



EFFECT OF ORAL HEALTH EDUCATIONAL PROGRAM ON DENTAL CARIES AND ORAL HYGIENE IN A GROUP OF ORPHAN CHILDREN: A BEFORE AND AFTER STUDY

Reem Mohamed Abd Al-Azeem* , Hala Mohy El-Deen Abbas** ,
Fatma Abdelgawad ***  and Samaa S Hanafy **** 

ABSTRACT

Aim: to assess the dental caries and oral hygiene status of orphans before and after an oral health educational program.

Methodology: This study was conducted on 139 orphans aged from 7-17 years old residing in five different branches in Egypt (Wadi Hof- Dokki- Helwan- Masr El Gedida- 6th of October). The study took 2 months and was conducted on four phases including a reinforcement session after 1 month. Dental caries experience was recorded using (DMF, def) index and oral hygiene status was measured using (OHI-S) index. The educational materials such as brochures, posters and PowerPoint presentation were used, as well as the distribution of oral hygiene aids such as tooth brushes and tooth pastes.

Results: There was a statistically significant difference before and after the educational program as the total mean of DMF decreased from (0.18) to (0.17), likewise total mean of def decreased from (0.92) to (0.73). Regarding oral hygiene, total participants with (good) score of the OHI-S increased from (0.83) to (1.59) and participants with (fair) score decreased from (1.76) to (1.7). Regarding Debris and Calculus index, the mean participants with good DI increased from (0.76) to (1.48). In addition, mean participants with good score of CI increased from (0.77) to (1.51).

Conclusion: The program was effective because there was an overall decrease in caries levels and enhancement of oral hygiene status.

KEYWORDS: Oral health education, Orphans, Dental caries, Oral hygiene, Oral hygiene Index- Simplified, Debris Index, Calculus Index.

* MSC Student Master degree in Dental Public Health, Military Institute of Health and Epidemiology, Military Medical Academy, Cairo. Egypt.

** Professor and Head of Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University.

*** Associate Professor in Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University.

**** Lecturer in Pediatric Dentistry and Dental Public Health Department, Cairo University.



INTRODUCTION

Oral health is considered a crucial component of general health because it's strongly correlated with major systemic diseases. Most widely spread diseases such as diabetes, cancer, obesity and cardiovascular diseases share common risk factors with dental diseases such as dental caries, periodontal diseases and dental infections (Winkelmann et al., 2022).

Dental caries is one of the most common non communicable diseases. It affects more than one-third of the world's population. According to the 2022 WHO Global Oral Health Status Report, Dental Caries of permanent teeth affects an estimated 2 billion individuals worldwide with the highest prevalence in the African Region (87%). In Egypt, statistics reported that 74% of children suffer from dental caries. It affects the child's normal activity causing sleep disturbances, school absenteeism and poor academic performance (World Health Organization, 2022; Jain et al., 2023).

Orphans are considered to be amongst the socially disadvantaged communities. They are deprived of their basic needs of parental care and supervision and suffer from significant health disparities. Studies showed an increase in the caries levels among orphan children aged 6 to 12 years. This indicates a high treatment need and an urgent need for long-term primary prevention programs (Chu et al., 2022; Mahmoud et al., 2022).

Oral health education is proven to be the most cost-effective method for the prevention of oral diseases. It helps to raise the oral health knowledge and awareness, encourages the individual to adopt healthy behaviors and allows early detection of oral diseases (Sharma et al., 2022).

The aim of the present study is to evaluate the impact of the oral health educational program on the dental caries and oral hygiene status of the orphans.

SUBJECTS AND METHODS

Study design and setting

This study was conducted as a before and after interventional study to assess the dental caries and oral hygiene status among orphans residing in five different branches.

Participants

Inclusion Criteria

- Orphan Children aged 7-17 years old.
- Educated children.

Exclusion Criteria

- Orphans with learning difficulty.
- Orphans with Medical conditions.
- Orphans that refused to participate in the study

Trial registration:

The study was retrospectively registered on clinicaltrials.gov with the identifier (NCT06897956).

The Ethical Committee

The Ethical Committee, Military Medical Academy reviewed and approved the protocol with no. (38-2024) concerning the scientific content and compliance with applicable research and human subjects regulations.

Sample size:

The sample size was calculated based on the results of (D'Cruz and Aradhya, 2013). Sample size calculation was performed using G*Power version 3.1.9.2, (Faul et al, 2007) University Kiel, Germany. Copyright (c) 1992-2014. The effect size d was 0.25 using alpha (α) level of 0.05 and Beta (β) level of 0.05, i.e., power = 90%; the estimated sample size (n) was 139 children.

Outcomes

- Dental caries experience.
- Oral hygiene status.
- Debris and calculus status.

Data source and management:

A total of 139 educated orphans including boys and girls aged 7-17 years old residing in five different branches in Egypt (Wadi Hof- Dokki- Helwan- Masr El Gedida- 6th of October) were selected to participate in this study. The study was conducted for a period of two months from August 2022 till October 2022 including a visit before starting the educational program in July 2022. Permission to conduct the study was obtained from the Military Medical Academy and the administration of the orphanages. Informed consent was obtained from the orphans' caregivers and supervisors of all branches.

The study was conducted at four phases. Phase 1 was a pilot study that involved a meeting with the supervisors and caregivers to get permissions and to determine the suitable days and time that fit the orphans' daily routine and their needs.

Phase 2 was a baseline assessment in which clinical examination was performed through recording the dental caries experience using the DMFT index for the permanent dentition and the (DMFT+deft) index for the mixed dentition. In addition to measuring oral hygiene status using the Oral hygiene Index-Simplified.

Phase 3 involved conducting a 60-minutes oral health educational program in Arabic language. The caregivers also attended the program. The program focused on the risk factors and prevention of dental caries, the dental plaque stages, the importance of tooth brushing and the role of healthy nutrition in maintenance of oral health. The program was delivered in the form of a 15-minutes PowerPoint presentation and video illustrating tooth brushing technique.

Simulation method for tooth brushing (Roll technique) and dental flossing on a dental model

was performed followed by a hands-on session where each participant was allowed to perform tooth brushing on dental model under observation in addition to interactive activities about healthy/unhealthy food for teeth.

Printed posters for tooth brushing were hung in the main hall and bathrooms of every branch. Oral care packages were distributed to all participants which contained a brochure, a tooth brush, a fluoridated tooth paste and tooth brushing chart.

A reinforcement session was conducted one month from baseline where the educational information was repeated to ensure retention of information and compliance of participants.

The Post intervention (phase 4) was performed after 2 Months, the participants were reassessed after the educational program through remeasuring dental caries and oral hygiene status using the previously used indices.

Statistical Analysis:

Data management and statistical analysis was performed using the computer program SPSS software for windows version 26.0 (Statistical Package for Social Science, Armonk, NY: IBM Corp). All data were collected, calculated, tabulated and statistically analyzed using the following statistical tests. A normality test (Kolmogorov-Smirnov) was performed to check normal distribution of the samples. Descriptive statistics was calculated in the form of Mean $\pm$ Standard deviation (SD). The Chi-square test was used to test significance of association between categorical variables. Dependent Student's T-test (paired) was performed for comparison of the mean differences between pre and post for Clinical Examination (Dental Caries Index). Qualitative data were presented as frequencies (n) and percentages (%). P value ≤ 0.05 was considered to be statistically significant.

RESULTS

Demographic data

The study was conducted on 139 cases from five different locations: Wadi hof (30), Dokki (20), Helwan (45), Misr El Gedida (20) and 6th October (24). According to gender in the total population, 52.5% were females and about 47.5% were males. According to age, about 57.6% were less than 13 years and 42.4% were more than 13 years. All respondents had some form of basic education. About (11.5%) 1st primary grade and (14.4%) 2nd secondary grade.

Assessment of dental caries:

There was a statistically significant difference of DMF & def between pre and post intervention for all locations. Both DMF & def decreased in all locations except in Wadi Hof which demonstrated a rise in DMF from 0.253 to 0.257 post intervention. The filled teeth increased the most in Misr El Gadida

branch from 0.44 to 1.22. The Decayed permanent teeth decreased the most in Wadi Hof branch from 0.63 to 0.37. The total mean of DMF decreased from 0.18 to 0.17, likewise total mean of def decreased from 0.92 to 0.73 as shown in table (1).

Assessment of oral hygiene status:

There was a significant difference between pre and post intervention for DI, CI and OHIS. These indices were fluctuated for all locations. The mean values for these indices post intervention were higher than pre intervention as shown in figure (1). The mean participants with good OHI-S score increased from (0.83) to (1.59). All participants had fair OHI before the program, however after the education program, the mean participants with fair OHI decreased from (1.76) to (1.7). participants with good DI increased from (0.76) to (1.48) while CI was increased from (0.77) to (1.51) as shown in figure (1).

TABLE (1) Total overall mean (Dental Caries Index)

			pre	post	P value
Wadi Hof	Permanent	DMF	0.253	0.257	ns
	deciduous	def	1.177	1.043	0.04*
El-Doki	Permanent	DMF	0.167	0.167	ns
	deciduous	def	1.240	0.860	0.03*
Helwan	Permanent	DMF	0.217	0.207	ns
	deciduous	def	0.667	0.517	0.04*
Misr El Gedida	Permanent	DMF	0.133	0.133	ns
	deciduous	def	1.000	0.777	0.0
6th October	Permanent	DMF	0.110	0.110	ns
	deciduous	def	0.500	0.453	ns
Total over all mean	Permanent	DMF	0.18	0.17	ns
	deciduous	def	0.92	0.73	0.02*

** means significant ($p \leq 0.05$) ns; non-significant ($p > 0.05$)

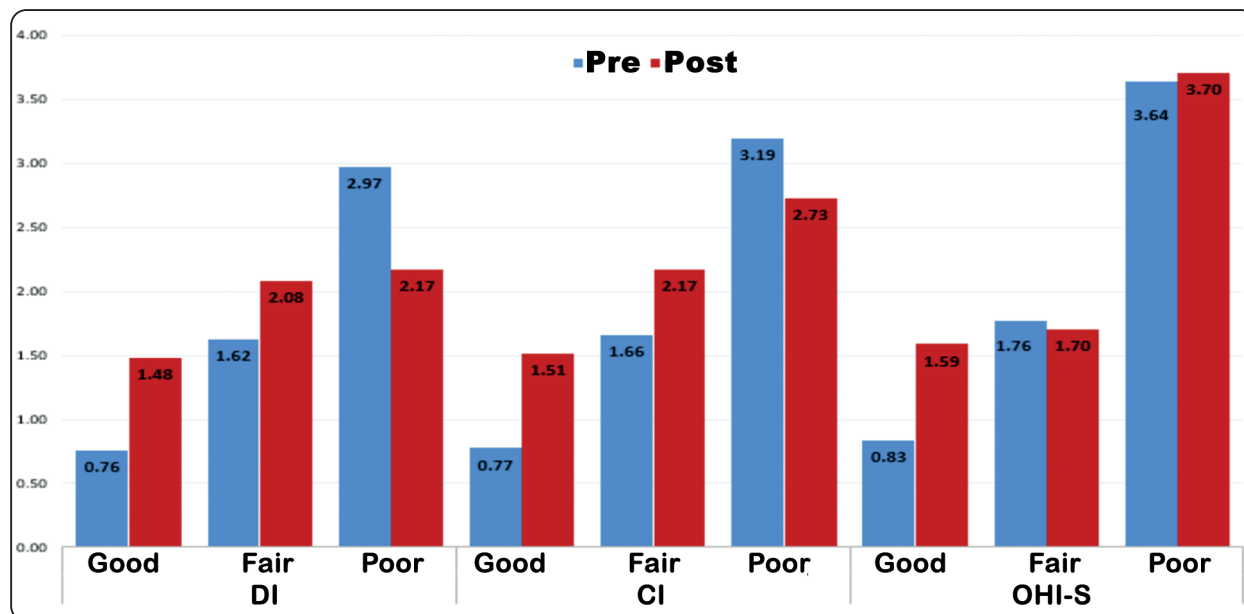


Fig. (1) Total overall mean of OHI-S in all branches.

DISCUSSION

The dental caries index (DMF) was chosen in the current study since it is the simplest, most extensively used, internationally understood, and recommended by WHO (Ahmed et al., 2023). The assessment of oral hygiene status was conducted by using (OHI-S) since it provides a quantitative and composite measure of oral hygiene as it entails both the debris and calculus components, making it easier to trace changes over time (Re et al., 2021).

The educational program was conducted through PowerPoint presentation since it was feasible and provided favorable acceptability to the majority of audience with diverse educational backgrounds in comparison with different methods, our study was compatible with (Sistani et al., 2022). Additionally, the usage of video due to the effectiveness of audiovisual aids in active participation of the targeted audience, our study agreed with (Kavitha et al., 2023), who proved the significant role of videos in enhancing knowledge, attitude and practice compared to conventional methods.

Simulation of tooth brushing was demonstrated through employment of the roll technique which allied with (Iba, & Adamu, 2021) and (Laurent Citradi et al., 2022), as it is one of the most commonly acknowledged brushing methods for general use since it ensures the meticulous massage of gum tissues and elimination of dental plaque from all tooth surfaces. Furthermore, the dissemination of brochures and hanging posters with tooth brushing and flossing instructions was comparable to (Bramantoro et al., 2021).

The overall mean of DMF decreased from (0.18) to (0.17) after the educational program, our study resonated with (Park et al., 2024). The Decayed teeth decreased mostly in wadi Hof branch from (0.63) to (0.37) and the Filled teeth increased from (0.10) to (0.37) due to referral of the participants to the primary dental hospital for treatment, our study complied with (Adiningrat and Farani, 2023). The total def index decreased from (0.92) to (0.73), our study lined up with (Kalevski et al., 2021). On the contrary, our study contradicted with (Subedi et al., 2021) who showed no significant difference in mean DMF.

The majority of districts had fair OHI-S scores pre intervention except the Doki branch, this corresponded to (Baishya et al., 2020). However, after the educational program, all participants in the five branches scored good OHI-S, which coincided with (Kumari et al., 2021) and (Kumala Dewi et al., 2022).

There was a significant difference with more participants scored good scores from (0.83) to (1.59) post intervention. The highest percentage of good scores (90%) was manifested in Misr El Gegida branch since its participants had the best oral hygiene practices (Babaei et al., 2023).

Most of the participants had a fair DI score before the educational program, however participants with good DI increased from (0.76) to (1.48) after the program. The mean participants with good CI score increased from (0.77) to (1.51). Our study coincided with (Rashid and Othman, 2022).

The results of our study aligned with (Hanafy and Abdelmoniem, 2022), who assessed the oral health status before and after 3 months oral health educational program in Egyptian children aged 8–12 years old. There was a significant increase in cases with “Good” scores after the program implementation ($p < .001$).

CONCLUSIONS

- All the studied participants showed statistically significant difference in dental caries.
- Most of the participants demonstrated fair OHI-S before the educational program, while after the implementation of program it increased.
- The program was effective because there was an overall decrease in caries levels and enhancement of oral hygiene status.

RECOMMENDATIONS

- Execution of basic preventive oral health programs in schools following the WHO health promotion schools focusing on caries prevention measures, oral hygiene and dental visits.

- Integration of oral health education in the primary health care.
- Incorporation of oral health education messages in school curriculum.
- Planning extensive oral health training to caregivers in orphanages.
- Dietary Counseling to caregivers and children in orphanages that foster healthy eating patterns.

REFERENCES

1. Adiningrat, A. and Farani, W. 2023. Support the program of caries-free Indonesia in 2030: Optimizing oral health promotion at an early age. *Community Empowerment*. 8(8), pp.1251–1256.
2. Ahmed, M.A., Jouhar, R., Faheemuddin, M., AlJafar, A., Alabawi, H., Alhumaidi, B. and Al Madeh, M. 2023. Assessment of Oral Health Knowledge, Attitude, Practice and DMFT Scores among Patients at King Faisal University, Al-Ahsa. *Medicina (Lithuania)*. 59(4), pp.1–15.
3. Babaei, A., Pakdaman, A., Shamshiri, A.R., Khazaei, P. and Hessari, H. 2023. One-year oral health outcome of a community-based trial in schoolchildren aged 6-7 years old in Tehran, Iran. *PLoS ONE*. 18(4 April), pp.1–13.
4. Banashree Baishya, Anurag Satpathy, Rashmita Nayak, R.M. 2020. Oral hygiene status, oral hygiene practices and periodontal health of brick kiln workers of Odisha. . (May), pp.113–118.
5. Bramantoro, T., Santoso, C.M.A., Hariyani, N., Setyowati, D., Zulfiana, A.A., Nor, N.A.M., Nagy, A., Pratamawari, D.N.P. and Irmalia, W.R. 2021. Effectiveness of the school-based oral health promotion programmes from pre-school to high school: A systematic review. *PLoS ONE*. 16(8 August), pp.1–16.
6. Chu, D.T., Thi, H.V., Al-Tawfiq, J.A. and Memish, Z.A. 2022. Children orphaned by COVID-19: A grim picture and the need of urgent actions. *Travel Medicine and Infectious Disease*. 50(September), p.102446.
7. D'Cruz, A.M. and Aradhya, S. 2013. Impact of oral health education on oral hygiene knowledge, practices, plaque control and gingival health of 13- to 15-year-old school children in Bangalore city. *International Journal of Dental Hygiene*. 11(2), pp.126–133.

8. Hanafy, R.M.H. and Abdelmoniem, S.A. 2022. Impact of an oral health education program in Egyptian children with attention deficit hyperactivity disorder: A cross sectional study. *Special Care in Dentistry*. 42(3), pp.252–256.
9. Iba, B., & Adamu, V.E. 2021. Tooth brushing: An effective oral hygiene measure. *Orapuh Journal*. 2(2), pp.1–7.
10. Jain, N., Dutt, U., Radenkov, I. and Jain, S. 2023. WHO's global oral health status report 2022: Actions, discussion and implementation. *Oral Diseases*. (January).
11. Kalevski, K., Vojinovic, J., Gajic, M., Aleksic, E., Tambur, Z., Milutinovic, J., Borotic, N. and Mladenovic, R. 2021. The outcomes of an interventional oral health program on dental students' oral hygiene. *International Journal of Environmental Research and Public Health*. 18(24).
12. Kavitha, M., Devi, T.S., Prathima, G., Shankar, S., Anusha, D. and Babu, E. 2023. Effectiveness of Oral Health Education Using Child Model Video vs Conventional Education by Dentist among Orphanage Children of Puducherry, India: A Prospective Interventional Study. *Journal of Clinical and Diagnostic Research*. 17(December 2021), pp.2021–2024.
13. Kumala Dewi, R., Qotrunnada Hakim, A., Oktiani, B.W. and Nabila, N. 2022. the Effectiveness of Video Dental Health Education Special Needs Children on the Oral Hygiene Status. *Dentino : Jurnal Kedokteran Gigi*. 7(2), p.198.
14. Kumari, A., Marya, C., Oberoi, S.S., Nagpal, R., Bidyasagar, S.C. and Taneja, P. 2021. Oral hygiene status and gingival status of the 12-to 15-year-old orphanage children residing in delhi state: A cross-sectional study. *International Journal of Clinical Pediatric Dentistry*. 14(4), pp.482–487.
15. Laurent Citradi, J., Hatta, I. and Azizah, A. 2022. the Effectiveness of the Roll Tooth-Brushing Technique Toward Gingival Health Status of Totally Blind People. *Dentino : Jurnal Kedokteran Gigi*. 7(1), p.1.
16. Mahmoud, S.A., El Moshy, S., Rady, D., Radwan, I.A., Abbass, M.M.S. and Al Jawaldeh, A. 2022. The effect of unhealthy dietary habits on the incidence of dental caries and overweight/obesity among Egyptian school children (A cross-sectional study). *Frontiers in Public Health*. 10.
17. Park, S.A., Lim, J.N. and Lee, J.Y. 2024. Evaluation of the Effectiveness of Children's Dental Care Programs: A Retrospective Study. *Healthcare (Switzerland)*. 12(7), pp.1–12.
18. Rashid, B. and Othman, Z.Y. 2022. EAJSE Initial Impact of an Educational Program Programme for the Orphans in Erbil City. . 8(1), pp.180–186.
19. Re, P.R., Purnama, T., Tauchid, S.N. and Prihatiningsih, N. 2021. Knowledge of Oral and Dental Health Impacts the Oral Hygiene Index Simplified (OHI-S) of Primary School Children. (September), pp.4–9.
20. Sharma, S., Mohanty, V., Balappanavar, A.Y., Chahar, P. and Rijhwani, K. 2022. Role of Digital Media in Promoting Oral Health: A Systematic Review. *Cureus*. 14(9).
21. Sistani, M.N., Karami, S. and Heravi, M.D. 2022. Promoting Oral health in Elementary students: Implementing Presentation and Practical Methods. *Int Pediatr*. 10(99), pp.15640–15652.
22. Subedi, K., Shrestha, A., Bhagat, T. and Baral, D. 2021. Effectiveness of oral health education intervention among 12–15-year-old school children in Dharan, Nepal: a randomized controlled trial. *BMC Oral Health*. 21(1), pp.1–11.
23. Winkelmann, J., Listl, S., Ginneken, E. Van, Vassallo, P. and Benzian, H. 2022. Comment Universal health coverage cannot be universal without oral health. *The Lancet Public Health*. 2667(22), pp.10–12.
24. World Health Organization (ed.). 2022. Global oral health 2022nd ed. 18 November 2022.