

# Caries Prevalence and Its Association with Body Mass Index in Children Aged 4 to 10 Years in Al Dulaymiah Qassim Region of Saudi Arabia – A Pilot Study

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**Abstract Introduction** - Dental caries is a commonly encountered disease of childhood. It is a multifactorial disease and consumption of fermentable carbohydrates is one of causes for caries. Ingestion of excessive amounts of refined carbohydrates is also associated with obesity. **Aims** - The aim of this study is to determine the prevalence of dental caries and its association with Body Mass Index (B.M.I) in Al Dulaymiah. **Subjects and methods** - The study consisted of 2 parts. In the first part, the socio demographic details were recorded. The second part consisted of the clinical dental examination and height and weight measurements. Dental caries was recorded as per World Health Organization criteria using the WHO Oral health form 1997. The weight was measured using a digital weighing scale nearest to 0.1 kg while the children wore light clothing and no shoes. The height was measured to the nearest full centimeter using a stadiometre while the children were in standing position. BMI was calculated by dividing the kilogram by height squared ( $\text{kg/m}^2$ ). **Results**- The highest percentages of caries were found among the underweight and overweight males (93.1 % and 85% respectively) with statistically significant difference from females who showed 73% caries in underweight females while no caries were detected among the overweight females. Considering the Odds Ratio the underweight children are more likely to have caries than the normal and overweight children in our study.

**Keywords:** *body mass index, dental caries, obesity*

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## 1. Introduction

Dental caries although preventable still remains the most commonly encountered chronic disease of childhood [1]. When dental caries is left untreated, it can lead to unfavourable outcomes such as pain, swelling, difficulty in mastication and finally loss of teeth thereby affecting growth and development [2]. A multi centric study on caries in the primary dentition in Saudi Arabia showed a prevalence of dental caries at 82% [3].

Dental caries is a multifactorial disease and several factors contribute towards it including oral hygiene maintenance, use of fluorides and amount of fermentable carbohydrates in food [4,5]. Obesity is also a public health problem in Saudi Arabia, its prevalence increasing among adolescents from 3.4 to 24.5% from 1988 to 2005 and the trend continues [6]. Dental caries and obesity are associated with a great number of negative health outcomes. It is also interesting to note that both obesity and dental caries are associated with lifestyle choices that

include exposure to unhealthy diets especially sugar [7]. The association between dental caries and obesity is confounding. Some studies show a positive association whereas other studies show a weak or no association with BMI.

The aim of this study is to investigate the prevalence of dental caries in the primary dentition in Saudi Arabian children and its association with body mass index in Qassim Province of Saudi Arabia.

## 2. Subjects and Methods

This cross sectional study consisted of a total of 171 children. Informed consent was obtained from the parent prior the commencement of the study.

## 3. Study Design

The study consisted of 2 parts. In the first part, the socio demographic details were recorded. The second part

consisted of the clinical dental examination and height and weight measurements.

Dental caries was recorded as per World Health Organization criteria using the WHO Oral health form 1997.

### 3.1. Inclusion Criteria

1. Good general health
2. Minimum of 20 primary teeth present in the oral cavity

### 3.2. Exclusion Criteria

1. Any medical condition or children suffering from any disease with dental implications were excluded.
2. Unaccompanied children and those who refuse consent.

#### 3.2.1. Armamentarium

- C.P.I.Probes (WHO Probes)
- Disposable examination kits
- Mouth masks and gloves

#### 3.2.2. Method of Examination

The children were examined on an Portable dental chair in adequate light (Surgitel® 1 watt head lamp) .Subjects were not allowed to crowd around the examination chair, to prevent errors during examination and recording. The examination was undertaken by a single examiner to avoid inter examiner variability. Recording was done by another trained person who assisted throughout the study.

Clinical examination - Caries was recorded as per WHO criteria (1997)

The CPI probe should be used to confirm visual evidence of caries on the occlusal, buccal and lingual surfaces.

The weight was measured using a digital weighing scale nearest to 0.1 kg while the children wore light clothing and no shoes.

The height was measured to the nearest full centimeter using a stadiometre while the children were in standing position. BMI was calculated by dividing the kilogram by height squared (kg/m<sup>2</sup>)

### 3.3. Statistical Analysis

Data was tabulated and analyzed using SPSS ver. 22 for windows. Data was tested for normality using Kolmogorov–Smirnov test. Prevalence of dental caries was presented in the form of frequency and percentages. Chi square test was applied to compare the prevalence of dental caries among the study groups. The total def was presented in the form of mean, standard deviation and median. Relation between def and gender using Mann-Whitney U test and for different BMI categories using Kruskal-Wallis test with Mann-Whitney test used as a post-Hoc test with Benferroni’s correction. Odds ratio (OR) and their 95 % confidence intervals (95 % CI) were calculated. Statistical analysis was performed at a significance level p<0.05.

## 4. Results

A total of 171 children aged 4 years to 10 years enrolled in our study of which 101 were males and 70 females. The mean ages and sex distribution of the sample is given in Table 1.

Table 1. Mean Age for study Sample

	Male N <sub>1</sub> = 101		Female N <sub>2</sub> = 70	
	Mean	SD	Mean	SD
Age	8.09	1.38	7.77	1.80

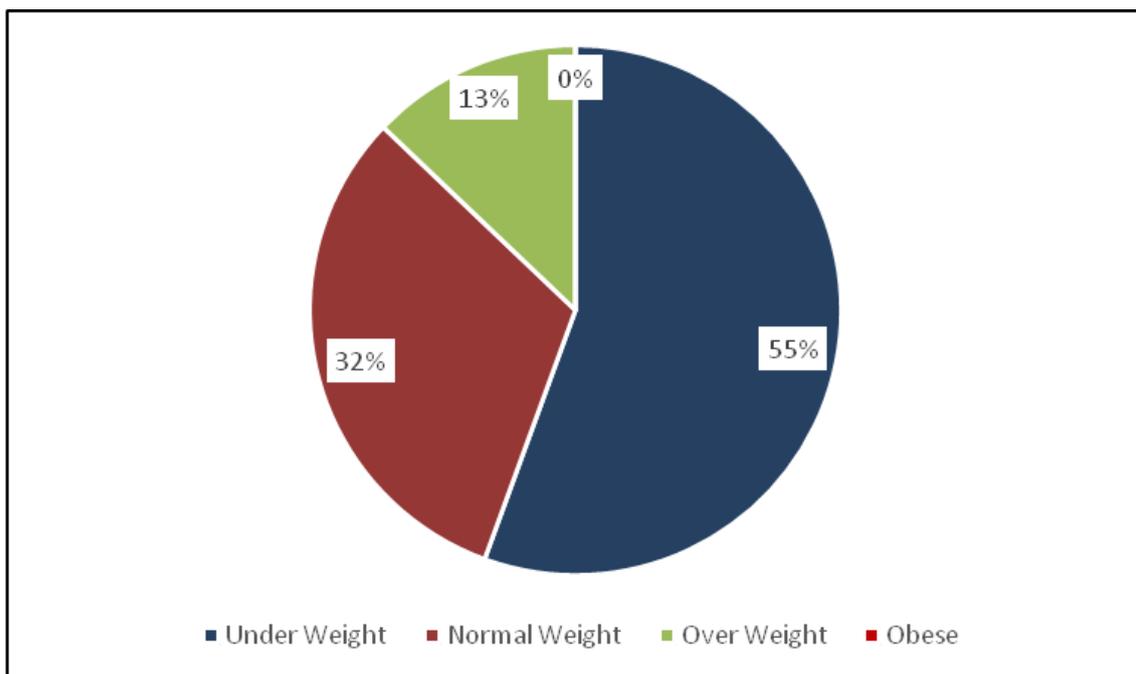


Figure 1. Distribution of the study participants by B.M.I

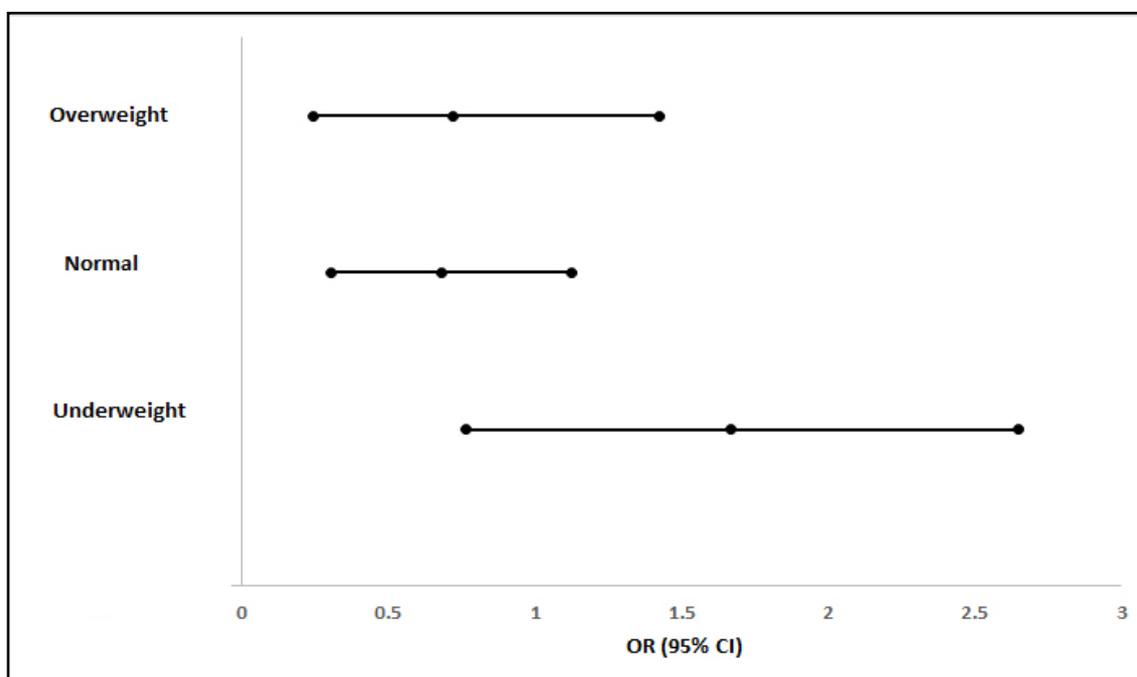
The distribution of the study participants by BMI is provided in Figure 1. The prevalence of dental caries in the primary dentition is given in Table 2 which shows the

highest prevalence of 93.1% in underweight boys and caries prevalence is statistically significant in the underweight and overweight category.

**Table 2. Caries prevalence in the primary dentition**

BMI category	Gender	Caries presence	No	%	p
Underweight	Male (N1=58)	No Caries	4	6.9%	0.001*
		Caries	54	93.1%	
	Female (N2=37)	No Caries	10	27.0%	
		Caries	27	73.0%	
Normal weight	Male (N1=23)	No Caries	5	21.7%	0.444
		Caries	18	78.3%	
	Female (N2=31)	No Caries	7	22.6%	
		Caries	24	77.4%	
Overweight	Male (N1=20)	No Caries	3	15.0%	0.019*
		Caries	17	85.0%	
	Female (N2=2)	No Caries	2	100.0%	
		Caries	0	0.0%	

P for chi-square test  
\*: significant at p<0.



**Figure 2. Odds Ratio**

The odds ratio are provided in Figure 2 and Table 3.

**Table 3. The Odds Ratio (95 % CI) For The Prevalence Of Primary Dental Caries**

BMI categories	OR	95% CI	
		Min	Max
Underweight	1.667	0.762	2.647
Normal	0.679	0.302	1.122
overweight	0.719	0.243	1.423

**Table 4. Relation between Mean def and different BMI categories**

	Def			P
	Mean	SD	Median	
Under Weight	4.63	3.50	4.00	0.040 *
Normal Weight	3.52	2.67	3.00	
Over Weight	2.77	2.29	3.00	

p for Kruskal Wallis Test, \*: significant at p<0.05

**Table 5. Post-Hoc test for significance between the study groups**

	Normal Weight	Over Weight
Under Weight	0.104	0.024*
Normal Weight		0.241

Post-Hoc Mann-Whitney test with Benferroni's correction.

## 5. Discussion

The primary findings of our study can be summarized as follows

Most of the children enrolled in our study were underweight (55%) and 32% of them were considered as normal weighted children and only 13 % were overweight children (Figure 1).

This is in contrast to studies from the Qassim Region (Al-Muhaimeed et al [8]) This may be partly due to the

fact that our sample was from a rural area with a more active lifestyle. Our results compare favorably with a study from the Jazan region [9].

The highest percentages of caries were found among the underweight and overweight males (93.1 % and 85% respectively) with statistically significant difference from females who showed a 73% caries in underweight females while no caries were detected among the overweight females. However the accuracy of the data for females can be impacted by the fact that females were underrepresented in the study.

The odds ratio (OR) are provided to measure the association between the caries and BMI with the highest value among the underweight children 1.667 (CI 0.762-2.647) and the lowest value was among the normal children OR= 0.679. Thus the underweight children are more likely to have caries than the normal and overweight children in our study

Regarding the caries (def) score for the study sample, the highest score was among the underweight children ( $4.63 \pm 3.5$ ) followed by the normal weight ( $3.52 \pm 2.67$ ) and the lowest score among the overweight children ( $2.77 \pm 2.29$ ) with a statistically significant difference between the 3 groups.

We hypothesised to find a positive association between BMI and dental caries experience in the children aged 5-10 years. However our study fails to establish this kind of a relationship. This is in accordance to a studies conducted on children in the United States [10,11] France [12] and Iran [13]. However, studies by Gerdin [14] et al. and Willershhausen [15] et al. did offer support for a positive association hypothesized here. Nonetheless, these studies were longitudinal in nature and examined on children aged 10 years old. It is realistic to infer from these findings that overweight and obesity reveals itself in the older age groups.

Within the confines of our study, being caries active cannot be correlated to obesity and vice versa. However the literature does recommend a common risk factor approach to caries prevention since dietary habits are an overlapping element in caries and obesity. Hooley M et al [16] concluded dietary interventions intended for caries reduction may reduce overweight and obesity in children. Sheiham A et al. [17] advocated a common risk factor approach terming it more rational to avoid duplication of energies and avoid conflicting health messages. This would also allow for concentrating on socio-political factors as health determinants instead of simply emphasizing on individual behavior change.

In our study, an inverse relationship is seen between anthropometric measurements and caries and these findings are reconfirmed from studies by Alkarimi et al [18]. This could be explained atleast partly from the possibility of untreated caries and associated pain affecting the child's ability to eat leading to undernourishment and lower body weight.

The results of any study must be interpreted based on its limitations. A cross sectional study by its very nature, does not allow to confirm cause and effect association and these need to be reconfirmed by longitudinal studies. Secondly dental caries detection in this study was based on visual examination. The use of radiographs may lead to detection of proximal caries lesion and thereby affect the

prevalence of dental caries. Thirdly potential confounders such as consumption of carbonated beverages, energy drinks and other life style choices have not been considered in this study.

## 6. Conclusion

A common Risk Factor approach for the prevention of both caries and obesity is not supported by our study.

## References

- [1] Yen C.E, Hu.S.W. Association between dental caries and obesity in preschool children. *European Journal of Paediatric Dentistry*. 2013;14/3:185-189.
- [2] Sheiham A. Oral health, general health and quality of life. *Bull World Health Organ* 2005; 83: 644-645.
- [3] AlDosari AM, Akpata ES, Khan N. Associations among dental caries experience, fluorosis, and fluoride exposure from drinking water sources in Saudi Arabia. *J Public Health Dent*.2010; 70: 220-6.
- [4] Roberts MW. Dental health of children: where we are today and remaining challenges. *J Clin Pediatr Dent*. 2008; 32(3): 231-4.
- [5] Schroth RJ, Cheba V. Determining the prevalence and risk factors for early childhood caries in a community dental health clinic. *Pediatr Dent*. 2007; 29(5): 387-96.
- [6] Al-Hazzaa HM. Prevalence and trends in obesity among school boys in Central Saudi Arabia between 1988 and 2005. *Saudi Med J* 2007; 28: 1569-74.
- [7] Kottayi S., Bhat S.S., Hegde K.S., Peedikayil F.C, Chandru T.P, Anil S. A cross sectional Study of the Prevalence of Dental Caries among 12-15 year old overweight schoolchildren. *The Journal of Contemporary Dental Practice*. September 2016; 17(9): 750-754.
- [8] Al-Muhaimeed A.A, Dandash K., Ismail M.S, Saquib N. Prevalence and correlates of overweight status among Saudi school children. *Ann Saudi Med* 2015; 35(4): 275-281.
- [9] Quadri M.F., Hakimi B.M, Asma A.A, Hakami R.Y., Saadi F.A, Ageeli F.M.,et al Relation between Dental Caries and Body Mass Index-for-age among Schoolchildren of Jazan City, Kingdom of Saudi Arabia., *The Journal Of Contemporary Dental Practice*. 2017; 18(4): 277-82.
- [10] Macek MD, Mitola DJ. Exploring the association between overweight and dental caries among US children. *Pediatr Dent* 2006; 28(4): 375-380.
- [11] Kopycka-Kedzierawski DT, Auinger P, Billings RJ, Weitzman M. Caries status and overweight in 2-to 18-year-old US children: Findings from national surveys. *Community Dent Oral Epidemiol*. 2008; 36(2): 157-167.
- [12] Tramini P, Molinari N, Tentscher M, Demattei C, Schulte AG. Association between caries experience and body mass index in 12-year-old French children. *Caries Res*. 2009; 43(6): 468-473.
- [13] Sadeghi M, Alizadeh F. Association between dental caries and body mass index-for-age among 6-11-year-old children in Isfahan in 2007. *J Dent Res Dent Clin Dent Prospects* 2007; 1(3): 119-124.
- [14] Gerdin EW, Angbratt M, Aronsson K, Eriksson E, Johansson I. Dental caries and body mass index by socio-economic status in Swedish children. *Commun Dent Oral Epidemiol*. 2008; 36(5): 459-65.
- [15] Willershhausen B, Moschos D, Azrak B, Blettner M. Correlation between oral health and body mass index (BMI) in 2071 primary school pupils. *Eur J Med Res*. 2007; 12(7):295-9.
- [16] Hooley M, Skouteris H, Millar L. The relationship between childhood weight, dental caries and eating practices in children aged 4-8 years in Australia, 2004-2008. *Pediatr Obes*. 2012; 7(6): 461-70.
- [17] Sheiham A, Watt RG. The common risk factor approach: A rational basis for promoting oral health. *Community Dent Oral Epidemiol*. 2000; 28(6): 399-406.
- [18] AlKarimi H.A, Watt R.G, Pikhart H., Sheiham A.et al . Dental Caries and Growth in School-Age Children. *Pediatrics* 2014; 133: E 616-623.