



Prevalence of Abnormal Pap Smears at Prince Sultan Military Medical City in Riyadh, Saudi Arabia from 2012 to 2021: A Retrospective Study

Abdullah Bandar Almutiri^{1*}, Luluh B. AlBehlal², Rawan Abdullah O. Alshammari³, Abdullatif Ahmed Alzahrani⁴, Fadhel Zaben Alotaibi⁵

¹Central Military Laboratory and Blood Bank, Prince Sultan Military Medical City, Riyadh 11314, Kingdom of Saudi Arabia; ²Scientific Research Center, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia; ³Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia; ⁴Department of Pathology Security Forces Hospital, Riyadh, Saudi Arabia.

ABSTRACT

Introduction: Cancer is a significant global public health concern that demands immediate attention as it affects populations worldwide. Among cancers affecting women, cervical cancer stands out as the fourth most common. Remarkably, it is worth noting that around 90% of these deaths occurred in countries with low or middle incomes. These countries face challenges such as limited access to public health services and the inadequate implementation of screening and treatment measures for this disease. In Saudi Arabia, a country with a population of 10.7 million, women aged 15 years and older are at risk of developing cervical cancer.

Aim/Objectives: In this present study, the prevalence of abnormal Pap smears and their quality metrics at the Prince Sultan Military Medical City were analyzed. Additionally, the study sought to shed light on the evolutionary trend of this clinical technique for cervical screening in Riyadh and probably serve as cohort finding for the Saudi population.

Methodology: A retrospective analysis was carried out using the medical result sheets from medical analyses conducted between 2010 and 2021, at the Prince Sultan Military Medical City in Saudi Arabia. The focus was on smears, cervical cancer, Human papillomavirus (HPV), and atypical glandular cells.

Results: The study examined Pap smear data, including both conventional and liquid-based cytology (LBC), for a total of 27,319 collected between 2010 and 2021. Out of the 27,319 pap smears, 2.93% (801) were classified as abnormal, with 3.18% (869) been considered unsatisfactory (UNSAT) for diagnostic.

Conclusion: We recorded 1.72 ratio for atypical squamous cell and squamous intraepithelial cell, as with 0.98% prevalence in abnormal pap smears. We observed a fluctuating, relatively stable and a decreasing frequency of atypical glandular cells, respectively before the onset, during, and after the Covid-19 pandemic. We believe these variations in frequencies are due to different factors.

Key Words: Abnormal pap, cervical cancer, Saudi Arabia, Human Papillomavirus, immediate attention, Covid-19 pandemic

INTRODUCTION

Cancer is a significant global public health concern that demands immediate attention as it affects populations worldwide. Among cancers affecting women, cervical cancer stands out as the fourth most common.¹ In 2018 alone, approximately 570,000 women were diagnosed with cervical cancer, tragically resulting in 311,000 deaths.¹ Remarkably, it is worth noting that around 90% of these deaths occurred in countries with low or middle incomes. These countries face challenges such as limited access to public health ser-

vices and the inadequate implementation of screening and treatment measures for this disease.²

In Saudi Arabia, a country with a population of 10.7 million, women aged 15 years and older are at risk of developing cervical cancer. Furthermore, current estimates suggest that 358 women are diagnosed with cervical cancer annually, leading to 179 deaths. Additionally, cervical cancer ranks as the eighth most frequently occurring cancer among women in Saudi Arabia, particularly affecting those between 15 and 44 years of age.³

Corresponding Author:

Abdullah Bandar Almutiri, Central Military Laboratory and Blood Bank, Prince Sultan Military Medical City, Riyadh 11314, Kingdom of Saudi Arabia, Email: abdullah.2003@yahoo.com

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However, it is crucial to emphasize that most of these cases and deaths can be prevented through effective screening programs and early detection. In this prevention effort, the Pap test, also known as a Pap smear, assumes a pivotal and indispensable role. Serving as a primary cytology-based screening tool for cervical cancer screening, the Pap test is important in identifying abnormalities at an early stage. One of the key factors it detects is the presence of human papillomavirus (HPV), which is the most prevalent viral infection of the reproductive tract and one of the most common sexually transmitted infections globally.^{4,5} Importantly, HPV is the primary cause of nearly all cervical cancers.⁶ HPV can lead to cellular changes in the cervix that if left untreated, may progress into cervical cancer. By collecting cervical cells for analysis, the Pap test enables the identification of these HPV-related changes. The ability of Pap tests to detect both precancerous cells and early-stage cancerous cells,⁷ provides crucial information for healthcare professionals to intervene promptly and initiate appropriate treatment measures. Moreover, the test holds the potential to uncover non-cancerous conditions, such as infections or inflammation.⁷ Therefore, the Pap test is not only a valuable diagnostic tool but also a key component in the comprehensive efforts to combat cervical cancer and safeguard women's health.

In this context, research studies focusing on the prevalence of abnormal pap smears, play a crucial role in understanding the local burden of cervical abnormalities. This study aims to assess the prevalence of abnormal pap smears, along with an evaluation of the quality metrics associated with Pap smear screening using medical test result sheets from the Prince Sultan Military Medical City in Riyadh, Saudi Arabia.

MATERIAL AND METHODS

Research design and Settings

Retrospective design was used to guide this study, encompassing a period from 2012 to 2021. Data was retrieved from the laboratory information system, at Prince Sultan Military Medical City in Riyadh, Saudi Arabia.

Data collection and Statistical Analysis

Pap smear data from Prince Sultan Military Medical City in Riyadh, Saudi Arabia, was retrospectively retrieved from the laboratory information system and organized in an Excel sheet. Following the addition of a cytotechnologist, all Pap smears were rescreened, with 100% of the reports being conducted by pathologists. Statistical Package for the Social Sciences (SPSS) version 27 was used for data management and statistical analysis. Descriptive statistics was used to summarize the pap smear data. Inferential statistics such as Chi-square and linear regression was used to assess the relationship between variables.

Ethical Consideration

Institutional Review Board (IRB) approval was attained from Prince Sultan Military Medical City in Riyadh, Saudi Arabia. The study guaranteed the confidentiality and privacy of the data, ensuring that all patient medical information was kept strictly confidential. No identifiable information was disclosed. Patients were not asked for consent since the data were obtained from their medical records, posing minimal risk to them.

RESULTS

Between 2012 and 2021, a total of 27,319 pap smears were examined at Prince Sultan Military Medical City. Out of the screened pap smears, 2.93% (801) were classified as abnormal, with 3.18% (869) been considered unsatisfactory (UNSAT) for diagnostic. Table 1 shows the percentage distribution of evaluated pap smears using Liquid-based cytology method. Only 0.22% positive results for Adenocarcinoma (ADCA), and Squamous cell carcinoma (SQCCA).

Table 1: Descriptive statistics of abnormal Pap smears using Liquid-based cytology method from 202-2021.

Gynecologic Cytology Diagnoses	2012 - 2021	
	n	%
Total pap smears	27319	-
UNSAT	869	3.18%
ASCUS	243	0.98%
AGC	288	1.05%
LSIL	123	0.45%
Abnormal Pap smears (APS)	ASC-H	43 0.16%
	HSIL	43 0.16%
	POSTIVE (ADCA & SQCCA)	61 0.22%
TOTAL APS	801	2.93%
ASC/SIL RATIO	1.72	-

UNSAT: Unsatisfactory for diagnostic evaluation, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cells, LSIL: Low grade squamous intraepithelial lesion, ASC-H: Atypical squamous cells of undetermined significance – cannot exclude a high-grade intraepithelial lesion, HSIL: High grade squamous intraepithelial lesion, ADCA: Adenocarcinoma, SQCCA: Squamous cell carcinoma, APS: Abnormal pap smear, POS: Positive, NEG: Negative.

Table 2 represents frequency comparison for prevalence of abnormal pap smears, and ASC/SIL ratio between our study and previous works. We recorded a ratio 1.72 with 2.97% prevalence in abnormal pap smears.

Table 2: Statistical comparison for prevalence of abnormal pap smears, and ASC/SIL ratio between our study and previous works.

Published study	Years covered	Number of Pap smears	Prevalence of abnormal Pap smears	ASC/SIL ratio
Mufti& Altaf ⁸	2000–2012	15,805	14.52%	2.57
Al-Kadri <i>et al.</i> ⁹	2008–2011	19,650	4.28%	2.26
Nasser <i>et al.</i> ¹⁰	2006–2016	19,759	1.97%	2.19
Andijany <i>et al.</i> ¹¹	2010–2022 including LBC	14,376	3.05%	2.61
This study	2012–2021	27,525	2.97%	1.72

ASC: Atypical squamous cell, SIL: Squamous intraepithelial lesions

Table 3. Summarize the descriptive statistics for gynecologic cytology diagnoses for the evaluated pap smears. The statistics show that many Pap smear results were negative, ranging from 89.8% in 2019 to 97.16% in 2015, with a slight declining trend over the years. While the percentage of unsatisfactory Pap smear samples increased steadily from 0.49% in 2013 to 8% in 2019. This trend then reversed during the COVID-19 pandemic years, the unsatisfactory rate declined from the 2019 peak, dropping to 5.98% by 2022. The percentage of ASCUS results remained relatively stable, ranging from 0.44% in 2019 to 1.97% in 2021. The percentage of LSIL and ASC-H results remained low throughout the study period. The percentage of HSIL results was consistently low, varying from 0% in 2020 and 2021 to 0.31% in 2016.

Table 3: Descriptive statistics for Gynecologic Cytology Diagnoses Pap smears from 2012 - 2021

Catego- ries	2012	%	2013	%	2014	%	2015	%	2016	%	2017	%	2018	%	2019	%	2020	%	2021	%
NEG	3112	97.1	2941	96.8	3115	95.9	3047	97.16	1531	93.81	2119	91.1	3221	91.71	3255	89.8	916	90.2	2096	91.6
UNSAT	22	0.69	15	0.49	18	0.55	18	0.57	41	2.51	128	5.51	236	6.72	290	8	59	5.81	42	1.83
ASCUS	30	0.94	22	0.72	30	0.92	21	0.67	21	1.29	30	1.29	18	0.51	16	0.44	10	0.98	45	1.97
AGC	12	0.37	29	0.95	43	1.32	18	0.57	20	1.23	29	1.25	23	0.65	30	0.83	18	1.77	66	2.88
LSIL	16	0.5	17	0.56	17	0.52	11	0.35	6	0.37	4	0.17	7	0.20	23	0.63	4	0.39	18	0.79
ASC-H	0	0	2	0.07	5	0.15	6	0.19	3	0.18	10	0.43	1	0.03	3	0.08	5	0.49	8	0.35
HSIL	8	0.25	3	0.1	3	0.09	7	0.22	5	0.31	5	0.22	4	0.11	2	0.06	0	0	6	0.26
POS	4	0.12	9	0.3	16	0.49	8	0.26	5	0.31	0	0	2	0.06	5	0.14	4	0.39	8	0.35
TOTAL	3204	100	3038	100	3247	100	3136	100	1632	100	2325	100	3512	100	3624	100	1016	100	2289	100

UNSAT: Unsatisfactory for diagnostic evaluation, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cells, LSIL: Low grade squamous intraepithelial lesion, ASC-H: Atypical squamous cells of undetermined significance – cannot exclude a high-grade intraepithelial lesion, HSIL: High grade squamous intraepithelial lesion, ADCA: Adenocarcinoma, SQCCA: Squamous cell carcinoma, APS: Abnormal pap smear, POS: Positive, NEG: Negative.

DISCUSSION

In our current study, we recorded 2.97% frequency of abnormal pap smears occurrence at Prince Sultan Military Medical City between 2012 and 2021. This frequency is extremely lower compared to that of Mufti & Altaf ⁸ who reported 14.52% frequency. But our records are relatively lower than those reported by Al-Kadri *et al.* ⁹ and Andijany *et al.* ¹⁰ who reported 4.28% and 3.05%, respectively. However, our results are slightly similar to the 1.97% reported by Nasser *et al.* ¹¹

The significantly high data reported by Mufti & Altaf ⁸ compared to ours is likely due to difference in geographical factors and screening sensitivity which must have drastically

raised the record in abnormal Pap smears. It is primordial to design a uniform screening protocols across all tertiary health care facilities across the Kingdom of Saudi Arabia. Additionally, these differences in findings could affect frequencies of abnormal pap smears due to varied interpretations. While the slightly high data recorded by Al-Kadri *et al.* ⁹ and Andijany *et al.* ¹⁰ could be associated with differences in cohort population being screened with different types of methods.

Pap smears are among the diagnostic techniques used in Saudi Arabia for the early detection of cervical cancers.^{12,13} Riyadh is the study setting for both our work and that of Nasser *et al.* ¹³ which explains the relatively similar frequen-

cies reported. Because these two data reflect the similarity in the population dynamics of Riyadh and probably the consistency in the early detection methods for cervical cancers.¹⁴

The cumulatively high frequency (1.06%) of atypical glandular cells (AGC) observed in this present study suggest significant genital tract pathologies and other infections linked with the extra genital structures. Studies have proven that, for cervical cytology samples, the glandular cell abnormalities are estimated between 0.1% and 2.1%.^{15,16} It has also been demonstrated that females between 40-69 years old are prone to these abnormalities in the AGC.^{17,18,19,20} Additionally, nearly 1% of the evaluated pap smears were atypical squamous cells of undetermined significance (ASCUS). Although it is clinically known that the cytological reports on the medical importance of ASCUS are linked with the squamous intraepithelial lesions (SIL).^{21,22} This means that nearly 1% of the patients in our study are prone to develop Adenocarcinoma (ADCA), or Squamous cell carcinoma (SQCCA). Although, studies have proven that nearly 10-20% of ASCUS patients have cervical intraepithelial neoplasia (CIN) at certain levels,^{23,24} 1% of these women could be carrying a more aggressive Human Papillomavirus (HPV), therefore, have a higher risk of developing cervical cancer. Considering the imbalanced ASC/SIL ratio, we could affirm that unclear borderline results were mostly diagnosed than the normal lesions suggesting ambiguity in the screening process and uncertainty in the medical report of patients.

However, the percentage of atypical glandular cells (AGC) results fluctuated between 0.37% and 0.65% respectively in 2012 and 2018, suggesting potential changes in the prevalence of glandular abnormalities. We observed a relatively stable frequency in AGC, 0.83% in 2019, and a significant raised up to 1.77% in 2020. This is probably due the reduction in case number, and healthcare disruption. According to reports, by March 2020, HPV vaccine consumptions dropped by >70% at early Covid-19 stage.²⁵ The effects of the pandemic were mainly the delayed diagnosis and treatments as result of decrease in the number of screening appointments and diagnostic procedures.²⁶

In 2021, AGC frequency of occurrence increased to 2.88%, from 1.77% in 2020. This drastic spike, and extremely higher than the pre-pandemic era could be explained by the Covid-19 pandemic effects on existing healthcare facilities, protocols and strategies, especially cervical cancer screening and treatment programs.

Also, the introduction of new HPV detection techniques such as the Liquid-based cytology has minimized the abnormalities in diagnostics.

Our study explored and assessed the prevalence of abnormal pap smears, along with an evaluation of the quality metrics associated with Pap smear screening using medical test result

sheets from the Prince Sultan Military Medical City in Riyadh, Saudi Arabia. One limitation of this study is that it relied on data obtained from Prince Sultan Military Medical City in Riyadh, which may not fully represent the Pap smear abnormalities burden across the entire country. However, this study has a large sample size, which enhances the generalizability of the finding within the context of Riyadh city. Nevertheless, observed a fluctuating, relatively stable and a decreasing frequency of atypical glandular cells, respectively before the onset, during, and after the Covid-19 pandemic. We believe these variations in frequencies are due to different factors. Perhaps, we suggest that the health authorities of the Kingdom of Saudi Arabia should design screening protocols for cervical cancer using pap smears and other advanced methods. The government should also implement nationwide training and certification programs for healthcare professional, especially laboratory technicians and technologists.

CONCLUSION

The findings of this study are expected to significantly enhance the understanding of the application of pap smears and shed light on the local burden of cervical cancer in Saudi Arabia. By examining the data and analyzing the results, this study aims to assess the prevalence of abnormal pap smears, along with an evaluation of the quality metrics associated with Pap smear screening at Prince Sultan Military Medical City in Riyadh, Saudi Arabia. The outcomes of this study will contribute to improving healthcare strategies, raising awareness, and facilitating early detection and intervention measures for cervical cancer in Saudi Arabia. Ultimately, this research has the potential to positively impact public health policies, medical practices, and the overall well-being of women in the country.

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Authors' Contribution:

A.B.A.: Conceptualization, study design, data collection and supervision.

L.B.A.: Literature review, data curation and drafting the manuscript.

R.A.O.A.: Data analysis, interpretation of results, and assistance with manuscript writing.

A.A.A.: Assistance with data analysis.

F.Z.A.: Critical revision of the manuscript, and approval of the final version for submission.

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