seen in several studies, such as that of S. Önol and Z. Kırzıoğlu which found that 29.4% of autistic children did not brush their teeth compared to a control group of healthy children where only 0.9% of them did not brush their teeth [17]. Other studies show the same results. In Egypt, for example, 39% of children refuse brushing [14]. Or in Tel Aviv, 25.5% of children with ASD do not brush their teeth [35]. Learning and instituting good brushing can be difficult for these children. Those who accept it often do so because of their cognitive and motor difficulties. For others, they have an aversion to brushing and refuse this daily act of hygiene. Sometimes sensory dysorality syndrome can be the cause [36]. When brushing was accepted by the child in the present study, it was either done the child himself; either supervised by a parent, or else completely carried out by the parent. Several studies around the world report various involvement in the brushing routine, reported in Table 6. In addition, 35.2% of children brushed at least twice a day. 45.9% only once a day, while 18.9% of children brushed irregularly. In several studies, brushing is most often adopted once a day, which is consistent with the results of this study [9] [14] [15] [16] [17] [30] [34] [35] [36] [37] [38] [39]. All of the children included in the survey brushed their teeth using a manual pedodontics toothbrush. The lack of use of the electric toothbrush in these children can be explained by a lack of information or the noise or vibrations of the toothbrush that can be a source of discomfort. Not to mention its cost which still is higher than that of an ordinary toothbrush. The type of toothbrush used by children with ASD according to some studies has been summarized in Table 7. 97.5% of the parents questioned as part of the survey, said their child used toothpaste while brushing their teeth. 98.3% of these children used fluoride toothpaste, and 97.6% tolerated the different tastes of toothpaste. These results are similar to those of similar studies carried out in Sweden where all children with ASD used fluoridated toothpaste [40], in Egypt with a use rate of 65.8% [31] or even in India with 65% [38]. The use of fluoride is essential for oral prevention. The preventive fluoride strategy to be adopted for the child depends on the individual caries risk (ICR) and the dental stage. Classified among children at high caries risk, it is recommended to use fluoride toothpaste in children with ASD provided the risk of swallowing fluoride paste is controlled. In addition, only 10.7% of the study population used fluoride mouthwash as a brushing aid. The American Academy of Pediatric Dentistry suggests, in its 2016 oral health guide for children with special needs, to impregnate the toothbrush in mouthwash and apply it for children who cannot spit, and especially for children who cannot tolerate the use of toothpaste. [41]. As a result, a recent study carried out in 2019 by Anna STRUNECKA and Otakar STRUNECKY at the Institute of Technology and Research in Czechia, shed light on the relationship between fluorine and autism spectrum disorder. Fluoride (F) is rarely recognized as an environmental risk factor for ASD, as the neurotoxic effects of F are generally not recognized. The study by STRUNECKA and STRUNECKY aims to provide evidence on the neurotoxicity of F. Indeed, they have focused on a set of toxic manifestations of fluorine such as metabolic and mitochondrial dysfunction, oxidative stress, inflammation, immunoexcitotoxicity and decreased levels of melatonin. These symptoms have been observed both after chronic exposure to F (especially in the prenatal and postnatal developmental stages) and in ASD. In addition, the authors show that F, in synergistic interactions with the free metal caution of aluminum (Al3 +), can enhance the pathological symptoms of ASD. This takes place at concentrations several times lower than when F acts alone. A large number of epidemiological reports have highlighted the potential link between ASD and chronic exposure to F. The authors, in this study, attempted to compare the current prevalence rates of ASD in countries where fluoridation is done. The review presented figures regarding the prevalence of autism and other pervasive developmental disorders in various geographic regions of the world during the period 1960 to 2010. In addition, seventy-seven other studies from 39 countries on the five continents have been identified.

Analysis of all of these studies concludes that autism prevalence rates have increased over time in all regions studied. In fluoridated areas, the authors observed some symptoms of ASD in some people. These include IQ deficits, hypocalcemia, hypomagnesemia, hypothyroidism, disturbed sleep patterns, impaired cognitive abilities, learning, and behavioral problems. The study suggested that understanding F-induced pathways in the etiopathology of ASD may lead to new treatments. [42] These results highlight controversial findings in the preventive oral care of children with autism. [43] Regarding the brushing method, only 12.3% of children in the present study used the "Bass" method when brushing, while 51.8% of parents of autistic children described irregular tooth brushing methods. This irregularity can be explained by certain symptoms of children with ASD such as aggressiveness, behavioral problems, lack of manual dexterity and hypersensitivity [44]. Added to this is a lack of information among parents or educators who supervise or brush the children's teeth on the correct method of tooth brushing. Instructions on how to brush your teeth and training to improve motor skills to make brushing more effective are needed. Learning to brush should be consistent with the type of disability, the severity of the disorder and the individual characteristics of each child [35]. The American Academy of Pediatric Dentistry recommends an initial dental visit within one year of the appearance of the first tooth. Consultations should then be regular (at least once a year), especially in patients with specific needs, the frequency of appointments having to be increased to 2 to 4 times a year [41]. 59.9% of the parents in the present study took their child, at least once, to a dentist. This percentage is relatively high and it can be explained by the fact that the survey took place, in associations on the one hand, and in the Dental Consultations and Treatments Center of Casablanca, which benefits from a number of oral prevention campaigns. A review of the studies that looked at the regularity of dental visits by children with ASD revealed a disparity in the results, which are grouped together in Table 8. In the present survey, 51.6% of parents declared that they were referred by an attending physician for a dental consultation, followed by 41.8% who consulted following an emergency. In Egypt, 38.9% of visits were following a routine consultation, while 61.1% were for dental problems. [14]. Another 2018 study published in the European Journal of Pediatric Dentistry, found that 17.1% of visits were for routine consultations. [15]

CONCLUSION

The daily management of oral hygiene in children suffering from an autism spectrum disorder is a real challenge for the parents. This difficulty is compounded by the child's limited cooperation and social interaction disabilities. Thus, certain characteristics of the disorder have a direct impact on the quality of oral hygiene in children with autism, such as behavioral problems, hypersensitivity and lack of manual dexterity. Not to mention that certain educational management methods worsen harmful eating habits, in particular the use of cariogenic food positive reinforcers. The present study made it possible to draw positive points concerning oral hygiene in children with ASD, such as generalized brushing in 80.3% of children, but also the use of fluoridated toothpastes, supervision of brushing and visit of the dental surgeon. However, some negative findings were also noted, such as unbalanced diet and the use of positive cariogenic food enhancers. Also, the brushing frequency is always lower than the recommended one, with an irregular brushing method, without the use of oral hygiene adjuvants. In order to be able to reinforce the positive points and rectify the negative points and specially to generalize a good oral hygiene in the child suffering from ASD, an oral prevention program intended both for the child but also for the people who take care of him, with in-depth training in benefit of oral health professionals must be established.

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