

Comparison between the Effect of Conventional Cigarette and Electronic Cigarette in Oral Mucosa

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Abstract: ***Background:** Controlling Oral Cavity Carcinoma increase poses significant challenge due to Cigarette smoke. Therefore, Electronic cigarettes-a battery-operated device-are preferred as an alternative to traditional cigarettes to quit smoking [1]. This study evaluate the effect of e-cigarette use for smoking cessation by studying cytological changes of oral mucosa among Electronic Cigarette smokers and compare it with traditional smokers. **Materials and Methods:** A total of 100 volunteers selected from different areas in Saudi Arabia during study period. Among them 35 were e-cigarette smokers, 35 were smokers and 30 were non-smokers as control group. Data were collected by questionnaire and the collected oral smear were subjected to Papanicolaou stain and microscopically analyzed for studying cytological alterations. **Results:** Cytological changes were detected among smokers and e-cigarette smokers; keratinization (2%, 2% respectively), inflammation (22%, 19% respectively), and bacterial infection (7%, 11% respectively). Also, atypia was occurred only in Conventional smoker with 2%. **Conclusion:** E-cigarette cause cytological changes in oral mucosa similar to the other risk factors including cigarette smokers, which contribute to the development of oral cavity carcinoma.*

Keywords: Oral mucosa, Cigarette smokers, Electronic Cigarette

1. Introduction

Tobacco Smoking remains one of the leading causes of death worldwide approximately 6 million people and 600.000 of them were die due to secondhand smoke exposure [2]. According to WHO statistics, this number expected to increase to 8 million on 2030 unless strong policies implement to control tobacco uses. [3].

Smoking impact negatively towards human health and economic status [4, 5]. It harmfully affected numerous organs and several diseases were associated with smoking cigarette such as respiratory diseases, cardiovascular disorders, diabetes, cancers and oral conditions [6]. In United State, 40% of all cancer deaths among men related to smoking [7]. Even after diagnosis, it has crucial impact on quality of life and treatment outcomes. [8] The oral cavity cancer represent the most widespread of head and neck carcinomas with incidence 300, 373 cases each year and a mortality rate of 145, 353 [9, 10] and the risk increase 1.4 – 1.7 times in people who consume tobacco compared with non-users [11, 12]. Therefore tobacco consider hazardous factor for oral cancer and periodontitis [13].

In many countries, effective cessation programs had started to reduce smoking prevalence [14]. In Saudi Arabia there are recent study revealed 3184 cases of oral cancer between 1994 and 2015 where females more likely to be diagnosed than males [15]. However Saudi Arabia is one of these countries where best practice level had adopted by introducing comprehensive bans on promotions and advertising like pack warnings [14]. Therefore, Electronic smoking, which is a device vaporize

aerosol with or without nicotine widely used instead of Cigarette smoke to help people quit smoking as cessation method. However, there is no evidence for the safety and efficacy of E-cigarette [16]. In 2008, FDA recorded serious side effects for e-cigarettes include congestive heart failure, increased heart rate, pneumonia, convulsions confusion, second-degree facial burns, hypotension and chest pain [17, 18]. Even in Oral cancer, e-cigarette aerosol enhance chemotherapy resistant [19]. Although easy to access Oral cancer requires self-examination, it usually diagnosed at advanced stages, resulting in poor prognosis, and survival rate among patients.

Oral exfoliative cytology is particularly valuable for mass screening purposes; with a sensitivity of 94%, and specificity of 100% [20]. Recent advances in technology facilitate the use of reliable quantitative techniques such as cytomorphometry, histometric, and computer-assisted image analyzer. The evaluation of parameters such as nuclear area (NA), cytoplasmic area (CA), and ratio of NA/CA (N/C), may increase the sensitivity of exfoliative cytology for early diagnosis since these are precise, objective, and reproducible [21].

2. Materials and Methods

The study was launched after the Ethical Committee in Al-Rayan Medical College, had approved the proposal. Each participant involved in the study was informed and asked to sign a written consent form.

Questionnaire information:

Information obtained in questionnaires from cigarette smokers, e-smokers and non-cigarette smokers were as follows: age, occupation, and frequency of daily smoking.

A total of 100 volunteers selected from different areas in Saudi Arabia during study period. Among them 35 were e-cigarette smokers, 35 were smokers and 30 were non-smokers as control group. All subjects were submitted to cytological examination by scraping of oral mucosa. Cytological smears were taken using a sterile wooden tongue depressor. In each case, the surface epithelium of the buccal mucosa was scraped and applied to a clean frosted glass slide. The smear was immediately fixed in 95% ethanol for 15 minutes, and finally stained using the Papanicolaou procedure. Quality control measures were taken during sample collection and processing. Cytological assessment: We assessed for the presence of inflammation, infection, atypia, and keratinization. Features such as irregular nuclear borders, bi-or multinucleation, and differences in size and/or shape of cells and nuclei, abnormal nuclear line, hyperchromatosis and cytoplasmic vacuolations.

Statistical analysis: Statistical analysis was carried out on all samples using the Frequencies, cross tabulation and chi-square were calculated, to determine statistical significance ($P < 0.05$) with 95% confidence level.

3. Results

Among the 100 participants, the percentage of men accustomed to smoke was 70% smokers with highest proportion between 20-30 years old. Within each age

group, there is no significant difference in number of Cigarette smokers and e-cigarette smokers ($P > 0.05$) except for 51-60 years old group; the smoker are 14% higher compared with e-smokers. In 20 to 30 and 31 to 40 years old group, the e-smokers are slightly more by 3% only for each group (Table 1).

Most participants of cases represented 65%-Cigarette smokers and e-smokers-had normal cytological properties similar to the control group (no significant difference ($P > 0.05$)). The rest, 35% of cases revealed cytological changes like Atypia, Inflammation, Bacterial Infection, Keratinization and Candida albicans compared with the control group that there were no cytological changes except 2% had Inflammation and Bacterial Infection separately.

Cytological inflammation was identified among 8/35 (22%) of cigarette smokers which is slightly higher than e-smokers 7/35 (19%). The reversely cytological bacterial infection was slightly higher between e-cigarette compared with traditional smokers, 11% to 7% respectively. Keratinization was occurred similarly in both cases groups with only 2%. However, Cytological Atypia and Candida albicans was detected only in cigarette smoker (2% for each) compared with e-smokers and control groups (Table 2).

Cytological changes such as inflammation and infection identified in both short and long duration of cigarette smoking, while atypia, fungal infection and keratinization were only identified in long duration (Table 3).

Table 1: Distribution of the study population by age

Age (year)	Smokers (n=35)		E-cigarette (n=35)		Nonsmokers n=30	
	N	%	N	%	N	%
20-30	15	42	17	48	8	27
31-40	8	22	11	31	10	33
41-50	5	14	5	14	10	33
51-60	7	20	2	6	2	6

Table 2: Frequency of cytopathological changes among the study population

Results	Smokers (n=35)		E-cigarette (n=35)		Nonsmokers n=30	
	N	%	N	%	N	%
Atypia	1	2	0	0	0	0
Inflammation	8	22	7	19	1	3
Bacterial infection	3	7	4	11	1	3
keratinization	1	2	1	2	0	0
candida albicans	0	0	0	0	0	0
Normal	22	62	23	65	28	94

Table 3: Relationship between of cytopathological changes and duration

	2-3 years	4-6 years	Up to 8 years
Atypia	0	0	1
Inflammation	9	5	0
Bacterial infection	5	2	0
keratinization	0	0	2
candida albicans	1	0	0

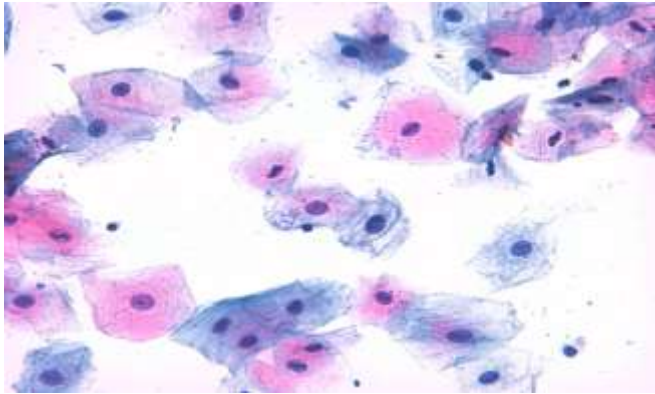


Figure 1: Photomicrograph of a buccal cell (conventional cigarette) containing atypical cells (Pap Stain 400x)

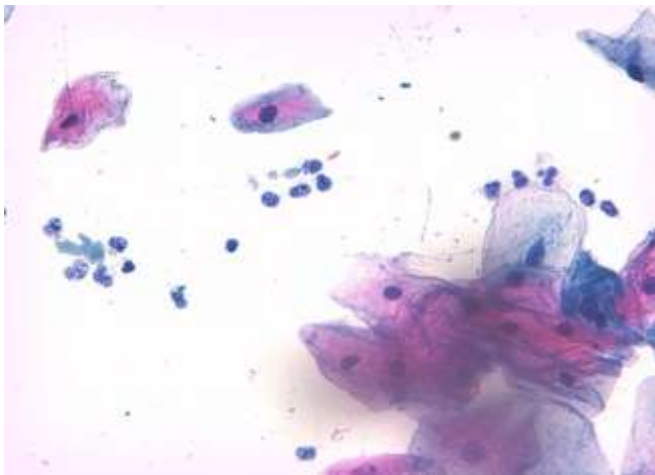


Figure 2: Photomicrograph of a buccal cell (E-cigarette) containing inflammatory cells (Pap Stain 400x)

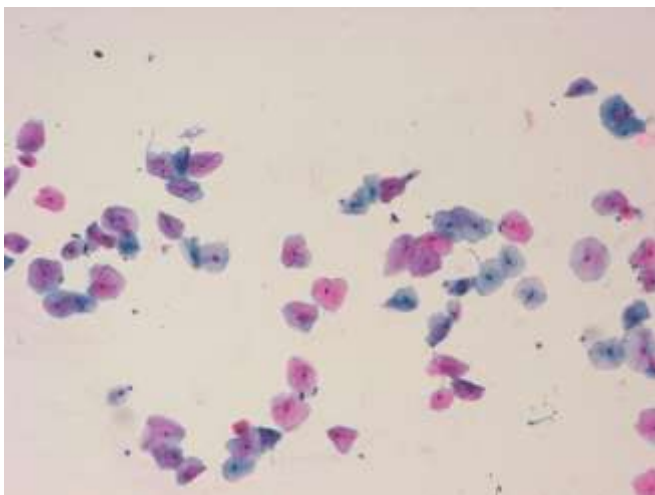


Figure 3: Photomicrograph of a buccal cell (nonsmoker) containing normal cells (Pap Stain 400x)

4. Discussion

Oral exfoliation cytology is a simple and non-invasive method. Diagnostic techniques that can be used for early detection potentially malignant lesions [22]. Cytological assesses parameters such as, nuclear shape, nuclear-cytoplasmic ratio, color density, and vacuolated cytoplasm. These quantitative techniques may increase the sensitivity of exfoliative cytology for the early diagnosis of oral cancers [23]. The present results report the causes

of oral cell changes among cigarettes smoking, which is strongly related to cancer risks. With the extension of smoking time, this risk tends to increase. The longer a person is exposed to smoking, the higher the risk [24]. This study shows that smoking is more common among young people (50%), followed by subjects between 30 and 40 years old (34%). These people are at greater risk of oral pathological changes, which may lead to cancer. Moreover, based on the cytological changes in the result there is no significant difference between traditional and e-smoking. Therefore, e-smoking may not be the good way for smoking cessation. The occurrence of inflammation and bacterial infection (in form of white blood cells) in control group mostly exist due to another cause.

5. Conclusion

The present study demonstrates that both smoking and vaping have cytological effects in oral mucosa compared with non-smokers. However, the result revealed no statistically significant changes between e-cigarette smokers and traditional smokers. In conclusion, this area needs significant concern for the future considering the duration of cigarette smoking and increase the sample size. These results do not confirm that e-cigarettes have a positive impact on public health [25].

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