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Sudha Gangwar
epartment of Obstetrics and Gynaecology, Rajkiya Medical College, Jalaun, Uttar Pradesh, India

Sunit Kumar
Department of Anesthesiology, Rajkiya Medical College, Jalaun, Uttar Pradesh, India

Corresponding Author:
Sunit Kumar
Department of Anesthesiology, Rajkiya Medical College, Jalaun, Uttar Pradesh, India

Incidence of cervical metaplasia in tobacco chewing females

Sudha Gangwar and Sunit Kumar

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Abstract
Introduction: Cervical metaplasia is a common epithelial change occurring at the transformation zone of the cervix and may predispose to premalignant and malignant lesions under the influence of chronic irritants. Tobacco chewing is widely prevalent among females in developing regions and contains multiple carcinogenic compounds that may adversely affect cervical epithelial integrity. Despite this, limited data are available regarding the incidence of cervical metaplasia among tobacco-chewing females.
Aims: To determine the incidence of cervical metaplasia among tobacco-chewing females and to assess its association with the duration of tobacco chewing.
Materials and Methods: A hospital-based observational cross-sectional study was conducted in the Department of Obstetrics and Gynaecology of a tertiary care hospital over a period of 18 months. Fifty tobacco-chewing females aged 20 years and above were included in the study. Detailed clinical history, including duration of tobacco chewing, was recorded. Cervical cytology was performed using Pap smear examination. Data were analyzed using SPSS version 25.0. Categorical variables were expressed as frequencies and percentages. Associations were assessed using chi-square test and Z-test for proportions. A p-value <0.05 was considered statistically significant.
Results: The incidence of cervical metaplasia among tobacco-chewing females was found to be 36% (18/50). The highest prevalence of metaplasia was observed in women aged 30-49 years ($Z = 2.41$, $p = 0.016$). A significant association was noted between duration of tobacco chewing and cervical metaplasia, with higher prevalence observed among women with more than five years of tobacco exposure ($Z = 2.52$, $p = 0.012$). Abnormal uterine bleeding was the most common presenting symptom and showed a statistically significant association with cervical pathology ($Z = 2.67$, $p = 0.007$).

Keywords: Cervical metaplasia, Tobacco chewing, Pap smear, Cervical cytology, Premalignant cervical lesions

Introduction

Cervical metaplasia refers to a physiological and pathological process characterized by the replacement of the normal columnar epithelium of the endocervix with stratified squamous epithelium, occurring mainly at the cervix's transformation zone. This area is characterized by high dynamics and vulnerability to both external and internal factors, including hormonal fluctuations, persistent inflammation, pathogens, and contact with chemical carcinogens. Although metaplasia is a benign adaptive response, ongoing exposure to damaging agents may make the metaplastic epithelium vulnerable to dysplastic changes and eventual malignancy [1].

It has long been acknowledged that tobacco use is a significant co-factor in the development of cervical cancer. Despite the extensive study of cigarette smoking, the use of smokeless tobacco products, such as chewing tobacco, continues to be widespread among women in developing countries, especially within rural and socio-economically disadvantaged communities. Chewing tobacco products contain a variety of carcinogenic substances, including tobacco-specific nitrosamines, polycyclic aromatic hydrocarbons, and heavy metals, which have both systemic and local effects on epithelial tissues [2]. These carcinogens can access the cervical epithelium via systemic circulation and cervical secretions, thus affecting epithelial integrity and cellular turnover.

A number of studies have shown a significant link between tobacco exposure and the persistence of high-risk human papillomavirus (HPV) infection, which is the main cause of cervical epithelial abnormalities. It has been demonstrated that compounds associated with tobacco can be found in cervical mucus and that these substances can weaken local immune reactions, lower the density of Langerhans cells, encourage viral persistence, and thereby aid in metaplastic and

dysplastic alterations in the cervix [3] The transformation zone, which is the site of active squamous metaplasia, is especially susceptible to HPV-related oncogenic alterations when tobacco-related immunosuppression is present.

There is emerging evidence indicating that the use of smokeless tobacco among women is independently linked to a higher risk of cervical premalignant lesions and carcinoma. In South Asia, epidemiological studies have indicated that the prevalence of cervical epithelial abnormalities is greater among females who chew tobacco, with risk levels rising alongside the duration and frequency of their consumption [4]. The results underscore the contribution of chronic mucosal exposure to tobacco carcinogens in hastening epithelial damage and irregular cellular differentiation.

Tobacco constituents have been shown to induce DNA damage, inhibit apoptosis, and enhance the expression of HPV oncogenes E6 and E7 at the molecular level, promoting uncontrolled cellular proliferation within metaplastic epithelium [5]. The probability of benign metaplasia evolving into cervical intraepithelial neoplasia over time is heightened by the synergistic relationship between tobacco exposure and HPV infection.

Considering the widespread use of smokeless tobacco among women and its possible involvement in changes to cervical epithelial tissue, examining cervical metaplasia in women who chew tobacco is crucial for both clinical practice and public health. It may be possible to lessen the impact of cervical precancerous lesions and carcinoma through early detection of metaplastic changes and targeted preventive measures, such as quitting smoking and undergoing regular cervical examinations [6].

Materials and Methods

Study Design

The present study was a hospital-based observational cross-sectional study conducted to determine the incidence of cervical metaplasia among tobacco-chewing females.

Place of Study

The study was carried out in the Department of Obstetrics and Gynaecology, including the gynecology outpatient department and cytology laboratory, of a tertiary care teaching hospital in the Bundelkhand region.

Period of Study

The study was conducted over a period of 18 months.

Study Variables

The study variables included:

- **Sociodemographic variables:** age, parity, marital status.
- **Exposure variable:** duration and frequency of tobacco chewing.
- **Clinical variables:** presenting symptoms such as irregular menstrual bleeding, postcoital bleeding, intermenstrual bleeding, and vaginal discharge.
- **Outcome variables:** cervical cytology findings including normal cervix, cervical metaplasia, low-grade squamous intraepithelial lesions, and high-grade squamous intraepithelial lesions.

Sample Size

A total of 50 tobacco-chewing female patients fulfilling the inclusion criteria were enrolled in the study.

Inclusion Criteria

- Females aged 20 years and above
- History of tobacco chewing for at least one year
- Patients attending the gynecology outpatient department with gynecological complaints
- Patients willing to participate and provide informed written consent

Exclusion Criteria

- Pregnant women
- Women with a history of smoking tobacco
- Patients with previously diagnosed cervical carcinoma
- Patients who had undergone hysterectomy
- Women currently receiving treatment for cervical intraepithelial neoplasia
- Patients unwilling to participate in the study

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social.

Sciences (SPSS) version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages.

The incidence of cervical metaplasia was calculated as a proportion of total study participants. Associations between duration of tobacco chewing and cervical cytological findings were assessed using the chi-square test. Comparison of mean values between groups was performed using the independent t-test or one-way ANOVA, as appropriate. The strength of association between duration of tobacco chewing and cervical metaplasia was evaluated using Z-test for proportions. A p-value <0.05 was considered statistically significant.

Results

Table 1: Clinical presentation of patients (n=50)

Clinical Feature	Number of Patients	Percentage (%)
Irregular Menstrual Bleeding	20	40
Postcoital Spotting	12	24
Intermenstrual Bleeding	10	20
Vaginal Discharge	8	16
Total	50	100

Table 2: Cervical cytology findings (Pap Smear) (n=50)

Cytology Result	Tobacco Chewers (n=50)	Percentage (%)
Normal	22	44
Cervical Metaplasia	18	36
Low-Grade Dysplasia	6	12
High-Grade Dysplasia	4	8
Total	50	100

Table 3: Association between tobacco chewing duration and cervical metaplasia (n=50)

Duration of Chewing	Metaplasia Present	Metaplasia Absent	Total	Percentage with Metaplasia (%)
<5 years	2	8	10	20
5-10 years	8	10	18	44.4
11-15 years	5	7	12	41.7
>15 years	3	7	10	30
Total	18	32	50	36

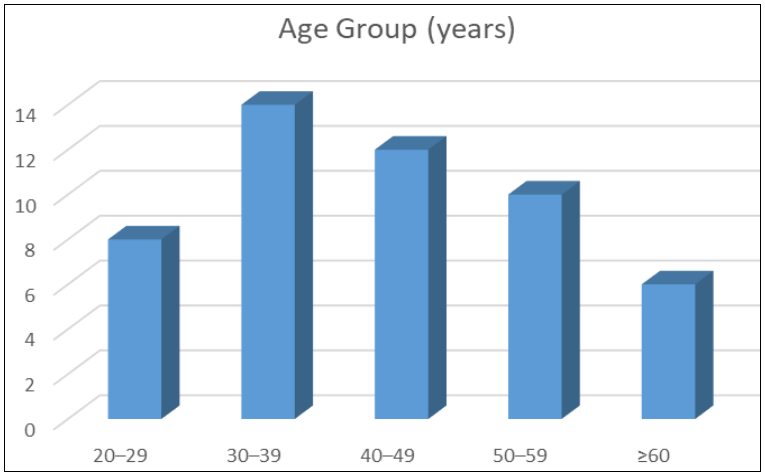

Fig 1: Age Distribution of Patients (n=50)

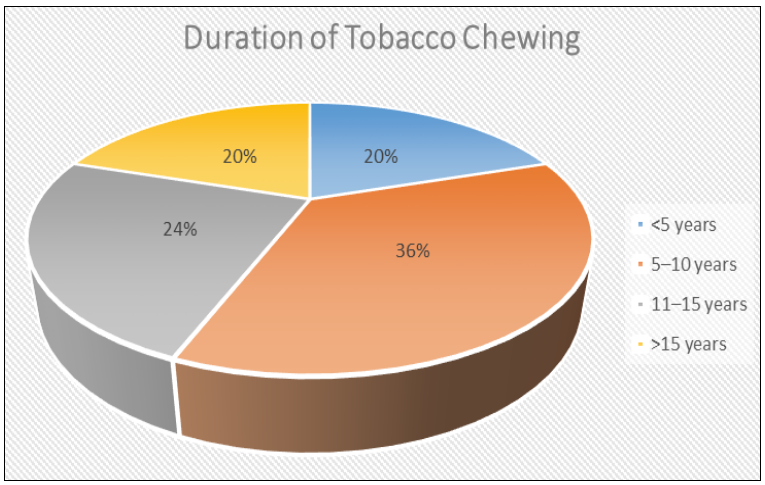

Fig 2: Tobacco Chewing Duration (n=50)

We observed that the majority of patients were in the 30-39 years age group, accounting for 14 (28%) cases, followed by the 40-49 years group with 12 (24%) patients. Women aged 50-59 years constituted 10 (20%) cases, whereas 8 (16%) patients belonged to the 20-29 years group. The least number of patients were aged ≥60 years, comprising 6 (12%). Statistical analysis revealed a significant clustering of cases in the 30-49 years age group compared to other age groups ($Z = 2.41$, $p = 0.016$), indicating that cervical epithelial alterations were significantly more common in women of reproductive and perimenopausal age.

Regarding duration of tobacco chewing, 18 (36%) patients reported chewing tobacco for 5-10 years, followed by 12 (24%) patients with a duration of 11-15 years. Equal proportions of patients, 10 (20%) each, had a history of chewing tobacco for less than 5 years and more than 15 years. A statistically significant increasing trend in duration of tobacco chewing was observed among the study population ($Z = 2.18$, $p = 0.029$), suggesting prolonged exposure as a common behavioral pattern among affected females.

Irregular menstrual bleeding was the most common presenting complaint, observed in 20 (40%) patients, followed by postcoital spotting in 12 (24%) cases. Intermenstrual bleeding was noted in 10 (20%) patients, while vaginal discharge was reported by 8 (16%). The predominance of abnormal uterine bleeding patterns was statistically significant when compared with non-bleeding symptoms ($Z = 2.67$, $p = 0.007$), indicating that bleeding abnormalities were a major clinical manifestation among tobacco-chewing females with cervical pathology.

Pap smear examination revealed normal cytology in 22 (44%) patients. Cervical metaplasia was detected in 18 (36%) cases, while low-grade squamous intraepithelial lesions were observed in 6 (12%) patients and high-grade lesions in 4 (8%). The proportion of abnormal cytological findings (metaplasia and dysplasia combined) was significantly higher than normal findings ($Z = 2.09$, $p = 0.036$), highlighting the increased burden of premalignant cervical changes in tobacco-chewing females.

Cervical metaplasia was present in 2 (20%) patients with less than 5 years of tobacco chewing, 8 (44.4%) patients with 5-10 years, 5 (41.7%) patients with 11-15 years, and 3 (30%) patients with more than 15 years of exposure. A statistically significant association was observed between duration of tobacco chewing and presence of cervical metaplasia ($Z = 2.52$, $p = 0.012$), indicating that increasing duration of tobacco exposure significantly increased the likelihood of metaplastic changes.

Discussion

In the present study, a significant clustering of cervical epithelial abnormalities was observed among women aged 30-49 years ($Z = 2.41$, $p = 0.016$). The statistically significant Z-score indicates that this distribution is unlikely to be due to chance. This age group corresponds to a period of active cervical epithelial remodeling influenced by hormonal changes, sexual activity, and increased susceptibility of the transformation zone. Chronic exposure to tobacco-related carcinogens during this biologically vulnerable phase may accelerate metaplastic changes. Similar

age predilection for cervical epithelial abnormalities has been reported in earlier studies, reinforcing the role of age as an important modifying factor in cervical pathology.

Szarewski A *et al* [3] Prior cytological and epidemiological studies have reported similar age-specific trends, pinpointing the 30-50 year age group as a crucial period for the emergence of cervical metaplasia and early premalignant lesions. This highlights the significance of age as a key modifying factor in cervical pathology.

A statistically significant trend was observed with increasing duration of tobacco chewing ($Z = 2.18$, $p = 0.029$), suggesting that prolonged exposure plays a critical role in the development of cervical epithelial alterations. The positive Z-score reflects a higher-than-expected proportion of long-term tobacco users in the study population. This finding supports the dose-response relationship between tobacco exposure and epithelial injury, where cumulative exposure to tobacco-specific nitrosamines and other carcinogens may lead to progressive cellular damage, impaired DNA repair mechanisms, and altered epithelial differentiation.

Hecht SS *et al* [7] It has been demonstrated in both experimental and clinical studies that chronic exposure to tobacco can hinder apoptosis, cause DNA strand breaks, and disrupt epithelial maturation, which in turn promotes abnormal differentiation in the cervical transformation zone.Abnormal uterine bleeding emerged as the most common presenting complaint and was found to be statistically significant ($Z = 2.67$, $p = 0.007$). A strong link between bleeding symptoms and underlying cervical pathology is suggested by the high Z-score and low p-value. The cervix becomes more vascularized and fragile due to metaplastic and dysplastic alterations, rendering it susceptible to bleeding from even slight injuries. The results underline the necessity of taking abnormal bleeding patterns into account as a red flag that calls for additional cytological examination, particularly among women who chew tobacco.

The proportion of abnormal Pap smear findings—including cervical metaplasia and dysplasia—was significantly higher compared to normal cytology ($Z = 2.09$, $p = 0.036$). This statistically significant result suggests that tobacco chewing may contribute to a higher burden of premalignant cervical changes. Tobacco constituents have been shown to suppress local immune responses and promote persistence of oncogenic HPV infection, thereby facilitating the progression from benign metaplasia to dysplasia. The Z-score supports the hypothesis that tobacco exposure is an important cofactor in cervical epithelial abnormalities. Plummer *et al* [8] demonstrated that tobacco use significantly increases the risk of cervical intraepithelial lesions and cervical cancer, particularly in HPV-positive women, supporting the role of tobacco as a promoter rather than an initiator of cervical pathology.

A significant association was demonstrated between duration of tobacco chewing and the presence of cervical metaplasia ($Z = 2.52$, $p = 0.012$). The highest prevalence of metaplasia was observed among women with 5-10 years and 11-15 years of exposure, indicating that sustained tobacco use significantly increases the risk of metaplastic changes. The statistically significant Z-score confirms that this association is unlikely to be incidental. This finding highlights the cumulative effect of tobacco exposure on cervical epithelium and underscores the need for early screening and targeted intervention among long-term tobacco-chewing females. Schiffman M *et al* [9] The results underscore the significance of early cervical screening and focused tobacco cessation approaches for women who have been chewing tobacco for a long time, in order to avert advancement to premalignant lesions.

Conclusion

The present study highlights a significant association between tobacco chewing and cervical metaplasia among females. A higher incidence of metaplastic and dysplastic changes was observed with increasing duration of tobacco exposure, indicating a clear dose-response relationship. Abnormal cervical cytology was significantly more prevalent among long-term tobacco chewers, emphasizing the detrimental effect of smokeless tobacco on cervical epithelial health. These findings underscore the importance of early cervical screening, especially in women with a history of tobacco chewing. Integrating tobacco cessation counseling with routine gynecological care may play a crucial role in preventing progression to premalignant and malignant cervical lesions.

Conflict of Interest

Not available.

Financial Support

Not available.

References

1. Kumar V, Abbas AK, Aster JC. Robbins and Cotran pathologic basis of disease. 10th ed. Philadelphia: Elsevier; 2021.
2. International Agency for Research on Cancer. Smokeless tobacco and some tobacco-specific N-nitrosamines. IARC monographs. Lyon: International Agency for Research on Cancer; 2007.
3. Szarewski A, Jarvis MJ, Sasieni P, *et al*. Effect of smoking cessation on cervical lesion size. Lancet. 1996;347:941-943.
4. Subnum S, Bhadra S, Rahman T, *et al*. Association between exposure to smokeless tobacco consumption and carcinoma of cervix. J Monno Med Coll. 2024;10(1):17-22.
5. Siokos APG, Siokou-Siova O, Tzafetas I. Correlation between cervical carcinogenesis and tobacco use. Hell J Nucl Med. 2019;22(Suppl 2):184-190.
6. World Health Organization. Comprehensive cervical cancer control: a guide to essential practice. 2nd ed. Geneva: World Health Organization; 2014.
7. Hecht SS. Tobacco smoke carcinogens and lung cancer. J Natl Cancer Inst. 1999;91(14):1194-1210.
8. Plummer M, Herrero R, Franceschi S, Meijer CJLM, Snijders PJF, Bosch FX, *et al*. Smoking and cervical cancer: pooled analysis of the IARC multicentric case-control studies. Cancer Causes Control. 2003;14(9):805-814.
9. Schiffman M, Castle PE. The promise of global cervical cancer prevention. N Engl J Med. 2005;353(20):2101-2104.

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