



**Research Article**

**THE RELATIONSHIP BETWEEN EARLY CHILDHOOD CARIES AND BODY WEIGHT AMONG CHILDREN IN RIYADH CITY**

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**ARTICLE INFO**

**Article History:**

Received 20<sup>th</sup> December, 2017

Received in revised form 18<sup>th</sup>

January, 2018 Accepted 05<sup>th</sup> February, 2018

Published online 28<sup>th</sup> March, 2018

**Key words:**

Dental caries, body weight, DMF.

**ABSTRACT**

**Introduction:** Weight gain and chronic diseases such as caries are both multi-factorial illnesses that impact children's health and psychosocial development. Given that excessive capacity of free sugars and social shortage are risk factors for dental caries and weight-gain, it has been hypothesized that these two outcomes may be more likely to co-exist within the same per or inhabitants.

**Materials and methods:** This study utilized 1156 primary school children and their body weight as well as DMFT index was recorded. The participants were divided in to age groups including 3-5, 6-8, 9-11 and 12+ years.

**Results:** There is highly statistically significant difference in the mean values of weight and dmf between male and female study participants, where the female study participants are higher mean weight and mean DMF values when compared with male study participants which is highly statistically significant ( $t = -14.28, p < 0.0001$ ;  $t = -5.49, p < 0.0001$ ).

**Conclusion:** The data indicates statistically significant positive correlation between age and weight; age and DMF; & weight and DMF.

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**INTRODUCTION**

General health has an impact on the oral health and vice versa. The relationship between nutrition and dental caries is complicated because of multiple factors including oral hygiene, available nutrients, saliva and oral flora influence on dental caries. Studies have taken place in various countries to establish a correlation between dental caries and body weight. Low weight children were found to have a connection with having high dental caries index (Prashanth *et al*, 2011). Sheiham (2005) described the relationship between oral and general health with the overall quality of people's life. He emphasized on the importance of oral health education and promotion in order to minimize the risk of poor health related to bad oral hygiene.

Low body weight was not the only variable associated with dental caries. Obesity has been linked with the high dental caries index as well. It may be noted that high sugar intake is causative factors for both obesity and dental caries, so the relationship between these two cannot be ignored. Therefore,

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dental caries has a strong association with high body weight individuals as well (Alm, 2008). On the other hand, some studies have revealed that there is no significant relationship between body weight and dental caries. It may be due to the absence of other risk factors that play an important role in causing dental caries (Pinto *et al*, 2007).

What makes The Public Health problem concern in the past years of life in dental decay is the amount of caries among children. The most worldwide fact about dental decay is chronic childhood cause, some say that dental caries increase in several age groups rise more than five times than asthma. In the early stage of the child life primary teeth are mostly linked by Early Childhood Caries (ECC), which through affect on the child's oral and through overall health, among the misery of tooth decay, three-quarters of children throughout continued untreated (Hong *et al*, 2008). Early childhood overweight is the most world spread nutritional health problem, there has been increasing most rapidly concern in agreement between dental decay & childhood overweight, Some Researchers believe that there is a huge connection between the child situation in health and the increasing fact of weight as well as high risk of developing dental caries. Weight gain and chronic diseases such as caries are both multi-factorial illnesses that

impact children's health and psychosocial development. Given that excessive capacity of free sugars and social shortage are risk factors for dental caries and weight-gain, it has been hypothesized that these two outcomes may be more likely to co-exist within the same per or inhabitants. Studies have shown that the majority of children are overweight due to the intake of low-density foods instead of fruits and vegetables and also due to high-fat and high-carbohydrate foods and a sedentary life style. There is also a thick bond between confiscation and both weight-gain and dental caries in children. Data from the National Child Measurement Programmed (NCMP) shows an almost linear relationship between obesity prevalence in children and the Index of Multiple Deprivation 2010 (IMD) decile for the area where they live. BMI is widely used as a surrogate measure for obesity because it corrects for an individual's height in relation to weight, and is a commonly used indicator of can indicate nutritional status (Child Obesity Facts Sheet, 2014).

Treatment of dental caries at the right time is imperative in order to improve their oral as well as general health in future. This may lead to better body weight maintenance among these children. Counter wise, if these children are not provided with the prompt treatment the improvement in their body weight may not be achieved (Sheiham, 2006). A study conducted by Thomas & Primosch (2002) revealed that providing appropriate and timely treatment to children suffering from early childhood caries led to slight improvement in the body weight. However, this change in body weight was not significant.

Similar findings were achieved in the preschool children in Michigan, USA, when Filstrup *et al* (2003) assessed the relationship between early childhood caries and quality of life. They acquired the responses from the children as well as their parents, which revealed that children who received treatment for ECC without any delay exhibited better quality of life as compared with the children having none or delayed treatment. Another investigation conducted on the indigenous children of Canada revealed that prevalence of early childhood caries affected their overall well being. However, the quality of life of these indigenous populations is not so well maintained. Therefore, this might play a confounding role in affecting the body weights other than caries (Schroth *et al*, 2009).

Several studies have attempted to associate factors such as socioeconomic status with the high incidence of caries. Sweet consumption has been more commonly observed in children belonging to upper socioeconomic class, hence increasing the risk of caries. However, a study done in Sweden failed to correlate the association of socioeconomic status with caries. On the other hand, increased body mass index has been reported among these groups of children (Gerdin *et al*, 2008). On the contrary, another Swedish study aimed to determine the relationship between increased body weight and prevalence of proximal caries in adolescents. Information from the patient was collected using the bitewing radiographs, which revealed a positive correlation between high body weight and increased prevalence of proximal caries (Alm *et al*, 2008). Speaking of factors associated with the higher incidence of dental caries, a Brazilian study focused on the association between nutritional status and dental caries. This study revealed that there was an evident relationship between dental caries and overall body health. Apart from the nutritional affects, another factor played an important role in causing more caries among children,

which was the educational levels of mother (Oliveira, Sheiham & Bonecker, 2008). One more factor was associated with low body weight among children, which was iron deficiency anemia. In the context of our study, this factor is important as iron deficiency anemia is suspected to be linked with early childhood caries. This must be included as a part of investigations for pediatric dentists when diagnosing and determining the causes behind early childhood caries (Clarke *et al*, 2006).

An investigation done on Filipino children having untreated caries and odontogenic infections revealed significantly low body mass index as compared with the children with no prevalence of such infection. However, these results also included the effect of a few confounding factors such as diet and socioeconomic factors (Benzian *et al*, 2011). On the contrary, study conducted by Shellar *et al* (2009) on American children was aimed to determine an association between caries and body mass index. Results concluded no significant relationship between the two. Similar findings were recorded when Tramini *et al* (2009) demonstrated a correlation between abnormal body mass index and dental caries among French children. They revealed that there was no association between body mass index and prevalence of dental caries.

Relevant to the above mentioned study, another attempt was made in order to determine the linkage between dental caries and body mass index. This investigation on Iranian children demonstrated that there was no relationship between these two variables. Mean values for dft were found to be low among children weighing higher than normal (Mojarad & Maybodi, 2011).

Several studies have reported the association of dental caries with body weight the other way around. Instead of decreasing weight with high caries prevalence, increase in body weight was also linked with high caries incidence. This may be due to the fact that high consumption of sweets and snacks between meals can cause both obesity as well as dental caries. Community based programs might be helpful in educating parents about this health hazard, which may result in the normalizing of body weight and keeping dental caries under control (Willershausen *et al*, 2004). A similar study took place in India, which measured the linkage between dental caries and obesity with dietary factors kept in consideration. The findings strongly suggested that the prevalence of dental caries increased with the increase in the body weight of children, with dietary intakes including sweets and fatty foods (Sharma & Hedge, 2009).

Hayden *et al* (2013) demonstrated a relationship between obesity and caries among British children. Their findings were similar to those discussed above as there was a strong correlation between obesity and dental caries. However, there are some other factors which may play an important factor in linking obesity with caries. Variations in findings have been witnessed as studies described caries association with BMI targeting different age groups. Similar strategy was acquired by Kedzierawski *et al* in 2007 when they compared children of various ages and revealed their association between dental caries and obesity. It was acknowledged from the findings that children aging between 2-5 years showed no evidence of the above mentioned association. This was also the case with older age groups; hence they concluded that there is not relationship between high BMI and dental caries.

**Aims of the study**

Due to the strong evidence, supporting the association of dental caries with irregular dietary manner & goodness and also the fact that the abnormal dietary intake has been linked to the development of weight-gain at a young age, a link between dental caries and weight is biologically reasonable. So, the present study was conducted to evaluate the relationship between BMI and dental caries among 7 and 10-year old school children in Riyadh City

**MATERIALS AND METHODS**

This study utilized 1156 primary school children and their body weight as well as DMFT index was recorded. The participants were divided in to age groups including 3-5, 6-8, 9-11 and 12+ years. Consent forms were sent to the parents and collected before the collection of data.

**Data Analysis**

Data were analyzed using SPSS 21.0 version statistical software. Descriptive statistics (mean, standard deviation, frequencies and percentages) were used to describe the study and outcome variables. Student’s t-test for independent samples was used to compare the mean values of weight and DMF in relation to gender. One-way analysis of variance was used to compare the mean values of weight and DMF in relation to the age groups, followed by Tukey’s multiple comparison tests. Pearson’s correlation coefficient was calculated between the quantitative variables (age, weight & DMF). A p-value of  $\leq 0.05$  was used to report the statistical significance of results.

**RESULTS**

Out of 1156 study participants, there were 316 (27.3%) male and 840(72.7%) female participants. The distribution of their age groups were 3 to 5 years ( 36.5%), 6 to 8 years (26.5%), 9 to 11 years ( 30.4%) and  $\geq 12$  years (6.6%). The mean (sd.) of weight and DMF of study participants is given (Table.1)

**Table 1** Distribution of study variables and descriptive statistics of outcome variables

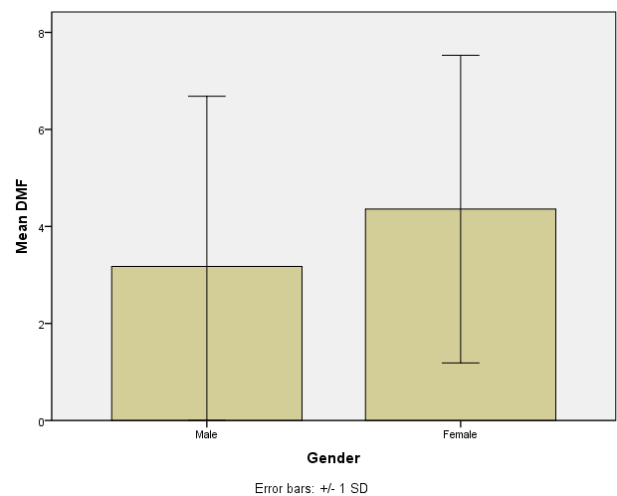
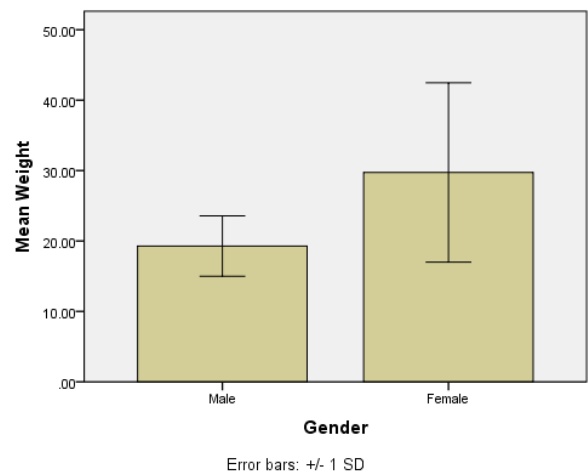
Variables	No.(%)
Gender	
Male	316(27.3)
Female	840(72.7)
Age Groups (in years)	
3-5	422(36.5)
6-8	306(26.5)
9-11	352(30.4)
$\geq 12$	76(6.6)
Weight ( Mean & Sd.,)	4.03(3.3)
DMF ( Mean & Sd.,)	26.88(12.02)

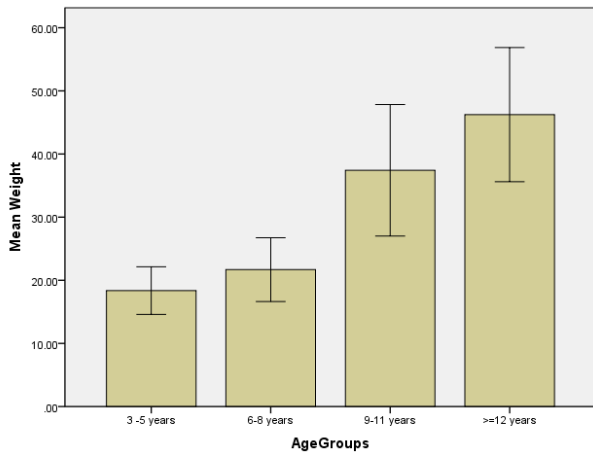
There is highly statistically significant difference in the mean values of weight and dmf between male and female study participants, where the female study participants are higher mean weight and mean DMF values when compared with male study participants which is highly statistically significant (  $t = -14.28$ ,  $p < 0.0001$ ;  $t = -5.49$ ,  $p < 0.0001$ ). Also there is highly statistically significant difference in the mean values of study participant’s weight in relation to their 4 age groups, where the mean weight is significantly higher in the age of groups of 9 to 11 years and  $\geq 12$  years when compared with other two

age groups ( 3-5 years & 6- 8 years) (  $F = 677.07$ ,  $p < 0.0001$ ). And there is also highly statistically significant difference in the mean DMF values of study participants in relation to their 4 age groups. Among the 4 age groups, the study participants in age group of 9 to 11 years are having higher mean value of DMF when compared with other 3 age groups. ( $F = 29.90$ ,  $p < 0.0001$ ). (Table 2)

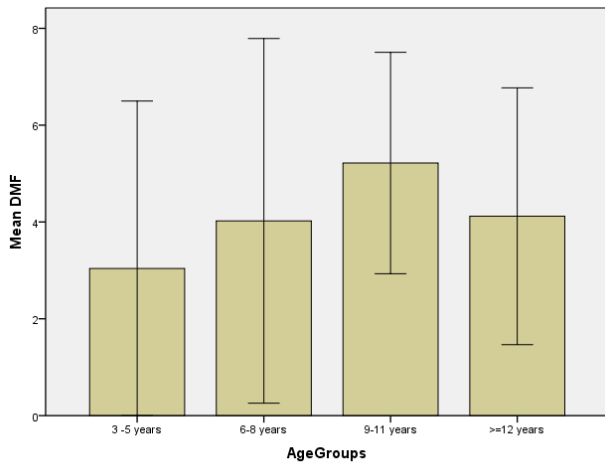
**Table 2** Comparison of mean values of Weight and DMF in relation of study class and age groups of study subjects

Study variables	Weight			DMF		
	Mean (Sd.,)	t-value/ F-value	p-value	Mean (Sd.,)	t-value/ F-value	p-value
Gender						
Male	19.28(4.3)			3.17(3.0)		
Female	29.75(12.8)	-14.28	<0.0001	4.36(3.1)	-5.49	<0.0001
Age Groups (in years)						
3-5	18.36(3.8)			3.04(2.9)		
6-8	21.69(5.0)	677.07	<0.0001	4.02(3.8)	29.90	<0.0001
9-11	37.42(10.4)			5.22(2.3)		
$\geq 12$	46.24(10.6)			4.12(2.6)		

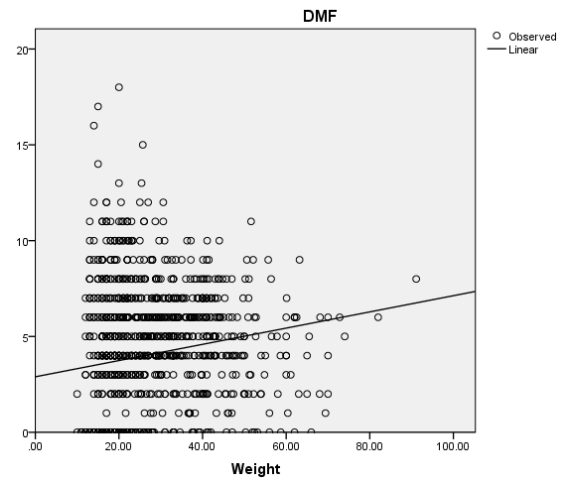
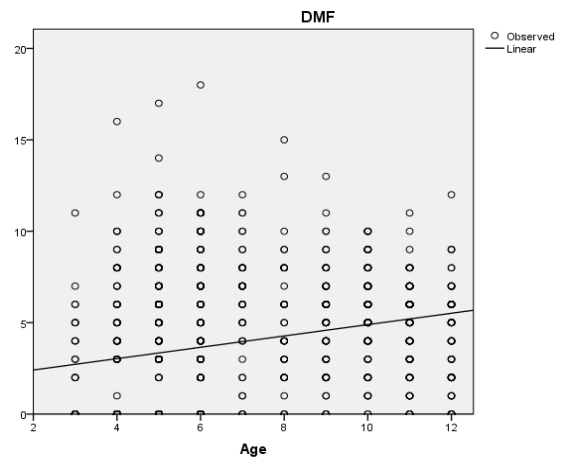




Error bars: +/- 1 SD

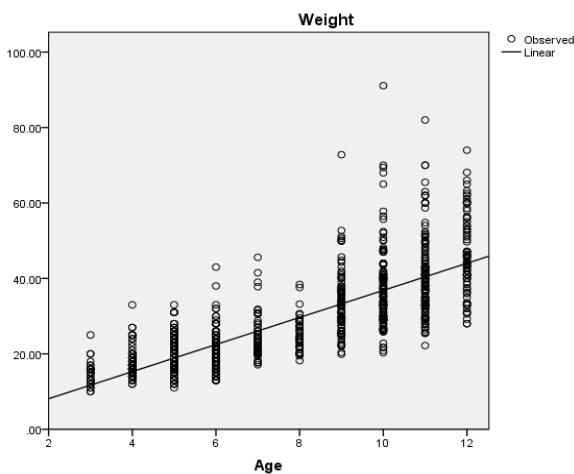


Error bars: +/- 1 SD



**Table 3** Correlation between age and (i)weight (ii) DMF

Variables	Correlation –r 'value & p-value		Correlation –r 'value & p-value	
	Age		Weight	
Age	--	--	--	--
Weight	0.806	<0.0001	--	--
DMF	0.253	<0.0001	0.154	<0.0001



## DISCUSSION

The aim of this study was to determine an association between dental caries and body weight of children. Various studies have demonstrated different kinds of associations with caries being more prevalent in high body weight children and vice versa. On the other hand, there have been studies showing no significant relationship. All these kinds of examples will be compared with our studies and discussed here.

Some studies demonstrate that the increasing rate in body weight, Results in the decreasing rate of dental caries in children from the age (3-6) years old and other studies suggest that dental caries actually increases, however, other studies even show that it has no effect whatsoever. Tooth decay is the most widespread public health problem; it starts at an early age of infants and preschool children. The relationship between body mass index and dental caries is complex and varies depending on many factors, such as age, gender, race, and family income.

Prashanth (2011) and Ayhan *et al* (1996) found that number of children was in normal BMI percentile, and overall underweight children had more mean number of caries, which is contrary to our study where the increase in body weight was associated with higher mean DMF especially in the females. However, studies done by Mostafa *et al* (2007), Larsson (2005) and Kantovitz *et al* (2006) showed high prevalence of dental caries in overweight + obese children, which actually supported some of our findings especially among the older aged children. However, according to the study done by Yen & Hu (2010), Kim *et al* (2007), Tramini *et al* (2009), and Macek

(2006), there was no statistically significant association between dental caries and different categories of BMI i.e. either normal, underweight, overweight and obese category.

## CONCLUSIONS

- There is highly statistically significant difference in the mean values of weight and dmf between male and female study participants, where the female study participants are higher mean weight and mean DMF values when compared with male study participants which is highly statistically significant
- The data also indicates statistically significant positive correlation between age and weight; age and DMF; & weight and DMF. That is, as the age of study participants increases their weight also increases; as the age of study participants increase their DMF values also increase & as the weight of study participants increases their DMF values also increases.

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**How to cite this article:**

Nora Hamid Al-Megren *et al* (2018) 'The Relationship Between Early Childhood Caries and Body Weight Among Children in Riyadh City', *International Journal of Current Advanced Research*, 07(3), pp. 10726-10731.  
DOI: <http://dx.doi.org/10.24327/ijcar.2018.10731.1832>

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