

## PREVALENCE AND DETERMINANTS OF ABNORMAL PAP SMEAR AMONG WOMEN ATTENDING AL-ELWEIYA TEACHING HOSPITAL 2016-2023

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Received date: 06 November 2024

Revised date: 27 November 2024

Accepted date: 17 December 2024



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### ABSTRACT

**Background:** In women worldwide, the Papanicolaou test (Pap smear) is critical for early cervical abnormality identification, including cancer. Cervical cancer is the fourth most common cancer in women, especially in low- and middle-income countries with poor screening. Regular screening and early intervention prevent many of these diseases. **Method:** This cross-sectional study assessed the prevalence and determinants of abnormal Pap smear results among 3,963 non-pregnant women at Al-Elweiya Teaching Hospital (2016-2024). Participants were analyzed by age, reproductive and lifestyle factors, and Pap smear outcomes (NILM, ASC-US, LSIL, HSIL, ASC-H, and AGC). Exclusions included prior cervical malignancy and incomplete records. **Results:** The study's findings reveal that the majority of Pap smear results were normal (NILM) at 82.2%, with ASC-US being the most common abnormal finding (9.1%). High-grade lesions (HSIL) and severe abnormalities (ASC-H) were rare, showing slight increases in older age groups. These results suggest age-related patterns in cervical abnormalities, with younger groups experiencing fewer severe findings and older age groups showing higher occurrences of HSIL and ASC-H, indicating increased cervical cancer risk with age. **Conclusion:** The majority of individuals had normal Pap smears, with ASC-US and LSIL abnormalities. Older age groups had more severe abnormalities including HSIL and ASC-H, suggesting higher cervical cancer risk. Lifestyle variables including contraceptive usage, smoking, and early marriage age were also connected to abnormal Pap screenings, underscoring their impact on cervical health.

**KEYWORDS:** Prevalence, Determinants, Abnormal, Pap smear, women Attending Al-Elweiya Teaching Hospital.

### INTRODUCTION

The Papanicolaou test, commonly known as the Pap smear, is a critical screening tool in the early detection of cervical abnormalities, including cervical cancer, among women worldwide. Cervical cancer ranks as the fourth most common cancer among women globally, with over 500,000 new cases reported annually, particularly affecting women in low- and middle-income countries where screening resources are limited. A significant portion of these cases can be prevented through regular screening and early intervention. The Pap smear enables the identification of pre-cancerous cellular changes, allowing for timely management and reducing progression to invasive cancer. Despite the importance of regular screenings, a large percentage of women still experience abnormal Pap smear results, with prevalence rates varying across regions and populations due to differences in access, lifestyle factors, and awareness of

preventive measures.<sup>[1,2]</sup> The prevalence of abnormal Pap smears is influenced by several determinants, including socioeconomic status, age, sexual activity, parity, smoking habits, and Human Papillomavirus (HPV) infection, which is the primary etiologic agent for cervical dysplasia and cancer. Women infected with high-risk HPV strains have a significantly higher likelihood of developing cervical intraepithelial neoplasia (CIN) and cervical cancer. Studies have shown that younger women often experience transient HPV infections that may lead to abnormal Pap results, whereas persistent HPV infections in older women pose a higher risk for cervical cancer. Other risk factors include early onset of sexual activity, multiple sexual partners, immunosuppression (e.g., HIV infection), and limited access to regular healthcare.<sup>[3,4]</sup> Socioeconomic factors play a critical role in determining the prevalence of abnormal Pap smears, as women in lower-income

brackets or with limited educational backgrounds may have reduced access to screening programs, health education, and follow-up care. Geographic and cultural factors also impact screening participation and outcomes, with rural populations often facing barriers related to healthcare infrastructure and awareness. Furthermore, the stigma and cultural beliefs surrounding gynecological health in some regions contribute to underutilization of Pap smear services, which may delay diagnosis and treatment of cervical abnormalities.<sup>[5,6]</sup> In recent years, the introduction of HPV vaccination has contributed to a reduction in HPV infection rates, particularly among younger populations, which could potentially decrease the prevalence of abnormal Pap smear results in the future. However, disparities in vaccination coverage and screening uptake continue to pose challenges, emphasizing the need for targeted health education, improved accessibility to screening facilities, and integration of HPV vaccination programs into routine healthcare. Understanding the prevalence and determinants of abnormal Pap smear results is vital in informing public health strategies to promote cervical health, reduce disparities in screening access, and ultimately lower cervical cancer incidence among women globally.<sup>[7,8]</sup> The aim of study is to explore the prevalence and Determinants of Abnormal Pap smear according to specific age groups among women Attending cervical screening unit in AL-ELWEIYA hospital since its establishment at April 2016 to April 2024.

## METHOD

The study employed a cross-sectional design to investigate the prevalence and determinants of abnormal Pap smear results among women attending the cervical screening unit at Al-Elweiya Teaching Hospital from April 2016 to April 2024. The sample included 3,963 sexually active, non-pregnant women with documented Pap smear records during this period. Participants were selected based on complete medical records, including age, age at marriage, parity, marital status, contraception use, smoking status, and family history of malignancy. Women with a history of cervical malignancy or incomplete records were excluded. Data were

systematically extracted from hospital records and categorized by age groups (<20, 20-29, 30-39, 40-49, 50-59, and ≥60 years) to evaluate age-related variations in Pap smear outcomes. Pap smear results were classified as NILM (Negative for Intraepithelial Lesion or Malignancy), ASC-US (Atypical Squamous Cells of Undetermined Significance), LSIL (Low-Grade Squamous Intraepithelial Lesion), HSIL (High-Grade Squamous Intraepithelial Lesion), ASC-H (Atypical Squamous Cells—Cannot Exclude High-Grade Lesion), and AGC (Atypical Glandular Cells). Demographic variables included age at first marriage (<18 or ≥18 years), parity (0, 1-4, >5 children), marital status (married, divorced, widowed), contraception use (yes or no), smoking status, and family history of malignancy (yes or no). Statistical analyses were conducted using SPSS (version 22), with frequencies and percentages calculated for categorical data. Chi-square tests were employed to examine associations between age groups and Pap smear outcomes, with a p-value ≤0.05 indicating statistical significance.

## RESULTS

Table 1 describes the distribution of patients based on various demographic and clinical variables. **Age Groups:** Most patients (33.1%) are in the 40-49 years' age group. The next largest group is 30-39 years (28.2%), followed by 20-29 years (19.2%). Only 1.1% of patients are under 20 years, and 4.3% are 60 years or older. **Age of Marriage:** The majority of patients (63.2%) were married at 18 years of age and above. A smaller proportion (36.8%) married before 18 years old. **Parity:** A (48.5%) of patients have 1-4 children. About 45.8% of patients have 5 children and more, while 5.7% have no children. **Marital Status:** Most patients (92.4%) are currently married. A small percentage are widowed (4.8%) or divorced (2.8%). **Contraception Use:** The majority of patients (82.7%) do not use contraception, while 17.3% do. **Smoking Status:** About 76.3% of patients are non-smokers, while 23.7% are smokers. **Family history of malignant disease:** The majority (82.0%) have no family history of breast diseases, with 18.0% reporting a positive family history.

**Table 1: distribution of patients according to study variables.**

Variables	frequency	percentage	
<b>Age groups (years)</b>	<20	45	1.1
	20-29	761	19.2
	30-39	1118	28.2
	40-49	1313	33.1
	50-59	555	14.0
	≥60	171	4.3
<b>Age of married</b>	<18	1459	36.8
	≥18	2504	63.2
<b>Parity</b>	0	227	5.7
	1-4	1922	48.5
	>5	1814	45.8

<b>Marital state</b>	<i>D</i>	112	2.8
	<i>M</i>	3661	92.4
	<i>W</i>	190	4.8
<b>Used of contraception</b>	<i>no</i>	3276	82.7
	<i>yes</i>	687	17.3
<b>Smoking</b>	<i>no</i>	3025	76.3
	<i>yes</i>	938	23.7
<b>Family history of malignant Disease</b>	<i>no</i>	3250	82.0
	<i>yes</i>	713	18.0
<b>Total</b>		3963	100.0

Table 2 focuses on the distribution of patients based on their diagnosis using the Pap smear test. **NILM (Negative for Intraepithelial Lesion or Malignancy)**: The majority of patients (82.2%) fall into the NILM category, indicating no abnormal cell changes. **ASC-US (Atypical Squamous Cells of Undetermined Significance)**: 9.1% of patients were diagnosed with ASC-US, representing a relatively higher number of atypical squamous cell findings compared to other abnormal categories. **LSIL (Low-Grade Squamous Intraepithelial Lesion)**: 6.5% of patients were diagnosed with LSIL, indicating the presence of mildly abnormal cells on the surface of the cervix. **HSIL (High-Grade Squamous Intraepithelial Lesion)**: 0.9% of patients were diagnosed with HSIL, suggesting more significant cell changes that could lead to cervical cancer if left untreated. **ASC-H (Atypical Squamous Cells—Cannot Exclude High-Grade Lesion)**: 0.8% of patients fell into the ASC-H category, which indicates that high-grade lesions cannot be ruled out and further investigation is needed. **AGC (Atypical Glandular Cells)**: Only 0.6% of patients were diagnosed with AGC, which may indicate changes in glandular cells that could be associated with pre-cancerous conditions. The vast majority of patients (82.2%) have normal Pap smear results (NILM). ASC-US (9.1%) is the most common abnormal result, followed by LSIL (6.5%). HSIL, ASC-H, and AGC are less frequent but indicate more serious cellular abnormalities that may require further clinical follow-up.

**Table 2: distribution of patients according to Diagnosis by Pap smear.**

Variables		frequency	percentage
<b>Diagnosis by Pap smear</b>	AGC	22	0.6
	ASC-H	32	0.8
	ASC-US	362	9.1
	HSIL	35	0.9
	LSIL	256	6.5
	NILM	3256	82.2

Fig 1 provides the distribution of diagnoses by Pap smear across different years from 2016 to 2024. The results are presented as column percentages for each year. **AGC (Atypical Glandular Cells)**: The percentage of patients diagnosed with AGC fluctuates over the years, with a peak in 2016-2017 (0.8%) and again in 2023-2024 (0.9%). In some years (2018 and 2020-2021), there were

no AGC cases reported. **ASC-H (Atypical Squamous Cells—Cannot Exclude High-Grade Lesion)**: The percentage of ASC-H cases is relatively low across all years, ranging from 0% (2020-2021) to 1.8% (2019). There is a notable increase in 2019, with a subsequent decrease in 2022 and 2023-2024. **ASC-US (Atypical Squamous Cells of Undetermined Significance)**: ASC-US cases are more variable. They peak in 2018 with 17.7%, followed by a lower percentage in 2023-2024 (7.8%). The percentage sharply declines in 2020-2021 (5.3%) but then rises again in 2023-2024. **HSIL (High-Grade Squamous Intraepithelial Lesion)**: The percentage of HSIL cases shows some variation over the years, with a slight increase in 2019 (3.9%) and a drop to almost negligible percentages in 2022 (0.2%) and 2023-2024 (0.3%). **LSIL (Low-Grade Squamous Intraepithelial Lesion)**: LSIL diagnoses fluctuate over the years. The highest percentage occurs in 2016-2017 (9.4%), while the lowest is in 2020-2021 (2.1%). The percentage slightly increases in 2023-2024 (2.5%). **NILM (Negative for Intraepithelial Lesion or Malignancy)**: NILM, representing normal results, shows the most significant variation. It peaks in 2022 with 95.6%, indicating that most patients in that year had normal Pap smear results. In 2016-2017, the percentage was lower at 80.4%, and it remains above 85% in 2020-2021, 2022, and 2023-2024.

**2018** and **2019** show the highest percentage of abnormal findings in ASC-US, ASC-H, and HSIL, indicating a greater proportion of patients with atypical or high-grade squamous cell abnormalities in those years. **2022** shows the highest percentage of normal results (NILM at 95.6%), suggesting that fewer abnormalities were detected that year. There is no consistent pattern in the occurrence of AGC, ASC-H, HSIL, and LSIL over the years, indicating fluctuating diagnostic outcomes.

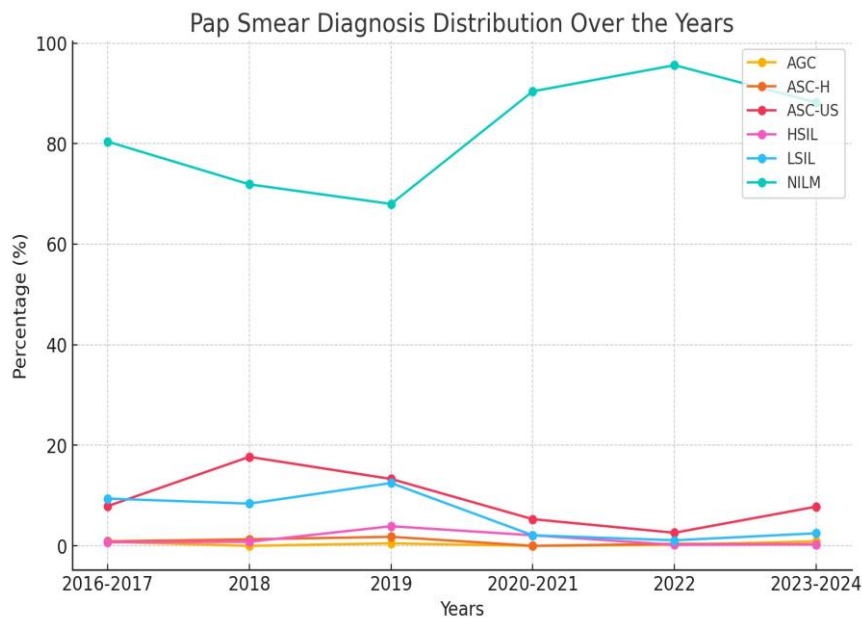


Fig 1: association between years and Diagnosis by Pap smear.

Table 3 presents the association between age groups and various study variables, offering insights into trends across different age brackets. **Marriage Age:** The proportion of individuals married under 18 years decreases with increasing age. For instance, 91.1% of patients under 20 were married before 18, compared to only 27.7% in the 50-59 age group. Conversely, the proportion of individuals married at 18 years or older increases with age, from 8.9% in the youngest group (<20) to 72.3% in the 50-59 group. **Parity (Number of Children):** In the younger age groups (<20 and 20-29), most individuals (35.6% and 8.4%, respectively) have no children. However, as age increases, this percentage declines, with most older patients having 1-4 or 5+ children. Notably, in the ≥60 age group, 66.7% of individuals have 5+ children. **Marital Status:** Most patients across all age groups are married (93.3% to 66.1%), though the proportion of widowed individuals increases sharply in the older age groups, particularly in those aged 50-59 (9.5%) and ≥60 (31.6%).

**Contraception Use:** Contraception use increases with age, with 6.7% of the youngest group (<20) using contraception compared to 22.0% of the 50-59 age group. However, usage drops again in the oldest age group (≥60). **Smoking Status:** Smoking prevalence decreases as age increases. For instance, 28.9% of patients <20 years are smokers, while only 24.0% of patients ≥60 years are smokers. **Family history of malignant disease:** The percentage of patients with no family history of malignant disease declines with age, with 91.1% of patients under 20 reporting no family history, compared to 78.9% of those ≥60. Conversely, the proportion of individuals with a positive family history increases with age. These associations provide insights into patterns of marriage, childbirth, smoking, contraception use, and family medical history across different age groups, highlighting the variation in demographic and clinical characteristics among the patients studied.

Table 3: association between age groups (years) and study variables.

Variables	Age groups (years)						P-value
	<20	29-29	30-39	40-49	50-59	≥60	
<b>Married age</b>							<b>0.0001</b>
<18	41 (91.1%)	437 (57.4%)	373 (33.4%)	386 (29.4%)	154 (27.7%)	68 (39.8%)	
18	4 (8.9%)	324 (42.6%)	745 (66.6%)	927 (70.6%)	401 (72.3%)	103 (60.2%)	
<b>Baby no.</b>							<b>0.0001</b>
0	16 (35.6%)	64 (8.4%)	37 (3.3%)	64 (4.9%)	35 (6.3%)	11 (6.4%)	
1-4	28 (62.2%)	579 (76.1%)	619 (55.4%)	466 (35.5%)	184 (33.2%)	46 (26.9%)	
5	1 (2.2%)	118 (15.5%)	462 (41.3%)	783 (59.6%)	336 (60.5%)	114 (66.7%)	
<b>Marital S.</b>							<b>0.0001</b>
D	3 (6.7%)	28 (3.7%)	30 (2.7%)	27 (2.1%)	20 (3.6%)	4 (2.3%)	
M	42 (93.3%)	731 (96.1%)	1064 (95.2%)	1229 (93.6%)	482 (86.8%)	113 (66.1%)	
W	0 (0.0%)	2 (0.3%)	24 (2.1%)	57 (4.3%)	53 (9.5%)	54 (31.6%)	

<b>C. used</b>							
<b>No</b>	42 (93.3%)	672 (88.3%)	933 (83.5%)	1045 (79.6%)	433 (78.0%)	151 (88.3%)	<b>0.001</b>
<b>Yes</b>	3 (6.7%)	89 (11.7%)	185 (16.5%)	268 (20.4%)	122 (22.0%)	20 (11.7%)	
<b>Smoking</b>							
<b>No</b>	32 (71.1%)	544 (71.5%)	846 (75.7%)	1042 (79.4%)	431 (77.7%)	130 (76.0%)	<b>0.003</b>
<b>Positive</b>	13 (28.9%)	217 (28.5%)	272 (24.3%)	271 (20.6%)	124 (22.3%)	41 (24.0%)	
<b>Medical F.H.</b>							
<b>No</b>	41 (91.1%)	654 (85.9%)	921 (82.4%)	1064 (81.0%)	435 (78.4%)	135 (78.9%)	<b>0.004</b>
<b>Yes</b>	4 (8.9%)	107 (14.1%)	197 (17.6%)	249 (19.0%)	120 (21.6%)	36 (21.1%)	
<b>Total</b>	45(100%)	761 (100%)	1118(100%)	1313(100%)	555(100%)	171(100%)	

Table 4 summarizes the distribution of Pap smear diagnoses across different age groups, presenting both counts and percentages within each age group for various diagnostic categories:

- **AGC (Atypical Glandular Cells):** Occurs most frequently in the <20 age group (4.4%) and decreases significantly with age, with no cases reported in the ≥60 group.
- **ASC-H (Atypical Squamous Cells - Cannot Exclude High-Grade):** Increases with age, peaking in the ≥60 group (3.5%).
- **ASC-US (Atypical Squamous Cells of Undetermined Significance):** Most frequent in the 40-49 group (10.3%) but also significant in younger age groups.

- **HSIL (High-Grade Squamous Intraepithelial Lesion):** Peaks in the 40-49 group (0.8%) but remains relatively low across all groups.
- **LSIL (Low-Grade Squamous Intraepithelial Lesion):** Consistently reported across all age groups, with percentages ranging from 5.9% to 7.0%.
- **NILM (Negative for Intraepithelial Lesion or Malignancy):** Represents the majority of cases across all age groups, ranging from 79.5% to 84.0%.

The **P-value** of 0.0001 indicates a statistically significant variation in the distribution of diagnoses across different age groups.

**Table 4: association between age groups (years) and Pap smear diagnosis.**

Variables	Diagnosis						P-value
	AGC	ASC-H	ASC-US	HSIL	LSIL	NILM	
<b>Age groups</b>							<b>0.0001</b>
<b>&lt;20</b>	2 (4.4%)	6 (0.8%)	4 (0.4%)	6 (0.5%)	4 (0.7%)	0 (0.0%)	
<b>20-29</b>	0 (0.0%)	1 (0.1%)	10 (0.9%)	8 (0.6%)	7 (1.3%)	6 (3.5%)	
<b>30-39</b>	3 (6.7%)	76 (10.0%)	86 (7.7%)	135 (10.3%)	51 (9.2%)	11 (6.5%)	
<b>40-49</b>	1 (2.2%)	3 (0.4%)	9 (0.8%)	11 (0.8%)	5 (0.9%)	6 (3.5%)	
<b>50-59</b>	3 (6.7%)	53 (7.0%)	69 (6.2%)	86 (6.5%)	33 (5.9%)	12 (7.0%)	
<b>≥60</b>	36 (80.0%)	622 (81.7%)	940 (84.0%)	1067 (81.4%)	455 (82.0%)	136 (79.5%)	
<b>Total</b>	45(100.0%)	761 (100.0%)	1118(100.0%)	1313(100.0%)	555 (100.0%)	171 (100.0%)	

**DISCUSSION**

The distribution of Pap smear diagnoses in this dataset reveals a predominant finding of NILM (Negative for Intraepithelial Lesion or Malignancy) across the years, with 82.2% of patients showing no abnormal cell changes. This aligns with findings from other studies, such as those by Ba DM et al. and Thunga S et al. where NILM constituted the majority of Pap smear results in their samples. This high percentage of NILM results suggests a generally low incidence of abnormal cervical changes among the studied population, which could be associated with regular screening and effective early intervention measures in place.<sup>[9,10]</sup> The most common abnormality observed is ASC-US (Atypical Squamous Cells of Undetermined Significance) at 9.1%, a finding corroborated by studies like those by Maraqa B et al. Yu YQ et al., where ASC-US often emerged as the most frequent atypical diagnosis. However, in this study, ASC-US prevalence shows significant variability across years, peaking in 2018 (17.7%) and subsequently decreasing.<sup>[11,12]</sup> This variability aligns with Madhloom

AS et al.'s findings that ASC-US incidence may fluctuate due to differences in population characteristics and screening intervals, suggesting that periodic increases could be due to intensified screening efforts during specific years.<sup>[13]</sup> LSIL (Low-Grade Squamous Intraepithelial Lesion) diagnoses also vary across years, with a peak in 2016-2017 (9.4%) and a decline in 2020-2021 (2.1%). High-grade abnormalities like HSIL and ASC-H remain rare, with ASC-H ranging between 0% and 1.8%, and HSIL being as low as 0.2% in 2022. These results are consistent with findings by Damgaard RK et al., who noted low but persistent rates of HSIL and ASC-H in comparable cohorts, emphasizing the importance of continual monitoring despite low prevalence.<sup>[14]</sup> The AGC category remains particularly rare, fluctuating slightly over the years, aligning with studies by Hassan D et al. which reported that glandular abnormalities are less common but still clinically significant due to potential associations with endocervical and endometrial conditions. This distribution highlights the necessity of sustained

screening and monitoring efforts; as even low percentages of high-grade lesions could lead to severe outcomes if left untreated.<sup>[15]</sup> The association between age groups and demographic factors in this study aligns with findings in similar research. For instance, early marriage trends observed in younger age groups are consistent with studies in low- and middle-income countries, where early marriage is more prevalent among younger cohorts but decreases over generations.<sup>[16]</sup> Parity trends, with older age groups having more children, reflect findings by Abekah-Nkrumah G et al., which showed higher parity rates in older women, often due to cultural expectations around family size in prior decades.<sup>[17]</sup> Increasing contraception use among middle-aged women, followed by a decrease in older age groups, matches trends noted in Demisse TL et al. where contraception use often peaks in reproductive years before declining post-menopause.<sup>[18]</sup> Additionally, the decline in smoking prevalence with age corresponds that suggesting younger generations are adopting smoking at higher rates than older associates.<sup>[19]</sup> Lastly, the positive family history of malignancy in older age groups is in line with studies indicating higher familial cancer awareness and reporting in older populations. These findings emphasize how sociocultural and lifestyle shifts impact demographic patterns across generations.<sup>[20]</sup> The distribution of Pap smear diagnoses across age groups highlights notable age-related trends in cervical cytology outcomes. In the youngest age groups (<20 and 20-29 years), the majority of patients present with NILM (80% and 81.7%, respectively), and severe abnormalities like HSIL or ASC-H remain infrequent, consistent with study by Tuncer HA et al. showing that younger women typically display fewer high-grade lesions.<sup>[21]</sup> As age increases, the prevalence of atypical squamous cells (ASC-US) and mild to moderate abnormalities, such as LSIL, becomes more prominent. This aligns with findings by Li B et al. indicating that women in their 30s and 40s are more likely to develop squamous abnormalities, likely due to prolonged HPV exposure.<sup>[22]</sup> In the older age groups (50-59 and ≥60 years), there is a marked increase in the proportion of severe abnormalities, particularly HSIL and ASC-H. This trend supports findings from So Miki M et al., who observed higher rates of high-grade lesions among postmenopausal women, suggesting that persistent HPV infections and age-related cellular changes may increase cervical cancer risk. The highest percentage of HSIL and ASC-H in the ≥60 age group (3.5% each) underlines the importance of vigilant screening in older women, even as screening guidelines often recommend less frequent testing with age. These trends highlight age as a key factor in cytological outcomes, reinforcing the need for age-specific screening protocols to address the evolving risk of cervical abnormalities across a woman's lifespan.<sup>[23]</sup>

## CONCLUSION

The study shows that most patients had normal Pap smear results, with abnormalities primarily in the ASC-

US and LSIL categories. Severe abnormalities, such as HSIL and ASC-H, were more prevalent among older age groups, suggesting increased cervical cancer risk with age. Additionally, we linked factors like contraceptive use, smoking, and early marriage age to a higher incidence of abnormal Pap smears, highlighting the influence of lifestyle factors on cervical health. These findings stress the importance of age-specific screening and targeted interventions for high-risk groups to improve early detection and outcomes.

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