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Educative Intervention in the Oral Hygiene of People with Down Syndrome: A Quasi-experimental Study

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Authors' contributions

This work was carried out in collaboration between all authors. Author MEPL designed the study, wrote the protocol, managed the literature searches and wrote the manuscript. Author GOV read, corrected and gave suggestions of the manuscript. Author NPR performed the statistical analysis, managed the analyses of the study, read, corrected and gave suggestions of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine the effect of an educative intervention on the oral hygiene of people with Down Syndrome in two special education schools in Celaya, Gto.
Study Design: Quantitative, correlational, quasi-experimental study.
Place and Duration of Study: The experimental group of the school of Special Education Mariana and the control group of the Center of Attention Multiple Henri Wallon in Celaya, Gto, between May 2016 and April 2017.
Methodology: We included 30 students (14 men, 16 women; age range 6-21 years) with Down Syndrome. An instrument based on Orem's theory was used to evaluate self-care abilities in oral hygiene and a National Autonomous University of Mexico format of personal control of the dentobacterial plaque. The intervention "Oral hygiene in people with Down Syndrome" was

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implemented. All was analyzed with Student t for paired means and Student t for independent groups, and *P-value*.
Results: Self-care skills showed a significant change after the nursing intervention (*P* = .009), knowledge (*P* = .02) and skills (*P* = .003); which had no significant difference were motivations (*P* = .23) and the percentage of dentobacterial plaque (*P* = .40).
Conclusion: It is fundamental to apply a nursing intervention to improve the oral hygiene of people with Down Syndrome favoring their capacities for self-care and preventing oral pathologies. But nurses need more training in psychoeducation to improve motivation in people.

Keywords: Down syndrome; oral hygiene; self-care; nursing intervention.

1. INTRODUCTION

Down syndrome (DS) or trisomy 21 is the most frequent genetic alteration causing intellectual disability [1-3]. People with DS are at greater risk of born with birth defects and are more vulnerable to certain diseases [4]. These include periodontal disease, which is common and early onset, as a result of altered leukocyte function, hypotonia, dentoalveolar joint laxity, as well as a lack of understanding of the importance of oral hygiene (OH) and decreased manual dexterity [5].

Guanajuato México, where the research was carried out, is one of the states with the highest birth rates of children with DS (5.45 per 10,000 births) [6], which are a vulnerable segment of the population.

OH includes a series of actions and habits acquired by people in order to maintain or achieve good oral health [7]. The dentobacterial plaque (DBP) is a set of microorganisms firmly adhered to each other and to a surface, surrounded by an abiotic extracellular material of a triple origin: bacteria, saliva and diet, with a yellowish-white matrix; It is involved in oral infectious processes, as it is the primary agent related to caries, periodontal disease and calculus [8,9].

In a systematic review of periodontal prevention and treatment in patients with DS found articles that support the high prevalence and severity of periodontal disease in people with DS, DBP which accumulates when there is an OH deficiency [8], which conclude that it is extremely important to introduce patients with this syndrome early in preventive programs and periodontal therapy [10]. In another, Dieguez-Perez, et al. [11], who found articles indicating that people with DS present poor oral hygiene and showed that they have inadequate gingival health with high indices of oral and teeth diseases, and showing that these are increasing with age and also showing a greater frequency of abnormalities in tooth development and bruxism. So they concluded that children with intellectual disabilities are a group that needs an early and regular dental care to prevent and limit the severity of the observed pathologies.

It is extremely important to promote the improvement of the OH of people with DS and with this, to improve their self-care capacity related to oral hygiene and thus prevent the appearance of pathologies in the oral cavity. All of the above was the basis for the development of the present research, which was based on Orem's Theory. From the Theory of Nursing Systems, the system that was implemented was the Educational Support System, since what was sought was to encourage the person with DS to carry out their oral hygiene in a correct and independent manner and therefore comply with this part of their self-care and from self-care deficit theory took self-care capacities as a basis for the comprehensive nursing intervention, which are: knowledge, skills and motivations [12]. All to prevent diseases of the oral cavity, avoid painful treatments for the person and costly for families; In addition the promotion of OH has the goodness that it can be carried out by the person with DS without having to have serious complications and the material to be used to perform the hygiene is easily accessible for the population [1,3,4,6,13].

The objective was to know the effect of an educative intervention in patients with DS to increase the self-care abilities on OH.

2. METHODOLOGY

2.1 Study Design

It was quasi-experimental (from Social Sciences Methodology), quantitative, comparative, longi-tudinal.

2.2 Place and Universe of the Study

The period of time to carry out the present investigation comprised from May of 2016 to April of 2017, in two Schools of Special Education Celaya, Guanajuato, Mexico, with all students with DS registered.

2.3 Selection of Participants

2.3.1 Inclusion criteria

People with DS, who were 6 to 21 years of age, who were registered in the Special Education Schools of Celaya, Gto, Mexico who accepted to participate in the present study and whose parents or guardians had signed informed consent.

2.3.2 Exclusion criteria

Persons with health complications that did not allow them to participate in the intervention.

2.4 Variables

2.4.1 Sociodemographics

It was measured: age in years, type of trisomy, concomitant diseases, surgery, disability, siblings, place between siblings, career.

2.4.2 Independent

Educative intervention called "Oral hygiene in people with Down syndrome" was first implemented in the experimental group for a period of 2 months, three days a week in total were 24 sessions, also included a short workshop for parents or guardians of the experimental group on the "Importance of correct oral hygiene", which was also given to the parents or guardians of the comparison group as a thank you for their participation in the research, after the end of the study; all this was carried out by the person in charge of the present investigation.

In the intervention throughout the 24 sessions were used communication techniques such as: pediatric language, distraction, speech therapy, voice control, play therapy, non-verbal techniques, Triple technique E (Explain-Teach-Run), imitation or modeling, desensitization and positive reinforcement. The learning activities that were used in this intervention were exposure, group discussion, interrogation, demonstration technique, role play or drill. And the didactic resources that were used were models, videos and triptychs.

The intervention was also based on the self-care capabilities of Orem's theory, which included: knowledge (approached with learning the correct brushing technique), skills (encouraged with exercises to control and improve fine-motor skills) and motivations (for this, dental brushing after meals was promoted in the morning and before bedtime, the workshop "Importance of correct oral hygiene" was applied to parents and guardians and teamwork with peers was encouraged).

2.4.3 Dependent

Self-care of oral hygiene: It is a quantitative continue variable; it is the ability of the person with Down syndrome to independently perform the brushing technique; it was measured as score (higher score better self-care capability) and it was presented as mean and standard deviation.

Dentobacterial plaque: It is a quantitative continue variable; is the percentage of DBP in teeth, using the O'Leary index, which uses a telltale solution staining, which is placed on the teeth by means of a swab and observes if the teeth were painted in each of its four segments, which are the mesial, distal, vestibular and lingual, this is registered in the personal plaque control format of the UNAM to obtain the percentage of PDB, using a rule of three, multiplying the number of dental pieces with plaque per 100 among the total dental pieces of the person. It was measured as percentage; it was presented as mean and standard deviation.

2.5 Questionnaires

Two instruments were used, the first one was the Personal Control Form of Bacterial plaque of the Faculty of Dentistry of the National Autonomous University of Mexico (UNAM), which has diagrams of the teeth of both, children and adults, to obtain the O'Leary index, in which the percentage of plaque in the teeth is obtained using dental plaque developers in teeth [14]; and the second was the "Dental evaluation of dental brushing technique based on Dorothea Orem's theory", the which is an ex-profeso instrument, which had a constructo validity, consulting experts dentistry and nurses, with an inter-observer reliability of 0.70 and intra-observer of 1 (Cohen’s Kappa).

2.6 Procedures

The protocol was submitted for evaluation to the Research Committee and Bioethics Committee of the University of Guanajuato, Campus Celaya-Salvatierra, Division of Health Sciences and Engineering, and its approval was obtained. After the authorization of institutions and obtaining informed consent, the pre-intervention measurement was carried out with the students who fulfilled the inclusion criteria, after which the educational intervention plan was carried out. After this the second measurement was performed.

2.7 Sample Size and Sampling

Assuming a mean difference of 9 points and a standard deviation of 8, the minimum sample size is 14 in each group, with 95% accuracy and 80% power (Epidat 4.1, 2014, Xunta de Galicia, PAHO and University CES).

The groups were naturally formed; only randomized to know what school was experimental group and what comparison group. It was worked with all subjects with DS because they were few.

2.8 Statistical Analysis

Descriptive statistics were used for the statistical analysis of data on socio-demographic variables. The association was measured with the Chi square test, it was not possible to calculate the Risk Ratio since the quantity of the sample did not obtain the score of the level of association required for this and to test the hypothesis was calculated Student t of paired and independent means with a value of $P < .05$ to demonstrate the statistical significance between the results. Statistical analysis was performed with the STATA 13.0 statistical program (Stata Corp. College Station, TX, USA).

3. RESULTS AND DISCUSSION

The two groups have very similar characteristics, the most relevant of which were the following: gender was the same number of men and women, as the type of trisomy is unknown in most participants of both groups, and in the two groups the type of trisomy that is found in greater proportion is the regular, as for the variable of the level of intellectual disability was found difference between the experimental group (EG) and the comparison group (CG), the EG has the same number of students with mild, moderate and severe intellectual disabilities, with CG having more subjects with moderate intellectual disability level and as the main caregiver of the study subjects in both groups the mother predominates, this with respect to the variables as can be seen in Table 1.

As for the numerical variables it is identified that although there is difference in the age and schooling ranges this is not significative and the groups are comparable.

Self-care skills scores with respect to the brushing technique in the pre-intervention measurement show that the scores ranges in the two groups are fairly similar in overall score, knowledge and motivation, only in the skills and the percentage of PDB shows a statistically significant difference (Table 3).

In the second measurement, post-intervention, there are statistically significant differences for the overall self-care score, knowledge, abilities but not in motivation neither in percentage of DBP (Table 4).

Comparing pre and post intervention in experimental group, it was found that the mean of differences' were statistically significative fro overall self-care score, knowledge, abilities and motivation ($P<.05$); only for %DBP the differences were not significative. For the comparison group, the mean of differences were not statistically significative for all dimensions of self-care, except for abilities ($P<.05$) (Table 5). This data show that the intervention had an effect on self-care.

Although this study included a workshop for parents in which they were trained on oral hygiene issues, their importance, why people with DS are more susceptible to oral diseases, of to perform DBP detection and the brushing technique was correctly identified that this had a minimal impact, this may be due to that in several studies has been found that by parents or caregivers, there is the idea of the lack of autonomy of the students to assume their own care [15], which may explain why the lack of family motivation to follow the intervention in the home.

In addition to this is proven that they are sometimes not supervised to carry out the brushing technique correctly and the frequency of this in people with DS is inadequate, it is

usually <2 times / day; these factors lead directly to high rates of DBP which, according to studies in people with DS, range from 53% to considerably higher than or equal to 80% [16,17], which is similar to the data obtained in the sample from Celaya since in the first measurement the student who had a lower percentage of DBP was 11 and the major one was 92 and for the second measurement the lowest was 9.2% and the greater of 100%, so that despite that in the experimental group in the second measurement if there was difference with respect to the lower percentage of plaque obtained in the first measurement, this is not considered significant since the majority of the participants continued to present higher plaque percentages even higher than in the first measurement.

Table 1. Distribution of categorical sociodemographic variables by group

Variables		Experimental group (n=15)		Comparison group (n=15)		*P*-value
		f	%	f	%	
Gender						1.0**
	Female	8	53.3	8	53.3	
	Male	7	46.67	7	46.67	
Trisomy	Unknown	7	46.67	13	86.67*	.02*
	Regular	6	40.00	2	13.33*	.01*
	Mosaicism	2	13.33	0	00.00*	.14*
Concomitant disease						.2**
	No	10	66.67	13	86.67	
	Yes	5	33.3	2	13.33	
Surgery						.44**
	No	9	60.00	11	73.33	
	Yes	6	40.00	4	23.67	
Disability						.09**
	Mild	5	33.33	2	13.33	
	Moderate	5	33.33	11	73.33	
	Severe	5	33.33	2	13.33	
Siblings						.36**
	Does not have	2	13.33	4	26.67	
	Has	13	83.67	11	73.3	
Place between siblings						.69**
	Does not have	2	13.33	4	26.67	
	Greater	1	6.67	1	6.67	
	Intermediate	1	6.67	2	13.33	
	Minor	11	73.33	8	53.33	
Career	Mother	13	86.67	12	80.00	.62*
	Father	1	6.67	1	6.67	1.00*
	Grandparents	0	0	2	13.33	.14*
	Siblings	1	6.67	0	0	.31*

** Z for two proportions; ** Chi squared test*

Table 2. Distribution of quantitative sociodemographic variables by group

Variable		Range	Mean ± SD	*P*-value*
Age (years)	EG (n=15)	6 - 21	14.13 ± 5.37	.17
	CG (n=15)	7 - 16	12 ± 2.27	
School (years)	EG (n=15)	5 - 20	11.6 ± 5.05	.32
	CG (n=15)	6 - 15	10.1 ± 2.7	
Number of siblings	EG (n=15)	0 - 4	2 ± 1.2	.30
	CG (n=15)	0 - 5	1.5 ± 1.4	

** Student-t test for two independent means; SD: Standard deviation; EG: Experimental groups; CG: Comparison group*

Table 3. Distribution of self-care capacity score and percentage of dentobacterial plaque per group, prior to intervention

Variables		Range	Mean ± SD	*P*-value*
Overall self-care score	EG (n=15)	11 – 37	28.8 ± 9.0	.37
	CG (n=15)	10 – 33	21 ± 7.7	
Knowledge	EG (n=15)	5 – 16	11.4 ± 3.5	.72
	CG (n=15)	5 – 18	10.9 ± 4.1	
Abilities	EG (n=15)	2 – 14	7.93 ± 4.06	.02
	CG (n=15)	1 – 11	4.73 ± 3.03	
Motivation	EG (n=15)	0 – 7	4.4 ± 2.3	.32
	CG (n=15)	1 – 7	5.3 ± 2.3	
% DBP	EG (n=15)	11 – 37	23.8 ± 9.04	.00001
	CG (n=15)	11.3- 93.2	57.68 ± 23.60	

** Student's t test for two independent means; DBP: Dentobacterial plaque; EG: Experimental group; CG: Comparison group; SD: Standard deviation*

Table 4. Distribution of self-care capacity score and percentage of dentobacterial plaque per group, post-intervention

Variables		Range	Mean ± SD	*P*-value*
Overall self-care score	EG (n=15)	19 – 50	32.47 ± 10.13	.009
	CG (n=15)	11 – 38	23.13 ± 7.94	
Knowledge	EG (n=15)	9 – 23	15.07 ± 4.51	.02
	CG (n=15)	6 – 17	11.33 ± 3.50	
Abilities	EG (n=15)	5 – 20	11.6 ± 4.67	.003
	CG (n=15)	2 – 14	6.73 ± 3.45	
Motivation	EG (n=15)	3 – 7	5.8 ± 1.47	.23
	CG (n=15)	2 – 7	5.07 ± 1.79	
% DBP	EG (n=15)	9.2 – 100	37.53 ± 27.92	.40
	CG (n=15)	11.4- 95.8	45.48 ± 22.01	

** Student's t test for two independtent means; DBP: Dentobacterial plaque; EG: Experimental group; CG: Comparison group; SD: Standard deviation*

Table 5. Mean of differences of self-care scores by group, pre and post intervention

	Mean of differences ± SD	*P*-value*
Experimental group		
Overall self-care score	-8.67 ± 7.08	.0003
Knowledge	-3.6 ± 3.29	.0008
Abilities	-3.67 ± 3.20	.0006
Motivation	-1.4 ± 2.44	.04
% DBP	-0.12 ± 22.64	.98
Comparison group		
Overall self-care score	-2.13 ± 4.66	.1
Knowledge	-0.4 ± 2.20	.49
Abilities	-2.0 ± 2.75	.01
Motivation	0.27 ± 2.22	.64
% DBP	12.2 ± 34.81	.2

** Student's t test for paired sample; SD: Standard deviation; DBP: Dentobacterial plaque*

With regard to the studies found in those that address interventions or educational programs for improving oral health in this type of population, there were only two, the first is an educational program in which they used participatory affective techniques, a survey of knowledge and practices and a guide to observation of the shape of dental brushing; addressed only students with mild intellectual disabilities. Among their results, 85% of the students achieved acceptable oral hygiene indices and 90% improved their knowledge [18];

These results coincide with those of this research since the students with mild intellectual disabilities were also those that obtained a marked improvement both in self-care capacities and in the decrease of the percentage of DBP as opposed to those who presented moderate intellectual disability or severe, so we can identify that in this type of interventions it is extremely important to consider the level of intellectual disability since it does influence the level of effect of the same because at a higher level of intellectual disability is the effect of the intervention.

The second study is an educational intervention strategy in which they applied four collective games with a didactic component according to the psycho-pedagogical diagnosis; their results show that the oral hygiene index before the educational intervention was 70 to 78% ± 9 , 6 and after the intervention was 66 to 60 ± 11.52 and in terms of knowledge also obtained significant difference [19], if there was an effect in the improvement of knowledge and in the decrease of the percentage of plaque but still the latter is still high as in this investigation for which it is necessary to improve the interventions, increasing the time of application, the impact in the area of motivation and in the family involvement, because although these interventions if they are effective the improvement is extremely gradual and referring to oral hygiene requires percentages of plaque smaller than those obtained to decrease the incidence of periodontal diseases.

4. CONCLUSION

It is fundamental to apply a nursing intervention to improve the oral hygiene of people with DS favoring their capacities for self-care and preventing oral pathologies. But nurses need more training in psychoeducation to improve motivation in people.

CONSENT

All authors declare that written informed consent was obtained from the parents or guardians of the study participants for publication of this investigation.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

The protocol was approved by Bioethics Committee from University of Guanajuato, Campus Celaya Salvatierra, Division of Health Sciences and Engineering with registry No. CBDCSI-106160929.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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