

Prevalence of Halitosis and Its Relationship with Tooth Brushing, Oral Habits and Bacterial Isolates among Children in Hillah City, Iraq

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Abstract

Background: Halitosis, commonly known as bad breath, is a prevalent condition among children and usually occurs due to bad oral hygiene, oral disease, and sometimes due to extraoral causes. **Objectives:** The study of halitosis is the key for the prevention of the embarrassing factor in children and gives education about oral hygiene to children and their parents. **Materials and Methods:** This study examined 174 children that come to the dental clinic of Babylon University College of Dentistry in Hilla, Babil, Iraq, and wrote information in a case sheet about the frequency of brushing their teeth in a day and used organoleptic measurement for halitosis among children. It also measured the number of times children aged 4_12 years old in Hilla, Babil, Iraq, brush their teeth in a day and their halitosis scores. Also measured was the presence of specific oral habits (tongue thrusting, thumb sucking, mouth breathing) for their potential influence on the halitosis; in addition, measured were bacterial isolates in children that had halitosis. **Results:** The present study found that most children that had high scores of halitosis either do not brush their teeth or brush less frequently in a day, and the oral hygiene of girls is better than that of boy children. **Conclusion:** The halitosis had many causes but was greater influenced by the frequency of toothbrushing and bacterial species in the day, and also some bad habits could lead to halitosis. Halitosis is more common in boys than girls due to better oral hygiene of females; also, females naturally care more about oral health than males.

Keyword: Halitosis, Toothbrush, Organoleptic, Bad habits. Bacterial infection

Introduction

The halitosis which known as bad breath effect on children, adolescent and adult effect on oral health and on social interaction with community [1]. So should apply the light on this subject. Halitosis is a state greatly effect on people especially children make them embarrassing when communicate [2]. The prevalence of halitosis is large and found in millions of people in world and usually related to bad oral hygiene and other factors lead to halitosis intraoral and extra oral factor [3]. It can lead to decrease social interaction and poor quality of life so lot of people look for solve this problem and go to dental clinic for treatment [4]. The primary cause

of halitosis is volatile sulfur compounds (VSCs) produced by bacteria in mouth, especially on tongue, in pockets of periodontal tissue, and in plaque in teeth [5]. bad oral hygiene a smaller number of brushing teeth in day and accumulation of dental plaque, dental caries, periodontal disease, and decrease salivary flow and increase consumption of sugary diet and carbohydrate snack all these factors could cause halitosis of children [6]. The bacteria that accumulate in dorsal surface of tongue also lead to halitosis [7,8]. Some food gives the odor like onion; garlic and spicy food also lead to bad odor from mouth [9]. Some children have nasal obstruction lead to breath from mouth and dry

mouth increase halitosis [10]. Tonsillitis, Small calcified debris in tonsils cause foul odors, also leads to halitosis [11]. The study of halitosis is the key for the prevention of the embarrassing factor in children and gives education about oral hygiene to children and their parents.

Material and Methods

Before start this study, we take consent and permission for examination the children from their parents and children themselves. The design of the study is cross sectional study and the selection of the samples by simple random sampling and select 174 children from age 4_12 years old, these children come to clinic of Dentistry College for dental treatment in Hillah city Babel /Iraq. In case sheet wrote information from children and their parents about how many brush teeth in day and if the children had bad habit such mouth breathing, tongue thrust, nail biting and thumb sucking and take full history about systemic disease because in all children we examined is free from any systemic disease or taken drug to avoid confusion that odor with any systemic disease. We examine the children for bad habit by examination of teeth and mouth to prevent any malocclusion in future because of bad habit. Sample collection: The child seat on dental chair that clean and sufficient light available [12] and use dental mirror, periodontal probe, tweezer, cotton roll and dentist use all infection control protocol by wearing mask, gloves, lab coat and protective eye wear. Ask the child about number of toothbrushing in day and then examination of halitosis by smelling with the nose, this is called the organoleptic measurement [13,14]. the dentist asked the child to take a deep breath by inspiring the air by nostrils and holding awhile, then expiring by the mouth directly while the dentist smell the Odor at a distance of 20 cm. The severity of the Odor is classified into various scales, such as a 0-to-5-

point scale (0: no Odor, 1: barely noticeable, 2: slight but clearly noticeable, 3: moderate, 4: strong, and 5: extremely strong). This approach provided a subjective assessment of breath odor, as halitosis can sometimes be perceived through the breath exhaled by the child. [15-17]

Culture sample

In the present study selected samples use sterile cotton swab from dorsum surface of the tongue of children with halitosis and transmitted with anaerobic media and then to microbiology laboratory for culturing and identification of the bacteria species (*Bacteroides* spp, *peptostreptococci* spp, *staphylococcus aureus*, *Porphyromonas* spp and *Veillonella* spp).

Statistical analysis

The data taken from present study were tabled and analyzed using descriptive and inferential statistical methods and use the SPSS use mean, standard deviation and p value and found that p value larger than 0.05 so not significant difference. For statistical analysis, inferential statistics were used to explore associations between dental hygiene, the frequency of tooth brushing and the presence of specific oral habits (tongue thrusting, thumb sucking, mouth breathing) were examined for their potential influence on the halitosis.

Ethical approval

Before start this study, we take ethical approval from University of Babylon, College of Dentistry (number 95 in 10-2-2026).

Results

In table 1 seen that halitosis more common in boy (38 children) than girls (30 children) in spite of girls in the study more than boy. The number of girls 95 more than boys 79.

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Table 1: explain destitution of halitosis among children according to gender

Count of gender	Column Labels				
Row Labels	No halitosis	Yes have halitosis	Grand Total	mean	standard deviation
Female	65	30	95	0.3158	0.4689
Male	41	38	79	0.481	0.4998
Grand Total	106	68	174	0.9308	0.4905

Table 2 seen that more common halitosis among (9-10) years old in boys and girls, decrease number of children with halitosis at age 4 of girls while in boys decrease number of halitosis at age 5,6 years old.

Table 2: explain destitution of halitosis among children according to age

Row Labels	No	Yes	Grand Total	Mean ± SD
Female	65	30	95	8.88 ± 3.34
4	2	0	2	
5	3	1	4	
6	5	1	6	
7	7	2	9	
8	8	4	12	
9	12	6	18	
10	10	6	16	
11	8	5	13	
12	10	5	15	
Male	41	38	79	9.24 ± 3.02
4	0	6	6	
5	2	0	2	
6	5	0	5	
7	3	4	7	
8	3	5	8	
9	7	7	14	
10	10	6	16	
11	4	5	9	
12	7	5	12	
Grand Total	106	68	174	9.04

In this table 3 the count of all children (both girls and boys) who brush their teeth once a day is

(62) , twice a day (40) and three times (2) and high number of children 70 not brush their teeth (mean 0.402 , S.D 0.49).

Table 3: illustrate the number of tooth brush in day among children.

Row Labels	Count of How Many Brush Teeth In Day	Mean	Standard deviation
No	70	0.4023	0.4901
(1)Once a day	62	0.3569	0.4784
(2)Twice a day	40	0.2299	0.4296
(3)Three times a day	2	0.0115	0.1073
Grand Total	174		

In this table 4 seen that when increase number of toothbrushing in day decrease in halitosis of children and large number (42) of halitosis found in children that not brush their teeth. The number of children that brush once in day (22) more than that brushes twice and three times in day.

Table 4: demonstrate relation between frequency of tooth brushing and halitosis

Count of How Many Brush Teeth in Day	Column Labels				
Row Labels	No	Yes	Grand Total	Mean	Standard deviation
(1)Once a day	40	22	62	1.35	0.83
(2)Twice a day	36	4	40	1.1	0.78
(3)Three times a day	2	0	2	1	0
No	28	42	70	0.6	0.49
Grand Total	106	68	174	1.05	0.87

In this table 5 seen that children with bad habits tongue thrust had halitosis (mean 2.42, S.D 1.39) more than other habits but there was not significant difference. Also found that Children had mouth breathing and had halitosis more than children with thumb sucking habits.

Table 5: explain the relation of bad habit and halitosis among children.

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Factor	Group	Mean	SD	p-value
Does Child Have Halitosis vs Tongue Thrust	Yes	2.42	1.39	0.58
	No	2.35	1.23	
Does Child Have Halitosis vs Thumb Sucking	Yes	2.1	1.18	0.23
	No	2.5	1.2	
Does Child Have Halitosis vs Mouth Breather	Yes	2.35	1.3	0.08
	No	2.6	1.15	

Table 6 seen that *Bacteriodes* spp and *Peptostreptococci* was most common species isolated form halitosis group of children, there was 19 isolates of *Bacteriodes* spp which the large number of bacterial isolates in children that had halitosis.

Table 6: types of isolated bacteria among children had halitosis.

organism	No. of isolates	Gram stain
<i>Bacteriodes</i> spp	19	Negative
<i>Peptostreptococci</i>	13	positive
<i>Staphylococcus aureus</i>	6	positive
<i>Porphyromonas</i> spp	8	positive
<i>Veillonella</i> spp	8	negative

Table 7 explain that score 2 and 3 higher in children with halitosis of both boys and girls and seen that score 5 is the least score of halitosis in both girls and boys. Also seen that 68% of female free from halitosis while only 52% of boys free from halitosis.

Table 7: explain distribution the scores of halitosis among male and female children

Male children			Female children		
Score of halitosis	No.	%	Score of halitosis	No.	%
0	41	52%	0	65	68%
1	8	10%	1	5	5.5%
2	12	15%	2	10	10.5%

3	13	16%	3	9	9.5%
4	3	4%	4	5	5.5%
5	2	3%	5	1	1%

Discussion

Oral health in children is greater effected by their daily habits, including oral hygiene routines (use of tooth brush and dental floss), dietary choices, and parental influence. In this study find that the oral hygiene has greater effect on halitosis and seen when increase frequency of tooth brushing decrease in halitosis and this agree with another study by A villa, 2014 [18]. Which said that halitosis in the children is related to bad oral hygiene. Also found that halitosis caused by microorganism of prevotella and alloprevotella Jo JK, 2021 [8]. Also found the halitosis more common in male than female children and this related to oral hygiene duo to female more care about oral health than male and this disagree with study by Panov V, 2016 which suggest that bad breath more common in female than male under age 18 years old [19]. In the present study find large number of children (70) not brush their teeth so we need do preventive program for education of these children and their parents for daily routine of tooth brushing and use dental floss and apply topical fluoride application and this agree with study by Rajat Das, 2024 [20]. Many children worldwide do not meet the recommended twice-a-day brushing guideline [21]. In some regions, a significant number may brush only once a day or not at all. In addition, found that mouth breather children have more halitosis than nasal breathing and mouth breather related to nasal obstruction or another reason and this agree with study by J. Alqutami, 2019 which said that a significant association between halitosis and mouth breathing [22] and also agree with Motta et al. [2008], who suggests that when breathing from mouth make the mouth dry

because to saliva evaporation lead to halitosis [23]. In the present study found the bacteriodes spp high in children with halitosis and these finding agree with study by Roldán S, 2005 that found bacteriodes spp is high related with halitosis [24]. And also the present study agrees with study by Awano S., 2002 reported that bacteriodes spp is greater related with halitosis [25]. The present study found that score 2 and 3 higher in children with halitosis agree with study by Rodrigues NC, 2023 [26].

Conclusion

The halitosis which known as bad breath and cause social embarrassing. Halitosis had many causes, in this study seen that greater influence by oral hygiene of children (frequency of toothbrushing in day) and also suggested some bad habits could lead to halitosis especially mouth breather. In the present study seen that boys had halitosis more common than girls. In addition, found large numbers of children not brush their teeth and these children need preventive program to them and their parents to improve oral health.

Limitation of the study

In this present study examined only children that come to dental clinic of University of Babylon, College of Dentistry and not included all children of Babylon government, also in this study not measured the dental caries and gingival disease among children.

Conflict of Interest

The authors state that they have no conflicts of interest.

References

- [1] Buj-Acosta C, García-Sanz V, Bellot-Arcís C, Tortajada-Girbés M, Paredes-Gallardo V, Tarazona-Álvarez B. Prevalence of Halitosis in Children and Associated Factors: A Systematic Review and Meta-Analysis. José María, Prevalence of Halitosis in Children and Associated Factors: A Systematic Review and Meta-Analysis. 2022.
- [2] Rösing CK, Loesche W. Halitosis: an overview of epidemiology, etiology and clinical management. *Braz Oral Res.* 2011;25:466–71.
- [3] Bawazir OA. Risk factors, diagnosis, and management of halitosis in children: a comprehensive review. *J Contemp Dent Pract.* 2021;22(8):959–63.
- [4] Van Den Broek AM, Feenstra L, De Baat C. A review of the current literature on management of halitosis. *Oral Dis.* 2008; 14(1):30–9.
- [5] Carvalho AP, Viana KS, Costa FO, Lima RP, Martins-Júnior PA, Cota LO. Bibliometrics and altmetrics on halitosis: exploring the top 100 most-cited papers. *J Breath Res.* 2025;19(2):024001.
- [6] Cortelli JR, Barbosa MD, Westphal MA. Halitosis: a review of associated factors and therapeutic approach. *Braz Oral Res.* 2008;22:44–54.
- [7] Quirynen M, Dadamio J, Van den Velde S, De Smit M, Dekeyser C, Van Tornout M, et al. Characteristics of 2000 patients who visited a halitosis clinic. *J Clin Periodontol.* 2009;36(11):970–5.
- [8] Jo JK, Seo SH, Park SE, Kim HW, Kim EJ, Na CS, et al. Identification of salivary microorganisms and metabolites associated with halitosis. *Metabolites.* 2021;11(6): 362.
- [9] Nalçacı R, Sönmez IS. Evaluation of oral malodor in children. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008;106 (3):384–8.

- [10] Messadi DV. Oral and nonoral sources of halitosis. *J Calif Dent Assoc.* 1997;25(2): 127–31.
- [11] Motta LJ, Bachiega JC, Guedes CC, Laranja LT, Bussadori SK. Association between halitosis and mouth breathing in children. *Clinics (Sao Paulo).* 2011;66(6):939–42.
- [12] World Health Organization. Oral health surveys: basic methods. Geneva: World Health Organization; 2013.
- [13] de Mesquita-Guimarães KS, Santin GC, Scatena C, Junior AL, Serra MC. Reproducibility of an organoleptic method for halitosis assessment. *Eur J Gen Dent.* 2017;6(1):9–13.
- [14] Brunner F, Kurmann M, Filippi A. The correlation of organoleptic and instrumental halitosis measurements. *Schweiz Monatsschr Zahnmed.* 2010;120(5):402–8.
- [15] Otsugu M, Sasaki Y, Mikasa Y, Kadono M, Sasaki H, Kato T, et al. Incompetent lip seal and nail biting as risk factors for malocclusion in Japanese preschool children aged 3–6 years. *BMC Pediatr.* 2023;23(1):532.
- [16] Dini I, Laneri S. Spices, condiments, extra virgin olive oil and aromas as not only flavorings, but precious allies for our wellbeing. *Antioxidants (Basel).* 2021;10: 868.
- [17] Hasan DM, Abbas MJ, Al-Ghurabi BH, Başaran B. Antimicrobial leakage assessment of glass ionomer restoration enhanced by indium oxide nanoparticles suspension compared to conventional glass ionomer restoration: an in vitro study. *J Baghdad Coll Dent.* 2025;37(3):1–2.
- [18] Villa A, Zollanvari A, Alterovitz G, Cagetti MG, Strohmenger L, Abati S. Prevalence of halitosis in children considering oral hygiene, gender and age. *Int J Dent Hyg.* 2014;12(3):208–12.
- [19] Panov V. Bad breath and its association with age and gender. *Scripta Sci Med Dent.* 2016;2(2):12–5.
- [20] Das Gupta R, Kothadia RJ, Haider SS, Mazumder A, Akhter F, Siddika N, et al. Toothbrushing frequency among children and adolescents in 72 countries: findings from the Global School-based Student Health Survey. *Dent Med Probl.* 2024;61(4):495–506.
- [21] Al Khafaji SY, Wais ZM, Salman OL. The prevalence of premature loss of primary molars among children who attended College of Dentistry/Hillah City, Iraq. *Med J Babylon.* 2024;21(4):812–5.
- [22] Alqutami J, Elger W, Grafe N, Hiemisch A, Kiess W, Hirsch C. Dental health, halitosis and mouth breathing in 10- to 15-year-old children: a potential connection. *Eur J Paediatr Dent.* 2019;20(4):274–9.
- [23] Motta LJ, Bachiega JC, Guedes CC, Laranja LT, Bussadori SK. Association between halitosis and mouth breathing in children. *Clinics (Sao Paulo).* 2011;66(6): 939–42.
- [24] Roldán S, Herrera D, O'Connor A, González I, Sanz M. A combined therapeutic approach to manage oral halitosis: a 3-month prospective case series. *J Periodontol.* 2005;76(6):1025–33.
- [25] Awano S, Gohara K, Kurihara E, Ansai T, Takehara T. The relationship between the presence of periodontopathogenic bacteria in saliva and halitosis. *Int Dent J.* 2002;52(Suppl 5 Pt 1):212–6.
- [26] Rodrigues NC, Abrão A, Nadanovsky P. Accuracy of two methods to detect the presence of halitosis: the volatile sulfur compounds concentration in the mouth air and the information from a close person. *J Appl Oral Sci.* 2023;31:e20220412.