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Assessment of Dental Caries among a Group of Foundation Orphan Children and Parented School Children

***Mohamed Karam Shakshak[1], Rehab Ahmed Soliman[2], Raafat Hassan Anwar Riad3**

[1]Dental Department, Al-Khanka Specialized Hospital, Egypt

[2]Faculty of Dentistry, Misr International University (MIU), [3]Military Medical Academy, Oral Surgery Department Egypt

***Corresponding author: Mohamed Karam Shakshak**, **Mobile:** +201092047430, **E-mail:** mohamedkaramshakshak@gmail.com

ABSTRACT

Background: Children living in orphanages are often exposed to unfavorable socioeconomic and health conditions, which may affect their oral health status compared to their parented peers.

Aim: This study aimed to assess and compare the prevalence of dental caries and associated risk factors between foundation orphan children and parented schoolchildren. **Method:** A comparative cross-sectional study was conducted involving 100 children aged 6–14 years, divided equally into two groups: Group A (orphaned children living in an institution) and Group B (parented schoolchildren). Data on sociodemographic factors, oral hygiene habits, dietary behaviors, and dental visits were collected through interviews. Clinical oral examinations assessed the DMFT index, gingival index, plaque index, and presence of early childhood caries (ECC). **Results:** Orphaned children had significantly higher DMFT and DMFS scores poorer among orphans, with lower brushing frequency and fluoride toothpaste use. Higher consumption of sugary snacks and beverages, along with fewer dental visits, was observed among orphans. Gingivitis, gingival bleeding, and plaque accumulation were also more prevalent in the orphan group. Multivariate regression identified orphan status with frequent sugar intake and low socioeconomic level as strong predictors of dental caries.

Conclusion: Orphaned children exhibited significantly poorer oral health and hygiene behaviors compared to parented schoolchildren. Institutionalized care settings require targeted oral health interventions and policy attention to bridge the health disparity gap and improve the quality of life in this vulnerable population.

Keywords: Dental caries, Orphans, Oral health, DMFT, Gingival index, Socioeconomic status, Oral hygiene behavior.

INTRODUCTION

Family support and care are crucial factors in a child's overall well-being and health, including oral and dental health [(1)]. Children tend to imitate their parents in essential health behaviors, and their caries experience is influenced by their cultural knowledge and attitudes toward oral health [(2–4)]. The prevention of dental caries depends on a balanced diet and proper oral hygiene—both of which should be supervised by a responsible guardian to ensure the child enjoys good dental health and general well-being [(5)]. Seeking professional preventive care and early dental treatment is another essential family responsibility in maintaining a child's oral health [(6)].

The compromised socioeconomic status of institutionalized orphans—along with issues such as overcrowding, a low caregiver-to-child ratio, poor nutrition, inadequate psychological support and limited access to dental care—contributes to their poor oral health. Additionally, the undervaluation of dental care by caretakers in these institutions exacerbates the situation. Studies show that institutionalized orphans have significantly worse oral health compared to their parented counterparts, including higher rates of dental caries, dental trauma, pain, and poor oral hygiene [(7)].

The World Health Organization (WHO) recommends that oral health education and dental services be designed based on survey data that reflect the needs of the community. While many descriptive studies have assessed the prevalence of dental caries in various populations, few have specifically examined homeless or institutionalized children especially within the Egyptian context [(8)]. It is widely believed that a caregiver's presence and support are vital to a child's oral health and well-being, including their experience with dental caries. When a child is deprived of such care, their overall health and particularly their oral health is likely to deteriorate. To the best of our knowledge, the dental caries experience of institutionalized children who lack family care in comparison with children raised by their parents in Egypt remains underexplored [(9)].

Primary teeth are essential to both oral and general health, influencing a child's quality of life. Maintaining healthy primary teeth until the eruption of permanent successors is crucial for proper occlusal development and the preservation of arch form integrity. Dental caries, traumatic injury, and other conditions that affect both primary and permanent teeth can result in severely decayed teeth. Globally, dental caries is the most common chronic childhood disease.

This study aimed to assess the dental caries among a group of foundation orphan children compared to parented school children after oral health educational program.

PATIENTS AND METHODS

This was a comparative cross-sectional study that aimed to assess and compare the prevalence and severity of dental caries in two populations of children: Orphans living at the Al-Yasmin Foundation and schoolchildren attending Dr. Gamal El-Den Private School. Standardized indices were employed for the evaluation of oral health outcomes, including the DMFT index, Restorative Care

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Index, and Unmet Treatment Needs Index. Al-Yasmin Foundation is a non-governmental care facility for orphaned children, while Dr. Gamal El-Den Private School is a private school for children with parental care. The sample population consisted of 6- to 12-year-olds from both facilities, boys and girls, to identify differences in dental health between populations with different living standards and access to oral health care.

All data were anonymized, with confidentiality respected. There was minimal risk of harm associated with the study, though minor fatigue may have occurred during examinations. In instances where dental treatment was necessary, such as endodontic therapy, it was carried out under controlled conditions in the researcher's clinic.

Inclusion criteria: Children aged between 6 and 12 years, mentally healthy, cooperating in clinical examinations and without serious systemic conditions or major dental surgeries in the past that could affect oral health.

Exclusion criteria: Children with mental disorders, developmental disorders, with acute medical conditions, or whose guardians refused to be participants in the study.

This cautious sampling was important to maintain consistency and reduce confounders affecting oral health outcomes. The sample consisted of 100 children: 50 children were recruited from Al-Yasmin Foundation and 50 children from Dr. Gamal El-Den Private School. Sample size was computed by G*Power software (version 3) based on a previous 2023 study, for a 95% confidence interval, using an actual statistical power of 95.14%. Orphan children who lived full time in the foundation at least six months previously, usually with very limited access to dental care or preventive oral health education, were included in the study group. Children in the control group had been living with their biological parents and attending private school, thus having regular access to dental care and oral hygiene education. Matching by age, gender, and socioeconomic status was undertaken to reduce potential confounding effects.

The data collection consisted of educational interventions combined with clinical examinations and structured questionnaires. Educational tools used in this study included flyers, posters, videos and lectures to increase participants' awareness of oral hygiene. Clinical examinations were performed with conventional dental instruments, like mirrors, probes, tweezers, and cotton rolls, which were sterilized before use. The examiners adhered to the norms of infection control: wearing gloves, masks, and face shields.

Prior to the actual study, calibration was done on children attending Shakshak Dental Clinic to standardize the examination procedures. Assessment of the children's teeth took place in the same clinic. Data were collected in three sessions over one week and repeated after six months for follow-up. Parental or guardian consent was obtained for all participants, and coordination with administrators in both institutions ensured smooth and systematic data collection.

Assessment measures: Demographic data of age, gender, and socioeconomic status were elicited from each participant. Socioeconomic status of orphan children was estimated based on their parental education, employment, family size, and income prior to orphanhood. Oral hygiene behavior of the study participants was assessed based on a structured questionnaire regarding toothbrushing frequency, the use of fluoride toothpaste, pattern of dental visits, dietary habits, especially cariogenic food and drinks. The clinical dental examination consisted of DMFT and DMFS indices, recording tooth-level and surface-level information on first molars. Caries were classified into ECC in children below six years of age and caries in permanent teeth in children aged six years and above.

Ethical considerations: Ethical approval was obtained from Military Medical Academy Review Board. Participating institutions and guardians provided informed consents, while participants were aware that they had the right to withdraw from the study at any time without penalty. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

Data management and statistical analysis were entered and cleaned using SPSS version 23. Descriptive statistics summarized demographic, socioeconomic, dietary and oral hygiene variables. Chi-square tests were employed for categorical variables, while the Mann-Whitney U test analyzed continuous non-parametric data such as DMFT, DMFS, dietary intake and gingival scores. Spearman's rank correlation coefficient was used for correlation analyses and multiple linear regression identified predictors of higher DMFT scores. A p-value ≤ 0.05 was considered statistically significant, while p-values ≤ 0.001 indicated high significance. Graphs and charts were used to illustrate differences in dental health outcomes between the two groups.

RESULTS

The current study included 100 children divided equally into two groups: Orphans (Group A) and parented children (Group B). Age and gender distribution were comparable between the groups indicating adequate demographic matching. However, significant differences were observed in socioeconomic characteristics. Orphaned children had lower parental education, reduced family employment and lower household income compared to parented children, highlighting socioeconomic disparities that could influence health behaviors and access to dental care (Table 1).

Table (1): Demographic and socioeconomic characteristics of both studied groups

Variable	Category	Group A (Orphan, n=50)	Group B (Parented, n=50)	Total (n=100)	p-value
Age (years)	6–8	24	24	48	0.491
	9–12	26	26	52	
Gender	Male	30	30	60	0.491
	Female	20	20	40	
Parental Education	Low/High	40 / 10	15 / 35	55 / 45	0.000***
Employment Status	Yes/No	18 / 32	45 / 5	63 / 37	0.000***
Income Category	Low/High	46 / 4	20 / 30	66 / 34	0.000***
Family Members (mean ± SD)	—	—	5.6 ± 1.3	—	—

Oral hygiene practices differed markedly between the groups. None of the orphans brushed their teeth twice or more daily, whereas the majority of parented children (80%) met this recommended frequency. Similarly, fluoride toothpaste usage and dental visits in the past year were significantly lower among orphans. These findings suggest that orphaned children had limited supervision and guidance regarding oral hygiene, which likely contributes to their poorer oral health outcomes (**Table 2).**

Table (2): Oral hygiene practices of both studied groups

Variable	Group A (Orphan)	Group B (Parented)	Total	p-value
Tooth Brushing (≥2/day)	0 (0%)	40 (80%)	40 (40%)	<0.001
Use of Fluoride Toothpaste	28 (56%)	46 (92%)	74 (74%)	<0.001
Dental Visit in Past Year	17 (34%)	31 (62%)	48 (48%)	0.005

Dietary habits further accentuated the risk profile of orphaned children. They consumed significantly more sugar, snacks, and soft drinks compared to parented children. The mean sugar intake for orphans was nearly five times per day, while parented children consumed less than once per day on average. Frequent intake of cariogenic foods and beverages among orphans may partly explain the higher prevalence of dental caries observed in this group (Table 3).

Table (3): Dietary Habits of both studied groups of both studied groups

Variable	Group A (Orphan) Mean ± SD	Group B (Parented) Mean ± SD	p-value
Sugar Intake (times/day)	4.50 ± 1.16	0.92 ± 0.80	<0.001
Snack Intake (times/day)	2.84 ± 0.82	0.82 ± 0.85	<0.001
Soft Drink Intake (times/week)	5.16 ± 1.08	1.06 ± 0.79	<0.001

Dental caries assessment revealed that orphans had significantly higher decayed and missing teeth than parented children, whereas filled teeth did not differ significantly, indicating limited access to restorative care. The overall DMFT and DMFS scores were substantially higher among orphans and caries in first molars was more prevalent. Interestingly, early childhood caries prevalence was similar in both groups, suggesting that initial caries risk may be comparable, but progression is worse among orphans due to lack of preventive and therapeutic interventions (Table 4).

Table (4): Dental caries (DMFT/DMFS) of both studied groups

Component	Group A (Orphan)	Group B (Parented)	p-value
D (Decayed)	2.48 ± 2.44	0.96 ± 1.42	0.001**
M (Missing)	0.32 ± 0.80	0.02 ± 0.14	0.003**
F (Filled)	1.40 ± 1.65	1.18 ± 1.77	0.42
DMFT	4.88 ± 1.44	1.08 ± 0.83	<0.001
DMFS	6.34 ± 6.27	3.04 ± 4.57	<0.001
Caries in 1st Molar	32/50 (64%)	21/50 (42%)	0.028
ECC Presence	35/50 (70%)	35/50 (70%)	1.000

Gingival and plaque status also showed notable differences. Orphans had significantly higher plaque accumulation and were more likely to have gingivitis and gum bleeding on probing compared to parented children, despite similar gingival index scores. These findings reflect the combined impact of poor oral hygiene practices and dietary habits on periodontal health. Overall, the study demonstrated that orphaned children were at higher risk of oral diseases, emphasizing the need for targeted preventive programs, caregiver training and improved access to dental care to reduce these disparities (Table 5).

Table (5): Gingival and Plaque Status of both studied groups

Parameter	Group A (Orphan)	Group B (Parented)	p-value
Gingival Index (Loe & Silness)	0.97 ± 0.50	0.99 ± 0.50	0.817
Plaque Accumulation	2.56 ± 0.50	1.08 ± 0.83	<0.001
Gingivitis (Yes)	35 (70%)	20 (40%)	0.006
Gum Bleeding on Probing (Yes)	32 (64%)	18 (36%)	0.010

DISCUSSION

Parentless children who grow up in institutional environments are a socially disadvantaged group that faces numerous risk factors for poor oral and general health. Lack of support from family members, lower ratios of caregivers to children, and inadequate access to preventive health routines greatly raise their risks for poor oral health outcomes [11]. Most studies report that children growing up in institutions present higher caries and gingival diseases and dental traumatism compared to children who belong to families due to insufficient supervision, improper hygiene and inadequate levels of oral health awareness among caregivers [12, 13].

Socioeconomic inequalities are thus strong contributors to these oral health inequalities. Orphaned children in the current study predominantly came from backgrounds characterized by low levels of parental education, unemployment and lower household incomes prior to their institutionalization. This finding is in agreement with **Khattab and Abd-Elsabour [11]**. Systematic reviews have also identified that orphans face ongoing socioeconomic disadvantages, which increase caries risk and reduce access to healthy nutrition, fluoridated products, and routine dental care, exacerbating the overall prevalence and severity of caries [12, 14]. Identifying similar international findings, **Burnett *et al.* [15]** stressed that orphaned children in Addis Ababa lacked the health and hygiene facilities necessary to meet their needs, while **Edelstein [13]** demonstrated unmet dental needs among low-income children in the United States and highlighted the global nature of socioeconomic determinants.

Prolonged residential stay, poor training of caregivers, and a general lack of structured oral health programs are some institutional factors that further worsen the oral health disparities. In this study, 40% of the orphaned children had stayed in institutions for more than 24 months, which might impact their oral hygiene practices and frequency of health education.

Shah *et al.* [16] and **Meshki *et al.* [17]** found that the lack of supervision by adults in an institutional setup undermines oral health literacy and maintenance, thereby increasing caries and gingival disease prevalence. **Christian *et al.* [18]** and **Abedassar *et al.* [19]** also demonstrated that institutionalized children brushed their teeth less frequently and used non-fluoridated toothpaste more often than parented children, with caregiver influence being a major determinant of daily oral hygiene habits.

Dietary behavior is another critical contributor to oral health disparities. In the current study, orphaned children consumed significantly more sugary snacks and soft drinks than their parented counterparts, which strongly correlated with higher DMFT scores. Multivariate regression models confirmed orphan status, frequent sugar consumption, and low socioeconomic level as most indicative of dental caries, while brushing frequency and fluoride use were weaker predictors. **Liu *et al.* [14]** highlighted that parents' guide and moderate sugar intake promote preventive practices, whereas **Sinha *et al.* [20]** and **Bennadi *et al.*** [21] reported frequent consumption of cariogenic foods in orphanages added to dental disease risks.

These behavioral and socioeconomic observations are corroborated by clinical findings. Orphaned children had significantly higher DMFT and DMFS scores, with decayed and missing components higher than those in parented children, reflecting poor access to restorative care. The filled component did not differ significantly between groups, suggesting that treatment provision was low in both populations, but its impact in orphans was more pronounced because of their greater disease burden. Prevalence of early childhood caries did not differ significantly between groups, indicating that initial caries risk might be similar, but institutional factors and the lack of preventive interventions lead to a worse condition in permanent teeth [11, 12, 18]. The above findings agree with previous Egyptian studies and international ones, including **Khattab and Abd-Elsabour [11]**, **Gamal AbdelNaser *et al.* [12]** and **Booth *et al.* [15, 22]** who showed high untreated caries and unmet treatment needs among orphaned children worldwide.

These differences again reflected poor oral hygiene and institutional care, with significantly higher plaque

accumulation, gingivitis prevalence and bleeding on probing in orphaned children, although gingival index scores were comparable for the two groups. **Burnett *et al.*** [15] and **Soni *et al.*** [23] speculated that this resulted from a lack of supervision, low levels of caregiver involvement and limited access to professional prophylaxis within institutions. Poor oral hygiene combined with high-frequency sugar intake suggests that both behavioral and dietary factors have dual roles in driving both caries and early periodontal disease among orphans [17]. These findings add to the evidence of the multifactorial etiology of oral health disparities in orphaned children. In particular, protective effects from personal oral hygiene habits may be swamped by powerful systemic social determinants such as orphanhood, socioeconomic deprivation and institutional neglect. This again underlines the need for integrated treatment combining clinical treatment with education of caregivers, structured oral health programs and policies for improvement in nutrition and access to dental care [11–20, 23].

In aggregate, these findings point to a high-risk group status for the orphaned child population in Egypt due to oral disease. Accordingly, specific prevention strategies must include targeted training for caregivers on dietary monitoring, supervising daily brushing routines, using fluoride, and making regular dental assessments. Such educational programs have to go beyond the children themselves to institutional staff and administrators so that a culture of oral health is well established within facilities. At the policy level, support and allocation of resources are equally important in reducing systemic disparities underlying poor oral health outcomes among this vulnerable population [11–22, 23].

CONCLUSION

This study demonstrated significant differences in oral health between orphaned and parented children. Orphans exhibited higher levels of untreated tooth decay, poorer oral hygiene practices and greater consumption of sugary foods compared to their peers living with parents. These findings highlight the urgent need for enhanced oral health education, regular dental check-ups and comprehensive support within orphanages. Training caregivers and implementing effective health policies are essential measures to improve both the dental and overall well-being of orphaned children.

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