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Research Article

Predictors of Dental Caries

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Abstract

Introduction: Obesity is state of abnormal accumulation of fat in adipose tissues of the body to the level that one's health is adversely compromised. Tripathi et al. stated (according to World Health Organization (WHO)), obesity is now considered fifth leading cause of Mortality in the world. Reports suggest prevalence of obesity in the last two decades has doubled in developed and developing countries. Caries is a multifactorial disease and one of the major oral health issues of modern era effecting people around the globe. It is the main cause of Dental pain and loss of tooth. Rise in dental caries has been observed in developing countries as a result of factors including increase intake of carbohydrate and high sugar diet in form of deserts. Present study aims for accessing association between decayed missed filled teeth (DMFT) with Body Mass Index (BMI), Age and Gender. Study was conducted in Dental outpatient department (OPD) of Dow University of Health Sciences (Pakistan) between Feb 2016 and Jan 2017.

Methodology: A custom-made questionnaire was used to access BMI, DMFT, and socio-demographic of participants via interview. Sample size was kept at 385. Participant within age group of 14 to 65 yrs. old were included. BMI was categorized as underweight (BMI <18.5), Normal (BMI 18.5-24.9), Overweight (BMI 25-30) and Obese (BMI >30). Participant were acquired regarding their eating habits, frequency of eating consumption of refined sugars, Snacks and fast foods, Physical activity and tooth brushing habits. Caries prevalence was assessed via standard criteria set upon by WHO, the decayed, missing and filled teeth (DMFT) index. Chi-square test was used to study the relationship between variables and to compare means and p value of ≤0.05 was considered statistically significant. Linear logistic regression analysis was used to determine the degree of association between obesity and dental caries and other variables.

Results: Age reported as a strong predictor (R2 0.641) of DMFT followed by BMI and Gender as being a weakest predictor. Age and BMI had demonstrated statistically significant association with DMFT scores. Diet patterns affect general health, high calories over long periods effect BMI if quality of health is not maintained. Refined sugary diet in high calories increases risk of caries. Increasing age brings plethora of health problems, including Oral health issues also.

Conclusion: Present study has demonstrated possible BMI and age association with DMFT, Further studies taking into consideration certain confounding variables and DMFT association with Socioeconomic status will reveal more conclusive findings.

Introduction

According to WHO, Obesity is state of abnormal accumulation of fat in adipose tissues of the body to the level that once health is adversely compromised [1]. Alm et al. [2] & Tripathi et al. state (according to WHO), obesity is now considered fifth leading cause of Mortality in the world Reports suggest prevalence of obesity in the last two decades has doubled in developed and developing countries [3]. Association of Obesity with certain systemic diseases such as type 2 diabetes, hypertension, cerebrovascular diseases has been strongly reported in literature [4-7].

A comprehensive study of National Health and Nutrition Examination Survey (NHANES) between 1999 and 2004 revealed among individuals aged 20 to 34yrs having 85.58% effected by (DMFT), 35 TO 50yrs 94.30% and 50 to 64yrs having 95.62% effected by (DMFT) [8]. This state's DMFT score with respect to age increasing with increase in age. In recent years due to increased in refined and fat diet and sedentary lifestyles obesity has increased in South Asia. As highlighted by Amin et al. [9] one major factor of obesity is change in regional diet its quantity and quality. Recent studies has demonstrated increase consumption of Animal and refined foods with reduction in intake of vegetables [10].

Caries is a multifactorial disease and one of the major oral health issues of modern era effecting people around the globe. It is main cause of Dental pain and loss of tooth [11]. It accounts for one of the major oral health related diseases especially among younger individuals. Due to caries being so widespread globally, it is present among both genders, all age groups, among all cultures and socioeconomic classes. Dental caries not only results in financial burden but also has a major impact on quality of life of an effected individual [12,13]. Treatment of dental caries is also expansive. According to WHO report caries is 2nd most costly disease in Australia followed by cardiovascular diseases. Progression in caries prevention and treatment regimens is achieved via scientific research. In last ten years a reduction in dental caries has been

observed in developed nations [14,15].

Contrary to this a rise in dental caries has been observed in developing countries as a result of factors including increase intake of carbohydrate and high sugar diet in form of deserts, Increase in people with low socioeconomic status, lack of education and basic health care services. A number of studies have been documented assessing association of BMI and Dental caries, with conflicting results. Present study aims for accessing association between DMFT with BMI, Age and Gender.

Our Null hypothesis is BMI, Age and Gender are not associated with DMFT (Caries) and BMI and Age is a weak predictor of DMFT. Our Alternate hypothesis is BMI, Age and Gender are associated with DMFT (Caries) BMI and Age is strong prediction of DMFT.

Methodology

The study was conducted in Dental OPD of Dow University of Health Sciences between Feb 2016 and Jan 2017. No issues were observed during Routine patient care, as this study had no direct involvement regarding patient treatment or intervention. A custom made questionnaire was used to access BMI, DMFT and sociodemographics of participants via interview. Keeping confidence interval at 95% with standard error of mean at 0.5% the calculated sample size (Considering annual patient flow in OPD) was 385. Participant within age group of 14 to 65 yrs. old were included. BMI was categorize as underweight (BMI <18.5), Normal (BMI 18.5-24.9), Overweight (BMI 25-30) and Obese (BMI >30). Participant were enquired regarding their eating habits, frequency of eating consumption of refined sugars, Snacks and fast foods, Physical activity and tooth brushing habits.

Caries prevalence was assess via standard criteria set upon by WHO, the decayed, missing and filled teeth (DMFT) index. The index determines total number of dentition, surfaces of teeth having caries, missing or had restorative procedure. Clinical dental examination was undertaken by House officers specially trained in dental OPD, with use of natural sunlight or a source of illumination where needed. In accordance to infection control guidelines new Cap, Mask and glove were used in each patient. Questions regarding lifestyle were accessed by time spend in watching TV, use of computer, Playing games on consoles or computer and use of smartphone for purpose of entertainment. Edentulous patients were excluded, Patients having any communicable disease or any psychotic disorder or patients who have condition restricting them to a very strict diet regime, Patients with radiation therapy and Pregnant Women.

Statistical analysis

Data were analyzed using the Statistical Package for Social Science software, version 20.0 (SPSS, Chicago, IL, USA). The Chi-square test was used to study the relationship between variables and to compare means and p value of ≤0.05 was considered statistically significant. Linear logistic regression analysis was used to determine the degree of association between obesity and dental caries and other variables.

Results

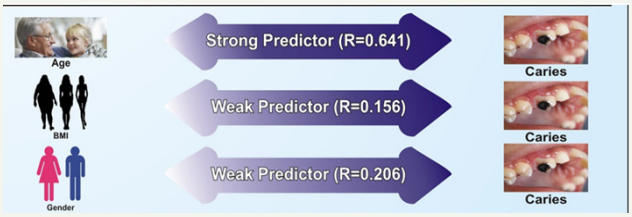

Figure 1: According to our results R^2 of 64.1% variance in age can be a strong predictor of DMFT score, while BMI (15.6%) and Gender (20.6%) variance are not good enough in predicting DMFT scores of an individual.

A total of 385 patients were enrolled in the study. The mean age was 24.60 yrs. and mean DMFT was 3.01. Young females constitute highest number of participants. Results are tabulated in Figure 1 and Table 1.

Table 1: Possible associations between variables, Age and BMI had demonstrated statistically significant association with DMFT scores.

	P = 0.000
Age Groups	**DMFT**
Teenagers (14-19)	28
Young Adults (20-40)	19
Adults (41-65)	338
	P = 0.003
BMI	**DMFT**
Underweight	42
Normal	298
Overweight	45
Obese	27
	P = 0.301
Gender	**DMFT**
Male	92
Female	293

(GENDER-AGE-BMI)

No Multicollinearity was observed among these independent variables
Tolerance = 0.845 (Acceptable >0.1)
Value inflation factor= 1.184 (Acceptable <10)

Discussion

Dental Caries and BMI both are related to diet related health outcomes, Association between the two is not surprising. Previously past studies have also reported association between these two variables [16]. Since mid of 1990s there has been drastic changes in lifestyle and diet, probably due to increased usage of food having rich calories and intake of carbohydrate drinks and foods. This can be one of the etiological factor of rise in Obesity and dental caries [17,18]. Obesity has seen a rise in US and Europe. According to Eurostats statistics, a report published in 2014 states European Union states as of 2014 had staggering 51.4% of population above 18 yrs. Obese. Similar report of NHANES (National Health &

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Nutrition Survey) in a 2012 survey states US individuals above 20 having BMI of 30+. Present study had less overweight individuals than those with normal BMI, thus majority of high DMFT score was among normal weight individuals probably here factors determining caries are other such as poor oral hygiene, lack of education etc. The result was as expected as according to Wan Siang et al. Asian countries has some of the lowest prevalence of overweight and obesity worldwide with Vietnam and India having lowest with 1.7% and 1.9% respectively. Older adults demonstrated highest number of DMFT score. A survey by National Institute of Dental and Craniofacial Research between 1999-2004 reported age group (20-34ys) constituting highest decayed untreated teeth, but with lowest DMFT score. Current study also demonstrated similar trend [19,20].

Sheiham & Sabbah [21] stated level of caries follow a predictable trend lines, provided stable environmental conditions and absence of any effective interventions. In present study, a large difference is observed in DMFT scores between Adults and youngsters. This is in line with similar findings in Iranian Study where higher age reported increase in caries experience [22]. Similar results were also reported in Northern and southern India study [23,24]. According to Eslamipur et al. [22] adults are at risk for a long duration of time, which gives a suggestion they are more likely to have caries. High DMFT scores among adults can also be accounted due to neglect from young individuals regarding their oral care and it is only in later stages of life that carious lesion progresses to a significant level that an individual seeks dental assistance.

Caries is a multifactorial disease. Number of factors is responsible for initiation of dental caries such as composition and frequency of diet. Socioeconomic status, salivary immunoglobulins, bacterial and fluoride intake. Due to multiple etiologies study of dental carries become complex. Apart from this obesity and dental caries are complex conditions with etiological factors such as genetics, biological, behavioral and environmental. BMI is used widely as a measurement tool for obesity due to the fact that it relates for height of a person with respect to his weight. It is also a tool for Nutritional status indicator. Thus, the fact that dental caries and BMI both are used as a measurement tool for diet related health outcomes. An association amongst them is not surprising.

Apart from this, Malnourishment is also one of the etiology for dental caries. Protein deficiency/energy loss leads to energy-protein malnourishment, reduction in flow of saliva, formation of calculus, increase in carious lesions and growth reduction. Studies have reported malnourishment in young adults predisposing to increase propensity to dental caries and salivary hypo function.

Present study demonstrated statistically significant association between BMI and DMFT. A study by Willerhausen et al. and Marshal et al. reported significant association between high weight and dental caries. Possible explanation can be the fact obese individuals tend to consume high levels of soda and other sugary drinks and foods which by nature are obesogenic and cariogenic. Moder et al. [25] gave an opinion that overweight individuals have high caries risk as a result of reduction in salivary flow rate, which itself is associated with protein deficient malnourishment. Contrary to these reported studies something also found in underweight children and which is associated with protein-deficient malnutrition [26,27]. Obese children may well suffer from protein deficient malnutrition if their energy intake is made up of high carbohydrate, highly processed foods. While others studies done by Macek et al. [28] Frisbee et al. and Cereceda et al. found no significant association between BMI for age and dental caries prevalence in either of the dentition. They concluded that relationship between nutrition and dental caries is complex because it is multifactorial disease also involving oral hygiene, available nutrients, saliva and oral flora influences dental caries.

Conclusion

However precise nature of these associations remains unclear, it is possible that different factors are involved in the development of caries in children with high and low BMI and in high and low socio-economic strata. Therefore further investigation of the association between the diseases and among their predictors is required. Specific attention should be given to longitudinal studies to gauge the association between early childhood caries and health outcomes in adolescence and adulthood, to the inclusion of younger children (aged 0 to 6 years) in the samples, to the perseverance of dietary and health-related behaviors developed during the preschool years, and to parental or familial influences on the development of these pattern.

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