Technical Note

Relationship between Cotinine and Helicobacter Pylori with Caries among Saudi Adults

Mohd G Sghaireen1, Ahed Alkhathib2, Rayan Alswilem2, Jin Toriya3, Akiko Mizohata4, Mohammed Alrowi5, Santosh Patil6, Naoto Osuga7 and Mohammad Khursheed Alam8

1) Department of Prosthodontics, College of Dentistry, Alfouj University, Sakaka, Saudi Arabia
2) Department of Forensic science, Jordan University of Science and Technology, Irbid, Jordan
3) Dental Interns, College of Dentistry, Alfouj University, Sakaka, Saudi Arabia
4) Department of Pediatric Dentistry, Matsumoto Dental University School of Dentistry, Shiojiri, Japan
5) Department of Oral and Maxillofacial Radiology, College of Dentistry, Alfouj University, Sakaka, Saudi Arabia
6) Orthodontic Department, College of Dentistry, Alfouj University, Sakaka, Saudi Arabia

(Accepted for publication, April 25, 2017)

Abstract: The objectives are to investigate the association between dental caries and H. pylori, the association between dental caries and smoking among Saudi students, and to investigate the association between smoking and H. pylori among students with dental caries. The present cross sectional study included 120 male students from Alfouj University. Participating students were clinically examined for dental caries. Urine samples were tested for cotinine and stool samples were tested for H. pylori. Both cotinine and H. pylori was tested using strips especially prepared based on antigen-antibody reaction (COT, Innovacon Inc., USA, Helicobacter antigen Quick, GA Inc, Germany). Statistical analysis was done using Chi-Square test. The mean age of study participants was 22.37±1.50 years. The mean of teeth with caries was 9.57±4.68. There were 93 (77.5%) students positive for H. pylori, and 100 (83.3%) positive for cotinine. There was a significant relationship between cotinine and caries (P=0.000), and H. pylori and dental caries (P=0.000). The co-existence of H. pylori and cotinine was also significant among cases with caries (P=0.000). The present study showed that cotinine and H. pylori were significantly associated with dental caries. The co-existence of both among cases with dental caries may be a new finding and may work synergistically with each other.

Key words: Caries, Cotinine, Helicobacter pylori

Introduction

Dental caries is viewed as an ailment that is portrayed by being influenced by way of life1. Dental caries includes a complex collaboration amongst heredity and environment. A few variables have been connected with dental caries among which are high quantities of cariogenic microbes, deficient salivary flow, inadequate fluoride exposure, poor oral cleanliness, unseemly techniques of feeding infants and low economic status. It has been accounted for that dental caries influences a great many people all through their lifetime. Moreover, it has additionally been accounted for that dental caries continues to influence 60-90% of kids at school age. The twenty essential metabolites of nicotine have been recognized. The main metabolite of nicotine is cotinine. In people, around 70-80% of nicotine is changed over to cotinine. This change from nicotine to cotinine is intervened by 2 stages. The first is intervened basically by CYP2A6 to deliver nicotine 1-(5)-iminium particle, which is in harmony with 5-hydroxynicotine. The second step is catalyzed by a cytoplasmic aldehyde oxidase. Nicotine iminium particle has gotten harmony with 5-hydroxynicotine. The second step is catalyzed by a cytoplasmic aldehyde oxidase. Nicotine iminium particle has gotten significant enthusiasm since it is an alkylating specialist and, in that capacity, could assume a part in the pharmacology of nicotine.

As indicated by Benowitz et al., it has been demonstrated that regardless to the way that around 70-80% of nicotine is metabolized through the cotinine pathway in people, just 10-15% of nicotine consumed by smokers shows up in the urine as unaltered cotinine. There have been 6 essential metabolites of cotinine in people. These metabolites are: 3-hydroxycotinine, 5-hydroxycotinine (additionally called aldehydohydroxycotinine), cotinine N-oxide, cotinine methonium particle, cotinine glucuronide, and norcotinine (likewise called demethylcotinine).

In a study by Aligne et al., there was a relationship between ecological tobacco smoke (contingent upon measuring cotinine) and risk of caries among kids. The study prescribed the lessening of inactive smoking as an imperative measure not just for the counteractive action of numerous restorative issues, additionally for the advancement of youngsters' dental wellbeing.

H. pylori are gram-negative, non-spore forming, microaerophilic bacterium). Many researchers reported the existence of H. pylori infection in the stomach is widely spread, and its prevalence is more than half of the adult population in developed countries and 90% of those in the developing countries. From a pathological point of view, the infection with H. pylori leads duodenum or stomach ulcers. From a clinical point of view, infected patients either pass asymptomatic or continue their life with superficial chronic gastritis. The mode of transmission of H. pylori is mediated by direct contact between family members and contaminated water and food.

As indicated by an investigation of Chitsazi, the segregation of H. pylori from dental plaque prompted to debates with respect to the presence of this bacterium in the dental plaque as a likely auxiliary supply for it. In some studies, the presence of H. pylori in dental plaque was a common finding and there are few studies which did not frequently detect it. The objectives of the present study were:

1. To investigate the association between dental caries and H. pylori...
among Saudi students.
2. To investigate the association between dental caries and smoking among Saudi students.
3. To investigate the association between smoking and H. pylori among students with dental caries.

Materials and Methods

One hundred twenty five male students from Aljouf University were recruited into this study. Participants’ age ranged between 18 and 25 years old (mean = 22.37±1.50 years). Students with systemic disease or on medication were excluded from this study. Also, participants with orthodontic appliances, and/or those who are unwilling to reveal their habits details were excluded. The study was ethically approved by the committee of studies on humans, Deanship of Research, Aljouf University. Informed consents were obtained from the participants after they received full explanation of the study.

In total, 120 participants agreed to participate in the study and 5 were excluded. All participants were undergraduate students enrolled in Aljouf University, Sakaka, Saudi Arabia. Intra-oral examinations were performed by 2 of the authors using dental oral mirror (15/16 inch, Hanhenkratt GMBH, Germany) and explorer probe (0700-9 anatomical handle single ended, ASA Dental Co, Italy). Three bitewing radiographs were done and interpreted for each subject. Intra-examiner reliability was also assessed for the clinical examination by repeating the examination 5 days later. Kappa statistics showed the error ranged between 0.08% and 0.2%, and the coefficient of reliability was above 95% indicating high agreement between the 2 occasions for all findings.

The total number of teeth with caries, missing and filled teeth due to caries was recorded. Students were asked to give urine and stool sample for testing cotinine and H. pylori. Both of cotinine and H. pylori were tested depending on antigen- antibody reaction through special types of strips (COT, Innovacon Inc, USA; Helicobacter antigen Quick, GA lnc, Germany).

The analysis of data was carried out using Statistical Package for Social Science (SPSS) computer software (SPSS 20.0, Inc., Chicago, USA). Data were presented as frequencies and percentages for general description of characteristics of participants. Means and standard deviations were also involved. Relationships between studying variables were tested using Chi-Square test. Significance was considered at p-value < 0.05.

Results

The study included 120 male students with mean of their age was 22.37±1.50 years. General characteristics of study participants are shown in Table 1. The mean of teeth with caries was 9.57±4.68. The number of teeth with caries ranged from 2-20.93. H. pylori was positive in 77.5% of the students. The positivity of cotinine was shown among 100 students (83.3%) (Table 1). The relationship between Cotinine and H. pylori with caries

As shown in Table 2, there were 50 cases (50%) positive for cotinine and had caries less than 9 teeth as well as the same number over 9 teeth. All cases for negative cotinine (20) had less than or equal 9 teeth. The relationship between smoking exposure and caries was statistically significant (p=0.000). Positive cases for H. pylori were demonstrated among patients who had teeth with caries. Slightly higher than the half (52.7%) of positive cases were among students with more than 9 teeth with caries. On the other hand, 96.3% of H. pylori negative cases were demonstrated among students with less than or equal 9 teeth with caries. The relationship between the exposure to H. pylori and caries was statistically significant (p=0.000) (Table 2).

The relationship between Cotinine and H. pylori

In this section, the significant association between cotinine and H. pylori among students with caries was investigated. The results showed a positive association between cotinine and H. pylori (p=0.000) (Table 3).

Discussion

Tobacco is one of the prime causes of the mortality worldwide and forth a major risk factor for disease worldwide, nicotine is a major tobacco component. Further, the widespread use of tobacco in the smoking and smokeless forms have contributed to accretion accountability of contributed non communicable disease particularly malignancies, pulmonary and cardiovascular disorders. In accession to its affiliation with added conditions, tobacco use plays a cogent role in the aetiology of a number of oral diseases. Likewise, other effects seen due to usage of tobacco are halitosis, staining of teeth, gingival recession, dysguesia and numerous oral lesions. Malignancies of the oral pharyngeal region rank additional for the highest relative risk of cancer secondary to smoking. In addition, the risk of developing oral malignancy is prominently related with the bulk of tobacco used and the continuance of smoking in all nations as reported in the literature. Also, some studies chronicle maternal smoking as a cause of primary caries in children. It has been acclaimed that children who are exposed to smoking may have about bifold the chances of developing dental caries in deciduous dentition compared to accouchement not apparent to smoking.

Numerous studies reported that more than half of the world’s population may be infected, with developed nations demonstrating a decreased prevalence of H. pylori infection among all age groups in comparison to developing nations. Conceivably, the aberration in the infection paradigm is notably apparent amid adolescent people. The fecal-oral tract is known to be a accepted avenue of transmittal of H. pylori among Saudi students. Table 1. General characteristics of study participants

<table>
<thead>
<tr>
<th>Gender (N, %)</th>
<th>Caries</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Male</td>
<td>120 (100%)</td>
<td></td>
</tr>
<tr>
<td>- Female</td>
<td>0 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Relationship between Cotinine and H. pylori with caries

<table>
<thead>
<tr>
<th>Variable</th>
<th>&lt; 9 teeth</th>
<th>&gt; 9 teeth</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotinine</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>- Positive</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>- Negative</td>
<td>20</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>H. pylori</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>- Positive</td>
<td>44</td>
<td>47.3</td>
<td>49</td>
</tr>
<tr>
<td>- Negative</td>
<td>26</td>
<td>96.3</td>
<td>1</td>
</tr>
</tbody>
</table>
of H. pylori infection. Moreover, it has been reported that H. pylori may exist as a component of the normal oral microbial flora, sustaining a commensal relationship with the host, but exits in very minimum amount such that reliable recognition is challenging.

It has for quite some time been conjectured that dental plaque may harbour H. pylori, and, by that reason, it can serve as a source of re-infection of the gastric mucosa. Moreover, the existence of the bacteria in the oral cavity was proposed to be related eighth an increased risk of dental caries development. In addition, different authors suggest that H. pylori may have a place with the normal oral flora of the human oral cavity, keeping up a commensal term with the host, but existing in a minimal number to such an extent that solid recognizable proof is difficult. In setting up an association between the role of H. pylori in the oral cavity and gastric infection stays dubious, since the detection rate of the bacterium in the mouth is exceptionally different, extending near 0% and 100%.

The role of dental plaque as a reservoir of H. pylori and a possible source of infection or re-infection of gastric mucosa has been examined for quite a while. A few reviews show a correlation between the infection of H. pylori in oral cavities and stomachs, yet perceptions concerning the role of oral cavity as another niche for H. pylori are not clearly established. In about 40% of individuals with gastritis, the bacterium is also existing in the oral cavity, which may represent the transient character of the infection.

Believing that oral cavity may serve as an extragastric reservoir of the H. pylori, it may be clinically important from the treatment aspect as the microorganisms existing in the dental plaque are afforded shield from systemically administered antimicrobial agents. Treatment of H. pylori infection usually comprises of a combination of antibiotics, acid suppressors, and stomach protectors. Regardless of the present treatment regimens that that prompt effective management of H. pylori, the reinfection rate is more. One of the suggested mechanisms of reinfection is the conceivable recolonization from the dental plaque.

This cross-sectional study investigated the progression of the correlation between H. pylori, cotinine and dental caries among a group of Aljouf dental students. The sample size of this study was 120 subjects, and it was considered acceptable compared to previous literature.

The used cotinine strips were color coded, especially made for qualitative detection of cotinine in human urine at cut off level of 200 ng/ml. The accuracy of this test was confirmed previously. The H. pylori strips were also colour coded used for the qualitative determination of Helicobacter pylori antigen in faecal specimens with a minimum detectable unit of H. pylori from 4-8 ng/ml. The accuracy of this test was confirmed previously.

The first objective was to investigate the association between dental caries and H. pylori among Saudi students. The study results showed a significant relationship between H. pylori and dental caries (p=0.000). The importance of these findings comes from the contradicting findings involved about the possible association between H. pylori and dental caries as indicated by Chitsazi et al. Our findings confirmed other studies that showed the presence of H. pylori in dental plaque was a common finding.

The second objective was about a possible association between smoking and dental caries among Saudi students. Our results showed a significant relationship between cotinine level and dental caries (p=0.000). This finding is in agreement with other studies. Such an association was shown by Aligne et al., between environmental tobacco smoke (depending on measuring cotinine) and risk of caries among children. The study recommended the reduction of passive smoking as an important measure not only for the prevention of many medical problems, but also for the promotion of children's dental health.

The third objective was about a possible association between H. pylori and cotinine. The results of our data showed a positive relationship between H. pylori and cotinine (p=0.000). Up to the best of our knowledge, no previous reports have described such an association. It is plausible to think that cotinine or exposure to smoking impacts the immune system and by thus increases the chance for H. pylori to participate in the occurrence of dental caries.

The present study showed that cotinine and H. pylori were significantly associated with dental caries. The co-existence of both among cases with dental caries may be a new finding and may work synergistically with each other.

Conflict of Interest

The authors have declared that no COI exists.

References


<table>
<thead>
<tr>
<th>Variable</th>
<th>H. pylori</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Cotinine</td>
<td>N  %</td>
<td>N  %</td>
</tr>
<tr>
<td>- Positive</td>
<td>88 88</td>
<td>12 12</td>
</tr>
<tr>
<td>- Negative</td>
<td>15 75</td>
<td>5 25</td>
</tr>
</tbody>
</table>


