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ORIGINAL STUDY

Effect of Health Educational Program on the Oral Health of Two Groups of Egyptian Primary School Children

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Abstract

Purpose: To investigate the influence of health education program on oral health of two groups of Egyptian primary school children in association with their socioeconomic status (the first group from governmental schools and the second group from private schools). **Patients and methods:** Four hundreds children age between 10-12 years from both genders were divided into two groups (n = 200) regarding to receiving health educational program: first group from the governmental schools and second group from private schools. Clinical examination was done to estimate Gingival index, Oral hygiene index (OHI−S) and Caries indices. A health education program has been implemented and follow up was done after 3 months. Gingival index, oral hygiene index and caries index were measured. **Results:** At base line, there was no statistically significant difference between gingival scores and Oral hygiene index scores in the two groups P value less than or equal to 0.05. After three months, participants from private schools showed statistically significantly lower median gingival scores and OHI−S scores than those from governmental schools. Whether in private or governmental schools at base line, and after three months; there was no major difference between caries scores in the two groups. **Conclusion:** Health education program is effective in enhancing oral health and reducing gingival index, oral hygiene index and caries index.

Keywords: Health education program, Oral health, Socioeconomic status

1. Introduction

Oral hygiene is a component of overall health that is seen as one of the dimensions of life-style quality [1]. Among the most important health concerns in children is the maintenance of dental hygiene [2]. Despite tremendous progress in recent times, oral health remains an important issue. The socioeconomic variations are most likely mirrored in the overall health, such as dental status, of the different groups [3]. It was discovered that the socio-economic status is inversely proportional to the incidence of dental diseases, which means that as socioeconomic level rises; the frequency and severity of dental diseases and their implications reduce, whereas people with low socioeconomic levels possess poor oral health. Although data on the prevalence of periodontal diseases in children and teenagers is restricted due to a lack of research and inconsistent evaluation standards, gingivitis of varying severity is believed to be prevalent in the vast majority of children and teenagers globally [4].

Gingival inflammation is the most frequent form of periodontal disease expression, as periodontal disorders include gingival diseases [5]. Poverty has long been linked to poor oral health. Poor socio-economic position in childhood has a negative influence on dental health, and the effects are profound, with negative consequences continuing into adulthood [6]. Longitudinal studies have found that parental work, money, or education as a kid is connected with periodontal disease in adulthood [7]. Oral health education plays a pivotal role in solving oral health problems, preventing common oral

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diseases, and promoting the oral health of the rural population. The World Health Organization suggested that school oral health promotion activities are effective in preventing oral diseases and promoting oral health among school children [8].

2. Material and methods

2.1. Sample size and calculation

Sample size is measured by utilizing the following equation [9,10]:

$$n = \left[\frac{Z_{\alpha/2} + Z_{\beta}}{P_1 - P_2}\right]^2 (p_1 q_1 + p_2 q_2)$$

N = sample size

$Z\alpha/2 = 1.96$

$Z\beta = 0.84$

p1 = Proportion of children who recognized the importance of teeth after the intervention program = 66%

p2 = Proportion of children who recognized the importance of teeth before the intervention program = 48%

q = 1-P So, sample size will be 114.7 in each group with 10% as nonresponse rate, the total sample size should be 127 children in each group.

2.2. Study design

This study was conducted on school children divided into two groups. The research was carried out over the course of 5 months from September 2020 to January 2021 in primary schools in Kafr El-Sheikh governorate to investigate the outcomes of health education program on oral health of group of primary school children and its relation to their socioeconomic status.

2.3. Ethical consideration

Approval of ethical committee had obtained (Code: REC-PE-22-05). Plaque, gingival and caries status were assessed by using Oral hygiene index, gingival index, and Caries index [11], respectively.

2.4. Inclusion criteria

Students at primary schools, age from 10 to 12 years both genders and children able to return for follow-up visits [12].

2.5. Exclusion criteria

Student who have medical illness, students taking any medication, uncooperative students and who undergoing orthodontic treatment [8].

2.6. Grouping of subjects

This study included (400) students, divided equally into two groups:

(1) First group was (200) students included from the governmental schools (EL-Mandora school) in grade 4, 5, and 6 which represent low socioeconomic level.
(2) Second group was (200) students included from private schools (EL-kawmia private school and EL-Tarbya EL-Haditha private school)in grade 4, 5, and 6 which represent high socioeconomic level.

Figure 1.

2.7. Children examination and education

Intra oral examination of oral tissue and teeth according to patient assessment chart before program intervention. Dental examination chart was filled to assess the soft and hard tissue condition using diagnostic aids including plane mouth mirror, explorer dental probe and blunt periodontal probe for recording Gingival Index, Oral Hygiene Index and Caries Index. All children were examined under adequate artificial light. 20 diagnostic sets were used for 20 children daily and next day the sets were sterilized. Children were given written recommendations for problems in their teeth and the need for treatment with follow-up. During base line visit the Gingival index, Oral hygiene index and Caries index were measured. The significance of brushing teeth, oral health and general health was explained for child. The patient was shown a proper brushing technique using demonstration on articulator. Informed consent obtained from school and from parents.

2.8. Interventions program procedure

The practical application on the child was carried out by using Modified Bass Technique [13] as shown in (Fig. 3). Children were advised to brush teeth after each meal. Toothbrush, Toothpastes were distributed and follow-up after 3 months to measure gingival index, oral hygiene index and caries index, as shown in (Fig. 2).

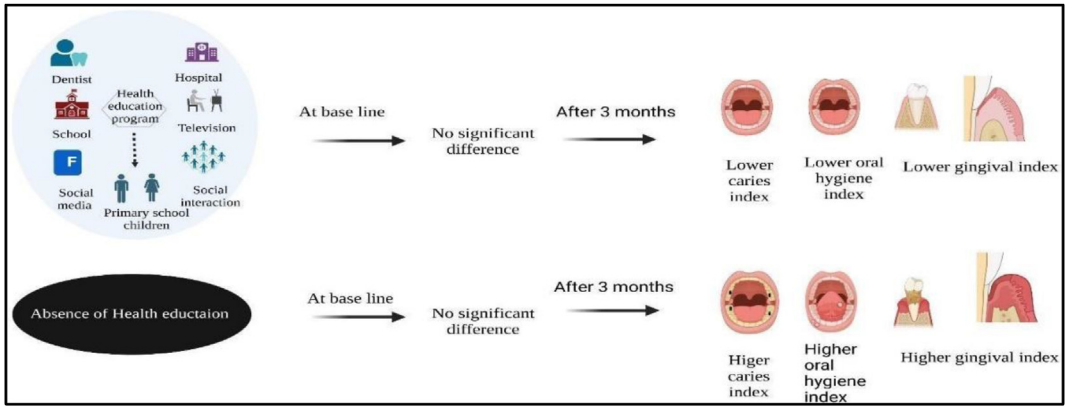

Fig. 1. Schematic representation of the influence of Health education program on oral health.

Fig. 2. Clinical examination.

Fig. 3. Demonstration for method of tooth brushing.

2.9. Statistical analysis

Numerical data were tested for normality by checking the distribution of data and using tests of normality. Age data showed parametric distribution while all scores data showed non-parametric distribution. Data were expressed as mean, standard deviation (SD), median and range values. For parametric data; Mann–Whitney *U* test was utilized for comparisons between two groups. Wilcoxon signed-rank test was used to study the changes after three months in each group. Qualitative data were expressed as frequencies and percentages. χ^2test was used for comparisons between gender distributions in the two school types. The significance level was set at *P* less than or equal to 0.05. Statistical analysis was done by IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

3. Results

3.1. Comparison between school types

3.1.1. Base line characteristics

There was no statistically major difference neither in the mean ages, nor in sex distributions between the two categories, as shown in Table 1.

Table 1. Descriptive analysis and results of Student's t-test and χ^2test in the two groups.

Baseline characteristics	Private (n = 200)	Governmental l (n = 200)	*P*-value
Age [Mean (SD)]	11.1 (0.8)	11 (0.8)	0.460
Sex [n (%)]			
Boy	100 (50%)	100 (50%)	1
Girl	100 (50%)	100 (50%)	

NS; Non-significant at *P* greater than 0.05.

3.1.2. Gingival index (GI)

Base line, there was no statistically major difference between GI scores in the two categories. After three months; participants from private schools showed statistically significantly lower median GI score than those from governmental schools, as shown in Fig. 4. As regards the changes in GI scores within each group; there was a statistically significant decrease in GI scores after three months, as shown in Table 2.

3.1.3. Simplified oral hygiene index (OHI–S)

At the base line, there was no statistically significant difference between OHI–S scores in the two groups. After three months; participants from private schools exhibited statistically significantly lower median OHI–S score than those from governmental schools, as shown in Table 3. As regards the changes in OHI–S scores within each group; there was a statistically significant decrease in OHI–S scores after 3 months, as regarded in Fig. 5.

3.1.4. Decayed, missed, filled (DMF) index

At the base line as well as after 3 months, there was no statistically significant difference between Decayed Missed Filled (DMF) scores in the two groups.

As regards the changes in DMF scores within each group, there was no statistically significant change in DMF scores after 3 months. Tables 4 and 5.

Figures 6 and 7.

3.1.5. Decayed, extracted, filled (def) index

At the base line as well as after 3 months, there was no statistically significant difference between def scores in the two groups.

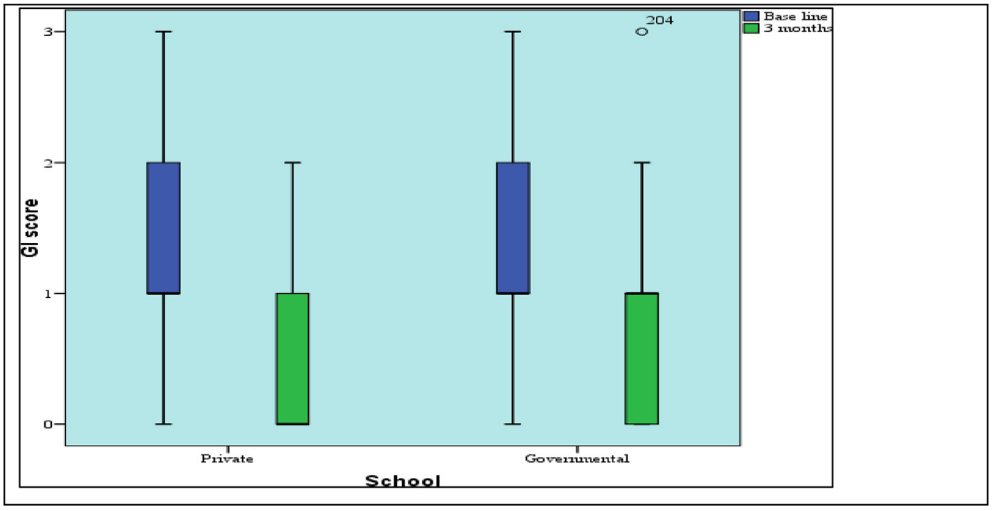

Fig. 4. Box plot showing median and range values for GI scores in private and governmental school.

Table 2. Descriptive for comparison between GI scores in the two groups.

GI	Private (n = 200)		Governmental (n = 200)		P-value	Effect size (d)
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)		
Base line	1.24 (0.72)	1 (0–3)	1.13 (0.72)	1 (0–3)	0.097	0.152
3 months	0.41 (0.55)	0 (0–2)	0.78 (0.68)	1 (0–3)	<0.001*	0.513
P-value	<0.001*		<0.001*			
Effect size (d)	0.818		0.572			

NS; Nonsignificant at P greater than 0.05.

Table 3. Descriptive statistics for comparison between OHI–S scores in the two groups.

OHI–S	Private (n = 200)		Governmental (n = 200)		P-value	Effect size (d)
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)		
Base line	1.04 (0.23)	1 (0.5–1.6)	1 (0.28)	0.9 (0.3–1.7)	0.114	0.157
3 months	0.72 (0.18)	0.7 (0.4–1.3)	0.83 (0.25)	0.8 (0.2–1.9)	<0.001*	0.512
P-value	<0.001*		<0.001*			
Effect size (d)	0.841		0.78			

NS; Nonsignificant at P greater than 0.05.

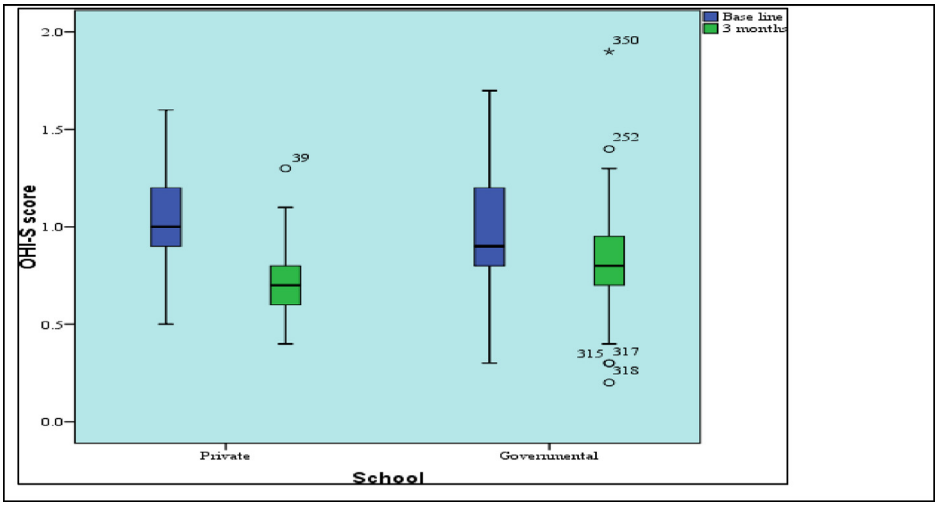

Fig. 5. Box plot representing median and range values for OHI–S scores in private and governmental schools (Circles and star represent outliers).

Table 4. Descriptive statistics and results of Mann–Whitney U test for comparison between DMF scores in the two groups and Wilcoxon signed-rank test for the changes within each group.

DMF	Private (n = 200)		Governmental (n = 200)		P value	Effect size (d)
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)		
Base line	1.79 (1.25)	2 (0–5)	1.82 (1.21)	2 (0–5)	0.638	0.045
3 months	1.82 (1.31)	2 (0–5)	1.82 (1.21)	2 (0–5)	0.704	0.037
P value	0.083	0				
Effect size (d)	0.122	1				

NS: Significant at P less than or equal to 0.05.

Table 5. Descriptive statistics and results of Mann–Whitney U test for comparison between def scores in the two groups and Wilcoxon signed-rank test for the changes within each group.

Def	Private (n = 200)		Governmental (n = 200)		P-value	Effect size (d)
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)		
Base line	2.96 (1.11)	3 (0–6)	2.91 (1.26)	3 (0–6)	0.515	0.063
3 months	2.57 (1.07)	3 (0–5)	2.64 (1.16)	3 (0–6)	0.594	0.051
P value	<0.001*	<0.001*				
Effect size (d)	0.59	0.475				

NS: Significant at P less than or equal to 0.05.

As regards the changes in def scores within each group, there was a statistically significant decrease in def scores after three months.

4. Discussion

Health care promotion is the process of encouraging individuals to have a direct authority over and improve their health Edelman and Kudzma [14]. Oral health education is a crucial and basic element of oral health services. Its goal is to promote oral health by educational techniques, namely the provision of information to increase oral health knowledge in order to encourage people to adopt a healthier lifestyle, as well as modify attitudes and behaviors Halawany and colleagues [15].

The current study's findings of both types of schools showed that the results of the Gingival Index, and the Simplified Oral Hygiene Index after 3 months when compared with the baseline readings had a significant difference ($P < 0.001$), with the least mean values belonged to group two (students of private and international schools). Within each group a significant difference was evident between the results of baseline and after 3 months ($P < 0.001$); this was a result of implementing the theoretical and practical oral health educational program that led to reduction in plaque and gingival scores through the change in tooth brushing rate, and the adoption of a proper tooth brushing technique.

On the other hand, Caries Index (DMF and def) results after 3 months in both groups when compared with the baseline readings showed no significant difference ($P = 0.704$ and $P = 0.594$, respectively). Moreover within each group, DMF results had no significant difference; but def scores

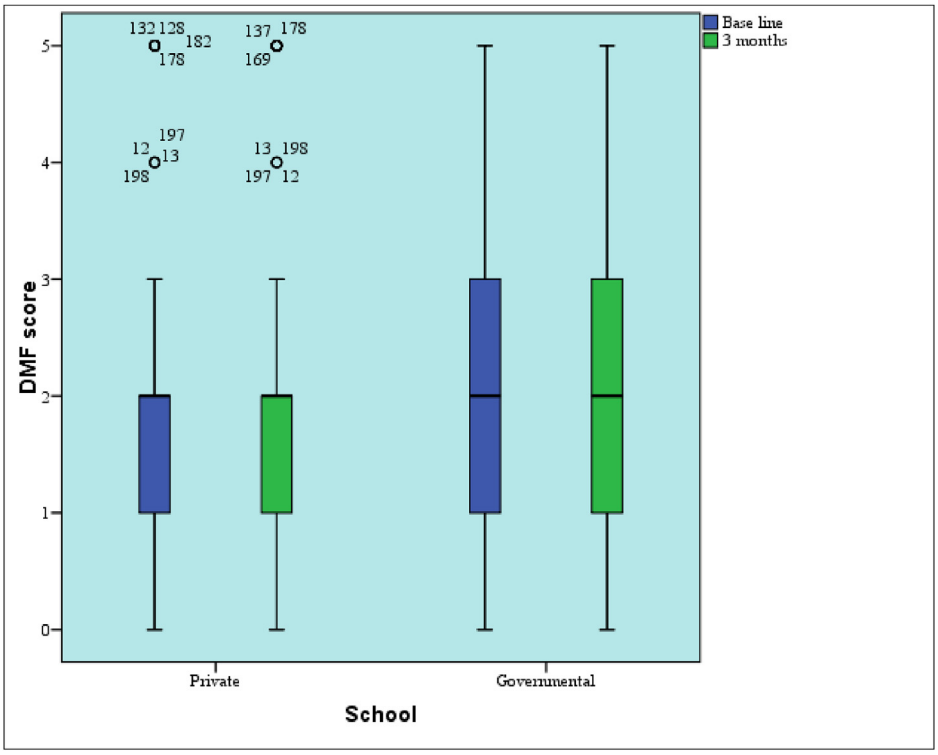

Fig. 6. Box plot representing median and range values for DMF scores in private and governmental schools (Circles represent outliers).

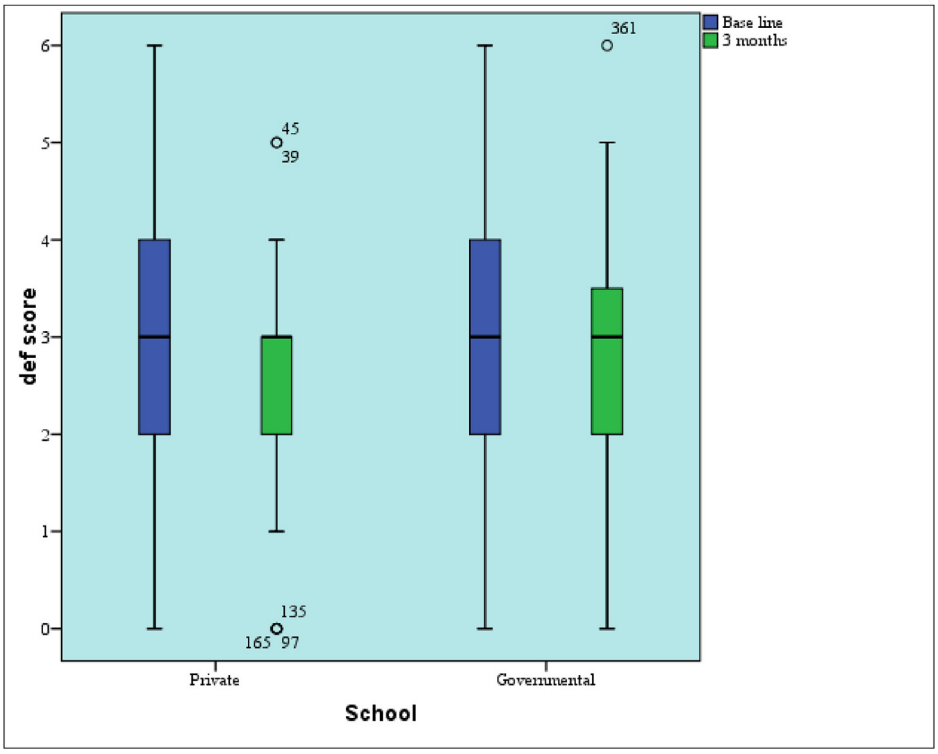

Fig. 7. Box plot representing median and range values for def scores in private and governmental schools (Circles represent outliers).

had a significant difference ($P < 0.001$). This can be due to the mixed dentition phase at which the children have shed primary teeth, and other permanent teeth have erupted. Although there are similar previous studies but this study is being conducted for the first time in Kafr El Sheikh governorate Geetha Priya and colleagues [16], we used Caries index, although there was no difference in the results during the follow-up, in order to benefit the students by examining them and identifying health problems related to their teeth and transferring them to specialized places to treat them with follow-up.

A study Ceylan and colleagues [17] was conducted through monitoring the caries index in 12 years old school children reached a conclusion that socioeconomic status and oral health practices have an impact on Caries Index and These results were in agreement with the present study.

Other researchers also found a relation between oral health educational programs and socioeconomic condition on the oral health conditions of school children whether their Gingival Index, Simplified Oral Hygiene Index, or Caries Index Khalid and colleagues [18]. The present study also conducted a comparison between boys and girls after applying the oral health educational program; after 3 months results showed no significant difference regarding Gingival Index, Simplified Oral Hygiene Index, and Caries Index, which come in accordance with previous study Bramantoro and colleagues [19].

The present study age group represents a particularly significant study group in caries epidemiology surveys for various reasons, including quick access to this population at school, the late stages of permanent tooth eruption (third molars omitted), and the initiation of self-made food and hygiene preferences Obregon-Rodriguez and colleagues [20]. Favorable health habits are best formed in the pre-adolescent and adolescent age groups, and once established, they have a high likelihood of being perpetuated throughout adulthood therefore this study included School-age children Ghaffari and colleagues [21].

Previous investigation has studied the relationship between several socioeconomic indicators and Oral Health-related Quality of Life (OHRQoL) in kids, teens, and adults Knorst and colleagues [22]. Even after adjusting for clinical variables, poor social status, low income, low educational attainment, and increased home crowding have been linked to adverse effects on OHRQoL. One reason is that those with lower SES are more susceptible to risk factors for systemic and oral health, and as a result, to dental diseases that could negatively affect the practical, emotional, and sociological aspects of quality of life Perez and colleagues [23]. Understanding how SES affects health implications and how they create various deficiencies among socioeconomic groups is necessary to address health inequities. The current investigation age group is an important research group in caries epidemiology surveys for various reasons: easy contact with this group at school, the final stage of permanent tooth eruption (third molars omitted), and the initiation of food and sanitation preferences Bramantoro and colleagues [19].

According to the current study, mean Simplified Oral Hygiene Index increased as socioeconomic level decreased, particularly, it was shown that kids with higher socioeconomic position had much better dental hygiene than kids with middle- or lower-class SES Elamin and colleagues [24]. This can be attributed to the fact that better oral cleanliness among more educated people, excellent income, more favorable attitudes about oral hygiene, and a higher frequency of dental appointments all contribute to oral health. According to the findings of the current survey, dentists are the most popular reference of oral health information (80.6%). These results are in accordance prior research on school children and university students Jain and colleagues [25].

4.1. Conclusion

This research confirms that even a thorough preventative program delivered by trained staff, coupled with free dental care, is unable to promote the oral health of children from lower socioeconomic backgrounds, and health education program is effective in enhancing oral health and reducing gingival index, oral hygiene index and caries index. Regardless of the execution of the awareness, a reflection of the profession's ethical obligation to teach children about oral disorders and their preventive measures should be performed.

5. Recommendation

Oral health education approaches should be concentrated on children, to promote the general health and social acceptance.

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Conflicts of interest

The authors declare that there is no conflict of interests.

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