TOOTHBRUSHING PROCEDURE IN SCHOOLCHILDREN WITH NO PREVIOUS FORMAL INSTRUCTION: VARIABLES ASSOCIATED TO DENTAL BIOFILM REMOVAL

Glenda N. Rossi[1], Ana L. Sorazabal[1], Pablo A. Salgado[1],
Aldo F. Squassi[1], Graciela L Klemonskis[1]

[1]Department of Community and Preventive Dentistry, School of Dentistry,
University of Buenos Aires, Argentina.

ABSTRACT

The aim of this study was to establish the association between features regarding brushing procedure performed by schoolchildren without previous formal training and the effectiveness of biofilm removal.

Out of a population of 8900 6- and 7-year-old schoolchildren in Buenos Aires City, 600 children were selected from schools located in homogeneous risk areas. Informed consent was requested from parents or guardians and formal assent was obtained from children themselves. The final sample consisted of 316 subjects. The following tooth brushing variables were analyzed: toothbrush-gripping, orientation of active part of bristles with respect to the tooth, type of movement applied, brushing both jaws together or separately, including all 6 sextants and duration of brushing. The level of dental biofilm after brushing was determined by O'Leary's index, acceptable cut-off point = 20%. Four calibrated dentists performed observations and clinical examinations. Frequency distribution, central tendency and dispersion measures were calculated. Cluster analyses were performed; proportions of variables for each cluster were compared with Bonferroni's correction and OR was obtained.

The most frequent categories were: palm gripping (71.51%); perpendicular orientation (85.8%); horizontal movement (95.6%); separate addressing of jaws (68%) and inclusion of all 6 sextants (50.6%). Mean duration of brushing was 48.78 ± 27.36 seconds. 42.7% of the children achieved an acceptable biofilm level. The cluster with the highest proportion of subjects with acceptable post-brushing biofilm levels ($p < 0.05$) differed significantly from the rest for the variable "inclusion of all 6 sextants in brushing procedure". OR was 2.538 (CI 95% 1.603 – 4.017).

Inclusion of all six sextants could be a determinant variable for the removal of biofilm by brushing in schoolchildren, and should be systematized as a component in oral hygiene education.

Key words: Oral hygiene, toothbrushing, dental plaque prevention and control.

PROCEDIMIENTO DE CEPILLADO EN ESCOLARES SIN PREVIO ENTRENAMIENTO FORMAL: VARIABLES ASOCIADAS AL BARRIDO DEL BIOFILM DENTAL

RESUMEN

El objetivo del trabajo fue establecer la asociación entre las características del procedimiento de cepillado en escolares sin previo entrenamiento formal con la efectividad para el barrido del biofilm dental.

Sobre una población de 8900 escolares de Ciudad Autónoma de Buenos Aires de 6 y 7 años de edad, se seleccionaron 600 niños concurrentes a escuelas situadas en áreas de riesgo homogéneo. Sobre esta muestra se solicito consentimiento informado a los responsables legales y el asentimiento formal, conformando una muestra final de 316 individuos. Se analizaron las siguientes variables del procedimiento de cepillado: tipo de toma del cepillo dental, orientación de la parte activa respecto del diente, tipo de movimiento aplicado, abordaje simultaneo o no de ambos maxilares, inclusión de los 6 sextantes y duración de cepillado. El nivel de biofilm dental posterior al cepillado se determinó con el índice de O'Leary-punto de corte aceptable= 20%. Cuatro odontólogos calibrados realizaron las observaciones y exámenes clínicos. Se calculó: distribución de frecuencias, medidas de tendencia central y su dispersión. Se realizó un análisis de clúster y comparación de proporciones de las variables de cada conglomerado con corrección de Bonferroni y OR.

Las categorías más frecuentes fueron: toma palmar (71,51%); orientación perpendicular (85,8%); movimiento horizontal (95,6%); cepillado de ambos maxilares por separado (68%) e inclusión de los 6 sextantes (50,6%). La media de duración del cepillado fue de 48.78 ± 27.36 segundos. El 42,7 % de los escolares alcanzaron un nivel de biofilm aceptable. El clúster que mostró la mayor proporción de individuos con niveles de biofilm postcepillado aceptables ($p < 0,05$) mostró diferencias estadísticamente significativas con los demás respecto de la variable "inclusión de 6 sextantes en el cepillado". El OR fue igual a 2,538 (IC 95% 1,603 – 4,017).

La inclusión de los seis sextantes podría ser una variable determinante de la efectividad del barrido de biofilm mediante el cepillado en escolares debiendo enfatizarse la sistematización del mismo como componente de la enseñanza de higiene bucal.

Palabras Clave: Higiene bucal, cepillado dental, prevención y control de placa dental.

INTRODUCTION

Oral health is an essential component of general health and wellbeing. Everyday activities such as communicating, eating and tasting food, as well as aspects of social interaction associated to self-esteem and self-confidence may all be affected by alterations in oral health status. On the other hand, everyday decisions and actions can contribute to wellbeing and health[1].

The most frequent oral diseases –caries and gingivitis– currently affect a large number of children, in particular those living in poverty, causing pain, discomfort, sleepless nights and limited masticatory function, producing nutritional problems, absenteeism from school and impact on families in terms of time and expense[2]. Children with deficient oral health are 12 times more likely to suffer restrictions in their daily activities than children with acceptable oral health status[3]. Despite scientific progress over the past 30 years, large population groups still suffer from preventable diseases. Based on the analysis of the strongest factors influencing children`s and youngster`s health in Latin American countries, the Pan American Health Organization (2005) has identified some areas which can clearly be defined as priorities for health interventions: healthy environment promotion; life skills development; active lifestyle encouragement and personal hygiene habits development[4]. Oral hygiene is a universal preventive measure, because it helps remove and control dental biofilm. The toothbrush is the most often used tool in daily oral hygiene[5]. People living in high-income countries have incorporated regular toothbrushing habits. However, there are substantial variations within countries, mostly related to educational level. Toothbrushing is less frequent in low-income countries[6]. Regular toothbrushing using an effective technique is a main, critical aim for individual and collective oral health preventive programs.

Effective removal of dental biofilm has been associated with lower prevalence of gingivitis, and in the long term, can prevent or reduce the progression of periodontitis, helping to preserve teeth over time[7]. Researchers such as Zenkner and Nyvad have considered effective biofilm removal as a potential factor regarding caries reduction[8-9]. In a study on 298 schoolchildren, Zenkner showed that teeth with a high level of biofilm accumulation were 14.5 times (95% CI = 6.5–32.4) more susceptible to caries activity than those without visible biofilm accumulation (data adjusted for molar type and eruption stage) and that molars partially exposed to the oral cavity were 63.6 times (CI 95 % = 22.0 to 183.7) more susceptible to caries activity than molars in full occlusion (data adjusted for biofilm accumulation and molar type) [8].

There is consensus that the efficacy of brushing techniques lies in the ability to remove dental biofilm[10]. However, none of the brushing techniques proposed to date has proven to be significantly more effective than other. Recommendations of one specific technique over another are largely based on professionals' personal preference, outcomes of personal experiences and empirical evidence. Neither is there clear evidence of which brushing variables have a greater influence on biofilm removal and should be emphasized. Wilson TG Jr. has reported that teaching a hygiene technique that involves major changes for the subject produces short-term results, but these results are not sustained over time. Adherence rate to new brushing techniques is lower than 50%[10].

This study analyzed one aspect involved in oral hygiene education, namely, toothbrushing technique in children from socially deprived populations, within the framework of school programs conducted during the first years of schooling.

In the understanding that it is important to learn about people's practices and knowledge of daily life in order to design health interventions that will be effective and relevant to the context, and require the lowest level of change in behaviors with the highest efficacy, the team intended:

- To characterize toothbrushing patterns in children without prior systematic instruction,
- To explore observable patterns in children who achieve satisfactory biofilm removal, and
- To identify variables associated to better dental biofilm removal.

The aim of this investigation was, thus, to establish association between features of the toothbrushing procedure in schoolchildren without prior formal instruction and the effectiveness of dental biofilm removal.

MATERIALS AND METHODS
This was an observational analytical study.

Sample
The population consisted of 8900 children from schools in Buenos Aires City (CABA).
Eligibility criteria were:
- Age: 6-7 years,
- Geographical residential area: living and attending schools in areas with high density of socially deprived households.

A non-probability sampling technique was used.
Exclusion criteria were:
- having received formal instruction in oral hygiene techniques
- presence of motor disorders.

Steps for sample selection were:
In the first place, a geographic area with critical levels of deprived households, according to Golovanevsky's (2007)[11] criteria for measuring social deprivation was selected. Territorial distribution of deprived households in Buenos Aires City was established following Con et al. (2009)[12] and INDEC (2010)[13] criteria. School District number 19, in the south-west of the city was chosen.
Secondly, schools to participate in the study were selected: opinion of local experts (Secretariat of Educational Inclusion of Buenos Aires City Ministry of Education) was taken into consideration to select 6 of the 9 schools in School District 19.
The final sample consisted of 316 6- to 7-year-old first-graders.
In order to accomplish ethical aspects of the investigation, informed consent to participate in the study was obtained from parents or legal guardians of the schoolchildren (n=600), as well as formal acceptance from the schoolchildren themselves.

Variable selection and categories
The following variables were selected to characterize the brushing procedure used by schoolchildren without prior formal training or instruction:
a) toothbrush gripping,
b) orientation of active part of the brush with respect to the longitudinal axis of teeth,
c) type of movement performed,
d) separate addressing of jaws in toothbrushing procedure,
e) including all 6 sextants during brushing,
f) duration of brushing.

Table 1 shows the selected variables and categorization.
Efficacy of biofilm removal was evaluated using O'Leary's plaque index[14] post- brushing procedure, which uses disclosure solution to provide information on presence of biofilm on tooth surfaces.

Researcher calibration
Four dentists took part in the study as researchers. Two meetings were held in order to standardize observation and recording of toothbrushing variables. These meetings included description of analyzed variables and operationalization description; watching videos to practice recording; and calibration to establish the level of consistency among researcher observations. A reference investigator trained the researchers in detecting biofilm and recording O'Leary's Index. The dentists who achieved inter-rater Kappa agreement statistic higher than 0.75 were included in the study team.

Study procedure
Observations and clinical examinations were conducted at schools. Researchers provided children with toothbrushes with a straight-handle and 1.5 cm head with three rows of straight nylon bristles (Colgate® Plan Escolar). Children were asked to

Table 1: Brushing procedure: study variables and categories.

Variables	
Toothbrush grip	Palm
	Pen
Orientation of the active part of the toothbrush with respect to tooth axis	Perpendicular
	Other
Predominant movement	Horizontal
	Other
Simultaneous addressing of both jaws	Yes
	No
Inclusion of all 6 sextants	No
	Yes
Biofilm level	0% to 20%
	20% to 100%
Brushing duration	In seconds

brush their teeth as usual. Each child brushed his/her teeth individually, out of sight from other children, to prevent them from influencing each other.

Children were examined under standardized conditions using technology with simplified equipment[15]. Presence of biofilm post-brushing procedure was determined using disclosure solution. O'Leary's index[14] was used to quantify biofilm.

Both procedures were recorded on an *ad-hoc* chart (Fig. 1).

Statistical processing

Frequency distribution was used to describe categorical variables, and central tendency and dispersion measures were used for quantitative variables.

Euclidian distances were used to establish the criterion for clusters similarity. Fifteen clusters were obtained, of which those with highest number of cases (n ≥ 30 cases) were selected for analysis: clusters 1, 3, 10, 11 and 13. The remaining ten clusters were considered non-classifiable because they included few cases (Table 2).

The proportions of variables in each cluster were compared with Bonferroni's correction coefficient. The Odds Ratio (OR) was calculated to assess the risk level of the variable that showed statistically significant differences in the cluster that achieved acceptable biofilm removal.

Compliance with legal aspects

The study was conducted within the framework of an agreement between Buenos Aires City Government's Ministry of Education and Buenos Aires University School of Dentistry (UBACyT200201201003324BA). It complied with legal rules of Buenos Aires City Government's Ministry of Education. Informed consent authorizing participation in the study was obtained from children's parents or legal guardians, and each child was asked for formal assent.

RESULTS

The study variable categories with highest frequency were: palm grip (71.51%), perpendicular orientation (85.8%), horizontal movement (95.6%), separate addressing of jaws (68%), and including all 6 sextants (50.6%). The sequence in which the children brushed the 6 sextants of the mouth showed a wide variation and no pattern could be defined in this regard. Post-brushing biofilm level beneath the risk threshold was achieved by 42.7% (Table 3).

Table 2: Number of subjects in clusters.

Cluster	N
1	54
3	41
10	36
11	44
13	41
Total	**216**
Not classifiable	100
Total	**316**

Table 3: Distribution of brushing variables in the whole sample.

Variables		Frequency	%
Toothbrush grip	Palm	226	71.5%
	Pen	80	28.5%
Orientation of the active part of the toothbrush with respect to tooth axis	Perpendicular	271	85.8%
	Other	45	14.2%
Predominant movement	Horizontal	302	95.6%
	Other	14	4.4%
Simultaneous addressing of both jaws	Yes	101	32.0%
	No	215	68.0%
Inclusion of all 6 sextants	No	156	49.4%
	Yes	160	50.6%
Biofilm level	0% to 20%	135	42.7%
	20% to 100%	181	57.3%

TEACHING AND MONITORING HYGIENE TECHNIQUE

NAME: _____ SCHOOL: _____ GRADE: _____ AGE: _____

1) **Ask child to brush his/her teeth as usual.**

2) **Watch and record:**

BRUSH GRIPPING: ☐ palm   ☐ pen   ☐ other: ....

POSITION OF BRUSH WITH RESPECT TO TOOTH AXIS:

☐ oriented to occlusal   ☐ perpendicular   ☐ oriented to gingival.

TOOTHBRUSHING MOVEMENT:

☐ Rotational   ☐ Horizontal   ☐ Transversal   ☐ other: ....

SEQUENCE: (number sequential addressing of sextants)

ADDRESSING JAWS: ☐ both jaws simultaneously   ☐ each jaw separately

BRUSHING DENTAL SURFACES: ☐ Only buccal   ☐ Buccal and occlusal
☐ Bucal, occlusal and lingual/palatal

BRUSHES TONGUE: ☐ YES   ☐ NO   TOTAL BRUSHING TIME: .... seconds

3) **Perform plaque disclosure. Record:**   Postbrushing plaque level: ☐ %

```
    16   15   14   13   12   11   21   22   23   24   25   26



    46   45   44   43   42   41   31   32   33   34   35   36
```

4) **Record changes in technique taught to child.**

Fig. 1: Ad-hoc chart for recording observations on tooth brushing procedure.

Table 4 shows the distribution of categories in each cluster.

Table 5 shows the significant differences found upon comparing proportions of study variables among clusters.

Cluster 13 had the highest proportion of children achieving acceptable biofilm removal (Fig.2).

Figure 3 shows duration of brushing. No statistically significant difference was found among clusters (Fig. 3).

Cluster 13 differed from the other four in terms of proportion of children that included all sextants during brushing. The following brushing features prevailed in the cluster of children with best biofilm removal: palm grip; perpendicular orientation of
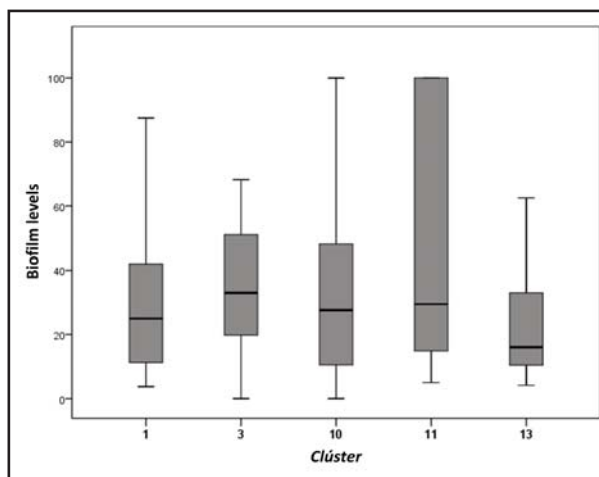

Fig. 2: Post-brushing biofilm level in selected clusters.

Table 4: Frequency of brushing variable categories broken down according clusters.

Variables		Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Orientation of the active part of the toothbrush with respect to tooth axis	perpendicular	52	96.3	34	82.9	31	86.1	39	88.6	40	97.6
	Other	2	3.7	7	17.1	5	13.9	5	11.4	1	2.4
Predominant movement	Horizontal	52	96.3	40	97.6	35	97.2	43	97.7	40	97.6
	Other	2	3.7	1	2.4	1	2.8	1	2.3	1	2.4
Simultaneous addressing of both jaws	Yes	11	20.4	10	24.4	21	58.3	9	20.5	3	7.3
	No	43	79.6	31	75.6	15	41.7	35	79.5	38	92.7
Inclusion of all 6 sextants	No	14	25.9	32	78.0	23	63.9	35	79.5	4	9.8
	Yes	40	74.1	9	22.0	13	36.1	9	20.5	37	90.2
Biofilm level	0 to 20%	22	40.7	11	26.8	16	44.4	15	34.1	24	58.5
	20% to 100%	32	59.3	30	73.2	20	55.6	29	65.9	17	41.5

Table 5: Comparison of proportions of study variables among clusters.

Variables		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
		A	B	C	D	E
Orientation of the active part of the toothbrush with respect to tooth axis	perpendicular					
	Other					
Predominant movement	Horizontal					
	Other					
Simultaneous addressing of both jaws	Yes			ABDC		
	No	C	C		C	C
Inclusion of all 6 sextants	No		AE	AE	AE	
	Yes	BCD				BCD
Biofilm level	0% to 20%					B
	20% to 100%					

brush head with respect to tooth axis; horizontal movement; brushing each jaw separately. The variable that showed significant differences with regard to other clusters was including all 6 sextants in the procedure (Fig. 4). Risk assessment determined OR = 2.538 (CI 95% 1.603 – 4.017).

DISCUSSION

There are few studies of toothbrushing practices without prior professional intervention, and even fewer on schoolchildren populations.

Our study identified 15 clusters according to proximity, reflecting the wide range of variable combination. The most frequent variables among children achieving best biofilm removal were palm gripping of brush, perpendicular orientation of toothbrush head with respect to tooth axis, predominantly horizontal movement, separate addressing of jaws and inclusion of all 6 sextants of the mouth during the oral hygiene procedure.

Movement: Observation of toothbrushing in schoolchildren without prior formal instruction showed predominance of horizontal movement (95.6%), in agreement with Andrade (1997)[16].

Gripping: Our results agree with those reported by Das (2009) in a study on 3- to 11-year-olds without previous instruction in tooth brushing, with palm gripping being the most frequent[17].

Orientation: Most children oriented the active part of the brush perpendicular to tooth axis.

Duration: Duration of brushing in our study (X = 48.78 sec. ± 27.36) was similar to duration reported in other studies. Mc Greggor and Rugg-Gunn (1979) found that average duration of brushing in schoolchildren was 60.3 seconds[18]. Das (2009) reported duration of toothbrushing in children aged 6 to 8 years was 48 seconds, increasing significantly with age[17]. Our study found no statistically significant difference between groups with better and worse biofilm control performance.

Biofilm: A frequent clinical finding has been that most schoolchildren have unacceptable levels of oral hygiene. Sandstrom (2011) found that only 19% of children removed dental biofilm acceptably[19]. However, in our study, 42.7% of the children achieved a post-brushing biofilm level beneath the cut-off point.

Sextants: All 6 sextants were included by 50.6% of the children who took part in this study, but the sequence in which they were brushed was disorderly, often leading to repeatedly brushing some sextants and omitting others. Andrade (1997) reports that 6-year-olds with no prior brushing instruction tend to brush only the molar zone, in contrast to younger children, who only brush the front teeth[16].

We found that children who did not include all 6 sextants during tooth brushing are at a 2.5 higher risk of having unacceptable biofilm levels than those who include all 6 sextants (OR = 2.538 (CI 95% 1.603 – 4.017), while the other variables analyzed showed lit-
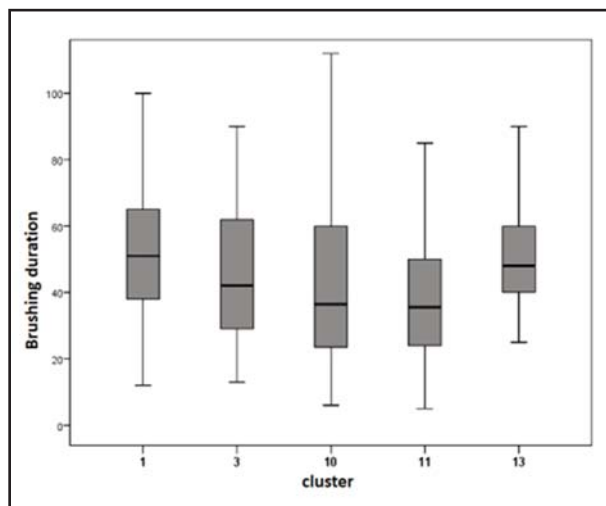

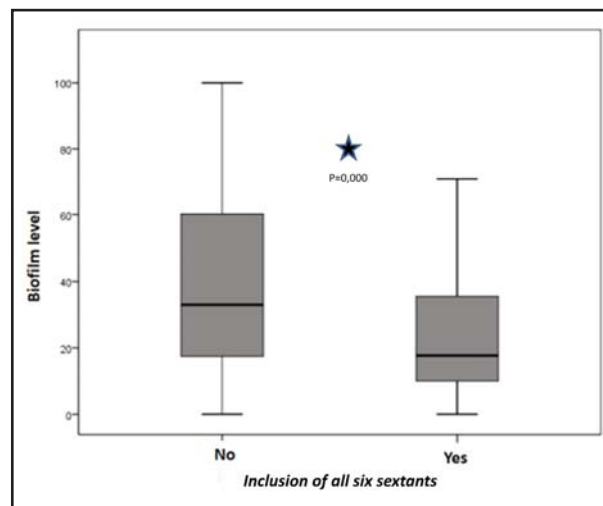*Fig. 3: Toothbrushing duration in selected clusters.*

Fig. 4: Biofilm level according to inclusion of sextants for the whole sample.

tle variability. These findings suggest that educational interventions, particularly if they are collective, should emphasize systematization of brushing by establishing a sequence for brushing the whole mouth as one of the aspects of mechanical hygiene.

Clearly, some subjects are able to achieve a high level of biofilm control, while others are not. In this regard, Frandsen (1985) remarks "efficiency in oral hygiene practices is more likely to be improved based on research and development related to conditions determining individual performance than by attempting to improve treatments and techniques[8]."

CONCLUSIONS

Including all six sextants may be a determinant variable for effective biofilm removal by toothbrushing in schoolchildren, and its systematization should be emphasized in oral hygiene education.

CORRESPONDENCE
Dra. Glenda N. Rossi
Cátedra de Odontología Preventiva y Comunitaria
Facultad de Odontología, UBA. Marcelo T. de Alvear 2142 5to B.
C1122AAH. Ciudad Autónoma de Buenos Aires, Argentina.
glerossi@yahoo.com.ar

REFERENCES

1. Akifusa S, Soh I, Hamasaki T, Takata Y, Yohida A, Fukuhara M, Sonoki K, Takehara T. Relationship of number of remaining teeth to health- related quality of life in community-dwelling elderly. Gerodontology 2005; 22:91-97.
2. Watt RG, Marinho VC. Does oral health promotion improve oral hygiene and gingival health? Periodontology 2000. 2005; 37: 35-47.
3. US Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General — Executive Summary. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000. URL:http://www.nidcr.nih.gov/DataStatistics/Surgeon General/Report/ExecutiveSummary.htm2
4. Municipios Saludables. Meresman Sergio Cap 14. Escuelas Promotoras de Salud. En Portafolio Educativo 1° ed.Buenos Aires: OPS/Ministerio de Salud y Ambiente de la Nación. 2005. URL: accessed at:http://www.msal.gov.ar/municipios/images/stories/4-recursos/pdf/2013-09_portafolio-educativo-municipios-saludables.pdf
5. Bordoni N, Piovano S.Control Mecánico y Químico de la Biopelicula. In: Bordoni N, Castillo Mercado R: Odontología Pediátrica. La salud Bucal del niño y el adolescente en el mundo actual. Buenos Aires, Argentina. Editorial Médica Panamericana, 2010; 250-258.
6. Yaacob M, Worthington HV, Deacon SA, Deery C, Walmsley AD, Robinson PG, Glenny AM. Powered versus manual toothbrushing for oral health (Review). The Cochrane Library 2014, Issue 6. URL: file:///C:/Users/usuario/Downloads/Yaacob_et_al-2014-The_Cochrane_Library.pdf
7. Aspiras MB, Barros SP, Moss KL, Barrow DA, Phillips ST, Mendoza L, de Jager M, Ward M, Offenbacher S. Clinical and subclinical effects of power brushing following experimental induction of biofilm overgrowth in subjects representing a spectrum of periodontal disease. [Abstract]. J Clin Periodontol 2013;40:1118-1125. DOI:10.1111/jcpe. 12161
8. Zenkner JE, Alves LS, de Oliveira RS, Bica RH, Wagner MB, Maltz M. Influence of eruption stage and biofilm accumulation on occlusal caries in permanent molars: a generalized estimating equations logistic approach. Caries Res 2013; 47: 177-182.
9. Nyvad B, Machiulskiene V, Baelum V. Construct and predictive validity of clinical caries diagnostic criteria assessing lesion activity. J Dent Res 2003; 82:117-122.
10. Wilson TG Jr. How patient compliance to suggested oral hygiene and maintenance affect periodontal therapy. Dent Clin North Am 1998; 42:389-403.
11. Golovanevsky L. Vulnerabilidad Social: una propuesta para su medición en Argentina. Revista de Economía y Estadística. Vol. XLV - N° 2 - (2007) -53-94. URL: http://revistas.unc.edu.ar/index.php/REyE/article/ view/3840
12. Con M, Susini S, Catalá S, Quinteros S. Índice De Vulnerabilidad Social (IVS). Informes Temáticos De La Dirección De Investigación y Estadística del Ministerio de Educación Del GCBA. Documento metodológico. 2009. URLhttp://www.buenosaires.gob.ar/areas/educacion/dirinv/pdf/ indice_vulnerabilidad_social.pdf
13. INDEC Instituto Nacional de Estadística y Censos de la República Argentina URL : http://www.indec.mecon.ar/
14. O´Leary TJ, Drake RB, Naylor JE. The plaque control record. J Periodontol 1972; 43: 38.
15. Pereyra L: Programa de Salud Bucal en escolares de comunidades rurales. Estudio de un Caso: Caraguatay, Tarumá y Guaraypo. Provincia de Misiones. República Argentina. In: Bordoni N, Castillo Mercado R: Odontología Pediátrica. La salud Bucal del niño y el adolescente en el mundo actual. Buenos Aires, Argentina. Editorial Medica Panamericana, 2010; 1059-1073.
16. Andrade AP; Escalona LX; Curi L E; Picasso SM. Evaluación de los movimientos que realizan los preescolares y escolares con el cepillado dental, sin haber recibido instrucción previa. Mag Int Coll Dent 1997;5 :32-36. URL: http://bases.bireme.br/cgi-bin/wxislind.exe/iah/online/?IsisScript=iah/iah.xis&src=google&base=LILACS&lang=p&nextAction=lnk&exprSearch=290348&indexSearch=ID
17. Das UM, Singhal P. Tooth brushing skills for the children aged 3-11 years. J Indian Soc Pedod Prev Dent 2009 Apr-Jun; 27:104-107.
18. Mc Greggor ID, Rugg-Gunn AJ. Survey of toothbrushing duration in 85 uninstructed English schoolchildren. Community Dent Oral Epidemiol 1979; 7:297-298.
19. Sandström A, Cressey J, Stecksén-Blicks C. Tooth-brushing behavior in 6-12 year olds. Int J Paediatr Dent 2011; 21:43-49.