Caries Risk Assessment and its Association with Socio-demographic Factors Among General Population of Lahore, Pakistan

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ABSTRACT

Background and Objective*: Dental caries is the major public health problem and prevalent chronic disease worldwide. The objective of the study is to conduct caries risk assessment (CRA) in general population and find its association with age and gender. The use of CRA deserves special emphasis because it benefits the dental professional as well as patients.*

Methods: *A total of 267 individuals participated in the study which was conducted in four months (May 2017 to August 2017) in Lahore Medical & Dental College. Risk Assessment was done on a proforma developed by American Dental Association which included both history and clinical examination related parameters.*

Results: *Out of 267 participants, 53.9% were at high risk, 34.8% at moderate risk and 11.2% were at low risk of developing future caries. No association was found between age groups (P = 0.106) and gender (P= 0.060) with caries risk.*

Conclusion: *The results suggest that majority of the population are at high risk of developing caries and awareness must be increased among masses.*

KEYWORDS: *Dental caries, Risk assessment, Dental care, Sociodemographics.*

INTRODUCTION

Dental caries is a disease associated with multiple causation factors that involves breakdown of tooth structure, oral acidogenic bacteria and dietary carbohydrates. Caries can have local and in some extreme cases systemic effects. The prevalence of dental caries is very high worldwide.[1] The study estimating global burden of the disease suggests that approximately 2.4 billion people are affected by caries of permanent teeth. Moreover, 486 million children suffer from caries of primary teeth. Among Pakistani population, dental caries is one of the major reasons of tooth loss.[2,3]

Oral health related quality of life in individuals of all ages have been compromised due to negative impact of tooth decay on oral health. In high income countries, incidence of dental caries has declined which can be attributed to the use of high quality preventive programs that includes the use of fluorides while in low and middle income countries, the decline has been less or inverse because of increase in consumption of refined foods and less effective preventive practices.[4]

According to Hausen et al.[5] there is a possi-bility that due to caries risk, a person will develop a definite number of carious lesions either cavitated or non-cavitated or achieve a specified level of disease progression, over a specific period of time, provided their contact remains the same during this period. Caries risk assessment (CRA) of an individual has become an essential component in the modern day practice of caries management. Greater importance is given to a preventive approach, rather than the surgical/restorative intervention.[6]

The CRA systems may include different factors or parameters such as past caries experience, socio-demography, socio-economy, oral hygiene, exposure to fluoride, recent extractions, dietary habits, oral microbiota, intake of sugary drinks and salivary characteristics etc. These factors help in the prediction of developing new dental caries in patients. The aim of CRA should be to help the clinician in making appropriate treatment recommendations, ensure that all aspects of information is analyzed in a constructive manner, establish recall timings in dental office and to create awareness among patients.[7,8]

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A number of caries prediction models have been proposed for use in clinical practice. In order to predict caries in children and adults, the 'Cariogram Model' can be employed.[9,10] Moreover, the International Caries Detection and Assessment System (ICDAS) and its International Caries Classification and Management System (ICCMS™) aids in staging and management of caries.[11] Caries Management by Risk Assessment (CAMBRA), developed in California, categorizes patients as low, moderate and high caries risk and also provides management according to the risk level.[12] American Academy of Pediatric Dentistry (AAPD) provides guidelines on CRA and management of infants, children and adolescents.[13] Caries Assessment and Risk Evaluation (CARE) identifies children, at an early stage, who have high caries risk and involves them in an aggres-sive preventive management system.[14]

American Dental Association (ADA) developed two caries risk assessment forms,[15-16] which are free for use and categorize individuals into low, medium or high risk of developing caries, based on history and clinical examination. These forms are accompanied with complete and detailed instructions. The ADA caries risk assessment model is simple to use, cost effective, less time consuming, results can be easily explained to patients and correctly identifies individuals at high risk.[17]

The purpose of the study was to conduct the ADA caries risk assessment in general population, evaluate its findings and explore its association with sociodemographic factors i.e. age and gender.

METHODS

In this cross-sectional study, 267 participants above the age of six years were selected by non-probability, convenience sampling technique from the outdoor department (dental section) of Lahore Medical and Dental College after the approval from ethical review committee (No. HCSC/18/ ERC/107). Data was collected over a period of four months from May 2017 to August 2017. Informed consent and approval was obtained for participation in the study. Individuals not willing to participate, who had previously CRA done or were less than six years old were excluded from the study. Age, gender, marital status and occupation were recorded as sociodemographic information of the par-

ticipants. All the respondents were further divided into six groups according to their age. ADA caries risk assessment form (age > 6 years) was filled based on results of history and clinical examination of the participants by a single examiner. History included a total of nine questions, four questions regarding the contributing conditions causing caries and five questions related to general health condition of the participants. Nine conditions were clinically inspected in the respondent's oral cavity.

Based on the responses, all respondents were categorized into low, moderate or at high risk of developing future caries as explained under:
i.   Low risk of caries: if only conditions in "Low Risk" column were present.
ii. Moderate risk of caries: only conditions in "Low" and/or "Moderate Risk" column present.
iii. High risk of caries: one or more conditions in the "High Risk" column present.

Even a single response in the high risk category was sufficient to place that person in the high risk of developing future caries group. A patient`s observed risk level can be modified (increased or decreased) based on the dentist`s clinical judgment. Results were shared with the participants and appropriate caries preventive and management strategy was advised.

STATISTICAL ANAYLYSIS

Date was analyzed in the SPSS version 25. Frequencies and percentages were calculated for age, gender and the responses of ADA form. ANOVA was used for age groups and independent sample t test for gender to check the significant mean difference. The *P-value of ≤ 0.05* was considered significant.

RESULTS

This study was conducted among 267 participants comprising 124 males and 143 females from the age of six year and above. Participants were divided into six age groups and majority (42.7%) were in 6 – 29 years age group as in (Table-1).

Figure. 1 shows the percentage of respondents to the contributor factors of dental caries. About 37.8% of participants, who answered yes to the frequent use of sugary foods or drinks (including juice, carbonated or non-carbonated soft drinks, energy drinks, medicinal syrups), were placed in the high risk to dental caries group. Similarly, 11.6% of respondents with caries experience of mother, caregiver, or other siblings in last 6 months were also placed in the high risk caries category.

Figure. 2 displays the percentage of responses to the questions related to general health conditions which can cause caries. Individuals with special health care needs (4.5%) with age from 6-14 years (developmental, physical, medical or mental disabilities that prevent or limit performance of adequate oral health care by themselves or

Table-1: *Demographic Characteristics (N = 267).*

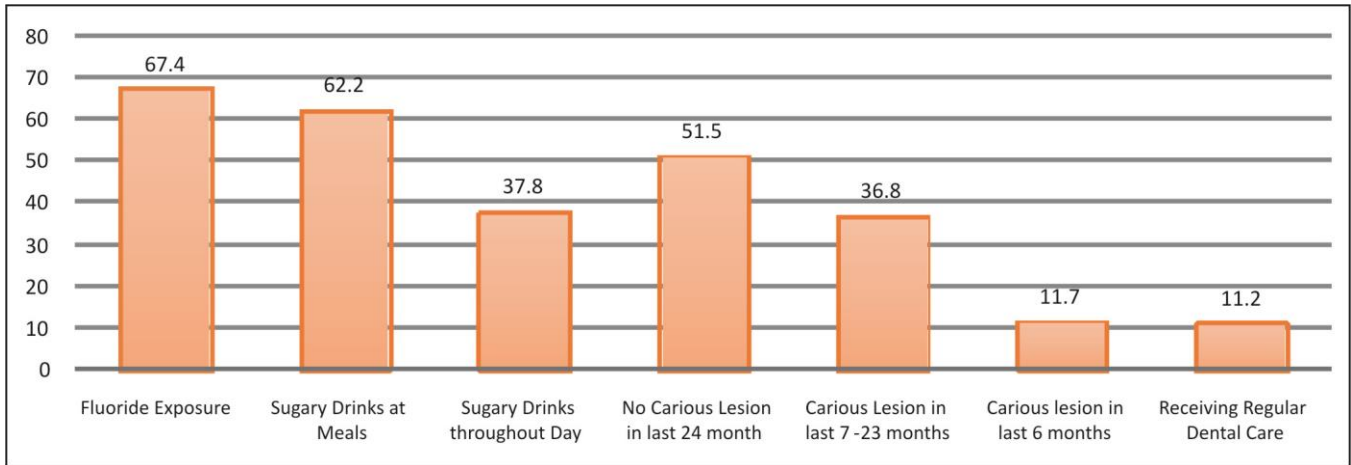| Characteristics		Frequency (N)	Percentage
Gender	Male	124	46.4
	Female	143	53.6
Age groups (years)	6 – 29	114	42.7
	30 – 39	75	28.1
	40 – 49	47	17.6
	50 – 59	18	6.7
	60 – 69	10	3.7
	≥ 70	3	1.1

Fig. 1: *Contributing Factors of Dental Caries among General Population (%)*
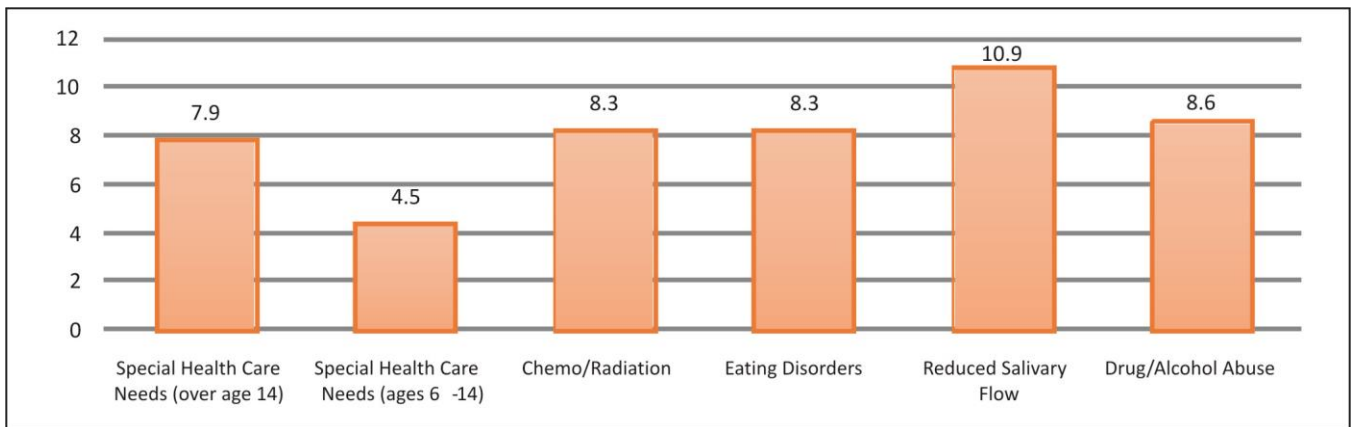

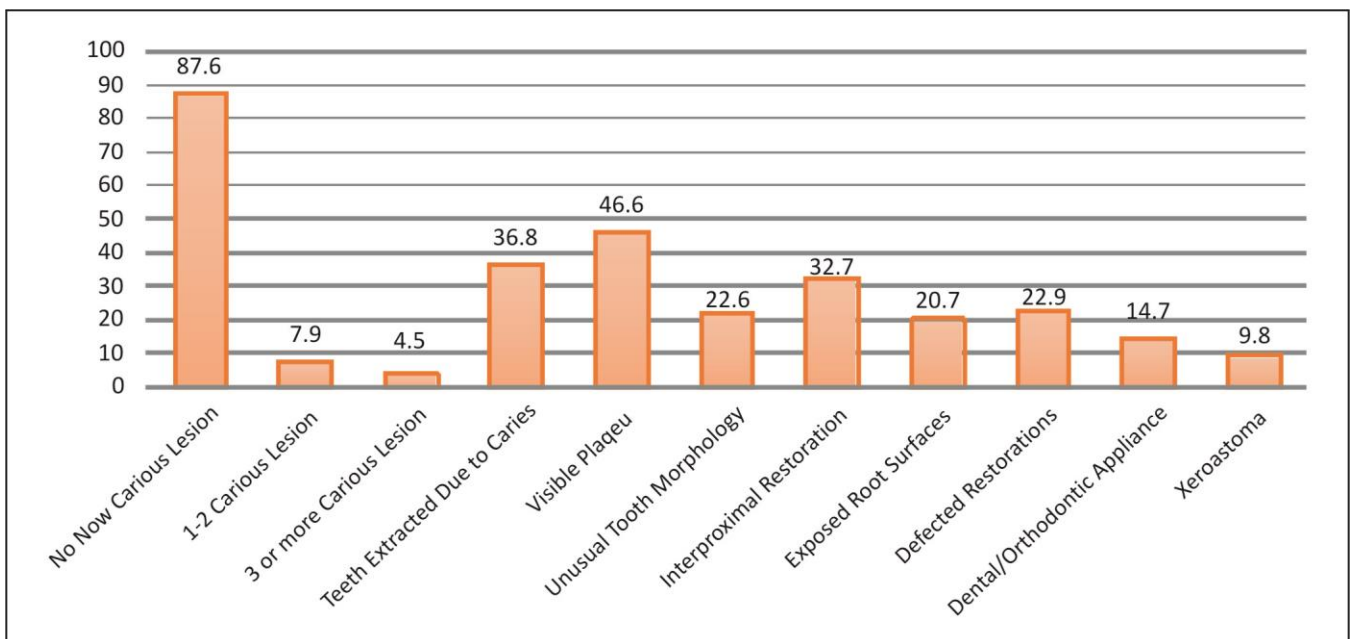**Fig. 2:** *General Health Conditions Cause Caries (%).*

Fig. 3: *General health conditions causing caries (%).*

caregivers) and those undergoing chemo/radiation therapy (8.3%) were placed in the high risk of caries category.

Figure. 3 displays the clinical conditions present in the oral cavity of the respondents. A total of 4.5% of respondents with three or more cavitated or non-cavitated carious lesions or restorations and 36.8% of respondents with teeth missing due to caries in past 36 months were categorized as individuals at high dental caries risk.

Figure.4 shows overall risk assessment of dental caries, 30 (11.24%) participants have low risk, 93 (34.83%) have moderate risk and 144 (53.93%) participants have higher risk of dental caries. In the high risk of future caries group, 63(50.8%) were males and 81 (56.6%) were females.
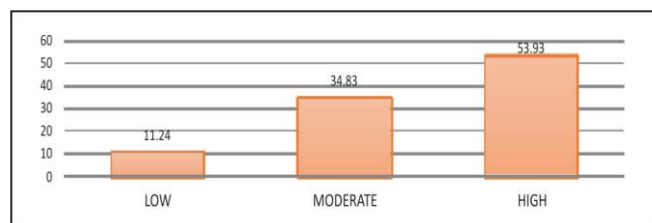

Fig. 4: *Overall assessment of dental caries risk (%).*

The clinical conditions present in the oral cavity of the respondents were also observed according to which 4.5% of respondents with three or more cavitated or non-cavitated carious lesions or restorations and 36.8% of respondents with teeth missing due to caries in past 36 months were categorized as individuals at high dental caries risk. Furthermore, 87.6% of respondents with no new carious lesions in teeth, 7.9% with

Table -2: *Comparison and association of dental caries risk assessment scores by age and gender (N = 264).*

Variables	n	Dental Caries Assessment Scores Mean ± SD
Age		
6 – 29 years	113	22.46 ± 3.70
20 – 29 years	73	23.20 ± 4.20
40 – 49 years	47	24.27 ± 4.94
50 – 59 years	18	24.27 ± 3.40
60 – 69 years	10	24.50 ± 4.85
≥70 years	3	24.00 ± 4.00
	P-value = 0.106	
Gender		
Male	124	22.70 ± 3.48
Female	140	23.65 ± 4.62
	P-value = 0.060	

1-2 carious lesions, 46.6% with visible plaque on surfaces of teeth, 22.6% with unusual tooth morphology, 32.7% with interproximal restorations, 20.7% with exposed root surfaces, 22.9% with defected restorations, 14.7% with dental orthodontic appliances and 9.8% respondents were found with xerostomia.

Moreover, according to risk assessment of dental caries, 30 (11.24%) participants had low risk, 93 (34.83%) had moderate risk and 144 (53.93%) participants had higher risk of dental caries. In the high risk of future caries group, 63(50.8%) were males and 81 (56.6%) were females.

Table-2 indicates comparison of dental caries assessment scores by age and gender variables. On comparison by age group, the difference in dental caries assessment mean scores was not statistically significant with *P-value of 0.106*. On gender wise comparison by dental caries assessment mean scores (i.e. t-test), males have higher scores 22.70 (3.48) from females 23.65 (4.62) while the difference was not statistically significant with *P-value of 0.06*.

DISCUSSION

Dental caries is one of the major cause of tooth loss in Pakistani population. In a study conducted in school going children of Lahore, 52.6% with satisfactory oral hygiene status had active dental caries.[18] In another study conducted in 65 to 74 year old individuals, 85% of them had dental caries in their oral cavity.[4] In a study conducted in three major cities of Pakistan, 91.9% of dentists were not performing any type of CRA in their practice. This shows that dentists are not concerned regarding this fundamental practice as compared to dentists in developed countries.[19]

American Dental Association recommends visiting a dentist at least once or twice a year; others may need more visits according to their oral condition.[20] In present study, majority of participants (88.8%) were not receiving regular dental care in a dental office (Fig.1). In another study conducted at a Dental college in Karachi, none of the participants had a regular dental care system.[17] This represents an alarming situation that majority of our population seek dental treatment only when symptoms appear and this has resulted in individuals getting high risk of caries. Low lite-racy rate, lack of awareness and a negligent trend to-wards dental care has contributed to this problem.

Sugary drink consumption throughout the day was the major contributing factor that placed 37.8% of the participants in high caries risk group (fig.1). The risk of getting dental caries may increase by 179% if the daily between meal consumption of carbo-nated sugary drinks is three or more times a day.[21] Dentists should play a role in educating the masses regarding the negative association of sugary drink con-sumption and caries.

A total of 36.8% of participants had history of tooth extraction due to caries in the past 36 months (Fig.3). This factor placed these individuals in the high risk caries category. In a study conducted in Taiwan, 55.3% of patients underwent tooth extraction predominantly due to caries, 22.1% due to periodontal disease, 12% due to impaction and 10.6% due to other reasons. Caries are a major factor of causing tooth extraction in primary and permanent dentition.[22]

Majority of the subjects (53.93%) were categorized as high risk, followed by (34.83%) as medium risk and (11.24%) as low risk for developing future caries (Fig.4).CRA conducted in Chilean adolescents and adults, majority of participants were classified as "high risk" or "very high risk" while none of them was at "very low risk" of developing future caries.[23] A similar trend is seen in many other studies.[17,24-27] This shows the dire need of creating awareness among masses regarding caries prevention/management and the need for incorporating CRA in dental practices.

Different age groups and gender had no significant association with dental caries risk assessment scores in current study (Table-2). A study conducted in Malaysia found different age groups as a significant risk indicator for coronal caries but gender was not significantly associated.[28] Gender did not have a statistically significant association with level of caries risk in another study.[9]

Generally, caries risk assessment forms does not cover all possible risk factors or to be used as a replacement for the practitioner's (dentist) judgement. Therefore, listed risk factors are intended to provide patient's with information that may help them lower the associated caries risk over time. While, by providing a template that can be integrated into a busy dental setting. More focused assessment may be appropriate for patients with specific health concerns e.g., a patient with decreased manual dexterity.

CONCLUSION
Majority of the participants had high risk of developing caries, didn't receive any regular dental care and were prone to sugary drink consumption throughout the day. No association was found between dental caries assessment scores with age groups and gender.

LIMITATIONS OF STUDY
Owing to inadequate resources, limited number of people were surveyed. This study may be supplemented with possible future, larger-scale surveys in order to strengthen the conclusions drawn about study topic under discussion.

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