Kerman Oral and Dental diseases research center

Kerman University of Medical Sciences and Health Services

Volume 1, No. 2, Autumn 2012
Biannual

Journal of Oral Health & Oral Epidemiology
Volume 1, No. 2, Autumn 2012

Kerman Oral and Dental diseases research center

Kerman University of Medical Sciences and Health Services

Volume 1, No. 2, Autumn 2012
Biannual

Scientific Research Journal

Journal of Oral Health & Oral Epidemiology

Official Journal of Kerman Oral and Dental Diseases Research Center

Online ISSN 2322-1372

Http://johoe.ir
johoe@kmu.ac.ir

Table of Contents

Review Article

Original Article

Journal of Oral Health & Oral Epidemiology

License Holder: Vice chancellor for Research, Kerman University of Medical Science.
Chairman: Arash Shahravan, DDS, MS
Editor- In- Chief: Masoud Parirokh, DDS, MS
Associate Editor: Maryamalsadat Hashemipour, DDS, MS
Executive Manager: Shiva Pour Adeli
Office Management: Forozan Rafiee

Editorial Board:

Journal's Office: Oral and Dental Diseases Research Center, Kosar Blvd, Kerman, Iran, 7618836555
TelFax: +98 341 2133440
Email: johkmu@kmu.ac.ir
Email: johkmu@yahoo.com
www.johoe.kmu.ac.ir

Copy edit, Layout edit, Design, and Print: Farzanegan Radandish Co.
Postal Code: 81465-1798, Isfahan, Iran
Tel: +98 311 2241953, 98 311 2241876
Email: f.radandish@gmail.com
www.farzaneganco.ir

Author's instructions for the *Journal of Oral Health & Oral Epidemiology*

Journal of Oral Health & Oral Epidemiology is the official journal of the Oral and Dental Diseases Research Center of Kerman University of Medical Sciences. The journal publishes original research articles, review articles, and case reports dealing with oral health and epidemiology. Papers in any of the following fields will be considered for publication: oral health, oral and dental treatment research, oral and dental epidemiology, as well as any issues regarding improvement of oral and dental treatment.

EDITORIAL REVIEW AND ACCEPTANCE

The acceptance criteria for all papers are the quality and originality of the research and its significance to the journal readership. Except for invited papers, submitted manuscripts are peer reviewed by three anonymous reviewers, and the journal's editorial board. Final acceptance or rejection is depending on the editorial board decision on peer reviewed papers.

Manuscripts should be written in a clear, concise and direct style. The Editorial board reserves the right to edit accepted papers to be more concise and free of grammatical typos and errors. Following acceptance an edited form of the paper will be sent to the authors' correspondence for final review and approval. If extensive alterations are required, the manuscript will be returned to the author for major revision.

SUBMISSION OF MANUSCRIPTS

The *Journal of Oral Health & Oral Epidemiology* is using an online submission and peer review. To submit a manuscript, please open journals website at: http://johoe.ir

Getting Help With Your Submission

Any enquiries should be sent to:
Ms. Pouradeli, Ms. Rafiee
Editorial Assistant, *Journal of Oral Health & Oral Epidemiology*
Oral and Dental Diseases Research Center, Qusar Boulevard, Kerman, Iran.
Email: johkmu@kmu.ac.ir, johkmu@yahoo.com
Telefax: +98 341 2133440

Cover letter

Papers should be submitted considering the fact that it's content has not been published or submitted for publication elsewhere except as an abstract in a scientific meeting or congress. This must be stated in the covering letter.

The covering letter must also contain an acknowledgement that all authors have contributed significantly, and that all authors are in agreement with the content of the manuscript.

Authors must declare any financial support or relationships with companies and should disclose any conflict of interest at the time of submission. Such information will be held in confidence while the paper is under review and will not affect decision about acceptance or rejection of the paper.

If tables or figures from previously published articles have been used in a submit paper a letter from the copyright holder (the Publisher), permitting to reproduce the material, must be attached to the covering letter.

ETHICAL CONSIDERATIONS

If the paper contains any issue regarding human and animals, authors must state that their protocol for the research project has been approved by the Ethics Committee of the institution

within which the work was performed. Journal of Oral Health & Oral Epidemiology reserves the rights to reject any manuscript at any steps on the basis of unethical conduct of either human or animal studies.
All research studies on human subjects should contain an ethical code obtained from the local university, the institution the authors are working for, or any other authorities who are in charge based on the rules of the related country. For clinical trials conducted in Iran, the Iranian Registry of Clinical Trial (IRCT) number should also be provided. In any case that patient's face photographs need to be printed all efforts should be done to prevent human subjects being recognized (for instances an eye bar should be used).

Abbreviations
At the first appearance in the paper the word should be used in full, followed by the abbreviation in parentheses. After that, use the abbreviation only.

Trade names
Chemical substances and drugs should be referred to by the generic name only. However, the name and location of the manufacturer (including the city and the country) of all employed instruments and devices have to be provided in parentheses.

PARTS OF THE MANUSCRIPT
Manuscripts should be presented as following orders: a) Title page, b) structural abstract and key words, c) introduction, d) methods, e) results, f) discussion, g) conclusion, h) acknowledgements, i) references, j) figures, k) tables (each table complete with title and footnotes).

Title page
The title page should contain a) the title of the paper, b) the full names of the authors, c) the running title, d) the authors' addresses, affiliations, and email addresses, and d) the full postal and email address of the corresponding author.

Abstract and key words
All articles must have a structural abstract contains a) background and aim, b) methods, c) results, d) conclusions in 300 words or fewer.
At least three key words should be supplied at the end of abstract. MeSH can be used for choosing right keywords.

Main Document
The main document of the paper should not exceed than 2000 words except for review and invited articles. The main document should contain: a) introduction, b) methods, c) results, d) discussion, and e) conclusion.
Case report should contain abstract, introduction, case report, and discussion. Case report should not exceed than 1500 words.
All submitted manuscript should be compatible with word 2007 with font size 11 Book Antiqua and double space between main documents lines.

Acknowledgements
The source of financial support and funding must be acknowledged.

References
Journal of Oral Health & Oral Epidemiology has instructed authors to use the Vancouver system of referencing. In the main document, references should be cited as superscripts and in order of their appearance in the text.

The maximum number of references for scientific articles, case reports and clinical updates are 35, 25, and 20, respectively. Review literatures and invited articles have no limit on the number of references.
In the reference list, cite the names of all authors when there are six or fewer; when seven or more, list the first six followed by et al. Reference list should contain all references that have been addressed in any part of the manuscript.
Names of journals should be abbreviated in the style used in Index Medicus.
Authors are responsible for the accuracy of the references.
References should be listed in the following form

Journal article:
1. Hori A, Poureslami HR, Parirokh M, Mirzazadeh A, Abbott PV. The ability of diagnostic sensibility tests to evaluate pulp vitality in primary teeth. Inter J Paedia Dent 2011; 21(6):441-5.

Chapter in a Book
Haapasalo M, Qian W: Irrigants and Intracanal Medicaments. In: Ingle JI, Bakland LK: Endodontics6. 6th Ed. BC Decker Inc, Hamilton; Ontario, Canada. 2008; Chapter 28: 997-999.

Book
Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology. 2nd ed. Philadelphia: W.B Saunders Co.; 2002. pp. 533–87.

Web pages
ProRootMTA safety data sheet. Available at: http://store.maillefer.com/lit2/pdfs/ MTA-MSDS-W_01-02C.pdf. Accessed November 27, 2009.

Tables
Tables should not duplicate information that have been described in the text. Table legend should be written above it and all tables should be print in separate pages. Tables should be placed after the references. Table legend should be comprehensive and footnotes must be described for each table separately. All abbreviations must be defined in footnotes.

Figures
Illustrations (diagrams and photographs) are classified as figures.
The figures should be provided electronically with high resolution (at least 600 d.p.i.) files should be saved as .JEPG or .Tif format. The figures must not be embedded in the word document - they must be uploaded in the separate files.
Magnifications of microscopic images should be indicated using a scale bar on the illustration or in the figure legend.
Figure legends should be written on separate pages at the end of the manuscript. Legends should be brief but comprehensive. Explain all abbreviations and the unit of measurements in the figure legend. If table(s) or figure(s) used from previously published documents, authors should send a permission letter from the copyright holder to the editorial office of the JOHOE.

Submission
Authors should submit their manuscripts through online submission system at: http://johoe.ir or johkmu@yahoo.com
It is necessary that corresponding author provide an email address and a mobile phone (Iranian authors) for communication with the journal authorities.

Table of Contents

Review Article

Original Article

Received: 14 Nov. 2012 **Accepted: 27 Dec. 2012**

Review Article

Statistics for dental researchers: descriptive statistics

Arash Shahravan DDS, MS[1], Amir Reza Ghassemi DDS[2], Mohammad Reza Baneshi PhD[3]

Abstract

Descriptive statistics is the process of summarizing gathered raw data from a research and creating useful statistics, which help the better understanding of data. According to the types of variables, which consist of qualitative and quantitative variables, some descriptive statistics have been introduced. Frequency percentage is used in qualitative data, and mean, median, mode, standard deviation, standard error, variance, and range are some of the statistics which are used in quantitative data. In health sciences, the majority of continuous variables follow a normal distribution. skewness and kurtosis are two statistics which help to compare a given distribution with the normal distribution.

J Oral Health Oral Epidemiol 2012; 1(2): 53-59

Descriptive statistics is a procedure through which raw data are summarized and simple, yet useful, statistics are generated for the audience.[1]

Suppose a dentist poses the question "What is the average length of maxillary lateral incisors for endodontic treatment?", to this end, the dentist extracts the working lengths of these teeth from 10 patient files and writes them down on paper as follows: 19, 18.5, 21, 21, 18, 19.5, 20.5, 20, 18, 19.

A brief look at the data, even without summarizing, shows that it is possible to gain some insight into the condition of the data, albeit with some difficulty. For example it is possible to say what the maximum and minimum lengths are. However, when there is an increase in the number of items in the data it becomes necessary to carry out some simple calculations to make data more comprehensible. Researchers and statisticians do this by implementing the principles of descriptive statistics. In addition, in big sample sizes it is difficult and time-consuming to report the characteristics of the samples individually in articles, and beyond the scope of time and patience of the audience in lectures. Therefore, if it is possible to summarize data by the use of applied statistics and present them in an article or a lecture, comprehensiveness of statistics makes it possible to compare different groups of data with each other. Descriptive statistics makes it possible to use accurate and scientific statistics in order to summarize data in the best manner possible for the audience. We hope you have now realized the importance of descriptive analysis.

The first step in reporting descriptive data is to determine whether the variable under consideration is qualitative or quantitative, because there are different principles for reporting data of different types of variables. It should be pointed out that a variable is a characteristic of an individual or a phenomenon, which can be measured and can assume different values in a research.[2] For example, in the example given above, the length of the maxillary lateral incisor is the variable under question, because it is measureable and assumes different values. However, the tooth type is not a variable

1- Associate Professor, Kerman Oral and Dental Diseases Research Center, Department of Endodontics, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
2- Private Practitioner, Kerman Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran
3- Assistant Professor, Research Center for Modeling in Health, Department of Epidemiology and Biostatistics, School of Public Health, Kerman University of Medical Sciences, Kerman, Iran
Correspondence to: Mohammad Reza Baneshi PhD
Email: m_baneshi@kmu.ac.ir

because all the teeth involved are maxillary lateral incisors. As a result, this characteristic does not vary and is constant.

Different Types of Variables

Variables can be divided into two general categories: quantitative and qualitative. Quantitative variables are expressed using numbers; for example, height, weight, the number of children in a family, DMF index (an index for the prevalence of caries), and root length are quantitative variables.

Qualitative variables are classified based on titles. For example, gender (male or female), satisfaction with dental services (very satisfied, fairly satisfied, dissatisfied, very dissatisfied), impression quality (good, moderate, poor), and post-operative pain (severe, moderate, mild, without pain) are qualitative variables. Of course, it should be noted that if the patients are asked to assign a numeric value from 0 to 10 to the severity of pain (VAS), the variable is quantitative.

Description of Qualitative Data

Frequency is used to describe qualitative data, which means the number of individuals with a particular characteristic or trait. Of course, in reporting the frequency of the variable in question, the sample size is important. For example, if in a class in an all-male high school, the frequency of caries-free students is 10 and in a class in an all-female high school the frequency is 15, the information cannot lead to the conclusion that the frequency is higher in female school children compared to male school children and attention should be paid to the total number of students in the two classes. As an example, if there are 20 male students and 30 female students in each class, which class has a higher frequency of caries-free students? In order to compare the two classes accurately in relation to the caries-free state, it is better to calculate the frequency percentage of caries-free state using the equation below:

$$\text{Frequency percentage} = \frac{\text{Frequency}}{\text{Total number}} \times 100$$

In the example given above, the frequency percentage of caries-free students in both male and female school children is 50%.[1]

Description of Quantitative Data Using Measures of Central Tendency and Dispersion Statistics

Central and dispersion statistics are used to report research data. Central statistic refers to a value around which the majority of the data of the community cluster; they include mode, median, and mean. Dispersion statistic shows the distance of the data from the central statistic.

Measures of Central Tendency

Mode

The mode refers to the most commonly occurring value in a set of measurements. For example, in the data series below, which is again related to the length of lateral maxillary incisors in a series of 10 patients the mode is 19 because, with three cases, it is the most frequent value in the series (20.5, 19, 20.5, 19, 21, 19, 19.5, 17.5, 18, 18).

During reporting of data, it is advisable to arrange data in ascending or descending order in the beginning in order to facilitate description of data. This process in itself provides useful information about data series. For example, the data series above can be arranged in ascending order (17.5, 18, 18, 19, 19, 19, 19.5, 20.5, 20.5, 21).

Sometimes, the data series is bimodal or polymodal. For example, the data series below is bimodal: 18, 18, 19, 19, 19.5, 20, 20.5. The modes are 18 and 19.

Data series might have no modes, i.e. the frequency of values might be the same. However, such a situation is rare.

Median

If the values are arranged in ascending or descending order, the value located in the center, with half of the values higher and with the other half lower than that value, is considered as median value. For example, what is the median value in the data series below?

7, 10, 6, 11, 6, 13, 8

At first the data series should be arranged in ascending order:

6, 6, 7, 8, 10, 11, 13

Since the number of values is an odd number, the formula $\frac{n+1}{2}$ (n = the number of values) can be used to locate the median value:

$$\frac{7+1}{2} = 4$$

Therefore, the 4th value is the median.

If the number of values is an even number, the median is calculated using the mean of the two values in the middle. For example, in the data series below, which consists of the students' exam grades in statistics, the median is calculated as follows:

10, 12, 12, 13, 15, 17, 18, 18, 18, 20

$$\frac{15+17}{2} = 16$$

Mean

The most frequently used central measure in the descriptive analysis of quantitative data is mean. Mean is calculated by dividing the total sum of all the values by the total number of values based on the formula below:[3]

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

The formula shows that all the values are used to calculate the mean, which is the strong point or advantage of the mean. However, sometimes this turns out to be a weakness for the mean, especially in relation to the median. For example, if in a data series there are extreme values, the mean will be strongly influenced by them, but the median does not have such a disadvantage. Here, we once again evaluate the data series of students' grades. The mean is calculated as follows:

$$\frac{10+12+12+13+15+17+18+18+18+20}{10} = 15.3$$

Here the mean is very close to the median (it was 16).

However, if an imaginary student No.11 has not been able to study well to pass the test and has a grade of 3, the mean will decrease to 14.18. In fact, the grade of this student decreases the overall mean of class grades by 1.12 grades, which is the weakness of mean.

Generally, if extreme values or outliers exist, the median is a more appropriate statistic compared to the mean. Outlier data are those that are located very far from the mean compared to other data. In order to solve the problems of the effect of outliers on the mean, two relatively new techniques are used to calculate the mean, which include 5% trimmed and M-estimates.

5% Trimmed

In this technique the upper and lower 5% values, which usually consist of outlier data, are deleted and the remaining values are used to calculate an arithmetic mean. In large sample sizes the elimination of 10% of values does not lead to any problems; however, in small sample sizes this process has detrimental effects on data.[1]

M-estimates

In this technique, the values are given grades in terms of their importance in order to calculate the mean, i.e. the values close to the center are given higher grades and the grade decreases as the values lie farther from the center. The means of graded values are calculated. In this technique, none of the values are eliminated, but at the same time the effect of extreme values is eliminated to some extent.

Note that if the means calculated by the three techniques discussed above in a data series are almost the same, it can be concluded that no outlier values exist. If the mean calculated by the use of 5% trimmed and M-estimates techniques are less than the main mean of data, outlier values exist in the upper bounds. On the contrary, if the means calculated by the two techniques above are greater than the conventional mean, outlier values exist in the lower bound of data.[1]

Measures of Spread (dispersion)

These measures show the distance of values from the central measures. Reporting of central statistics discussed above cannot show the status of numeric series. For example, the status of dental students' grades in statistics in two 5-sample groups is as follows:

Group 1: 10, 12, 15, 18, 20

Group 2: 13, 14, 15, 16, 17

Despite the equality of the mean in both groups (15) the grades in the two groups are not similar and different variation is observed, i.e. in group 2 the majority of the grades cluster around the mean, with less dispersion.

Therefore, it can be concluded that merely reporting central measures cannot result in a good judgment about distribution of data, and it is necessary to report a measure of spread along with each measure of central tendency.

Different types of measures of dispersion include:

1. Range
2. Variance
3. Standard deviation
4. Coefficient of variation

Range

The difference between the highest and lowest values in the data series is called the range:

Range = the highest value – the lowest value

Please once again note the two series of values mentioned previously, in which the mean was 15. The range in group one was 20-10 = 10 and in group two it was 17-13 = 4.

One of the advantages of the range is that it is easily calculated. The most important problem of the range is the fact that it is only affected by the lowest and highest values in the data series. Therefore, it does not fully demonstrate the dispersion of data for the comparison of different series of data. For example, compare the two series of students' grades here:

Group 1: 10, 11, 12, 13, 14, 15, 16

Group 2: 10, 13, 13, 13, 13, 13, 16

Although the mean and range are the same in the two groups, the distributions of data are different and this is the disadvantage of the range in demonstrating the distribution of data.

Variance

Variance is a measure of spread, which is, contrary to the range, under the influence of all the data values. The following formula is used to calculate variance:

$$\sigma^2 = \frac{\sum(\bar{x} - x_i)^2}{N - 1}$$

In the formula above, in the numerator of the fraction the distance of each value (data) from the mean is calculated and then the second powers of all these values are added up, which is divided by the number of values minus 1. Therefore, it is obvious that as the distance between the values and the mean increases the variance increases and shorter distances result in a smaller variance. Now we once again consider the grades of the two student groups and calculate the variance:

Group 1: 10, 11, 12, 13, 14, 15, 16

Group 2: 10, 13, 13, 13, 13, 13, 16

As discussed previously, although the range and the mean are the same in these two groups of grades, the dispersions are different. In groups 1 and 2, based on the formula above, the variances are 4.67 and 3, respectively, indicating a greater dispersion of data in group 1. This conclusion can also be reached by one short look at the data.

Standard deviation

Standard deviation is another measure of spread and is the square root of the variance:

$$SD = \sqrt{\sigma^2}$$

Coefficient of Variation

The standard deviation and mean are influenced by the measuring technique and unit. In comparing of standard deviations of various variables care should be exercised, because if the measuring units of the variables are different, the comparison might be incorrect and misleading. For example, if the standard deviation of the length of maxillary lateral incisors is 4 mm and the standard deviation of DMF in the 6-year-old students of a school is 2, it should not be concluded that the dispersion of the root length is greater than that of caries index. In order to solve the problem, coefficient of variation is used, which is calculated by dividing the standard deviation by the mean. Therefore, due to the division carried out, the coefficient of variation does not have a unit, making it possible to carry out comparisons between variables which have different units:

$CV = \frac{SD}{\bar{x}} \times 100$

Another consideration in the evaluation of quantitative variables is distribution and its comparison with normal distribution in relation to determining appropriate statistical tests. Therefore, first, the characteristics of normal distribution will be explained.

Normal distribution

The majority of continuous variables in health sciences follow a normal distribution. This is a two parameter distribution which depends on mean and standard deviation (SD) of the variable in the population.[1] The normal distribution has a symmetric bell-shaped curve in which mean, median, and mode are the same (Figure 1).This indicates that the frequency of values around mean is much higher than tails of the curve. For example, if blood sugar (BS) level follows a normal distribution with a mean of 110 and SD of 10, the BS level of the majority of people is around 110. In addition, the BS level of half of the population is lower than 110. To be more precise, the distribution of BS values depends on both mean and SD. Around 68% and 95% of data falls between one SD and two SD around mean. Therefore, in this society, the BS level of 68% of people falls between 100 and 120. The corresponding interval that covers 95% of people is 90, and 130.

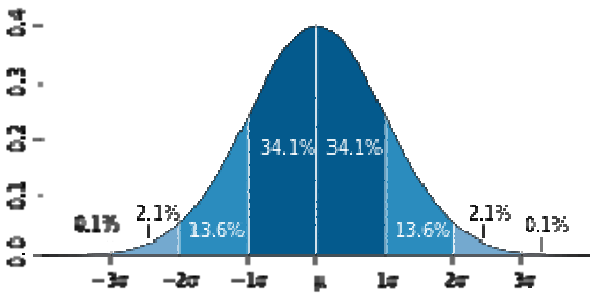

Figure 1: Normal distribution, symmetric bell-shaped curve

Dark blue is less than one standard deviation away from the mean. For the normal distribution, this accounts for about 68% of the set, while two standard deviations from the mean (medium and dark blue) account for about 95%, and three standard deviations (light, medium, and dark blue) account for about 99.7%

Normality is the underlying assumption behind most statistical techniques. Therefore, the investigation of this fundamental assumption, before planning for data analysis, is important. There are a variety of numerical, graphical, and P-value based tools to check whether data merit this assumption.

We should emphasise that investigation of normality necessitates the careful exploration of data. Each of the methods noted have their own advantages and disadvantages. Here we only present two descriptive statistics frequently used in the literature, known as skewness and kurtosis.

We noted that normal distribution has a symmetric curve. Skewness refers to a lack of symmetry. In the normal distribution we expect 5% of data to be out range of mean plus/ difference two SD. Data are skewed when the proportion of values in tails is contrary to our expectation from normal distribution. Skewed distributions have a tail in right (known as right or positive skewed) or left (left or negative skewed) (Figure 2). To estimate skewness one can simply calculate the difference between mean and median, and divide it by SD. Values between -1 to 1 indicate that the normality assumption is reasonable.[4]

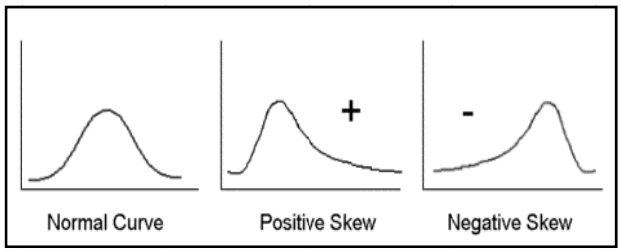

Figure 2: Positive and negative skewness vs. normal distribution

Kurtosis is another statistics which indicates whether the data are peaked or flat relative to a normal distribution. That is, data sets with high kurtosis tend to have a distinct peak near the mean, decline rather rapidly, and have heavy tails. Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak (Figure 3). Similar to skewness, values between -1 and 1 justify the normality assumption.

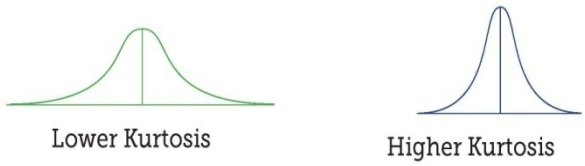

Figure 3: Lower kurtosis distribution vs. higher kurtosis

Descriptive statistics for qualitative variables in SPSS

In working with qualitative variables, the statistics to be reported are frequency, and percentage. You should select analyze, descriptive statistics, and frequencies. Then select categorical variables from the left box and transfer them to the right box. Finally, simply press the OK button. In the output window, the first table provides information about the percentage of missing and valid data for each variable. Then, the next table gives frequency, percentage, valid percentage, and cumulative percentage. We should note that in calculation of percentage the denominator is the total sample size, while in valid percentage the denominator is the number of subjects with available data.[1]

Descriptive statistics for quantitative variables in SPSS

Relevant statistics for continuous variables involve mean, median, percentiles, SD, variance, range, and etc. SPSS provides multiple tools for these statistics. These tools can be used from the frequency, descriptive, and explore menus. Details are given below.

Frequencies menu:

We have explained the use of this menu for qualitative variables. However, some descriptive statistics for quantitative variables can also be calculated through this menu. You must select analyze, descriptive statistics, and then frequencies. Remember to deselect the display frequency table. Otherwise, you will find a long frequency table for a quantitative variable in the output window, which is useless. Transfer quantitative variables from the left to the right box, and then press the Statistics button. This opens a new window in which you can select the central tendency statistics (such as mean, median, and mode), and dispersion statistics (such as min, max, variance, SD, and SE). In addition, if you select the quartiles in the percentile values box, the software will provide the first, second, and third quartiles. If you select percentile, you can ask the software to provide any percentile you wish. Finally, in the distribution box, you can select skewness and kurtosis statistics to check whether data follow a normal assumption or not.

Descriptive menu:

Again you must select analyze, descriptive statistics, and descriptive. Then, transfer the quantitative variables to the variable box and click the options button. From the central tendency statistics you can only select mean. This path does not provide median or mode. In addition, no option for percentiles is available. Other statistics can be selected similar to the frequency approach.

Explore menu:

Here select analyze, descriptive statistics, and explore. Transfer quantitative variables to the dependent list box. This path provides the opportunity to provide statistics across levels of qualitative variables as well. To do so you should select qualitative variables from the factor list box. If you do not select any variable from this box, the overall statistics will be calculated. In the output window, you will automatically find mean, 5% trimmed mean, confidence interval of mean, and etc. By selection of the statistics button, you can select some new statistics such as m-estimators of mean, and outliers.[1] In addition, it is possible to get graphs such as box plot and steam and leaf plot.

The next paper in this series will take a further look at using tables and graphs in dental articles.

Conflict of Interest

Authors have no conflict of interest.

References

1. Chehrei A, Haghdoost AA, Fereshtehnejad SM, Bayat A. Statistical methods in medical science researches using SPSS software. 1st ed. Tehran, Iran: Pazhvak Elm Arya; 2010.
2. Petrie A, Bulman JS, Osborn JF. Further statistics in dentistry: Part 1: Research designs 1. Br Dent J 2002; 193(7): 377-80.
3. Von Fraunhofer JA. Research writing in dentistry. New York, NY: John Wiley & Sons; 2009.
4. Chan YH. Biostatistics 101: data presentation. Singapore Med J 2003; 44(6): 280-5.

Received: 24 Feb. 2012 **Accepted: 11 Jun. 2012**

Original Article

Sensitometric characteristics of D-, E- and F-speed dental radiographic films in manual and automatic processing

Jahangir Haghani DDS, MSc[1], Molouk Torabi DDS, MSc[2], Farnaz Fahimi-Hanzaei MD, MSc[3], Mehrnaz Tahmasbi-Arashlow DDS[4]

Abstract

BACKGROUND AND AIM: The purpose of this study was to evaluate the sensitometric characteristics of Ultraspeed, Ektaspeed Plus and Insight dental radiographic films using manual and automatic processing systems.

METHODS: In this experimental invitro study, an aluminum step-wedge was used to construct characteristic curves for D-, E- and F-speed radiographic films (Kodak Eastman, Rochester, USA). All films were processed in Iranian processing solution (chemical industries Co., Iran, Tehran) both manually and automatically in a period of six days. Unexposed films of three types were processed manually and automatically to determine base plus fog density. Speed and film contrast were measured according to International Standard Organization definition.

RESULTS: There was significant difference in density obtained with the D-, E- and F-speed films in both manually and automatically processing systems ($P < 0.001$). There was significant difference in density obtained with the Ultraspeed and insight films. There was no significant difference in contrast obtained with the D-, E- and F-speed films in both manually and automatically processing systems ($P = 0.255$, $P = 0.260$). There was significant difference in speed obtained with the D-, E- and F-speed films in both manually and automatically processing systems ($P = 0.034$, $P = 0.040$).

CONCLUSIONS: The choice of processing system can affect radiographic characteristics. The F-speed film processed in automatic system has greater speed in comparison with manual processing system, and it provides a further reduction in radiation exposure without detriment to image quality.

KEY WORDS: Automatic Processing, Dental Radiography, Manual Processing, Radiographic Film Classification, Sensitometry, X-ray Film

J Oral Health Oral Epidemiol 2012; 1(2): 60-64

Great efforts in radiology are to improve the quality of radiographs and reduce the patient's exposure to radiation.[1] The radiation dose received by patients in dental radiography is low, but any radiological procedure should be justified and optimized in order to keep the radiation risk as low as reasonably achievable.[2] Thus, this may be achieved with the use of the fastest film.[3]

Kodak Company recently has introduced Insight, an F-speed direct exposure intraoral x-ray film, which is 20% faster than Ektaspeed Plus, and it maintains the same image quality.[4] Processing procedures and various processing solutions may influence on film sensitometric properties (density, speed, contrast, fog and resolution).[5] Some studies have compared the efficacy of different dental radiographic films when these films were developed manually and automatically with various processing solution.[4-6]

However, there has been a lack of research evaluating the sensitometric properties of these films with the use of manual and

1- Associate Professor, Department of Oral and Maxillofacial Radiology, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
2- Assistant Professor, Department of Oral and Maxillofacial Pathology, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
3- Assistant Professor, Department of Radiology, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
4- Dentist, Kerman Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran
Correspondence to: Molook Torabi DDS, MSc
Email: drtorabiparizi@yahoo.com

automatic Iranian processing solutions. Therefore, the goal of this study was to evaluate the sensitometric characteristics of Insight, Ektaspeed and Ultraspeed films automatically and manually processed using Iranian processing solution and compare them with other researches.

Methods

In this experimental in vitro study, Ektaspeed Plus (E-speed film), Ultraspeed (D-speed film) and Insight (F-speed film) films (Kodak Eastman, Rochester, USA) were exposed by using a Planmeca x-ray unit (Planmeca Intra Oy 00880 Helsinki, Serial No:ITHC76503, Tube type: D-711sb, Tube No:49824,70 Kv max, total filtration 2,0 mmGquAI Finland) with exposure factors of 70 KVp with 8 mA and 2 second, and a tube-to-film plane distance of 20 cm**.** Speed and film contrast were measured according to International Standard Organization definition.

To study radiographic contrast, a ten-step aluminum step-wedge with a thickness of 1.5 mm (Figure 1), was exposed to radiation. The step-wedge was radiographed on each type of film (Figure 2).Two films of Ultraspeed, Ektaspeed Plus and Insight films were exposed each day, and two unexposed films of each film type were considered to determine the base plus fog density for each day. One exposed and unexposed Ultraspeed, one exposed and unexposed Ektaspeed Plus, one exposed and unexposed Insight formed first set of dental films. The process was repeated for 6 days.

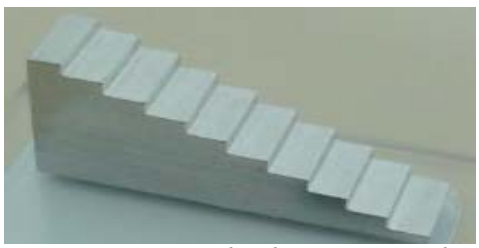

Figure 1. A ten-step aluminum step-wedge

Radiographic processing was performed manually and automatically on the same day of exposure, in less than one hour after being exposed, to keep the image quality. A total of 72 films (24 Ultraspeed, 24 Ektaspeed and 24 Insight films) were being exposed and developed at the end of sixth day.[6]

Figure 2. Expose film with aluminum step-wedge

All films were developed using Iranian solution (World chemical industries Co., Iran, Tehran) for manual and automatic processing systems. Automatic processor system (VELOPEX, intra oral processor, England) was set at 27° C, 2.5 min processing time. Manual processing system was at 24° C, and based on the table provided by the film manufacturer, film immersion times in the developer (1450 ml) and in the fixer (1450 ml) were 10 second and 1 minute, respectively.[7] The first set was processed manually, and the second set was processed automatically.[7] The processing solution in both manually and automatic systems was not changed during the experiment to evaluate the effect of depletion of chemicals on image quality.

After processing, film densities were measured with a film densitometer machine (Transmission densitometer DT 1505; Alrad instruments Ltd, Newbury). The densities of three different spots of each steps of step-wedge were measured by a densitometer, and average density was determined for each step. To evaluate the base plus fog density, the three different spots of each unexposed film were measured.[7] Finally, characteristic curves for each film type, processing system and processing day were constructed by plotting the optical density against the logarithm of exposure.[8] The characteristic curves were used to calculate film speed, inherent contrast and exposure latitude. Film speed was calculated as the exposure time (in

seconds) required producing a density of 1.0 above base-plus-fog.[9]

To construct the characteristic curves, we also needed the exposure levels. Exposure level of all processed films, where there was no steps, were measured by a dosimeter machine (RadexRD 1706 Geiger Counter with Range of dose rate indication 0.05 – 999 uSv/Hr, Energy range registered: Gamma 0.1 – 1.25 Mev; X-Ray 0.03 – 3.0MeV, Beta 0.25 – 3.5MeV, Germany) in the same condition of 70 KVp with 8 mA and 2 seconds. Then we placed an aluminum sheet with 1.5 mm diameter that was similar to the step-wedge in front of dosimeter machine to determine the exposure of first step. The process was repeated to 10 aluminum sheet in the same condition of 70 KVp with 8 mA and 2 seconds. The exposure of each step calculated for 3 times and average was determined for each step as an exposure of each steps.[6,7,10]

Contrast evaluation

Film's contrast evaluation was visually performed, and contrast level was completed in a sample list by two radiologists. During the rating process, the radiographs were viewed on a Medical Negatoscope with no identifying information visible or available about film type and type of film processing to the two observers. Each radiologist rated all films independently of the other one.

For the statistical analysis, the mean of the two observers' ratings was used as a single score for each Film type. Judges used a three-point rating scale: 1 = High, 2 = moderate, 3 = poor (Figure 3). Finally, to compare the sensitometric properties of films, one-way ANOVA test, Student's t-tests, Welch and Tukey's post-hoc test with 5% level of significance were employed using SPSS software, version 18 (SPSS, Inc., Chicago, IL, USA).

Results

The study revealed that Insight had the highest density in both automatic and manually processing system in first day. The characteristic curve of Insight, Ektaspeed Plus, and Ultraspeed films are shown in Figure 3. The location of the characteristic curves of different films along the X-axis relates to the speed of the films. According to the shift of curves, Insight had the highest speed.

Ultra-speed had the lowest density in manually processing system. Density gradually decreased from the first day to fifth day for all film types. The base-plus-fog density values are shown in table 1.

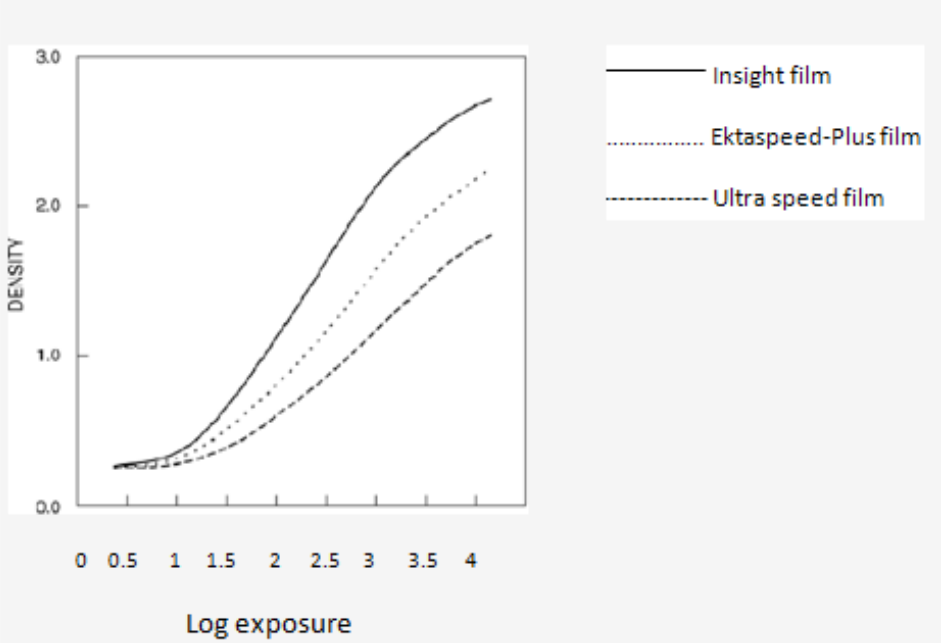

Figure 3. Characteristic curves of Insight, Ektaspeed Plus and Ultraspeed films

Table 1. Comparison between types of film density in manual and automatic processing systems

Kind of film	Speed	No	Mean ± SD	Test
Manual processing	D	6	0.151 ± 0.024	Df = 2
	E	6	0.190 ± 0.230	F = 30.13
	F	6	0.236 ± 0.027	P < 0.001
Automatic processing	D	6	0.161 ± 0.038	Df1 = 2
	E	6	0.226 ± 0.049	Df2 = 15
	F	6	0.273 ± 0.021	P = 0.026

SD: Standard deviation

Table 2. Comparison between types of film contrast in manual and automatic processing systems

Kind of film	Speed	No	Mean ± SD	Test
Manual processing	D	6	5.36 ± 0.024	Df1 = 2
	E	6	5.34 ± 0.041	Df2 = 8.23
	F	6	5.61 ± 0.390	P = 0.255
Automatic processing	D	6	5.27 ± 0.161	Df = 2
	E	6	5.39 ± 0.279	F = 1.458
	F	6	5.53 ± 0.311	P = 0.264

SD: Standard deviation

Table 3. Comparison between types of film speed in manual and automatic processing systems

Kind of film	Speed	No	Mean ± SD	Test
Manual processing	D	6	15.11 ± 0.993	P = 0.034
	E	6	16.40 ± 1.193	
	F	6	16.83 ± 0.996	
Automatic processing	D	6	16.84 ± 1.250	Df1 = 2
	E	6	18.54 ± 0.200	Df2 = 7.42
	F	6	18.65 ± 0.630	P = 0.042

SD: Standard deviation

There was significant difference in density obtained with the Ultraspeed, Ektaspeed Plus and Insight films (P < 0.001). Insight had the highest contrast in both automatic and manually processing system in first and second day, and Ultraspeed had the lowest contrast in automatic processing system in the first day.

The contrast values are shown in table 2. There was no significant difference in contrast obtained with the Insight, Ultraspeed, Ektaspeed Plus films in both manually and automatically processing systems (P = 0.255 , P = 0.260). There was significant difference in speed obtained with the Ultraspeed, Ektaspeed Plus and Insight films in both manually and automatically processing systems (table 3).

Discussion

In this study, speed, contrast, base-plus-fog density of Insight, Ultraspeed and Ektaspeed Plus films were evaluated. The results of this study showed that the different film types respond differently to various films processing systems and to depletion of chemicals.

The speed of films in automatic processing system is higher than in manually processing system. Insight film is faster than other film type that is consistent with previous studies.[1,5-7,11] There was significant difference in density obtained with the Insight, Ultraspeed, and Ektaspeed Plus films that density of Ultraspeed was lower than Ektaspeed Plus, and Ektaspeed Plus was lower than Insight. Density values gradually decreased from the first day to sixth day for all film types to solution depletion (diagram 2) as previously reported by Geist and Brand,[5] Dabaghi et al. [6] and Farman TT et al.[12] On the other hand, Bernstein et al.[4] found no significant difference in density obtained with Ultraspeed and Insight. There was no significant difference in contrast obtained with the Insight, Ultraspeed, Ektaspeed Plus films in both manually and automatically processing systems which is

consistent with those of previous studies.[5,6,11] On the other hand, Diehl et al[13] found that the contrast of Ultraspeed was greater than Ektaspeed Plus in manually processing system. In this study, contrasts of almost three films were similar during 6 days. Just Ektaspeed Plus had the highest contrast in automatic processing system in the first day and Insight had the highest contrast in automatic processing system in the first and fifth days and Insight had the highest contrast in manually processing system in the first and second days but these were not significant, that does not match with Dabaghi et al. study.[6] The silver halide grains in Insight film are flat, and it has a tabular crystals with a mean diameter of about 1.8 pm and the tabular grains of the Insight film are oriented parallel with the film surface to offer a large cross-sectional area to the x-ray beam, so Insight had the highest contrast.[14] Hadley et al.[15] showed in their study that Insight is more acceptable than Ultraspeed.

Conclusion

Based on these findings, Insight film provides a further reduction in radiation exposure, without any significant changes in image quality. Therefore, the use of Insight film could be suggested to reduce patient exposure to radiation. Moreover, the image quality of all the film types was decreased in depleted chemicals. In addition, there was no significant difference between Iranian processing solutions and those were used in other studies. The use of Iranian processing solution could also be suggested.

Conflict of Interest

Authors have no conflict of interest.

References

1. Syriopoulos K, Velders XL, Sanderink GC, van Ginkel FC, van der Stelt PF. Sensitometric evaluation of four dental X-ray films using five processing solutions. Dentomaxillofac Radiol 1999; 28(2): 73-9.
2. Looe HK, Pfaffenberger A, Chofor N, Eenboom F, Sering M, Ruhmann A, et al. Radiation exposure to children in intraoral dental radiology. Radiat Prot Dosimetry 2006; 121(4): 461-5.
3. Alsubael MO. Analysis of x-ray film quality in primary health care clinics in Riyadh. Journal of Applied Sciences 2009; 9(16): 2987-91.
4. Bernstein DI, Clark SJ, Scheetz JP, Farman AG, Rosenson B. Perceived quality of radiographic images after rapid processing of D- and F-speed direct-exposure intraoral x-ray films. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003; 96(4): 486-91.
5. Geist JR, Brand JW. Sensitometric comparison of speed group E and F dental radiographic films. Dentomaxillofac Radiol 2001; 30(3): 147-52.
6. Dabaghi A, Tahmasbi MJ, Karbasi N, Tabesh H. Sensitometric comparison of E and F dental radiographic films using manual and automatic processing systems. J Dent Med Tehran Univ Med Sci 2008; 20(4): 307-12.
7. Casanova MS, Haiter-Neto F, Boscolo FN, de Almeida SM. Sensitometric comparisons of Insight and Ektaspeed Plus films: effects of chemical developer depletion. Braz Dent J 2006; 17(2): 149-54.
8. ISO. Photography. Direct-exposing medical and dental radiographic film/process systems. Determination of ISO speed and ISO average gradient. 1991. Available from: URL:http://shop.bsigroup.com/ProductDetail/?pid=000000000000497894.
9. Thunthy KH, Weinberg R. Effects of developer exhaustion on Kodak EKTASPEED Plus, Ektaspeed, and Ultra-speed dental films. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995; 79(1): 117-21.
10. Araújo Lourenço AD, Pontual ADA, Fonseca da Silveira MM, dos Anjos Pontual ML. Radiographic image quality after interruption of the fixing stage to view the image with a viewbox. Journal of Dental Science 2010; 25(1): 78-82.
11. Price C. Sensitometric evaluation of a new F-speed dental radiographic film. Dentomaxillofac Radiol 2001; 30(1): 29-34.
12. Farman TT, Farman AG. Evaluation of a new F speed dental X-ray film. The effect of processing solutions and a comparison with D and E speed films. Dentomaxillofac Radiol 2000; 29(1): 41-5.
13. Diehl R, Gratt BM, Gould RG. Radiographic quality control measurements comparing D-speed film, E-speed film, and xeroradiography. Oral Surg Oral Med Oral Pathol 1986; 61(6): 635-40.
14. White SC, Pharoah MJ. Oral Radiology: Principles and Interpretation. 6th ed. St. Louis, Missouri: Mosby; 2008.
15. Hadley DL, Replogle KJ, Kirkam JC, Best AM. A comparison of five radiographic systems to D-speed film in the detection of artificial bone lesions. J Endod 2008; 34(9): 1111-4.

Received: 16 Apr. 2012 **Accepted: 5 Dec. 2012**

Original Article

Effect of topical phenytoin on creeping attachment of human gingiva: A pilot study

Gholam Ali Najafi-Parizi DDS, MS[1], Mohammad Mohammadi DDS, MS[1,2], Mohammad Seifsafari DDS, MS[3]

Abstract

BACKGROUND AND AIM: The aim of this study was to evaluate the effect of topical phenytoin on creeping attachment.

METHODS: In this pilot quasi-experimental study, 8 patients referring to Kerman School of Dentistry, Kerman, Iran with Miller class I or II gingival recessions were selected using convenient non-random sampling if they needed root coverage and met the study's inclusion criteria. The patients applied phenytoin mucoadhesive paste 1% on the surface of the deepithelialized gingiva of the tooth with gingival recession, twice a day for two months. Data was analyzed with paired t-test using SPSS version 17.

RESULTS: According to our findings, the width of keratinized gingiva at the baseline was 3 mm, and after 2 months it increased to 3.1 mm. The mean baseline height and width of gingival recession were 1.9 mm and 3 mm, respectively, and after 2 months they decreased to 1.8 mm and 2.9 mm accordingly. There was no significant difference in any of the aforementioned parameters before and after treatment ($P > 0.05$).

CONCLUSIONS: The results of this study showed that topical application of phenytoin mucoadhesive paste can not initiate and promote creeping attachment.

KEY WORDS: Creeping Attachment, Phenytoin, Gingival Recession

J Oral Health Oral Epidemiol 2012; 1(2): 65-69

Creeping attachment is the postoperative migration of the gingival marginal tissue in a coronal direction over portions of a previously denuded root.[1-3] This phenomenon was first described by Goldman and Cohen following usage of free gingival grafts in some cases.[1] Creeping attachment is reported by several clinicians and is apparently best observed on mandibular anterior teeth with narrow recessions.[1-3] This phenomenon can be detected 1 to 12 months after graft surgery with an average coverage of about 1 mm.[4] Creeping attachment is reported following free gingival grafts, free connective tissue grafts, acellular dermal matrix grafts, and subepithelial connective tissue grafts.[2,3,5-8] The onset of creeping attachment is not an immediate mechanism, and sometimes occurs following the initial healing.[5,6]

Phenytoin was first introduced as an antiseizure medication in 1973.[9] Its chemical structure is similar to barbiturates.[9] Gingival enlargement is a common complication of long-term oral phenytoin treatment.[10] This finding generated interest in using this drug to promote wound healing.[11]

Shapiro carried out the first study to evaluate the effects of oral phenytoin on periodontal wounds and reported that phenytoin accelerates wound healing and reduces pain and inflammation.[12] Some investigators have used topical phenytoin to accelerate healing in chronic wounds, leg ulcers, leprosy wounds, burns, diabetic foot wounds, skin graft donor sites, and war wounds.[13]

1- Assistant Professor, Department of Periodontics, School of Dental, Kerman University of Medical Sciences, Kerman, Iran
2- Assistant Professor, Kerman Dental and Oral Diseases Research Center, Kerman, Iran
3- Private Practice, Kerman, Iran
Correspondence to: Mohammad Mohammadi DDS, MS
Email: m_mohammadi@kmu.ac.ir

Topical phenytoin increases fibroblast proliferation, extracellular matrix production, collagen synthesis, and causes granulation tissue to form significantly earlier.[11,14,15]

Based on the results of the studies on this subject, creeping attachment is not predictable, and the onset and mechanism of development of this phenomenon has not been recognized until now.

Therefore, based on the effects of phenytoin on wound healing and the information related to creeping attachment, we decided to apply a phenytoin mucoadhesive paste on deepithelialized gingiva to initiate and promote creeping attachment. The aim of this study was to evaluate the effect of phenytoin mucoadhesive paste on creeping attachment.

Methods

In this pilot quasi-experimental study conducted in 2010, 8 patients (8 sites), four males and four females aged 23 to 47 years, who had Miller class I or II gingival recessions on one of premolar, canine, or incisor teeth and needed root coverage either for cosmetic reasons or dentinal hypersensitivity, were selected from the patients referred to the School of Dentistry of Kerman University of Medical Sciences, Kerman, Iran. These patients were selected using convenient non-random sampling (available samples).

The inclusion criteria of the study were no systemic diseases, no medications affecting the periodontium, no pregnancy or lactation, no periodontal diseases, no smoking, no occlusal trauma in the region under study, full-mouth plaque score and full-mouth bleeding score < 20%, recognizable cemento-enamel junction (CEJ) of the tooth under study, and no root decay and restoration. If the participants needed scaling and root planing, it had to be performed. Bass method of tooth brushing and dental flossing was instructed to all participants in this study.

These patients were informed of the purpose of the study and were required to sign an informed consent. The study design and consent form were approved by the ethical committee of Kerman University, School of Medical and Dental Sciences.

Clinical Measurements

Probing depth and keratinized gingival width (the distance between gingival margin and mucogingival junction) were measured at the midfacial aspect of the tooth in need of root coverage to the nearest millimeter with a Williams periodontal probe. In addition, height of gingival recession (the distance between gingival margin and CEJ of the tooth in midfacial region) and width of gingival recession at CEJ (the mesiodistal distance of gingival recession between interdental papilla at the level of CEJ) were measured to the nearest millimeter with a Williams periodontal probe.

This single-blind study was done by two clinicians. A periodontist who was blind to the study confirmed the need for root coverage in each patient and measured all clinical parameters at baseline and 2 months after application of topical phenytoin. Application of phenytoin mucoadhesive paste 1% was instructed to the patients by the second clinician that was not blind to the study. In this study, patients were not blind to the study.

Preparation of phenytoin mucoadhesive paste 1%

Phenytoin mucoadhesive paste 1% was prepared in Kerman School of Pharmacy. To prepare this paste, one gram of phenytoin powder was mixed with 100 grams of mucoadhesive paste compositions (including polyethylene LD, liquid paraffin, gelatin powder, lemon pectin powder, sodium carboxy methyl cellulose powder). The paste was then inserted into 100 mg tubes.

Application of phenytoin mucoadhesive paste 1% on gingiva

After root planning, the sulcular epithelium of the facial gingiva of the tooth under study, was removed by a Gracey curette 1-2, like gingival curettage and the oral epithelium confined to free gingiva was removed by a

rotary surgical handpiece with a round diamond bur under local anesthesia with lidocaine injection 2% with epinephrine. After removing sulcular and oral epithelium, patients were instructed on the application of phenytoin mucoadhesive paste 1%.

Two tubes containing phenytoin mucoadhesive paste 1% were given to each patient and patients were asked to apply one pea-sized amount of this paste on the facial surface of the gingiva of the tooth with gingival recession twice a day for two months. Patients were also educated on how to apply the paste. This act was continued for two months and at the end of the second month, probing depth, keratinized gingival width, height of gingival recession and width of gingival recession at CEJ were recorded again.

Statistical analysis

Data was analyzed using SPSS version 17. The normal distribution of collected data was tested by the one-sample Kolmogorov-Smirnov test. Paired t-test was used to compare the results of before and after the application of phenytoin mucoadhesive paste 1%.

Results

Patients involved in the study did not report any complication of this treatment. The clinical parameters including width of keratinized gingiva, probing depth, height of gingival recession and width of gingival recession at CEJ, at baseline and 2 months after treatment are reported in table 1. The differences between the width of keratinized gingiva, probing depth, height of gingival recession and width of gingival recession at baseline and 2 months after the treatment were not significant ($P > 0.05$, Table 1).

Discussion

The aim of this study was to evaluate the clinical effect of topical phenytoin on creeping attachment. The results of this study showed that topical application of phenytoin mucoadhesive paste did not cause any statistically significant creeping attachment ($P > 0.05$).

Matter and Cimasoni reported creeping attachment after free gingival graft.[2] The aim of this study was to determine which conditions predisposed to creeping attachment. In this study, factors which influenced the degree of creeping attachment were: width of recession, position of the graft, position of the tooth in the arch, bone resorption, and oral hygiene. In this study, more creeping attachment was developed following the treatment of a narrow type of gingival recession (less than 3 mm). However, creeping attachment was less successful in areas of wide recessions (0% to 33%).[2]

Matter in another study reported a mean of 0.89 mm of creeping attachment after 5 years of follow-up.[3] In this study, ten patients with areas of gingival recession of less than 3 mm in width were treated with free gingival graft (FGG).[3]

Haeri and Parsell compared the amount of creeping attachment following free gingival grafts and dermal matrix allografts.[6] An average of 1.23 mm of creeping attachment was measured on the FGG side, and 0.96 mm of creeping attachment was measured with the dermal matrix allograft.

Harris showed an average of 0.8 mm creeping attachment consequent to a connective tissue with partial-thickness double pedicle graft.[5] In this study, Harris did not find any factors that could be associated with creeping attachment.

Otero-cagide described a case with 5 mm of a unique creeping attachment that developed mesiobuccally oriented on a deep,

Table 1. The comparison between values of measured parameters at baseline and after two months

Parameter	Baseline (mean ± SD)	After 2 months (mean ± SD)	P*
Width of keratinized gingiva	3.0 ± 1.70	3.1 ± 1.70	0.34
Probing depth	1.6 ± 0.52	1.5 ± 0.52	0.34
Height of gingival recession	1.9 ± 0.87	1.9 ± 0.87	0.34
Width of gingival recession	3.0 ± 0.47	3.0 ± 0.47	0.34

SD = Standard deviation *Statistically significant at $P < 0.05$

wide recession of a maxillary first molar subsequent to autogenous gingival grafting.[7]

Al-Rasheed in a case report described a creeping attachment that developed after using free connective tissue graft to treat a gingival recession on the lower left central incisor.[8] In this study, about 2 mm of coronal migration of the gingival margin was reported.

In all studies mentioned above, some factors that may have an effect on creeping attachment were reported, but the mechanism of this phenomenon was not identified.

Topical application of phenytoin will lead to an increase in production of fibroblasts, myofibroblasts, extracellular matrix, its proteins, and activity of growth factors.[11-15]

Topical effect of phenytoin on repairing periodontal wounds was evaluated and a rapid repair of periodontal wounds, and decrease in pain and inflammation were also reported.[12]

Keeping the hypothesis that "root coverage with non-surgical treatment may be accelerated with topical medication such as phenytoin" in mind, and based on the studies performed on wound healing following application of topical phenytoin, we decided to evaluate this treatment modality. However, the results of the present study did not confirm this hypothesis. The results of this study did not show any significant increase in the width of keratinized gingiva and probing depth improvement ($P > 0.05$). Aimetti et al. evaluated root coverage following scaling and root planing.[16] In Aimetti's study, no significant differences were observed in keratinized tissue width and probing depth improvements.

In our study, at baseline, the mean recession height was 1.9 ± 0.87, which did not change significantly after 2 months of local phenytoin therapy ($P > 0.05$). In Aimetti's study, at baseline, the mean recession height in the test group was 1.64 ± 0.37 mm, and in the control sites it was 1.43 ± 0.42 mm, which, respectively, decreased to 0.78 ± 0.60 mm and to 1.34 ± 0.45 mm, after 12 months. The difference between the two groups was significant ($P < 0.001$). These results occurred because of development of creeping attachment following root planing. The duration of Aimetti's study was 12 months and root surface instrumentation was repeated twice a month during the first 2 months and at 2-month intervals over the next 10 months. This treatment is time consuming and invasive because of repeated instrumentation. In the present study, we applied phenytoin mucoadhesive paste to accelerate creeping attachment following root planning and deepithelialization of gingiva, but we did not find the anticipated effect. However, further clinical testing is needed. We suggest the application of different concentrations of phenytoin mucoadhesive paste, application of phenytoin for more than two months, and using other drugs, in a single or combined form.

Conclusion

The aim of this study was to evaluate the effect of topical phenytoin on creeping attachment. The results of this study showed that application of phenytoin mucoadhesive paste following root planing and deepithelialization of gingiva can not initiate and promote creeping attachment after 2 months. However, further studies should be designed to evaluate the mechanism of the development of creeping attachment.

Acknowledgement

The authors would like to thank Dr. Payam Khazaeli, Pharmacologist, for his support and preparation of phenytoin mucoadhesive paste, from Pharmacology School, Kerman University of Medical Sciences. This study was supported by a grant from Kerman Dental and Oral Diseases Research Center.

Conflicts of Interest

The authors declare that they have no conflicts of interests. This study was supported by a grant from Kerman Oral and Dental Diseases Research Center.

References

1. Goldman HM, Cohen DW. Periodontal therapy. 5th ed. Philadelphia, PA: C. V. Mosby Co; 1973.
2. Matter J, Cimasoni G. Creeping attachment after free gingival grafts. J Periodontol 1976; 47(10): 574-9.
3. Matter J. Creeping attachment of free gingival grafts. A five-year follow-up study. J Periodontol 1980; 51(12): 681-5.
4. Bell LA, Valluzzo TA, Garnick JJ, Pennel BM. The presence of "creeping attachment" in human gingiva. J Periodontol 1978; 49(10): 513-7.
5. Harris RJ. Creeping attachment associated with the connective tissue with partial-thickness double pedicle graft. J Periodontol 1997; 68(9): 890-9.
6. Haeri A, Parsell D. Creeping attachment: autogenous graft vs dermal matrix allograft. Compend Contin Educ Dent 2000; 21(9): 725-9.
7. Otero-Cagide FJ, Otero-Cagide MF. Unique creeping attachment after autogenous gingival grafting: case report. J Can Dent Assoc 2003; 69(7): 432-5.
8. Al-Rasheed A. Creeping attachment after free connective tissue graft for treatment of gingival recession. Saudi Dental Society 2006; 18(1): 41-6.
9. Merritt HH, Putnam TJ. Sodium Diphenyl Hydantoinate in the Treatment of Convulsive Disorders. JAMA 1938; 111(12): 1068-73.
10. Brown RS, Beaver WT, Bottomley WK. On the mechanism of drug-induced gingival hyperplasia. J Oral Pathol Med 1991; 20(5): 201-9.
11. Talas G, Brown RA, McGrouther DA. Role of phenytoin in wound healing--a wound pharmacology perspective. Biochem Pharmacol 1999; 57(10): 1085-94.
12. Shapiro M. Acceleration of gingival wound healing in non-epileptic patients receiving diphenylhydantoin sodium (dilantin, epanutin). Exp Med Surg 1958; 16(1): 41-53.
13. Shaw J, Hughes CM, Lagan KM, Bell PM. The clinical effect of topical phenytoin on wound healing: a systematic review. Br J Dermatol 2007; 157(5): 997-1004.
14. Pendse AK, Sharma A, Sodani A, Hada S. Topical phenytoin in wound healing. Int J Dermatol 1993; 32(3): 214-7.
15. Modaghegh S, Salehian B, Tavassoli M, Djamshidi A, Rezai AS. Use of phenytoin in healing of war and non-war wounds. A pilot study of 25 cases. Int J Dermatol 1989; 28(5): 347-50.
16. Aimetti M, Romano F, Peccolo DC, Debernardi C. Non-surgical periodontal therapy of shallow gingival recession defects: evaluation of the restorative capacity of marginal gingiva after 12 months. J Periodontol 2005; 76(2): 256-61.

Received: 24 Apr. 2012 **Accepted: 26 Aug. 2012**

Original Article

A modification of a previous model for inflammatory tooth pain: Effects of different capsaicin and formalin concentrations and ibuprofen

Maryam Raoof DDS, MS[1], Mehdi Abbasnejad PhD[2], Ladan Amirkhosravi MSc[3], Hamed Ebrahimnejad DDS[3], Ramin Raoof[4]

Abstract

BACKGROUND AND AIM: This study aimed to solve the problems faced with the previous model of inflammatory tooth pain in rats.

METHODS: After cutting 2 mm of the distal extremities, the polyethylene crowns were placed on the mandibular incisors. In contrast to the original model, we used flow composite instead of wire in order to maximize the retention of crowns. Different concentrations of capsaicin (10, 25 and 100 mg/ml) and formalin were administrated into the cavities under the crowns. The algesic agent-induced behaviors were evaluated.

RESULTS: The modified model had no liquid leakage. Furthermore, composite allowed the crowns to remain for a longer period of time. Capsaicin 25, 100 mg/ml and formalin applications induced significantly more painful stimulation compared with control groups ($P < 0.001$). These responses were significantly reduced by the administration of ibuprofen, 20 minutes prior to the capsaicin 100 mg/ml injection.

CONCLUSIONS: This model seems to be adequate for long-term pain related experiments in which fluid leakage elimination is important.

KEY WORDS: Odontalgia, Capsaicin, Formalin, Model, Rat

J Oral Health Oral Epidemiol 2012; 1(2): 70-77

Painful conditions are highly important health concern as well as increasingly researched topic of study.[1,2] Pain activates a wide range of cortical and sub-cortical structures. For example, spontaneous firing of neurons in the primary somatosensory cortex and the ventral posterior medial nucleus of the thalamus induces a wide range of compounds affecting different neurotransmitter systems.[3] Orofacial pain is the most prevalent pain that people are afflicted with and odontalgia is the most commonly experienced type.[1,4] Because of the clinical significance of pain, emphasis should be placed on pain research. In an early review, Beecher cited 60 original publications in 1957 that were related to the description, development, and application of experimental tests of pain in animals.[5] By 1999, more than 425 reports were published in these regards.[6] This certainly reflects the heightened interest in understanding the mechanisms and side effects of pain.

Animal models have been used widely in basic pain research to investigate the potency and efficacy of the pharmacologic action and the molecular response to new agents.[2,6] Although a variety of pain models have been developed, very few odontalgia models are available. Most of the studies have applied the electrical tooth stimulation methodology to investigate the nociception in dental pulp. Despite various advantages, it is not a natural type of stimulus like those encountered by an animal in its normal environment.[6] More importantly, intense electrical stimuli excite

1- Assistant Professor, Neuroscience Research Center, Department of Endodontics, Kerman University of Medical Sciences, Kerman, Iran
2- Associate Professor, Department of Biology, School of Sciences, Shahid Bahonar University of Kerman, Kerman, Iran
3- Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran
4- MSc Student, Department of Biology, School of Sciences, Shahid Bahonar University of Kerman, Kerman, Iran
Correspondence to: Maryam Raoof DDS, MS
Email: mraoof@kmu.ac.ir

all peripheral fibers, including large diameter fibers, which are not directly implicated in nociception. Brief and sudden electrical stimulation of dental pulp may produce highly synchronized neural signals and lead to wide behavioral responses.[6] Chemical stimuli are clearly different from electrical stimuli in regards to sensory and signal transduction as well as pattern of conductivity. They simulate features of human pain more closely. Typical reflexes, which necessitate a minimum level of synchronization of activity in primary afferent nerves, are inhibited by these stimuli. Moreover, drug release can be controlled in this way.[7,8]

Given the general consensus that current animal models of pain are suboptimal, it is important to consider what can be done to improve them.[6,9,10] In 2002, Chidiac et al. developed a new dental pain model induced by chemical inflammatory agents applied to rat incisors.[11] Although many advantages can be cited with respect to the use of this model, practical problems have prevented it from being widely used.

For example, in a pilot study, it was observed that the rats used their forepaws to remove the wires and crowns used in Chidiac's Model. Consequently, loss of crown retention and liquid leakage were found to be the dominant problems regarding long-term experiments. In this study, we aimed at improving and validating the above mentioned Chidiac's Model. We followed the time-course hypersensitivity of animals under these pain conditions and its reversal by ibuprofen as an analgesic drug.

Methods

Animals

Fifty-six adult male Wistar rats weighing 250-300 g were provided by the Neuroscience Research Center, Kerman University of Medical Sciences, Iran. Animals were kept on a 12-hour day-night schedule (lights on at 7:00 am) under standard laboratory conditions (temperature: 23 ± 2° C; relative humidity: 40%–50%) with standard rat chow and water ad libitum. All experimental procedures were approved by the Animal Research Ethics Committee of Kerman University of Medical Sciences, Kerman, Iran (Code: K/90/258).

Dental procedures

Animals received intraperitoneal (IP) injections of xylazine (Alfasan, Woerden, Holland) and ketamine (Alfasan, Woerden, The Netherlands) mixture (3 mg and 78 mg per kg bodyweight, respectively). A retractor was used to keep the animal's mouth open and the tongue to the side. The distal 2mm of the mandibular incisors were cut off using a fissure bur (Diatech, Heerbrugg, Switzerland) with a high-speed hand piece and copious water spray. Great care was taken not to expose the pulp.

Special crowns were designed to specifically fit over the incisors and mimic the natural occlusion as closely as possible. Crowns were made of polyethylene plastic except for the coronal plane, which was sealed by a metal cap that was fully covered with cyanoacrylate adhesive (Super Bonder; Loctite Brasil Ltda, Itapevi, SP, Brazil). Five auxiliary retention holes were placed (2 in the buccal aspect and 1 in the lingual and lateral aspects) using a slow-speed round bur (Fig. 1).

Figure 1. The artificial crown design

Teeth were acid etched (Kimia, Tehran, Iran) on all surfaces, except for cut edges. After applying bonding agent (Heliobond, Ivoclar-Vivadent, Liechtenstein) and polymerization, the teeth surfaces were

covered with tetric flow composite (Tetric Flow, Ivoclar Vivadent) and crowns were placed on the teeth. The auxiliary holes were filled automatically as to increase the retention of the crowns. A small space (hallow chamber) remained between the tooth structure and the internal surface of the crown (Fig. 2). Chlorhexidine 0.12% (Sharedaru Pharmaceutical Co., Tehran, Iran) was applied topically to the gingiva around the crown twice daily with a cotton swab.

Figure 2. Polyethylene crowns placed onto mandibular incisors using Tetric Flow, a flowable resin composite. A small cavity was left between the metal cap and the cut end of the teeth.

Study drugs

Formalin 2.5%: Formalin solution was freshly prepared from commercially available stock formalin (Sigma-Aldrich) diluted in isotonic saline to 2.5%. Stock formalin is an aqueous solution of 37% formaldehyde.

Capsaicin (Sigma-Aldrich): Capsaicin was dissolved in Tween 80 (Merck, Germany)-ethanol solution (10% ethanol, 10% Tween 80, 80% distilled water, w/w) at the graded concentrations of 10, 25 and 100 mg/ml and administrated intradentally (i.d.).

Ibuprofen (Kimidaru, Iran): Ibuprofen powder with vehicle (2% Tween 80/distilled water) in a dose of 120 mg/kg was administered by oral gavage.

Study groups

Fifty-six animals were randomly divided into eight groups (N = 7) as follows:

1: Control group (CO) included intact animals.

2: Sham operated group (SO) received i.d. injection of normal saline.

3: Sham vehicle group (SV) received i.d. injection of vehicle of capsaicin including Tween 80 and ethanol.

4-6: Capsaicin treated groups (C10, C25 and C100) received i.d. injection of 10, 25 and 100 mg/ml capsaicin, respectively.

7: Formalin treated group (F) received i.d. injection of formalin 2.5%.

8: Ibuprofen treated group (I) received ibuprofen 20 minutes before i.d. capsaicin 100 mg/ml.

After two days of recovery, unanesthetized rats were restrained in plastic holding tubes and the mouth was held open with the use of a small retractor. According to the study group, 10 µl of the specified drug was injected in the hallow chamber through a 27-gauge needle as quickly as possible and cyanoacrylate adhesive was used to close the crown perforation immediately. 4x magnifying loops were utilized.

Moreover, intradental injection of methylene blue dye was used to evaluate the sealing ability of the crowns in six rats, three with wire retention crowns and three with composite retention crowns.

Nociceptive behavior

Test sessions were carried out during the light phase between 10:00 and 17:00 in a quiet room maintained at 23–24° C. Before the injection, each animal was placed in the test box for a 30-min habituation period to minimize additional stress. The rats did not have access to food or water during the test.

Immediately following the injection, each rat was placed back in the transparent Plexiglas box (25 cm × 35 cm × 35 cm) with a transparent floor positioned over a mirror at the angle of 45 degrees to allow the

observation of nociceptive behavior. The behavior of the rats was observed for 21 minutes. The recording time was divided into 7 blocks of 3 minutes. A pain score was determined for each block by measuring the number of seconds that the animal presented each of the following responses (the same scoring criteria as Chidiac et al. study).[11] Zero indicated calm and normal behavior, including grooming; 1, abnormal head movements including mild head shaking or continuous placement of the jaw on the floor or the wall of the cage; 2, abnormal continuous shaking of the lower jaw; 3, excessive rubbing of the mouth with foreleg movements, such as head grooming, but concentrated consistently and mainly on the lower jaw. A video camera was used to record the behavioral response. Upon application of deep anesthesia, all animals were sacrificed at the end of the observation period.

Statistical analysis

Analysis of the nociceptive behavior was completed by an investigator who was blinded to the animal's group assignment. Behavioral data comparing the different groups over the total period of testing was analyzed by means of two-way repeated ANOVA measures followed by Tukey's post hoc test.

Results

The pilot study revealed that the animals exhibited an immediate nociceptive response to formalin and capsaicin injections, with a marked peak in the 18-21 minutes. In the control group, animals suffered no pain.

Normal saline values were not significantly different from those observed in control animals.

Capsaicin 25, 100 mg/ml and formalin applications induced significantly more painful stimulation compared with the SV and SO groups ($P < 0.001$). In contrast, administration of ibuprofen 20 minutes before the capsaicin 100 mg/ml was associated with a significant decrease in pain scores similar to that observed in the control group (Fig. 3).

Capsaicin 100 mg/ml treated animals spent a significantly higher amount of time in pain score 2 and 3 compared with C10 and I groups. The greatest effect was associated with capsaicin 100 mg/ml application (Fig. 4). Crowns cemented with composite revealed no visible leak of methylene-blue dye. In contrast, extensive leakage was observed in wire retention crowns.

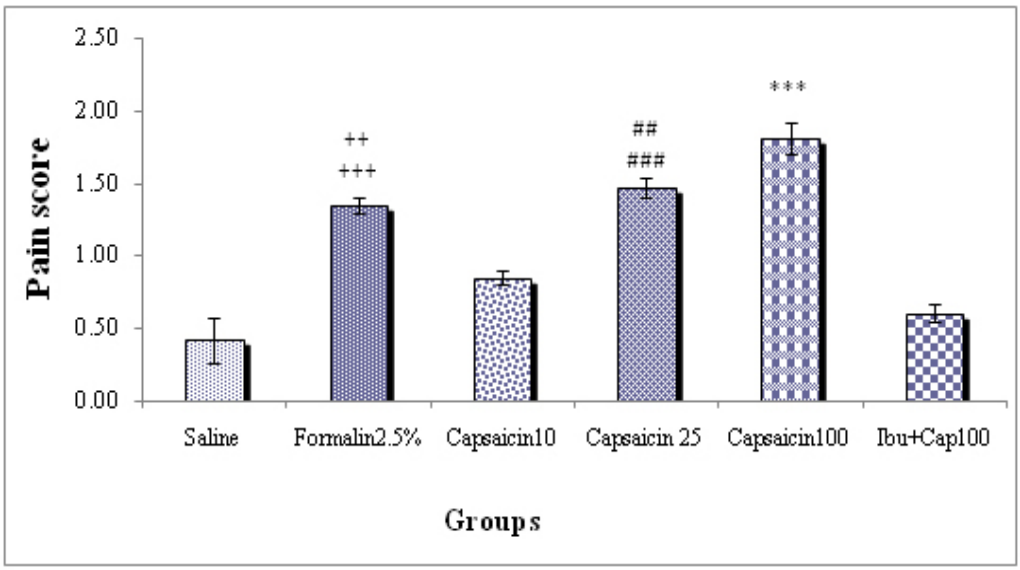

Figure 3. Pain scores recorded in different study groups

*** P < 0.0001 vs. formalin, capsaicin 10 mg/ml, ibuprofen + capsaicin 100 mg/ml and saline
+++ P < 0.0001 vs. capsaicin 100 mg/ml and sham
++ P < 0.01 vs. capsaicin 10 mg/ml
P < 0.0001 vs. capsaicin 10 mg/ml
P < 0.01 vs. capsaicin 100 mg/ml

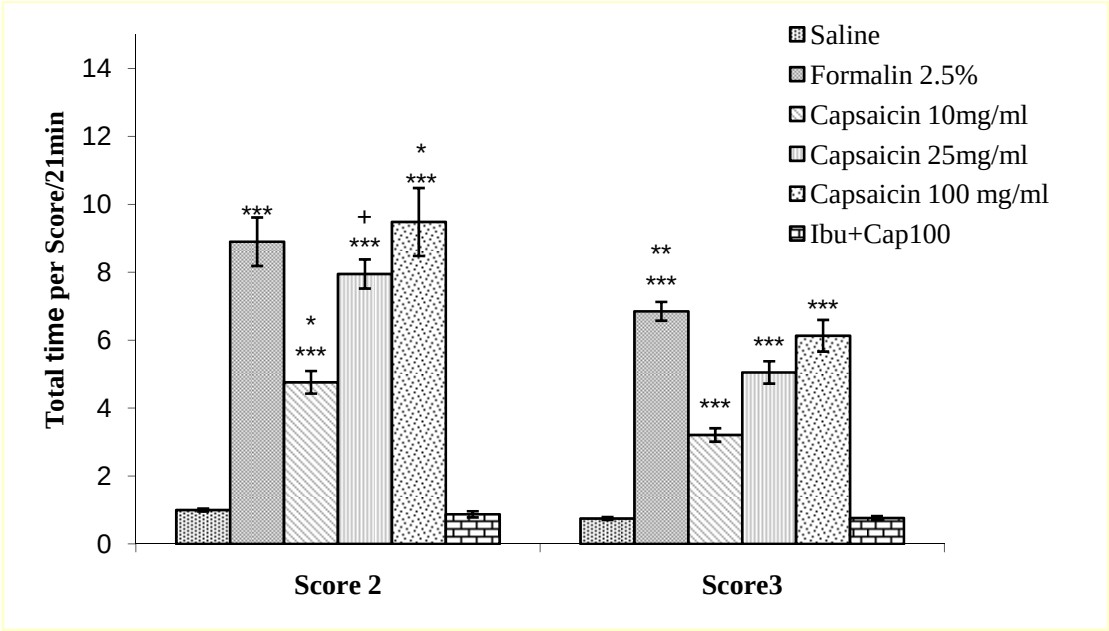

Figure 4. Total time spent in score 2 and 3 for different study groups

Score 2
*** P < 0.0001 vs. Saline and Ibuprofen + capsaicin 100 mg/ml
* P < 0.05 vs. capsaicin 25 mg/ml
+ P < 0.05 vs. capsaicin 10 mg/ml

Score 3
*** P < 0.0001 vs. saline and Ibuprofen + capsaicin 100 mg/ml
** P < 0.01 vs. capsaicin 25 mg/ml

Discussion

In the current study, we introduce an optimized behavioral model to study inflammatory tooth pain conditions by characterizing the nociceptive behavioral responses induced by the intradental injection of capsaicin and formalin.

Pain experimentation on human subjects is practically challenging, fundamentally subjective, and ethically self-limiting. Given these restraints, laboratory animal models of pain are widely used.[12] Gabka and Price found that, as a pain model, tooth pulp stimulation provided both repeatable results and good correlation between experimental and clinical analgesia.[13] Numerous investigators have described morphologic similarities between human and rat teeth.[14,15] It has been shown that the physiology and histology of human and rat pulps is probably similar.[16] Current animal models of pain are suboptimal and need to be improved. Proposals for improvement can be grouped into several categories including refinement of current models to enhance their accuracy and reduce their variability as well as the development of new models.[17]

Recently, Chidiac et al. introduced a new, intriguing model for inflammatory tooth pain.[11] In their model, artificial crowns were fixed on the incisors of rats by an orthodontic stainless steel wire. In a pilot study, we observed that the rats used their forepaws to remove the wires and crowns. As a result, loss of crown retention and liquid leakage were found to be the dominant problems for long-term experiments. Here, we presented a modified tooth pain model that can be widely used to study different fields of pain including the mechanisms as well as to test the effects of analgesics, especially at the peak of pain. Through our optimized model, improved crown retention and seal ability is achieved after providing retention auxiliary holes and using flow composite instead of wire.

The present study demonstrates that the injection of formalin rather than saline into the crown cavities produces quantitative nociceptive behaviors. This suggests that the pain behavior was not due to increased pressure and/or volume expansion because of the injected drug. A similar inefficiency of

saline in inducing nociceptive behaviors has already been noted in the temporomandibular joint (TMJ) region of rats[18], in the paw[19] and in the upper lip formalin test.[20] This was also demonstrated in the study by Chidiac et al. which mentioned that i.d. application of saline did not influence nociceptive scores.[11]

A number of mechanisms have been postulated to explain the formalin-induced orofacial pain in rats. Formalin predominantly evokes activity in C fibers,[21] which are found in the subodontoblastic layer and the deep pulp. The initial response is derived from direct chemical stimulation of nociceptors resulting in C-fiber firing through TRPA1 channels; however, ongoing inflammatory input and central sensitization causes the next step.[22]

One of the characteristics of the formalin response is its biphasic pattern.[21,22] However, the i.d. injection of formalin in the present study, demonstrated just one response phase. This is in line with the Roveroni et al. study which showed that the injection of formalin into the TMJ region induced only one pain phase.[18]

Since the formalin related nociceptive behavior is concentration-dependent,[20] we considered 2.5% formalin based on previous studies,[11,20] which indicated that formalin responses reached a maximum at 2.5%.

In the present study, Injection of capsaicin produced a dose-related pain response. Although the exact mechanism of how capsaicin elicits the sensation of pain upon the nociceptors is still not completely clear,[23] there are several proposed theories in this regard. Capsaicin, the primary pungent ingredient in hot chili peppers, has a selective action on small sensory fibers that convey pain sensations and elicit axon reflex vasodilatation.[24] Excitotoxic action of capsaicin has been shown on spinal afferent neurons expressing vanilloid receptor subtype 1 (VR1).[25] Functionally, VR1 is a nonselective cation channel that displays an exceptionally high permeability for Ca2+ and is expressed on a major subclass of nociceptors, including unmyelinated C fibers and some lightly myelinated A-delta fibers.[26] Pulpal C nociceptors are thought to have a predominant role in encoding inflammatory pain arising from dental pulp and periradicular tissue. This intriguing aspect of VR1 is likely to explain the burning sensation of capsaicin-evoked pain.[27] Capsaicin injection into the orofacial region also simultaneously increases the spontaneous firing of neurons in the primary somatosensory cortex and the ventral posterior medial nucleus of the thalamus.[28] In addition, activation of capsaicin-sensitive fibers in dental pulp increases pulpal blood flow. It has been reported that topical application of capsaicin in the maxillary region of the monkey produces changes in escape behavior, suggesting a thermal and mechanical hyperalgesia.[29]

Ibuprofen resulted in a significant decrease in the response score, which was comparable to that of the saline values, when it was given prior to capsaicin 100 mg/ml administrations. In contrast, Brandt reported that ketorolac as a non-steroid anti-inflammatory drug did not prevent hypersensitivity produced by capsaicin.[30] Moreover, in a study by Jones et al. ibuprofen had weak efficacy in attenuating capsaicin-induced mechanical allodynia in rats.[31] The difference could be attributed to the type of drug used, the dosage, route of administration and the factors associated with anatomical location of sensory endings.

It is noteworthy that, compared with placement of the jaw on the floor, continuous shaking of the lower jaw and excessive rubbing of the mouth were strongly correlated with capsaicin concentration. Although the behavior of rubbing the orofacial region resembles that of washing the face, prolonged face rubbing is not displayed spontaneously by normal intact rats.[32] This data demonstrates that mandible movement and rubbing behaviors are more related to pulpal pain, rather than placement of the jaw on the floor. On the other hand,

grooming was a common occurrence, even in intact animals, and resembled a general normal reaction rather than a pain response. Based upon this information, we assigned no score to this behavior.

There are some potential limitations of our study. After the surgical intervention, the animals' food intake was switched from pellets to powder in order to prevent weight loss. These stresses due to environmental changes may interfere with the pain process at the central and peripheral level. Furthermore, animal restriction followed by i.d. injection of the drug may result in an uncomfortable position, making it difficult to see the animals' normal responses to a stimulus. Finally, since the cerebral cortical structures participate in the conscious perception of pain,[3] it is imperative that assessments of pain in laboratory animals quantify behavioral responses to sensory experiences that are cortically medicated. Humans possess certain neuroanatomical features crucial for pain sensation that are not present in some of the species that most commonly used in pain research, such as rodents.

Conclusion

In summary, our findings suggested that the described experimental approach is a valid model of inflammatory dental pain. We concluded that intradental capsaicin or formalin-induced nociceptive rubbing and mandible movement responses may be used as indexes of inflammatory tooth pain.

Acknowledgement

The authors wish to thank the Research Committee of Kerman University of Medical Sciences and Kerman Neuroscience Research Center for financial support. We also express our sincerest thanks to Kimidaru Pharmaceuticals (Iran) for providing ibuprofen powder.

Conflict of Interest

Authors have no conflict of interest.

References

1. Moure-Leite FR, Ramos-Jorge J, Ramos-Jorge ML, Paiva SM, Vale MP, Pordeus IA. Impact of dental pain on daily living of five-year-old Brazilian preschool children: prevalence and associated factors. Eur Arch Paediatr Dent 2011; 12(6): 293-7.
2. Yaksh TL. Spinal systems and pain processing: development of novel analgesic drugs with mechanistically defined models. Trends Pharmacol Sci 1999; 20(8): 329-37.
3. Brooks J, Tracey I. From nociception to pain perception: imaging the spinal and supraspinal pathways. J Anat 2005; 207(1): 19-33.
4. Lipton JA, Ship JA, Larach-Robinson D. Estimated prevalence and distribution of reported orofacial pain in the United States. J Am Dent Assoc 1993; 124(10): 115-21.
5. BEECHER HK. The measurement of pain; prototype for the quantitative study of subjective responses. Pharmacol Rev 1957; 9(1): 59-209.
6. Le BD, Gozariu M, Cadden SW. Animal models of nociception. Pharmacol Rev 2001; 53(4): 597-652.
7. Gilchrist HD, Allard BL, Simone DA. Enhanced withdrawal responses to heat and mechanical stimuli following intraplantar injection of capsaicin in rats. Pain 1996; 67(1): 179-88.
8. Yeomans DC, Pirec V, Proudfit HK. Nociceptive responses to high and low rates of noxious cutaneous heating are mediated by different nociceptors in the rat: behavioral evidence. Pain 1996; 68(1): 133-40.
9. Quessy SN. Two-stage enriched enrolment pain trials: a brief review of designs and opportunities for broader application. Pain 2010; 148(1): 8-13.
10. Vierck CJ, Hansson PT, Yezierski RP. Clinical and pre-clinical pain assessment: are we measuring the same thing? Pain 2008; 135(1-2): 7-10.
11. Chidiac JJ, Rifai K, Hawwa NN, Massaad CA, Jurjus AR, Jabbur SJ, et al. Nociceptive behaviour induced by dental application of irritants to rat incisors: a new model for tooth inflammatory pain. Eur J Pain 2002; 6(1): 55-67.
12. Mogil JS. Animal models of pain: progress and challenges. Nat Rev Neurosci 2009; 10(4): 283-94.
13. Gabka J, Price RK. Tooth pulp stimulation: a method of determining the analgesic efficacy of meptazinol in man. Br J Clin Pharmacol 1982; 14(1): 104-6.

14. BERMAN DS, MASSLER M. Experimental pulpotomies in rat molars. J Dent Res 1958; 37(2): 229-42.
15. . 2012. Ref Type: Generic
16. Kozlov M, Massler M. Histologic effects of various drugs on amputated pulps of rat molars. Oral Surg Oral Med Oral Pathol 1960; 13: 455-69.
17. Wilson SG, Mogil JS. Measuring pain in the (knockout) mouse: big challenges in a small mammal. Behav Brain Res 2001; 125(1-2): 65-73.
18. Roveroni RC, Parada CA, Cecilia M, Veiga FA, Tambeli CH. Development of a behavioral model of TMJ pain in rats: the TMJ formalin test. Pain 2001; 94(2): 185-91.
19. Wheeler-Aceto H, Cowan A. Naloxone causes apparent antinociception and pronociception simultaneously in the rat paw formalin test. Eur J Pharmacol 1993; 236(2): 193-9.
20. Clavelou P, Dallel R, Orliaguet T, Woda A, Raboisson P. The orofacial formalin test in rats: effects of different formalin concentrations. Pain 1995; 62(3): 295-301.
21. . Heapy CG, Jamieson A, Russell NJW. Afferent C-fibre and A-delta activity in models of inflammation. Br J Pharmacol 1987; 90: 164-70.
22. McNamara CR, Mandel-Brehm J, Bautista DM, Siemens J, Deranian KL, Zhao M, et al. TRPA1 mediates formalin-induced pain. Proc Natl Acad Sci USA 2007; 104(33): 13525-30.
23. Galano A, Martinez A. Capsaicin, a tasty free radical scavenger: mechanism of action and kinetics. J Phys Chem B 2012; 116(3): 1200-8.
24. Baumann TK, Simone DA, Shain CN, LaMotte RH. Neurogenic hyperalgesia: the search for the primary cutaneous afferent fibers that contribute to capsaicin-induced pain and hyperalgesia. J Neurophysiol 1991; 66(1): 212-27.
25. Helliwell RJ, McLatchie LM, Clarke M, Winter J, Bevan S, McIntyre P. Capsaicin sensitivity is associated with the expression of the vanilloid (capsaicin) receptor (VR1) mRNA in adult rat sensory ganglia. Neurosci Lett 1998; 250(3): 177-80.
26. Caterina MJ, Schumacher MA, Tominaga M, Rosen TA, Levine JD, Julius D. The capsaicin receptor: a heat-activated ion channel in the pain pathway. Nature 1997; 389(6653): 816-24.
27. Holzer P. Neural injury, repair, and adaptation in the GI tract. II. The elusive action of capsaicin on the vagus nerve. Am J Physiol 1998; 275(1 Pt 1): G8-13.
28. Katz DB, Simon SA, Moody A, Nicolelis MA. Simultaneous reorganization in thalamocortical ensembles evolves over several hours after perioral capsaicin injections. J Neurophysiol 1999; 82(2): 963-77.
29. Kupers RC, Chen CC, Bushnell MC. A model of transient hyperalgesia in the behaving monkey induced by topical application of capsaicin. Pain 1997; 72(1-2): 269-75.
30. Brandt MR, Furness MS, Mello NK, Rice KC, Negus SS. Antinociceptive effects of delta-opioid agonists in Rhesus monkeys: effects on chemically induced thermal hypersensitivity. J Pharmacol Exp Ther 2001; 296(3): 939-46.
31. Jones CK, Peters SC, Shannon HE. Efficacy of duloxetine, a potent and balanced serotonergic and noradrenergic reuptake inhibitor, in inflammatory and acute pain models in rodents. J Pharmacol Exp Ther 2005; 312(2): 726-32.
32. Vos BP, Hans G, Adriaensen H. Behavioral assessment of facial pain in rats: face grooming patterns after painful and non-painful sensory disturbances in the territory of the rat's infraorbital nerve. Pain 1998; 76(1-2): 173-8.

Received: 21 Jun. 2012 **Accepted: 3 Dec. 2012**

Original Article

Quality of life and OHRQoL in head and neck cancer patients in Kerman, Iran

Molouk Torabi DDS, MS[1], Mohammad Hasan Larizadeh MD, MS[2], Hossein Safizadeh MD, MPH[3], Marzieh Karimi Afshar DDS[4], Nader Modares Ahmadi DDS[5]

Abstract

BACKGROUND AND AIM: Head and neck cancer is one of the six most prevalent neoplasms worldwide. Regardless of tumor site, deterioration of basic functions affecting head and neck areas are perceived and affect patients' lives. The aim of this study was to evaluate quality of life (Short Form) and oral health related quality of life (OHIP-14) in patients with head and neck cancer.

METHODS: This study was conducted on 42 patients being treated for head and neck cancer. Data collected from the survey included demographic (sex, age, and educational level), quality of life (QoL), and Oral Health Related Quality of Life (OHRQoL), which were, respectively, measured by short form-36 and OHIP-14 questionnaire. Cancer measurements were collected from the patient's hospital records. ANOVA and t-tests were used to determine the association between QoL scores and the variables.

RESULTS: 83.3% of the participants were men and 16.7% were women. Their mean age was 59.39 ± 12.5 years. 33.3% of the participants had oral cancer. 54.8% of patients had stage III cancer. The mean score of OHIP-14 was 21.4 ± 10.11. There was a significant correlation between OHIP-14 and site of cancer, and dose of radiation (P = 0.020 and P = 0.009, respectively). The best score of SF-36 was in social function (55.11 ± 30.9) and the worst score of SF-36 was in vitality domain (29.76 ± 9.67). There was a significant correlation between physical function, vitality and social activity with OHIP-14 (P = 0.020, P = 0.011, P = 0.009, respectively).

CONCLUSIONS: The QoL scores in Kerman like the other studies were low. Head and neck cancer can have a negative impact on QoL. Further research is recommended.

KEY WORDS: Short Form-36 (SF-36), Oral Health Impact Profile-14 (OHIP-14), Head and Neck Cancer

J Oral Health Oral Epidemiol 2012; 1(2): 78-82

Oral cancer is the sixth most common neoplasm in the world; approximately 900000 cases of this disease are identified every year.[1] Epidemiologic studies show an increase in oral cancer incidence in the general population and among young people.[2] Despite the progression in treatment 5-years survival rate is between 50-60%.[2-5] Oral health related quality of life is the self-evaluation of functional, psychological, sociological conditions that are affected by oral health condition.[6] One of the most important effects of treatment is quality of life improvement.[2] Ogama et al. showed radiation causes xerostomia and mucositis that can reduce the quality of life of patients.[7] Hanna et al. evaluated the quality of life of patients who had larynx carcinoma and were treated in different ways. They showed that the patients treated by surgery and radiotherapy had more problems in social functioning than the chemoradiation group Patients treated by surgery had a significantly higher number of

1- Assistant Professor, Kerman Oral and Dental Diseases Research Center, Department of Oral Pathology, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
2- Assistant Professor, Department of Radiation Oncology, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
3- Associate Professor, Research Center of Social Determinants of Health, Institute of Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran
4- Resident, Department of Orthodontics, School of Dentistry, Kerman University of Medical Sciences Kerman, Iran
5- Dentist, Kerman, Iran
Correspondence to: Molouk Torabi DDS, MS
Email: m_torabi@kmu.ac.ir

sensorial complications, and a higher number of xerostomia was reported in those treated by chemotherapy.[8]

Andrade et al. showed that patients with larger tumors and tumors in the posterior of the mouth had significantly lower quality of life and their chewing ability was limited.[9]

Mochizuki et al. showed that psychological status and quality of life were reduced in patients with oral cancer.[10] Kakoei et al. showed xerostomia, due to radiotherapy, plays an important role in worsening QoL among patients who undergo radiotherapy for head and neck cancer.[11]

Since similar research has not been done in Iran, this study planned to assess oral health related quality of life (OHRQoL) and quality of life (SF-36) in oral cancer patients referred to the Oncology Center at the University of Medical Sciences, Kerman, Iran, which is in fact the only oncology center in the Kerman province.

Methods

This descriptive cross-sectional study was conducted on 42 patients with head and neck cancer referred to the Oncology Center of Kerman University of Medical Sciences (Shafa Hospital). The participants were selected with simple sampling method. The aim of this project was explained to patients and then after obtaining written consents from them, they were enrolled into the study. Data collection was obtained from questionnaires consisting of 3 parts. The first part consisted of demographic characteristics and cancer information including histological type, location, clinical staging, method of treatment, and dose of radiation. The second part was the Persian version of the Oral Health Impact Profile-14 (OHIP-14) questionnaire. Validity and reliability of this questionnaire were assessed by Mirzadeh.[12] OHIP-14 consist of 14 questions about patients' problems due to their teeth or dentures. Answers were measured by Likert scale (never (0), seldom (1), occasionally (2), always (3), and every time (4)), so the rate of numbers are between 0-56. Part 3 was the Persian version of the quality of life (SF-36) questionnaire that consists of 8 domains of general health, the role of physical limitations, vitality, pain, social functioning, general mental health, and the role emotional limitations. Answers were measured from 0-100 in each domain, higher marks mean better quality of life. Reliability of this questionnaire was 85% based on alfa chronbach.[13] Validity and reliability of this questionnaire were assessed by Montazeri et al.[14] Four weeks after completion of radiotherapy and radiotherapy-induced improvement of acute symptoms, the patients were questioned. In order to complete the questionnaire, personal information was completed by the patient and disease characteristics, including location, type and tumor staging was extracted from patients' records and treatment records by the radiotherapist.

In cases where the patient was low-literate or illiterate questions were read for the patient by the researcher who tried to read all questions in an identical manner in order to prevent any prejudice or from guiding the patient to give a specific answer. After collecting the data, they were entered into the computer by using SPSS software version 16 and analyzed by t-test, ANOVA and LSD tests. The proposal of this study was approved under the ethical code K/89/37 by Kerman University of Medical Sciences.

Results

In this study, 42 patients were examined; 35 men (83.3%) and 7 women (16.7%). Their mean age was 56.39 ± 12.15 years. 52.4% had diploma and lower education. Radiotherapy dose in 66.6% was 70 GY. 40.5% had larynx cancer, and 33.3% had mouth cancer, and 54.8% of the cases had stage III cancer (Table1).

The mean and standard deviation score of oral health-related quality of life was 21.4 ± 10.11, with minimum 3 and maximum 41 points. The most important problem was changes in the patients' sense of taste.

Oral health-related quality of life index score based on individual characteristics and

Table 1. Demographic variables and OHIP-14

Variables		mean ± SD (OHIP-14)	Number (%)	Test result (P value)
Sex	Male	20.57 (9.98)	35 (83.3)	NS*
	Female	25.71 (10.45)	7 (16.7)	
Education level	Illiterate	21.25 (10.16)	12 (28.6)	NS
	Diploma and below	22.00 (10.07)	22 (52.4)	
	University	21.43 (11.39)	8 (19.0)	
Tumor site	Nasopharynx	10.00 (4.24)	4 (9.5)	P < 0.050
	Larynx	22.35 (9.53)	17 (40.5)	
	Mouth	26.14 (6.92)	14 (33.3)	
	Neck	21.43 (13.11)	7 (16.7)	
Clinical stage	I	16.00 (0.00)	1 (2.4)	NS
	II	20.36 (10.15)	11 (26.2)	
	III	22.52 (10.27)	23 (54.8)	
	VI	20.29 (11.28)	7 (16.7)	
Treatment dose	60	29.56 (7.78)	9 (21.4)	P < 0.050
	66	16.00 (9.19)	5 (11.9)	
	70	19.79 (9.73)	28 (66.6)	

* Not Significant

type of disease were compared and results in tumor site and dose of therapy showed a significant difference.

Additional tests showed quality of life of patients with nasopharyngeal tumors was higher in comparison with patients who had tumor in the larynx and mouth (P < 0.050), but it was similar to patients with cervical masses.

The patients who were irradiated with 60 Gy had the lowest quality of life (P < 0.050). Calculated scores for quality of life domains based on the questionnaire SF-36 showed that the highest quality of life was in social functioning and physical functioning and the lowest was in vitality (Figure 1).

Discussion

In this study, the mean of OHIP-14 was 21.4 ± 10.11. McMillan showed that the mean score of OHIP-14 was higher for patients with newly diagnosed nasopharyngeal carcinoma in comparison to those who had finished their radiotherapy treatment.[15]

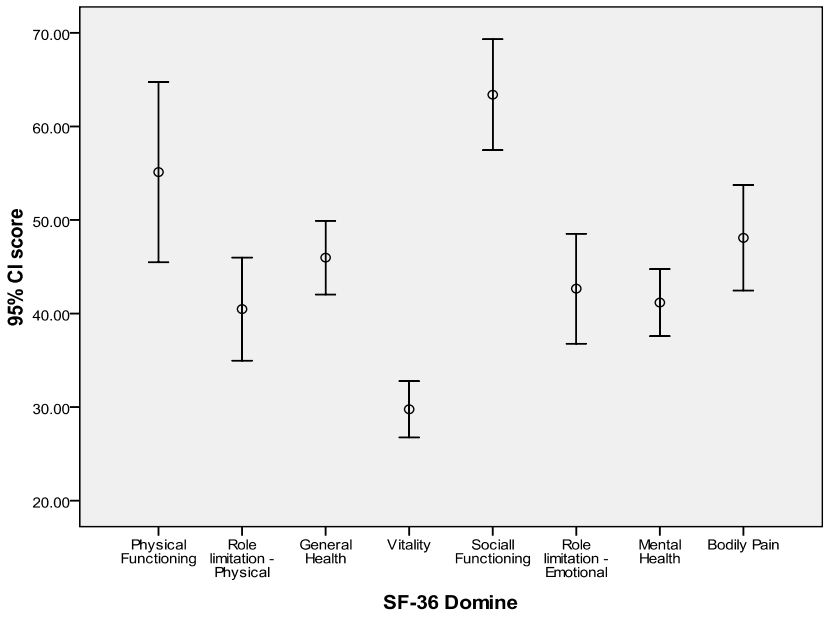

Figure 1. Mean of QoL in different domains of SF-36

In this study the relationship between OHRQoL and the location and staging of tumors was statistically significant. Average score of those who had oral tumors was lower than other people. The most important problem, which was change in their sense of taste, can be related to the decrease in saliva.

Alicikus et al., in a cross-sectional study of QOL in patients with head and neck cancer who had radiotherapy with or without chemotherapy, demonstrated that the tumor site and its clinical staging was significantly associated with patients' quality of life.[16] Fang et al. showed that patients who had tumor in stage 4 QoL had lower quality of life than patients in stage 1,2 and 3 QoL, and this is consistent with the results of the present study.[17]

In this study, the mean OHRQoL score was 20.57 ± 9.97 in men and 26.5 ± 11.22 in women. T-test showed no significant association between sex and OHRQoL. Caglayan et al. showed no statistical relationship between sex and OHIP-14, which is in agreement with the results of our study.[18]

The results of this study showed the lowest score of SF was in vitality (29.76 from 100), this is incompatible with the results of the study by Herce et al. (2009).[19] This difference can be explained by the social and cultural differences of the two studies.

Fang et al. showed that the average score of the 8 domains of SF-36 was significantly lower in patients with oral cancer than other patients.[17] Herce et al. (2009) showed that patients with oral cancer had lower social activity and higher level of pain than the control group.[19]

Although Hanna et al. showed that there was no difference in SF-36 of patients treated by total laryngectomy, and those with chemoradiation. Patients treated with chemoradiotherapy had fewer problems in social functioning than those treated by surgery or radiotherapy.[8]

Herce et al. (2007) showed no difference between quality of life of patients with oral cancer and ordinary people. However, they showed a small difference in social functioning and emotional domains of patients with oral cancer and ordinary people.[20] Karvonen et al. showed that the physical aspect of SF-36 was associated with the survival rate of patients with head and neck cancer.[21] It seems that the concept of quality of life varies due to differences in lifestyle and expectations of patients in different cultures.

In the present study, the OHIP-14 was correlated with the dose of treatment. Pow et al. (2006) also showed that patients with nasopharyngeal carcinoma and undergoing Intensity-Modulated Radiotherapy (IMRT) had higher quality of life than those treated with conventional radiation.[22] Kakoei et al. reported that decrease in flow of saliva in patient who undergo radiotherapy causes a decrease in QoL.[11] Kanatas et al. argue that the quality of life questionnaire should be used as an additional tool for giving information to patients, identifying their problems, and giving them the opportunity to solve their problem under the supervision of a specialist.[23]

Conclusion

Quality of life in patients with head and neck cancer in Kerman, like the other studies, is low. Quality of life can be a valuable tool for screening and identifying patients with low quality of life. This identified group must be followed in order to detect early recurrence of disease and use appropriate treatment for improving their survival rate. We also suggest that patients who are treated for head and neck cancer be trained by nurses and social workers to improve their life quality.

Conflict of Interest

Authors have no conflict of interest.

References

1. Silveira A, Goncalves J, Sequeira T, Ribeiro C, Lopes C, Monteiro E, et al. [Head and neck cancer: health related quality of life assessment considering clinical and epidemiological perspectives]. Rev Bras Epidemiol 2012; 15(1): 38-48.
2. Rapidis AD, Gullane P, Langdon JD, Lefebvre JL, Scully C, Shah JP. Major advances in the knowledge and understanding of the epidemiology, aetiopathogenesis, diagnosis, management and prognosis of oral cancer. Oral Oncol 2009; 45(4-5): 299-300.
3. Amtha R, Zain R, Razak IA, Basuki B, Roeslan BO, Gautama W, et al. Dietary patterns and risk of oral cancer: a factor analysis study of a population in Jakarta, Indonesia. Oral Oncol 2009; 45(8): e49-e53.
4. Ang E, Black C, Irish J, Brown DH, Gullane P, O'Sullivan B, et al. Reconstructive options in the treatment of osteoradionecrosis of the craniomaxillofacial skeleton. Br J Plast Surg 2003; 56(2): 92-9.
5. Kesting MR, Sudhoff H, Hasler RJ, Nieberler M, Pautke C, Wolff KD, et al. Psoriasin (S100A7) up-regulation in oral squamous cell carcinoma and its relation to clinicopathologic features. Oral Oncol 2009; 45(8): 731-6.
6. Naito M, Yuasa H, Nomura Y, Nakayama T, Hamajima N, Hanada N. Oral health status and health-related quality of life: a systematic review. J Oral Sci 2006; 48(1): 1-7.
7. Ogama N, Suzuki S, Umeshita K, Kobayashi T, Kaneko S, Kato S, et al. Appetite and adverse effects associated with radiation therapy in patients with head and neck cancer. Eur J Oncol Nurs 2010; 14(1): 3-10.
8. Hanna E, Sherman A, Cash D, Adams D, Vural E, Fan CY, et al. Quality of life for patients following total laryngectomy vs chemoradiation for laryngeal preservation. Arch Otolaryngol Head Neck Surg 2004; 130(7): 875-9.
9. Andrade FP, Antunes JL, Durazzo MD. Evaluation of the quality of life of patients with oral cancer in Brazil. Braz Oral Res 2006; 20(4): 290-6.
10. Mochizuki Y, Matsushima E, Omura K. Perioperative assessment of psychological state and quality of life of head and neck cancer patients undergoing surgery. Int J Oral Maxillofac Surg 2009; 38(2): 151-9.
11. Kakoei S, Haghdoost AA, Rad M, Mohammadalizadeh S, Pourdamghan N, Nakhaei M, et al. Xerostomia after radiotherapy and its effect on quality of life in head and neck cancer patients. Arch Iran Med 2012; 15(4): 214-8.
12. Mirzadeh A. validitY and reliability OHIP-14 in oral health related quality of life [Thesis]. Kerman medical university, Kerman, Iran: 2010. [In Persian]
13. Brazier JE, Harper R, Jones NM, O'Cathain A, Thomas KJ, Usherwood T, et al. Validating the SF-36 health survey questionnaire: new outcome measure for primary care. BMJ 1992; 305(6846): 160-4.
14. Montazeri A, Goshtasebi A, Vahdaninia M, Gandek B. The Short Form Health Survey (SF-36): translation and validation study of the Iranian version. Qual Life Res 2005; 14(3): 875-82.
15. McMillan AS, Pow EH, Leung WK, Wong MC, Kwong DL. Oral health-related quality of life in southern Chinese following radiotherapy for nasopharyngeal carcinoma. J Oral Rehabil 2004; 31(6): 600-8.
16. Alicikus ZA, Akman F, Ataman OU, Dag N, Orcin E, Bakis B, et al. Importance of patient, tumour and treatment related factors on quality of life in head and neck cancer patients after definitive treatment. Eur Arch Otorhinolaryngol 2009; 266(9): 1461-8.
17. Fang FM, Tsai WL, Chien CY, Chiu HC, Wang CJ. Health-related quality of life outcome for oral cancer survivors after surgery and postoperative radiotherapy. Jpn J Clin Oncol 2004; 34(11): 641-6.
18. Caglayan F, Altun O, Miloglu O, Kaya MD, Yilmaz AB. Correlation between oral health-related quality of life (OHQoL) and oral disorders in a Turkish patient population. Med Oral Patol Oral Cir Bucal 2009; 14(11): e573-e578.
19. Herce LJ, Rollon MA, Lozano RR, Salazar Fernandez CI, Gallana S. Quality of life in long-term oral cancer survivors: a comparison with Spanish general population norms. J Oral Maxillofac Surg 2009; 67(8): 1607-14.
20. Herce J, Rollon A, Polo J. [Quality of life in long-term oral cancer survivors and comparison with reference values of Spanish people]. Med Clin (Barc) 2007; 128(18): 692-6.
21. Karvonen-Gutierrez CA, Ronis DL, Fowler KE, Terrell JE, Gruber SB, Duffy SA. Quality of life scores predict survival among patients with head and neck cancer. J Clin Oncol 2008; 26(16): 2754-60.
22. Pow EH, Kwong DL, McMillan AS, Wong MC, Sham JS, Leung LH, et al. Xerostomia and quality of life after intensity-modulated radiotherapy vs. conventional radiotherapy for early-stage nasopharyngeal carcinoma: initial report on a randomized controlled clinical trial. Int J Radiat Oncol Biol Phys 2006; 66(4): 981-91.
23. Kanatas AN, Mehanna HM, Lowe D, Rogers SN. A second national survey of health-related quality of life questionnaires in head and neck oncology. Ann R Coll Surg Engl 2009; 91(5): 420-5.

Received: 28 May. 2012 **Accepted: 18 Nov. 2012**

Original Article

The oral health park: a new experience in delivering preventive services in Iran

Shahrokh Gheisari RDH, DDS, MPH[1], Ali Golkari DDS, MSc, PhD[2]

Abstract

BACKGROUND AND AIM: Effective and acceptable preventive dental services are hard to achieve in conjunction with treatment services. The Oral Health Office of Fars Province in Iran established the Oral Health Park in a deprived part of the city of Shiraz to attract families and school children to receive preventive services. No other treatment was provided in the setting. The aim of this study was to compare the number and the cost-efficiency of preventive dental services provided in such settings with those of other dental care settings in which preventive services are provided in conjunction with treatment services.

METHODS: The Oral Health Park and its activities were closely monitored for three years. Data on the number of provided services and their costs were compared with available data on other state settings.

RESULTS: From 2008 to 2011, more than 6000 children from about 3200 families used the Oral Health Park's free services. The number of preventive services provided in the Park was tens of times more than similar clinical settings in which both preventive and treatment services were provided. At the same time, the cost of each process provided in the Park was, in average, a quarter of a similar process in other clinics.

CONCLUSIONS: The oral health policy in developing countries such as Iran should move towards establishment of settings in which only preventive dental services are provided for a more effective and cost efficient approach.

KEY WORDS: Oral Health, Oral Health Services, Preventive Services, Shiraz, Iran

J Oral Health Oral Epidemiol 2012; 1(2): 83-86

Health promotion, worldwide, needs to tackle the main causes of diseases and concentrate efforts on preventive measures. Prevention is especially important in improving oral health indices, as most of them cannot be restored after oral diseases are established. Unfortunately, a normative health sector treatment approach is dominant in oral health care services worldwide that has proved unsuccessful in oral health promotion.[1] Therefore, a preventive approach to dental health services seems necessary. However, provision of preventive services in conjunction with treatment services has not been much success; especially when the importance of community involvement has been ignored. It is almost impossible to persuade a considerable proportion of the population in any society to pay for preventive dentistry. However, providing free or subsidized preventive oral care has not been enough to attract a considerable proportion of the population. Many other measures are necessary to persuade people to look for preventive services.[2] The factors affecting local people's decision to use the services should be carefully studied and applied to both the health setting and the community.[3] On the other hand, a professional preventive care needs to be followed by individuals' effort for effective oral hygiene and good dietary behaviours to show a positive outcome. Individuals, families, communities, schools, and other sectors should work collaboratively alongside the health care providers to make the provision of preventive measures effective. Reducing the risk factors of dental/oral diseases in the community, promoting people's knowledge

1- Instructor, Department of Dental Public Health, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran
2- Assistant Professor, Department of Dental Public Health, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran
Correspondence to: Ali Golkari DDS, MSc, PhD
Email: golkaria@sums.ac.ir

and skills for self care, and creating a supportive environment are as important as providing easily accessible and affordable preventive services such as fluoride and fissure sealant therapies.[1]

In Iran, oral health promotion programmes have been integrated into the general primary health care services since 1995. Oral hygiene education has been routinely provided to the public by health care auxiliaries. Fluoride mouth rinse has been provided to schools free of charge. Free oral hygiene aids, such as infant toothbrushes and children's stages toothpastes, have been given away. Considerable subsidies have been allocated to dental services of pre-school and primary school children in state clinics.[4] However, unfortunately, there is no good evidence to show any of these measures has had any positive effect on oral health indices. Comparison of the results of two national surveys conducted in 1998 and 2004 illustrates no success in improving Iranian children's oral health status.[5] That is while the trend of tooth decay was showing a significant decline in DMFT of 12-year-olds before the above-mentioned integration program.[6]

The Oral Health Office of Fars Province – situated in Shiraz, south of Iran – has studied the shortcomings in oral health promotion goals and problems in achieving these goals.[7] A strategic plan to overcome such problems and shortcomings was developed and applied to a deprived part of the city of Shiraz under the name of "Oral Health Park". Below, the park and its way of delivering services are described. The project's achievements are presented in the results section. In the discussion, the cost efficiency of this project is compared with other projects aimed to deliver preventive dental services, and some recommendations are given for continuing the project and expanding it to other cities of a developing country like Iran.

The Oral Health Park

Shiraz, as the 4th most populated city of Iran, has 768 primary schools with more than 120,000 pupils.[8] It is the centre of one of the biggest provinces, with several towns, villages, and gipsy communities, which dependent on Shiraz health services, especially for secondary and tertiary care. The Oral Health Park was established with the aid of the city and local councils in one of the most deprived areas of Shiraz in 2008.

The building in which the dental services are provided is built in 260 cubic meters with pre-fabricated walls to make it as cheap as possible, without endangering public safety. Next to the main building is a playground designed to look like an attractive little theme park. The playing equipments are checked regularly for safety standards and children are supervised at all times. This complex is situated in the middle of an eleven-hectare green local park. The building itself has a welcome area, an examination and screening room with two dental chairs, two main rooms with six dental chairs and necessary equipments and materials for delivering preventive services, a hall with simple audio-visual equipments for delivering oral health education to children, their parents, and other target groups, sterilization and utility rooms, and toilets. Inside and outside of the building are decorated with colourful paintings and health messages. The cost of building and equipments (around 120,000 US dollars) was paid by the Shiraz University of Medical Sciences (Shiraz, Iran), who also pays for maintenance and current costs.

Services

Families with pre-school and primary school children are invited to the Oral Health Park. Local communities, mosques, schools, and general clinics are engaged in informing the families about the facilities. Parents can bring their children to the park individually, or can arrange for their children to be brought by their school/nursery as a group. A schematic view of the process taking place for attendees is shown in figure 1.

Children are welcomed, registered, and then sent to the playground. They are supervised at all times by trained staff. In turn, group of children are called to the presentation

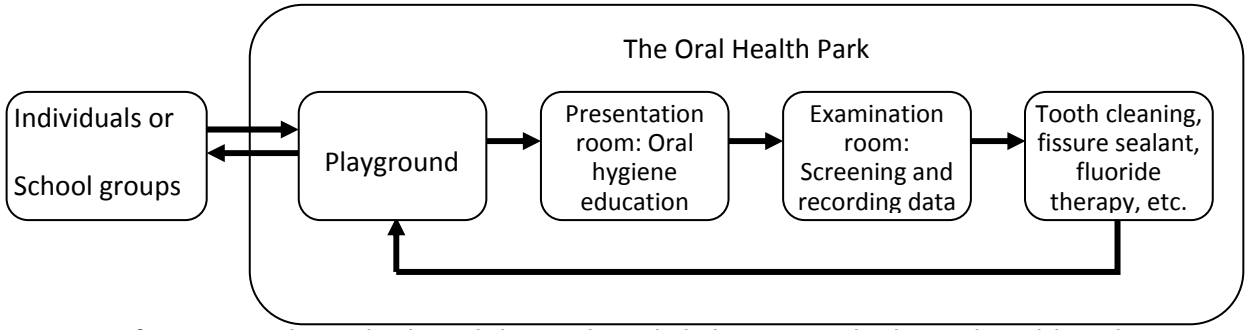

Figure 1: A schematic view of the routine admission process in the Oral Health Park

room, where models, video clips, posters, and flow charts, are used for oral hygiene education. Presentations are given in an attractive way and in a language that is based on the group's age. Children's favourite characters may be used. Next, they are guided to the examination room. They are told that they can return to the playground after cooperating on the dental chair. After screening and recording personal and oral health data, children are followed to the main practice rooms. Children receive tooth cleaning, fluoride therapy, and fissure sealant services based on their need. Appointments are given to those who need follow up visits, and those who need more complicated preventive services such as space maintenance. Referral letters are given to the parents of those who need dental treatment. Children are then sent to the playground again, until they are collected by their parents or school teacher.

Methods

The Oral Health Park and its activities were closely monitored for three years in a prospective study; 2008-2011. The numbers of services provided during each day were recorded. The average amount of material used for each procedure and its costs were measured and recorded carefully. The depreciation of equipments and the costs of running the park (personnel, utility, and etcetera) were also measured. The average share of the costs of the latter two for each kind of services was calculated based on the average time spent for each procedure. Data on the number of provided services in the Oral Health Park and their costs were compared with available data on other state clinical settings in the city of Shiraz. All state clinics that were under the supervision of the Vice-Chancellor for Health of the Shiraz University of Medical Sciences and provided both preventive and treatment services were included in this study. Data on the services provided, personnel costs, the costs of material used, and the costs of running those centres were collected from the reports that were sent to the vice-chancellor for the same period of time. Again the average cost of each procedure done in this group of clinics was calculated based on the average time spent on each procedure.

Results

During the three years since the Oral Health Park was opened, more than 6000 children from about 3200 families used its free services. Most of the children belonged to very low-income families. For these families, the park has provided a unique chance that they could not afford otherwise. They will also suffer less for paying direct and indirect costs of dental treatments for their children in the future. The park has been successful in showing its advantages to the local communities. Today the park does not need active invitation or advertisement to attract families to its services anymore. The number of main preventive services provided by the Oral Health Park is given in Table 1. Apart from those three services mentioned in the Table 1, tens of children received space maintenance, preventive orthodontic treatments, and dietary advice. Children with special needs received specific oral hygiene instruction and were followed to make sure they can take care of their teeth and mouth.

Table 1. Number of preventive services provided by Oral Health Park in a year compared to average of other state oral health centres in Shiraz

	Number of teeth received fissure sealant	Number of people received fluoride therapy	Number of people received tooth cleaning services
Oral Health Park	2369	1694	587
Average of other oral health centres	162	32	38

Discussion

The Oral Health Park has provided a variety of preventive services to a large number of children. The number of main preventive services provided by the park and other state oral health services are compared in Table1. The quantity of preventive services provided in the Oral Health Park was twenty times more than the average of other state settings of the city in the period of study. Each dental chair of the Oral Health Park provided ten times more services than other dental chairs allocated to preventive services in state clinics, and a few hundred times more than the average services provided by each dental chair of the city when private clinics where also taken into account.

The cost of providing preventive services was brought down to about one fourth of that of other health settings. Only necessary and basic equipments and materials were procured. No high technology equipments were needed. Depreciation of the equipments and the cost of their maintenance were negligible. A group of several dental auxiliaries, whom are cheap and fast to train and expect less salary, and one or two dentists were used in the Oral Health Park. However, those working in other settings were all dentists as they were required to provide more complicated treatments in conjunction with preventive services. Dentists need more time and money to train and expect more income. In addition, dentists are not satisfied with providing preventive services. They are trained in environments in which the treatment approach is dominant, and therefore prefer to take the same approach in clinics.

Conclusion

Provision of preventive dental services in a specifically set environment which is separated from treatment services is both effective and cost-efficient. It is also more attractive for children and families than other clinics that they go to when they are sick or in pain. Both establishment and current costs of the Oral Health Park explained in this paper are affordable in most parts of a developing country such as Iran.

Conflict of Interest

Authors have no conflict of interest.

References

1. Daly B, Treasure ET. Essential Dental Public Health. New York, NY: Oxford University Press; 2002.
2. Yu SM, Bellamy HA, Kogan MD, Dunbar JL, Schwalberg RH, Schuster MA. Factors that influence receipt of recommended preventive pediatric health and dental care. Pediatrics 2002; 110(6): e73.
3. Yu SM, Bellamy HA, Schwalberg RH, Drum MA. Factors associated with use of preventive dental and health services among U.S. adolescents. J Adolesc Health 2001; 29(6): 395-405.
4. Shiraz University of Medical Sciences. Integration of Oral Health Services in Health Network System. Shiraz, Iran: Shiraz University of Medical Sciences; 2009.
5. Iran's Department for Health. Oral health survey in 3-6-9- and 12-years-old Children in Islamic Republic of Iran 2003-2004. Tehran, Iran: Ministry of Health and Medical Education; 2008.
6. Pakshir HR. Oral health in Iran. Int Dent J 2004; 54(6 Suppl 1): 367-72.
7. Gheisari S. A Strategic plan for Oral health promotion in Fars Province. Shiraz, Iran: Shiraz University of Medical Sciences; 2006.
8. Statistics and information's office. Fars statistical Year Book. Shiraz, Iran: General Governor Office of Fars province; 2008.

Received: 16 May. 2012 **Accepted: 4 Oct. 2012**

Original Article

Pain experience after oral mucosal biopsy: A quasi-experimental study

Nader Navabi DDS[1], Arman Salehi DDS[2], Mohammadreza Zarei DDS[3], Roya Borna DDS[4]

Abstract

BACKGROUND AND AIM: The biopsy of an oral mucosal lesion is a minor operation. Pain might be an unpredictable consequence of the oral mucosal biopsy. The aim of this study was to examine the incidence and severity of post-operative pain following the biopsy of oral mucosal lesions in patients attending in an oral medicine department of Kerman Dental School.

METHODS: Visual analogue scale (VAS) was used to assess post-operative pain in 60 patients. Seven days after the biopsy of oral mucosa, patients were asked about overall pain experiences and analgesic usage over 3 days following the biopsy.

RESULTS: Forty percent of patients reported moderate pain in the day of the biopsy and 58% of patients experienced no pain in the third day after the biopsy. Thirty percent of patients used analgesic in the day of the biopsy and there was not any relationship between the average level of patient's pain and the location of the lesion removal, type of biopsy, type of coverage, maximum diameter and type of the lesions ($P > 0.05$).

CONCLUSIONS: Pain after biopsy from oral mucosal lesion is mild to moderate.

KEY WORDS: Biopsy, Pain, Oral Mucosa

J Oral Health Oral Epidemiol 2012; 1(2): 87-92

Biopsy is the oldest and the most exact method used for definite diagnosis of different lesions in dentistry.[1] Correct treatment of the patient with an oral lesion begins with an exact diagnosis and the gold standard is histopathologic evaluation of tissue specimen of the lesion.[2-5] In some oral mucosal lesions, delay in removal can cause disease progression and poor prognosis.[6] Biopsy is prescribed for majority of oral mucosal lesions (including mucocutaneous lesions, precancerous and suspicious lesions to malignancy).[7] Two common types of taking biopsy include incisional and excisional biopsy.[8] Other techniques such as fine needle aspiration, exfoliative cytology, cytobrush techniques and toluidine blue staining are complementary methods and performing each method alone is not enough for a definitive diagnosis.[9-16]

Correct specimen should include a tissue that shows the most evident and intensive changes and it is also sufficient for pathologic evaluation. Access to such specimen will be gained by careful attention to some points such as the specimen dimension, the correct site of specimen removal, management of the unpredictable consequences such as excessive bleeding, fixation of specimen, specimen carriage and enough attention to healing of the biopsied region.[3,4,7,17] Biopsy sometimes is accompanied with complications such as lip and tongue paresthesia, swelling and hematoma in tissues and trauma to salivary gland duct. Dentist's and patient's concern for such complications has caused the biopsy to be less common in dentistry.[18-21]

1- Assistant Professor, Department of Oral Medicine, Oral and Dental Diseases Research Center, Kerman University of Medical Science, Kerman, Iran
2- Assistant, Department of Operative Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran
3- Associate Professor, Department of Oral Medicine, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
4- General Dentist, Private Practice, Kerman, Iran
Correspondence to: Nader Navabi DDS
Email: n_navabi@kmu.ac.ir

Camacho-Alonso and Lopez-Jornet evaluated the level of pain after a biopsy from an oral mucosa using visual analogue scales (VAS) in 84 patients. They recorded maximum pain after biopsy of the oral mucosa during the first 48 hours, after which it gradually reduced.[22]

Kearns et al. evaluated the level of pain after a biopsy from an oral mucosa in 85 patients during 7 days after procedure. In the results of this research, 39% of patients did not complain about any pain on the first day, although it increased toward the seventh day (79%).[23] Lodi et al. evaluated their experience on the day of the biopsy and 7 days after that in 286 patients. 78% of patients had used analgesics in post-operative days.[24]

An awareness of pain score related to operative procedures helps clinicians prepare their patients for decreasing these complications. On the other hand, some of the experts in this field do not believe in the prescription of analgesics for these patients.[2] Although many investigators have studied pain experience after different dental treatments complications such as teeth extraction or root canal therapy, investigations concerning the pain after biopsy from mucosa have not been remarkable. The present study was carried out to evaluate the score and intensity of pain following biopsy form oral mucosa.

Methods

This quasi-experimental study took place in Department of Oral Medicine in Kerman Dental School. Consecutive patients undergoing biopsy of oral mucosal lesions were recruited into the study. These patients were above 12 years old. The subjects were excluded from the study in case of any systemic disease such as gastro-intestinal diseases, having any psychic or neurological pain or taking medicine such as analgesics or anti-inflammatory drugs in the last three days. Patients with painful oral lesion before biopsy were excluded too. Research objectives were explained for patients and a written consent was obtained from the volunteers prior to the commencement of the study.

Biopsy was done under sterilized and standard conditions by scalpel (No.15, model Wuxi X.D Medical Device Co., China). The tissue specimen had the maximum extent of 3 centimeters and the depth of all specimens was ultimately to the submucosal area and did not include periosteum and muscles. Biopsy was done by an experienced oral medicine specialist. The coverage of sites of biopsy was in primary form using silk suturing thread 3 zero (maximum 2 suture) or Coe-pack dressing according to clinical diagnosis.[22,23] The patients could use analgesic for post-operative pain if needed (ibuprofen 400 mg tablet QID).

Each patient was given a form to complete for each of the 3 post-operative days. Patients were instructed to note 3 items for each day: the overall level of pain, the worst pain experienced and whether analgesics had been taken. The overall and worst pain levels were recorded using visual analogue scales (VAS), each consisting of a 100 mm calibrated line on white paper, marked 0 to 10 at 10 mm intervals. Patients were informed that a score of 0 indicated 'no pain at all' while a score of 10 indicated 'the pain could not be worse'. Patients were instructed to record the pain experience of the previous day each morning by marking a point on the VAS for overall pain and by answering 'yes' or 'no' to the question on the analgesic use. Pain scores were also categorized as 'none', 'mild', 'moderate', or 'severe'.

An information collection form was filled for all patients including the date of biopsy, clinical diagnosis, patient's age and sex, exact location of the lesion removal, type of biopsy and type of coverage and whether specimen has been removed from keratinized or non-keratinized mucosa. Collected data was analyzed by SPSS software (version 17; SPSS Inc., Chicago, IL., USA). Chi-square test was used to compare nominal data and Student's t-test to compare quantitative data. Significance

level in all tests was assumed to be 0.05.

Results

Sixty patients took part in the present study. Of them, 25 (41.7%) were male and 35 (58.3%) were female. We divided our patients into three age groups (< 40, 40-60 and > 60 years old; Table 1). The mean (± SD) age of subjects was 45.8 ± 12.8 years.

The most frequent biopsy region was in buccal mucosa (47%) and after it, the lip, gingival and palate were placed next, respectively (25%, 16% and 10%).The least biopsy had been done on patients' tongue (3%). Thirty percent of biopsies were done in keratinized mucosa and 70% in non-keratinized mucosa. 43.3% of biopsies were done by incisional and 56.6 by excisional techniques.

Healing of specimen removal region was done in primary form in 93.3% of cases. The most frequent size of lesion was those greater than 2 centimeters (56.6%) and also the least was the lesions smaller than 1 centimeter (15.0%). From the clinical diagnosis viewpoint, the most frequent lesions were exophytic lesions (51.6%) and the least ones were pigmented lesions (1.6%) (Table 1).

The intensity of pain was evaluated using a VAS and was compared in terms of age groups, sex, site of lesion, type of mucosa, type of biopsy, type of coverage, the largest diameter and type of lesion. When the median pain scores were analyzed among these variables, there was no significant difference (P > 0.05; Table 1). The average pain scores were not affected by these demographic and clinical parameters.

Figure 1 shows severity of pain experienced by patients at the day of biopsy and the first to the third days after biopsy based on their description. As shown, the highest frequency of pain severity was related to moderate pain with the highest percentage at the day of biopsy (40%). On the first day after the biopsy, 22 patients (36.6%)

Table 1. Comparison of pain scores among the different characteristics groups of participants

Variation		Median (range) Pain	Frequency (%)	P-value
Age groups*	< 40 years	1.25 (0-5)	19 (32.7)	0.9461
	40-60 years	1.25 (0-9)	28 (48.2)	
	> 60 years	1.5 (0.75-4.75)	11 (18.9)	
Gender**	Male	1.25 (0-4.75)	25 (41.6)	0.1502
	Female	1.75 (0-9)	35 (58.3)	
Location	Lip	1.25 (0-5.5)	15 (25.5)	0.2889
	Tongue	2 (0-4)	2 (3.33)	
	Buccal mucosa	2.25 (0-9)	25 (41.4)	
	Palate	1 (0-7.5–1.75)	6 (10.0)	
	Gingiva	1.375 (0-4.75)	10 (16.6)	
	Others	0.5 (0-1)	2 (3.33)	
Mucosa	Keratinized	1 (0-4.75)	18 (30.0)	0.2532
	Non-Keratinized	1.625 (0-9)	42 (70.0)	
Type of Biopsy	Incisional	1.75 (0-6.5)	26 (43.3)	0.5488
	Excisional	1.25 (0-9)	34 (56.6)	
Type of Coverage	Suture	1.25 (0-6.5)	47 (78.3)	0.4130
	Co-Pack	1 (0.25–9)	9 (15.0)	
	Without	2 (1.75-4.75)	4 (6.67)	
Maximum size***	< 1 cm	1.75 (0-6.5)	8 (15.0)	0.0871
	1-2 cm	1.25 (0-3.25)	15 (28.3)	
	> 2 cm	1.875 (0-9)	30 (56.6)	
Type of lesion	Ulcer	2 (0-5.5)	16 (26.6)	0.2078
	White lesion	1.125 (0-6.5)	10 (16.6)	
	Exophytic lesion	1.5 (0-9)	31 (51.6)	
	Pigmented Lesion	1 (1-1)	1 (1.67)	
	Others	0.375 (0-0.75)	2 (3.33)	

* n = 58, ** n = 60, *** n = 53

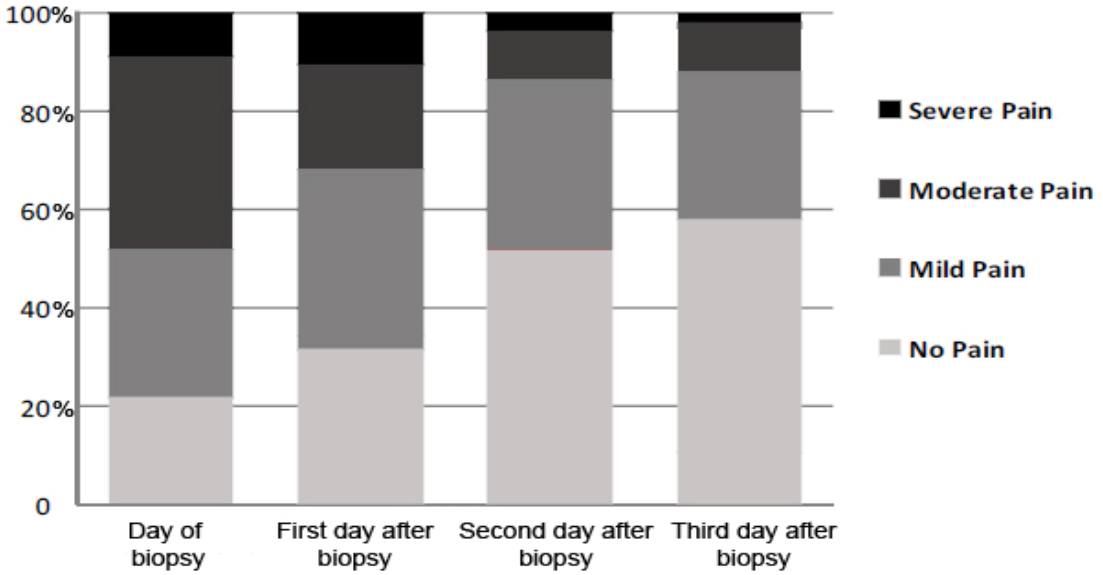

Figure 1. Frequency of different level of pain in the day of biopsy and three days after it

recorded mild pain. On the second day, 31 patients (57.6%) recorded overall pain levels corresponding to "none". This rose to 35 patients (58.3%) on the third day after the procedure. It seems that from patients' point of view, the pain after biopsy from oral mucosa was mild to moderate that often existed on the day of biopsy and on the first day after this procedure.

Maximum dose of analgesics used was related to the day of specimen removal (30%); it gradually decreased from the first to the third day after biopsy (18% on the day after biopsy and 10% on the second day). On the third day after biopsy, only 8.3% of patients used analgesics.

Discussion

In the present study, the recording of pain with VAS during three days after oral mucosal biopsy did not exceed 2.25 in any cases. Because of the subjective nature of pain and since it is accompanied by other sensations, there is not definitive evaluation system for it and also numerous factors such as variety of patients' personalities and cultural and social factors affect patients' response to pain. This makes it difficult to evaluate the pain after medical or dental procedure. However, the dose of analgesics needed to reduce more than half of the pain, expressing the severity of pain by patient qualitatively and VAS are commonly used in studies that investigate such pains; the present study applied the all three methods.[2,22,23] Kearns et al. believed that it is not suitable to measure pain after it occurs because of the fact that patients should remember it.[23]

In the present study, there was no significant relationship between average pain score after biopsy and site of the lesion. In Camacho-Alonso and Lopez-Jornet study, although the highest level of pain score was reported from floor of the mouth biopsy specimens, no significant differences were found.[22] It should be mentioned that in our study, none of mucosal specimens was from the floor of the mouth. In Kearns et al. study, maximum dose of analgesics consumption was in specimens form gingiva. However, none of the three patients whose site of specimen removal was floor of the mouth used drug for pain relief in Kearns et al. study.[23]

Comparison of these two different criteria for evaluating the degree of pain (analgesics use versus VAS) showed a contradiction between this study and Camacho-Alonso and Lopez-Jornet study.[22] In the present study, there was no significant relationship between

the level of patients' pain and type of biopsy (incisional versus excisional) that is similar to Camacho-Alonso and Lopez-Jornet study. Moreover, the present study which investigated the relation of variables such as kind of coverage, site of biopsy, maximum diameter of the lesions, type of the lesions and type of mucosal region of specimen removal, indicated no significant relationship with severity level of patients' pain. In similar studies, however, the mentioned variables were not studied.[2,22,23]

In Camacho-Alonso and Lopez-Jornet study, average pain level in females was significantly higher than that of men, but no significant relationship was found between patients' age and pain level. In the present study, conditions similar to Camacho-Alonso study were found concerning age, but they were different regarding sex.[22]

Maximum frequency of pain level described by patients in the present study has been related to the day of specimen removal; it was similar to Camacho-Alonso and Lopez-Jornet[22] and Kearns et al.[23] studies and it seems that this pain like other kinds of post-operative pain (such as extraction) had a tendency to begin after elimination of local anesthesia and reached maximum level during the day of biopsy.

The results of the present study were similar to Camacho-Alonso and Lopez-Jornet study[22] regarding average pain level with utilization of VAS and were similar to Kearns et al. study[23] regarding maximum frequency of pain intensity (moderate pain).

In results of the present study, dose of analgesics was reduced in patients at the day after biopsy and a significant relationship was observed between intensity of pain and analgesics use. However, the relationship between pain and analgesics use had not been evaluated in similar studies.

In Kearns et al. study, 70% of patients used analgesics at least once on biopsy day or afterwards.[23] In Camacho-Alonso and Lopez-Jornet study, an average of 60% of patients used these drugs for two days.[22] In Lodi et al. study, 18% of patients did so.[24] However, in the present study, 30% of patients took analgesic on the day of biopsy and on the first day after biopsy it was 78%.

One of the limitations of this study and other similar studies was the multi-factorial nature of pain. It means that several factors including cultural background, personality and level of anxiety, memory and previous experiences can all have an influence on pain.

It is observed that dose of analgesic in patients with oral mucosal lesion biopsy in different studies had different levels and this issue could be the result of the difference in drug using habits in different societies and the fact that many patients start using prophylactic analgesics drug without dentists' prescription and continue it even in the lack of pain experience. It should be mentioned that misuse of non-steroidal anti-inflammatory drugs which are often used for relieving such pains can lead to various side effects such a digestive disorders (gastritis and peptic ulcer) and bleeding disorder.

Conclusion

The results of the present study showed that pain after biopsy from oral mucosal lesion is mild to moderate. In a few percentages of patients, there is a need of analgesic prescription after the procedure but clinical-trial study is recommended for more definitive prescription of analgesics by the dentist. Regarding the existing data, clinicians who are doing this can advise their patients to use analgesics in the case of pain after biopsy.

Acknowledgment:

The authors wish to thank Dr. Sudabeh Navadeh for her sincere cooperation.

Conflict of Interest

Authors have no conflict of interest.

References

1. Melrose RJ, Handlers JP, Kerpel S, Summerlin DJ, Tomich CJ. The use of biopsy in dental practice. The position of the American Academy of Oral and Maxillofacial Pathology. Gen Dent 2007; 55(5): 457-61.
2. Poh CF, Ng S, Berean KW, Williams PM, Rosin MP, Zhang L. Biopsy and histopathologic diagnosis of oral premalignant and malignant lesions. J Can Dent Assoc 2008; 74(3): 283-8.
3. Oliver RJ, Sloan P, Pemberton MN. Oral biopsies: methods and applications. Br Dent J 2004; 196(6): 329-33.
4. Mota-Ramirez A, Silvestre FJ, Simo JM. Oral biopsy in dental practice. Med Oral Patol Oral Cir Bucal 2007; 12(7): E504-E510.
5. Pena Torres LM, Revelo Perez LA, Banos AG. Importance of biopsy in dental practice 2. Pract Odontol 1989; 10(8): 35-40.
6. Eisen D. The oral mucosal punch biopsy. A report of 140 cases. Arch Dermatol 1992; 128(6): 815-7.
7. Abubaker AO, Benson KJ. Oral and Maxillofacial Surgery Secrets. Philadelphia, PA: Mosby Elsevier; 2007. p. 365-9.
8. Pilch BZ. Head and Neck Surgical Pathology. Philadelphia, PA: Lippincott Williams & Wilkins; 2001.
9. Burket LW, Greenberg MS, Glick M, Ship JA. Burket's Oral Medicine. 11th ed. Shelton, CT: PMPH-USA; 2008. p. 191-3.
10. Sugerman PB, Savage NW. Exfoliative cytology in clinical oral pathology. Aust Dent J 1996; 41(2): 71-4.
11. Ogden GR, Cowpe JG, Wight AJ. Oral exfoliative cytology: review of methods of assessment. J Oral Pathol Med 1997; 26(5): 201-5.
12. Roberts DM. Comparative cytology of the oral cavities of snuff users. Acta Cytol 1997; 41(4): 1008-14.
13. Mehrotra R, Singh MK, Pandya S, Singh M. The use of an oral brush biopsy without computer-assisted analysis in the evaluation of oral lesions: a study of 94 patients. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008; 106(2): 246-53.
14. Christian DC. Computer-assisted analysis of oral brush biopsies at an oral cancer screening program. J Am Dent Assoc 2002; 133(3): 357-62.
15. Driemel O, Kunkel M, Hullmann M, Kleinsasser N, Staudenmaier R, Muller-Richter U, et al. Performance of conventional oral brush biopsies. HNO 2008; 56(2): 205-10.
16. Gupta A, Singh M, Ibrahim R, Mehrotra R. Utility of toluidine blue staining and brush biopsy in precancerous and cancerous oral lesions. Acta Cytol 2007; 51(5): 788-94.
17. Bornstein MM, Winzap-Kalin C, Cochran DL, Buser D. The CO2 laser for excisional biopsies of oral lesions: a case series study. Int J Periodontics Restorative Dent 2005; 25(3): 221-9.
18. Neville BW. Oral and Maxillofacial Pathology. Philadelphia, PA: Saunders/Elsevier; 2009. p. 388-97.
19. Jephcott A. The surgical management of the oral soft tissues: 3. Biopsy. Dent Update 2007; 34(10): 654-7.
20. Lopez JP, Velandrino NA, Martinez BY, Fernandez SM. Attitude towards oral biopsy among general dentists in Murcia. Med Oral Patol Oral Cir Bucal 2007; 12(2): E116-E121.
21. Diamanti N, Duxbury AJ, Ariyaratnam S, Macfarlane TV. Attitudes to biopsy procedures in general dental practice. Br Dent J 2002; 192(10): 588-92.
22. Camacho-Alonso F, Lopez-Jornet P. "Study of pain and swelling after oral mucosal biopsy". Br J Oral Maxillofac Surg 2008; 46(4): 301-3.
23. Kearns HP, McCartan BE, Lamey PJ. Patients' pain experience following oral mucosal biopsy under local anaesthesia. Br Dent J 2001; 190(1): 33-5.
24. Lodi G, Sardella A, Demarosi F, Canegallo L, Moneghini L, D'Orefice S, et al. Oral biopsy. A prospective study on 286 consecutive procedures. Minerva Stomatol 2007; 56(5): 241-51.

Received: 25 Aug. 2012 **Accepted: 13 Nov. 2012**

Original Article

Knowledge, attitude, and practices of pediatricians about children's oral health

Elham Bozorgmehr DDS[1], Tayebeh Malek Mohammadi DMD, PhD[2], Abolghasem Hajizamani DMD, PhD[3], Aliasghar Vahidi MD[4], Fatemeh Khajoee DDS[5]

Abstract

BACKGROUND AND AIM: Many pediatric oral diseases are preventable if physicians recognize and encourage preventive care and refer patients to dentists whenever necessary. Parents usually visit pediatricians for routine care during the first few years of a child's life. Therefore, pediatricians have can assist dental professionals by educating parents to maintain their children's oral health. The main objective of this study was to determine knowledge, attitude, and practices of pediatricians about the oral disease prevention.

METHODS: A piloted questionnaire was completed by volunteer pediatricians and pediatric residents in Kerman, Iran. It comprised a series of questions including sociodemographic and practice characteristics, knowledge about the risk factors for oral diseases, attitude toward oral disease prevention, practicing preventive care for oral diseases, and information about oral diseases.

RESULTS: Overall, 60 subjects participated in the study. Less than half of the respondents knew all the main risk factors of dental caries, gingivitis, and malocclusion. There was also a positive attitude that caries can be prevented (100%). Less than 10% of the participants prescribed dietary fluoride supplements for their patients.

CONCLUSIONS: Although we found inadequate knowledge about oral and dental diseases among pediatricians, the majority of our subjects believed that they had an important responsibility in preventing oral diseases.

KEY WORDS: Oral Health, Children, Pediatrician, Preventive Care

J Oral Health Oral Epidemiol 2012; 1(2): 93-98

Primary preventive strategies for oral health are an essential public health priority since dental caries is the most common chronic disease among children worldwide. Experts have recommended to begin initiatives with very young children to promote positive outcomes during childhood and subsequent adulthood.[1,2] Dental care should start at approximately six months of age with the eruption of the first tooth. Regular annual visits are then required to determine if there is a need for prevention or treatment.[3-5]

Dental decay may show its effects at three years of age. Because pediatricians and other pediatric health care professionals are more likely to encounter children at this age than are dentists, it is necessary for them to be aware of pathophysiology and associated risk factors of early childhood dental caries. They will then be able to make appropriate decisions about referring children to a dentist for effective interventions.[4]

The important role of pediatricians in preventive programs including oral health has been neglected in many countries like Iran. Moreover, little published literature has focused on the extent to which pediatricians participate in preventive oral health programs. Nevertheless, many efforts has

1- PhD Student, Kerman Oral and Dental Diseases Research Center, Department of Dental Public Health, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
2- Associate Professor, Research Center for Social Determinant of Health, Institute of Futures Studies in Health AND Department of Dental Public Health, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
3- Assistant Professor, Department of Dental Public Health, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
4- Associate Professor, Research Center for Social Determinant of Health, Institute of Futures Studies in Health AND Department of Pediatric, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
5- School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran
Correspondence to: Tayebeh Malek Mohammadi DMD,PhD
Email: t_malekmohammadi@kmu.ac.ir

care services. The American Academy of Pediatric Dentistry has prepared a guideline on oral health screening and examination for pediatricians. The basic theme of the guideline is the knowledge of physicians' about oral health.[3] Several researchers have reported different levels of background knowledge among physicians.[6-9] Inadequate dental knowledge of physicians has suggested that some oral and dental health instructions should be included in medical curricula.[6]

Precise knowledge and attitude can affect oral health practices. Surveys on subjects are clearly the most important part of the implementation and eventual success of a preventive program. Therefore, the purpose of this study was to assess the oral health-related knowledge, attitude, and current practices of pediatricians in Kerman (southeast of Iran).

Methods

This cross-sectional study was conducted on pediatricians and pediatric residents in Kerman, Iran. The list of this group of doctors (60 pediatricians and 15 residents) was provided by the Kerman Medical Council. A piloted questionnaire and an informed consent form that explained about the objectives of the study and ensured data confidentiality were distributed among eligible subjects in three places. Some questionnaires were distributed in a continuing education seminar and collected at the end of the session. The others were distributed in the private offices of the pediatricians or the medical school where the residents were studying. These questionnaires were collected on the next day. The participants who had received the questionnaire twice were asked to mark the relevant option on the questionnaire. Their second form was then excluded from the analysis.

The questionnaire comprised five sections. The first section evaluated sociodemographic and practice characteristics of the participants and included questions about age, gender, year of graduation, years in practice as a pediatrician, working hours per week, and number of patients visited on a typical workday. The second section assessed knowledge through questions pertaining to the main risk factors of dental caries, gingivitis, and malocclusion. This part was scored as low (14-18), medium (19-23), or high (24-28).

In the third section which surveyed the subjects' attitudes toward the prevention of oral diseases, the respondents had to use a three-point Likert scale (1 = agree, 2 = no idea, and 3 = disagree) to answer the questions. The items in this part asked if the subjects agreed that dental caries, gingivitis, and malocclusion are preventable, the pediatricians can have an important role in the prevention of oral diseases, pediatricians should do oral examinations, oral hygiene is effective in prevention of dental caries, and regular dental checkups are important in preventing oral diseases.

In order to identify the participants' practices to prevent oral diseases, the fourth section asked if they assessed dietary habits, performed oral health examination, and recommended regular dental visits and fluoride supplements to patients and local fluoride therapy to parents. They were also questioned if they recommended parents to brush their children's teeth, use fluoridated water, and other ways to prevent oral diseases and if they gave educational or hygiene tools (such as books, pamphlets, tooth brushes, and dental floss) to parents/caregivers. These items were closed-ended with binary (yes/no) or categorical answers. Some questions were answered on a five-point Likert scale that ranged from never to always.

In the fifth section, the subjects were asked about their sources of information about oral disease prevention and if they were interested in having more information on oral health. The final item requested the individuals to report if they had filled the same questionnaire before.

For data analysis, right answers were

scored as 1 and wrong answers or unanswered questions were scored as zero. The sum of scores was categorized as low, medium, and high knowledge. Attitude was considered as positive or negative. The frequency of subjects who practiced different measures was also calculated.

Results

As 60 subjects returned the questionnaires, the response rate was good (80%). The mean age of the participants was 40 years old and females constituted 55% (n = 33) of the whole population. Table 1 shows the sociodemographic and practice characteristics of the participants. Low, medium, and high levels of knowledge about oral disease prevention were detected in 15.0%, 48.3%, and 36.7% of the participants, respectively.

Figure 1 shows the pediatricians' attitude toward oral disease prevention. All subjects believed that oral hygiene and regular dental checkups are important in preventing oral diseases. While most participants were positive that dental caries and gingivitis are preventable (93.3% and 98.3%, respectively), 46.7% were uncertain or disagreed about the preventability of malocclusion. Moreover, the majority of subjects (86.7%) considered the role of pediatricians to be important in prevention of oral diseases. They (88.3%) thus thought that pediatricians should conduct oral examinations.

Most participants (83.3%) reported that they assessed children's dietary habits. Oral examination was performed by 88.3% of the pediatricians when a patient had a problem. In addition, 61.7% of the subjects recommended their patients to have dental examinations every six months, 71.7% recommended parents to brush their children's teeth, and 78.3% recommended some ways except fluoride to prevent oral diseases (Table 2).

In the fifth section, 16.7% of the subjects declared that they had no special source of

Table 1. Demographic and practice characteristics of the participants

	Sex (%)		Age (years)		Number of years after graduation		Experience as a pediatrician (years)		Working hours per week		Patients visited each workday	
	Male	Female	< 40	> 40	< 17	> 17	< 16	> 16	< 30	> 30	< 46	> 46
Number	45	55	26	34	48	12	46	14	20	40	55	5
Mean			40		17		16		30		46	

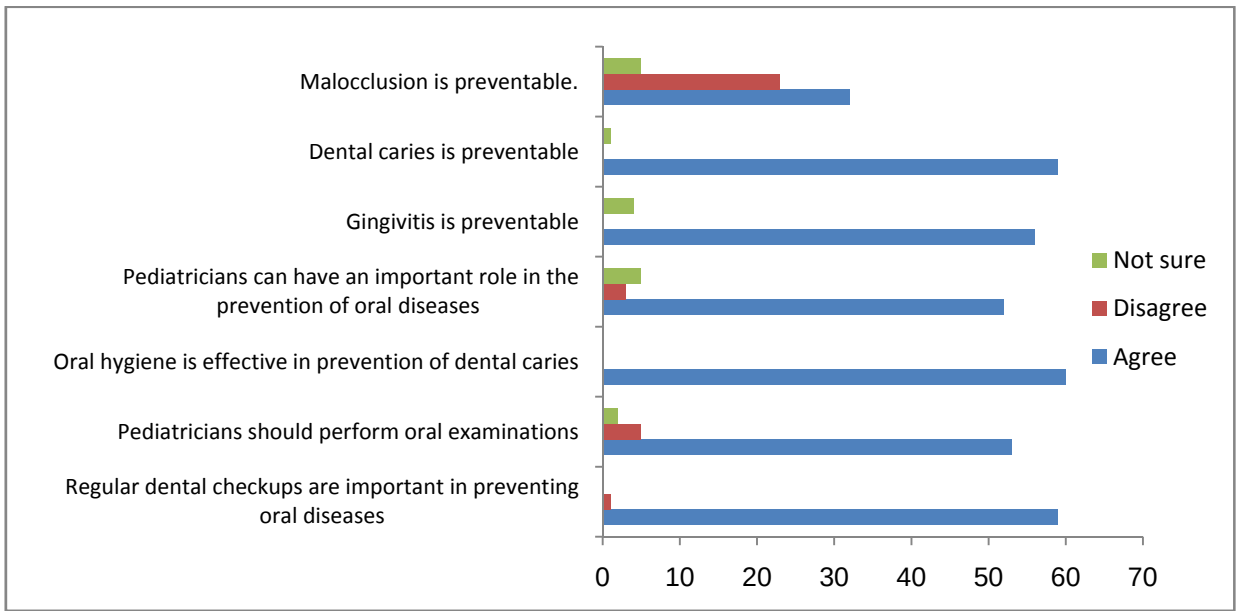

Figure 1. Frequency distribution of the participants based on their attitude toward oral disease prevention

Table 2. Frequency of oral diseases preventive practices among pediatricians and pediatric residents

	N	%
Assessment of dietary habits		
Yes	50	83.3
No	10	16.7
Recommendation for dietary fluoride supplement		
Yes	16	26.7
No	44	73.3
Oral health examination		
Not at all	5	8.4
In case of problems	53	88.3
On the request of the parent	2	3.3
Recommended time for dental examinations		
Once a month	2	3.3
Every four months	13	21.4
Every six months	37	61.7
Once a year	8	13.3
Recommendation of topical fluoride therapy		
Yes	23	38.3
No	37	61.7
Recommending parents to brush their children's teeth		
Yes	43	71.7
No	17	28.3
Recommendation on using fluoridated water		
Yes	29	48.3
No	31	51.7
Recommending other ways to prevent oral diseases		
Yes	47	78.3
No	13	21.7
Providing the parents with educational or oral hygiene tools such as books, pamphlets, tooth brushes, and dental floss		
Yes	2	3.3
Sometimes	14	23.3
Rarely	3	5.0
No	41	68.3

information on oral disease prevention. However, 31.7% obtained their information from scientific journals. Approximately all participants (96.7%) stated that they were interested in having more information about oral disease prevention (Table 3).

Table 3. The participants' sources of information on preventive oral care

Information resources	N	%
No special resource	10	16.7
Pediatric association	10	16.7
Scientific journals	19	31.7
Colleagues	16	26.7
Continuing education programs	4	6.7
Other sources	1	1.7
Need for more information		
Yes	58	96.7
No	2	3.3

Discussion

This study tried to explore knowledge, attitude, and practice of a group of potential oral health care providers to children whose role has been neglected in this regard. As we warmly welcomed the target group, we could include a representative and unbiased sample. Therefore, our findings can provide a generalizable picture of the study context in Kerman.

We found undesirable levels of knowledge among the studied pediatricians which may have affected their practice of oral health. Although only 36.8% of participants had high levels of knowledge about oral health, there was a positive attitude toward the preventability of dental caries and gingivitis. Since these problems are common,[10] it is very important for the pediatricians to know about

their preventability.

All subjects in the present study believed that oral hygiene is important in preventing dental caries. Similarly, Di et al. emphasized the significance of regular dental checkups (routine dental visits) in oral disease prevention.[1] High rates reported by Di et al.[1] (88.7%) and Balaban et al.[11] (72.2%) along with our findings suggest that almost all pediatricians are aware of the consequence of oral hygiene and routine dental visits.

It is essential to know the attitudes of pediatricians about their role in preventing oral diseases. According to our findings and those of previous studies,[1,12] many pediatricians consider their role in oral disease prevention as critical. Moreover, there was a positive attitude toward performing oral examination by pediatricians among 88.3% of our participants and 96.6% of Italian subjects.[1]

The majority of individuals in our study and a similar study by Di et al.[1] (83.3% and 88.4%, respectively) reported that they assessed children's dietary habits. Since dietary counseling is necessary for optimal oral health in children, it should be included in pediatricians' routines as a part of general health counseling.

Oral health examinations were conducted by 88.3% of our participants only when a patient had a problem. Apparently, almost all pediatricians know about the necessity of oral health examination and their ability to perform it. They should only be trained to incorporate such examinations in their regular procedures. In the United States, 98.9% of pediatric care providers performed occasional or frequent examination of a child's teeth.[13] As a result, 47% detected early childhood caries in their examination at least once a month.[12]

Although all pediatrician and pediatric residents in the present study stated that regular dental visits are important in preventing oral diseases, only 61.7% of them recommended their patients to have dental examinations every six months. Therefore, despite having adequate knowledge, absence of positive attitudes among parents or their time limitations prevented our participants from further recommendations. In addition, the frequency of hygiene advices, such as advising parents to brush their children's teeth (71.7%) and employ ways other than fluoride to prevent oral diseases (78.3%), was relatively low in our study.

Most of our participants did not prescribe fluoride supplements, i.e. pills or drops, for children. Balaban et al. reported the same issue in about 98.9% of their study subjects.[11] The absence if special guidelines in Iran may justify these high rates. However, supplements are necessary in places with low levels of fluoride in water.

In this study, almost all subjects stated they needed more information about oral health. It can thus be concluded that pediatricians do not receive adequate training during their education. Therefore, their curricula require to be revised to include courses on oral health. Holding seminars on oral health and discussions between general and oral health professionals can also improve their knowledge and motivation after graduation.

We collected data based on self-reports. Social desirability may force respondents to over- or under-report their attitudes and practices. However, in order to obtain valid results, we ensured the participants' anonymity.

Overall, knowledge and practice of pediatricians in Iran was not in favor of a preventive approach toward oral health in children. A number of barriers might have resulted in such a situation. One of the problems is short appointments which force the pediatricians to exclude preventive measures such as oral health. Moreover, inadequate partnership between health professionals and oral health professionals to solve existing problems is another issue. There is a need to resolve these problems through an evidence-based and collaborative approach.

Conclusion

The results of this study showed that the

pediatricians' awareness about oral health needs to be improved. Clinical guidelines, continuing education programs, and including oral health preventive programs in pediatric residency could help to fill the gap between dental and child health care professionals. Consequently, pediatricians may act as a potential partner group in oral health promotion of children and their families.

Acknowledgements

The authors are grateful to the pediatricians and pediatric residents in Kerman who kindly participated in this study and dedicated a part of their valuable time to fill out the questionnaires

Conflict of Interest

Authors have no conflict of interest.

References

1. Di GG, Nobile CG, Marinelli A, Angelillo IF. Knowledge, attitude and practices of pediatricians regarding the prevention of oral diseases in Italy. BMC Public Health 2006; 6: 176.
2. Pine CM, Harris R. Community oral health. London, UK: Quintessence Pub; 2007.
3. Originating Committee Clinical Affairs Committee - Infant Oral Health Subcommittee. Guideline on Infant Oral Health Care [Online]. 2005; Available from: URL: http://www.aapd.org/media/Policies_Guidelines/G_infantOralHealthCare.pdf/
4. Hale KJ. Oral health risk assessment timing and establishment of the dental home. Pediatrics 2003; 111(5 Pt 1): 1113-6.
5. Levine RS, Stillman-Lowe CR. The scientific basis of oral health education. In: Kay EJ, Levine RS, Stillman-Lowe CR, Editors. A guide to prevention in dentistry: including Prevention and The scientific basis of oral health education. London, UK: BDJ Books; 2004. p. 89.
6. Schaff-Blass E, Rozier RG, Chattopadhyay A, Quinonez R, Vann WF, Jr. Effectiveness of an educational intervention in oral health for pediatric residents. Ambul Pediatr 2006; 6(3): 157-64.
7. Formicola A, Valachovic RW, Chmar JE, Mouradian W, Bertolami CN, Tedesco L, et al. Curriculum and clinical training in oral health for physicians and dentists: report of panel 2 of the Macy study. J Dent Educ 2008; 72(2 Suppl): 73-85.
8. Crall JJ, Davidson PL, Nakazono TT, Gutierrez JJ, Bai J, Andersen RM. Involvement in health policy regarding oral health and dental education: effects of the Pipeline program. J Dent Educ 2009; 73(2 Suppl): S308-S318.
9. Prakash P, Lawrence HP, Harvey BJ, McIsaac WJ, Limeback H, Leake JL. Early childhood caries and infant oral health: Paediatricians' and family physicians' knowledge, practices and training. Paediatr Child Health 2006; 11(3): 151-7.
10. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bull World Health Organ 2005; 83(9): 661-9.
11. Balaban R, Aguiar CM, da Silva Araujo AC, Dias Filho EB. Knowledge of paediatricians regarding child oral health. Int J Paediatr Dent 2012; 22(4): 286-91.
12. Lewis CW, Grossman DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: A national survey. Pediatrics 2000; 106(6): E84.
13. Dela Cruz GG, Rozier RG, Slade G. Dental screening and referral of young children by pediatric primary care providers. Pediatrics 2004; 114(5): e642-e652.