



RESEARCH ARTICLE

Determinants of Dental Caries among Preschool Children in Dessie Town, 2019: A Case-Control Study

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Abstract

Background: The burden of childhood caries in developing countries is continued to be a significant problem and negatively affects the growth of the child. Despite, dental caries is substantially distressing children, there was the paucity of study on associated factors of dental caries in pre-school children in the study situate.

Objective: The study intended to determine risk factors of dental caries among preschool children in Dessie town, North East, Ethiopia 2019.

Methods: A total of 130 cases and 260 controls were integrated into the study. A systematic random sampling technique was used to select schools. Structured questionnaires were used to collect socio-demographic characteristics, dietary habits, and dental care practices. Dental examination was carried by the trained dental doctor using standard diagnostic guidelines. Analytically crude odds ratios and adjusted odds ratios were performed to test the association between dependent and independent variables.

Result: Multivariate logistic regression showed that maternal education below grade 9 (AOR = 3.95% CI = 1.84-1.95), the firstborn children in the family (AOR = 4.95% CI = 1.3-14), bottle feeding at night (AOR = 6.95% CI = 2.5-15), Children who fed sweet food (AOR = 3.95% CI = 1.7-6.9) and child who fed soft drink (AOR = 5.95% CI = 2.4-10.4) were statistically associated with dental caries.

Conclusion: This study concludes that the firstborn child in the family may due to lack of parental familiarity in managing children, feeding at night; using sugar-based food and soft drink were found to be statistically associated risk factors for dental caries in preschool children.

Keywords

Dental caries, Dietary habit, Preschool children, Risk factors

Introduction

Dental caries is the localized destruction of susceptible dental hard tissues by acidic by-products from bacterial fermentation of dietary carbohydrates [1]. It is one of the most prevalent chronic diseases of people worldwide with individuals are susceptible to this disease throughout their lifetime [2]. Caries in primary teeth of preschool children commonly referred to as early childhood caries (ECC) continues to be a pandemic disease worldwide [3]. The decline in the prevalence of ECC in the high-income countries cannot be denied but the burden is continued at epidemic proportions in low-middle income countries with the prevalence is ranged from 12% to 40% in high-income countries whereas the prevalence is ranged from 36% to 85% in low-middle income countries [4].

Preschool children with oral disease and disorders have been shown to have a poorer quality of life. It is a major public health oral disease that hinders the achievement and maintenance of oral health in all age groups [5,6]. Children with ECC grow at a slower pace than caries-free children moreover; some preschool children with ECC may be severely underweight because of associated pain and their disinclination to eat [5]. Assessing the oral health of preschool children is important because the experience of caries in primary teeth has been considered the strongest predictor of caries in permanent teeth [7].

ECC is multi-factorial diseases including inadequate teeth brushing, poor oral hygiene, fermentable carbo-

hydrate diet, presence of dental plaque, high numbers of cariogenic micro-organisms such as mutant's streptococci and lactobacillus have been identified risk factors for dental caries in children [8].

There are no national data on the oral health of preschool children in Ethiopia. Despite, dental caries is substantially affecting preschool children; there was a paucity study on prevailing associated factors of dental caries in pre-school children in Desire town, Ethiopia. Thus, the present study was employed to determine risk factors associated with dental caries in preschool children.

Materials and Methods

Study area and period

This study was conducted in Dessie Town North central Ethiopia from November 01, 2018, and May 30, 2019. Dessie is the capital town of South Wollo zone, in the Amhara national, regional states, which is located at 401 Km North East of Addis Ababa. According to the 2018 Population census of the Central Statistic Authority the projected population of South Wollo zone for 2018 is estimated to be 2,518,862. The gender composition is 47.4% and 52.6% female and the number of preschool children is estimated to be 12,820. The town has 34 kindergartens (KG) schools, of these, 22 were private and the rest 12 was a public school.

Study design: School-based unmatched case-control study design was employed.

Source population: All preschool children between 4 to 6 years of age who live in Dessie town.

Study population: Cases: All children in the selected KG school having dental caries and available at the time of the data collection period were included in the study.

Controls: All children in the selected KG school who did not have dental caries and available during the data collection period.

Sample size determination

The required sample size for this study was calculated by considering the risk of dental caries using EPI-INFO version 3.5.1 by considering two sample proportions based on the following assumptions. Proportions used to determine the sample size obtained from the study conducted in Thailand. Among all the risk factors of dental caries, consumption of sugar as predictors of dental caries was found to give the largest sample size with one to two allocation ratios of cases to controls (1:2) and a 10% non-response was assumed. Accordingly, the final sample was 130 cases and 260 controls.

Sampling technique and procedure: A systematic random sampling technique was used to select the study participants. Among all 34 kindergartens in the town, six were selected using a systematic random sam-

pling technique. The sample size was allocated proportionally based on the number of children in each selected school. All consecutive preschool children that fulfil the criteria of being a case were included in the study until the calculated sample size was obtained whereas for the controls, the first control was selected before a given case and the second control was selected following the case. The study group (n = 130) included children (cases) who were diagnosed with ECC (def > 0) who were compared with the control group (n = 260) which included caries-free children (def = 0). Preschool children or Early childhood caries defined (ECC) as the presence of one or more decayed, missing or filled tooth surfaces in any primary tooth in a child of 71 months of age or younger. Children who were medically compromised and those who declined to participate were excluded as defined by the American Academy of Paediatric Dentistry (AAPD). Written informed consent was obtained from the parents before the commencement of the study.

Data collection process: A structured questionnaire, adapted from a prior study, was used to collect socio-demographic characteristics, dietary habits, and dental care practices. Dental examination was carried out for all selected children by one trained dental doctor using World Health Organization (WHO) dental caries diagnosis guideline under natural daylight. Three trained examiners collected information through the face-to-face interview with the parent of the child. Before the commencement of the study, training was given for data collectors regarding data collection tools and procedures based on dental caries assessment tools of WHO guidelines. A tooth was considered decayed (d) if there was visible evidence of cavitations, filled (f) if the tooth was restored and extracted (e) if extracted due to caries. An assistant recorded the findings and the dental examination was usually completed within 10 min. The presence of dental plaque was assessed by direct visual inspection and palpation of the buccal and lingual surfaces of all teeth with clean glove and spatula.

Data analysis: Data was entered and analyzed using statistical package for social science (SPSS) version 25. Odds ratio with 95% confidence interval (CI) was calculated using logistic regression analysis to assess to statistically significant association between dental caries and independent variables. Significance was set at $p < 0.05$ (significance level 95%). For those variables that had a p -value < 0.05 on binary logistic regression inter into multiple logistic regression analysis to compute the adjusted odds ratio. Ethical clearance was obtained from the ethical review committee of the College of Medicine and Health Sciences, Wollo University. Written consent was obtained from children's parents before the dental examination of children.

Results

Scio-demographic characteristics

In this study, a total of 130 children aged 4-6 years

Table 1: Scio-demographic characteristics of cases and controls preschool children in Dessie town, Ethiopia, 2019.

Variables	Category	Case n (%) n = 130	Control n (%) n = 260	n = 390
Age of children	4 years	46 (35.4)	60 (23.1)	106 (27.2)
	5 years	31 (23.8)	77 (29.6)	108 (27.7)
	6 years	43 (40.8)	123 (47.3)	178 (45.1)
Sex	Male	71 (54.6)	126 (48.5)	197 (50.5)
	Female	59 (45.4)	134 (51.5)	193 (49.5)
Order of birth	1 st child	64 (49.2)	101 (38.8)	165 (42.3)
	2 nd child	5 (3.8)	47 (18.1)	52 (13.3)
	3 rd child	26 (20.0)	52 (20.0)	78 (20.0)
	4 th child	35 (26.9)	60 (23.1)	95 (24.4)
Grade	KG-1	46 (35.4)	58 (22.3)	104 (26.7)
	KD-2	31 (23.8)	83 (31.9)	114 (29.2)
	KG-3	53 (40.8)	119 (45.8)	172 (44.1)
Maternal education	Primary	45 (37.7)	91 (35)	140 (35.9)
	Secondary	22 (16.9)	135 (51.9)	157 (40.3)
	College and above	59 (45.5)	34 (13.1)	93 (23.8)
Father education	Primary	41 (31.5)	82 (35.5)	123 (31.5)
	Secondary	35 (26.9)	89 (34.2)	124 (31.8)
	College and above	54 (41.5)	89 (34.2)	143 (36.7)
Monthly income	< 1000	12 (9.2)	47 (18.1)	59 (15.1)
	1000-1500	33 (25.4)	80 (30.8)	113 (29)
	1501-2500	23 (17.7)	56 (21.5)	79 (20.3)
	> 2500	62 (47.76)	77 (29.6)	139 (35.6)
Maternal occupation	Housewife	47 (36.2)	90 (34.6)	137 (35.1)
	Government employ	29 (22.3)	59 (22.7)	88 (22.6)
	Merchant	31 (23.8)	45 (17.3)	76 (19.5)
	Private employ	23 (17.7)	66 (25.4)	89 (22.8)
Father occupation	Government employ	38 (29.2)	96 (36.9)	134 (34.4)
	Merchant	22 (16.9)	71 (27.3)	93 (23.8)
	Private employ	70 (53.8)	93 (35.8)	163 (41.8)

with dental caries cases with their mothers and a total of 260 control children aged 4-6 years who had no dental caries with their mothers participated which making the response rate of 100%. Majority 172 (44.1%) of participants were learning in KG-3, more than one third 137 (35.1%) of the child's mothers were housewives and the majority of 165 (42.3%) of the child was a firstborn child in the family. More than one third 139 (35.6%) of the participant family earned above 2500 Ethiopia birr per month (Table 1).

Food consumption pattern, dietary habits, and practices of dental hygiene

More than half 224 (57.4%) of children were breast-feeding longer than 24 months duration, while approximately two-fifth 149 (38.2%) of the children had fed at night. One hundred eight (46.2%) of the children have used sugared tea while one hundred fifty-six (40%) of children drunk soft drink (Table 2).

Bivariate analysis of risk factors for dental caries among preschool children

After the analysis of bivariate and multivariate logistic regression, five variables had shown significant association with dental caries among preschool children. Maternal education was found to be a risk factor for dental caries. Children with dental caries, whose mothers' education are below grade 9 were 3 times more likely to develop dental carries as compared to those mothers having education of college and above (AOR = 3.95% CI = 1.84-1.95). The firstborn child in the family was 4 times more likely to develop dental caries as compared to the fourth children in the family (AOR = 4.95% CI = 1.3-14). Children having feeding always at night were found to be risk factors for dental caries. Children who were having feeding at night were 6 times more likely to have dental caries than those children who did not (AOR = 6.95% CI = 2.5-15). Children who fed sweet food were 3 times more likely to have caries than those

Table 2: Food consumption pattern and dietary habits and practices of dental hygiene among preschool children in Dessie town, 2019.

Variables	Category	Case n (%)	Control n (%)	n = 390
		n = 130	n = 260	
Breast feeding	< 24 months	49 (37.7)	117 (45.0)	166 (42.6)
	More than 24 months	81 (62.3)	143 (55.0)	224 (57.4)
Night feeding with the	Not at all	48 (36.9)	64 (24.6)	112 (28.7)
	Sometimes	16 (12.3)	113 (43.5)	129 (33.1)
	Always	66 (50.8)	83 (31.9)	149 (38.2)
Consumption sugared tea	Yes	70 (53.8)	110 (42.3)	180 (46.2)
	No	60 (46.2)	150 (57.7)	210 (53.8)
Types of food for breakfast	Bread with tea	34 (26.2)	72 (27.7)	106 (27.2)
	Past with tea	46 (35.4)	55 (21.2)	101 (25.9)
	Egg with tea	50 (38.5)	133 (51.2)	183 (46.9)
Consumption of sweet food	Yes	79 (60.8)	68 (26.2)	147 (37.7)
	No	51 (39.2)	192 (73.8)	243 (62.3)
Consumption of soft drink	Yes	89 (68.5)	67 (25.8)	156 (40.0)
	No	41 (31.)	193 (74.2)	234 (60.0)
Rinse after feeding	Yes	80 (61.5)	88 (33.8)	168 (43.1)
	No	50 (38.5)	172 (66.2)	222 (56.9)

Table 3: Bivariate and multivariate logistic regression of risk factors for dental caries among preschool children in Dessie town, Ethiopia, 2019.

Variables	Category	Case	Control	COR	AOR
Sex of child	Male	71 (54.6)	126 (48.5)	1.3 (0.84, 1.95)	
	Female	59 (45.4)	134 (51.5)	1	
Maternal education	Primary (1-8)	45 (37.7)	91 (35)	3 (1.8, 5.8)	3 (1.5, 7.3)
	Secondary (9-12)	22 (16.9)	135 (51.9)		
	College and above	59 (45.5)	34 (13.1)	1.0	1.0
Father education	Primary (1-8)	45 (37.7)	91 (35)	1.3 (0.7, 2.2)	
	Secondary (9-12)	22 (16.9)	135 (51.9)	0.8 (0.5, 1.4)	
	College and above	59 (45.5)	34 (13.1)	1.0	
Maternal occupation	Housewife	47 (36.2)	90 (34.6)	1.1 (0.6, 1.9)	
	Government employ	29 (22.3)	59 (22.7)	0.8 (0.4, 1.3)	
	Merchant	31 (23.8)	45 (17.3)	1.5 (0.8, 2.7)	
	Private employ	23 (17.7)	66 (25.4)	1.0	
Father occupation	Government	38 (29.2)	96 (36.9)	1.0	
	Private employ	22 (16.9)	71 (27.3)	1.3 (0.6, 2.35)	
	Merchant	70 (53.8)	93 (35.8)	0.5 (0.3, 0.8)	
Order of birth	1 st child	64 (49.2)	101 (38.8)	5 (2.2, 15.7)	4 (1.3, 14)
	2 nd child	5 (3.8)	47 (18.1)	1.3 (0.7, 2.2)	
	3 rd child	26 (20.0)	52 (20.0)	1.1 (0.6, 1.8)	
	4 th child	35 (26.9)	60 (23.1)	1.0	1.0
Breast feeding	< 24 months	49 (37.7)	117 (45.0)	0.7 (0.5, 1.1)	
	More than 24 months	81 (62.3)	143 (55.0)	1.0	
Night feeding with the	Nor at all	48 (36.9)	64 (24.6)	1.0	1.0
	Sometimes	16 (12.3)	113 (43.5)	0.9 (0.6, 1.5)	
	Always	66 (50.8)	83 (31.9)	5 (2.8, 10.0)	6 (2.5, 15)
Consumption sugared tea	Yes	70 (53.8)	110 (42.3)	1.6 (1.2, 4)	
	No	60 (46.2)	150 (57.7)	1.0	

Types of food breakfast	Bread with tea	34 (26.2)	72 (27.7)	0.6 (0.3, 0.9)	
	Past with tea	46 (35.4)	55 (21.2)	1.3 (0.7, 2.1)	
	Egg with tea	50 (38.5)	133 (51.2)	1.0	
Consumption of sweet food	Yes	79 (60.8)	68 (26.2)	4 (2.7, 6.9)	3 (1.7, 6.9)
	No	51 (39.2)	192 (73.8)	1.0	1.0
Consumption of soft drink	Yes	89 (68.5)	67 (25.8)	6 (3.9, 9.9)	5 (2.4, 10.4)
	No	41 (31.0)	193 (74.2)	1.0	
Rinse after feeding	Yes	80 (61.5)	88 (33.8)	0.3 (0.2, 0.5)	
	No	50 (38.5)	172 (66.2)		

children who did not (AOR = 3.95% CI = 1.7-6.9) and child who fed soft drink were 5 times more likely develop dental caries as compared to those children who did not (AOR = 5.95% CI = 2.4-10.4) (Table 3).

Discussion

In Ethiopia, there is less attention in dental caries, particularly in preschool children. It is one of a major public health oral disease which hinders the achievement and maintenance of oral health in all age groups. The present study was designed to study risk factors for dental caries among preschool children in Dessie town.

In this study, lower educational levels of children's mothers were found to be risk factors for dental caries with the likelihood of dental caries was 3 times higher among children whose mother's educational level was lower than those children who were not. This is in line with the study done in China [9-11]. Birth order revealed a statistically significant association between the control and the study group. The firstborn child was 4 times more likely of having dental caries as compared to the fourth born child which is in line with other studies [12]. This may be due to the relative lack of parent experience in managing the child's behavior.

This study showed that children who were having feeding at night were 6 times more likely to have dental caries than those children who did not. This is congruent with other studies [11,13]. This condition could be explained that feeding at night decreases the clearance of liquid carbohydrates from the oral cavity due to decreased salivary flow at night [9]. Thus, prolonged use of feeding at night should be carefully managed for improving children's dental health.

The finding of this study also indicated that consumption of sugared food increases 3 times the likelihood of having dental caries than those who did not. Similar findings have also been established that there was a significant association between the consumption of sugared food and dental caries [14,15]. This is explained that sugars in food and drinks play a major role in the development of dental caries. Bacteria within the plaque use the sugar as energy and release acid as a waste product, which gradually dissolves the enamel in the teeth [16].

This study revealed that the consumption of soft drink increases dental caries 5 times more likely than those who did not use a soft drink. Other studies reported that frequent use of sugar-based beverages increases the risk of dental caries [17,18]. This may be explained that consumption of sugar-based drinks causes dental caries through the high levels of sugar, which are metabolized by plaque microorganisms that generate acid, which in turn can demineralize tooth enamel and cause dental caries.

Conclusion

This study concludes that the firstborn child in the family may be due to lack of parental familiarity in managing children, feeding at night; using sugar-based food and soft drink were found to be statistically associated risk factors for dental caries in preschool children. Thus, health education on parental familiarity in managing children, feeding at night; using sugar-based food and soft drink should be included as an integral part of dental health promotion program.

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The authors declare that there is no conflict of interest regarding the publication.

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