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Research Article

Prevalence of abnormal pap smears in the western region of Saudi Arabia from 2010 to 2022

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ABSTRACT

Objectives: The objectives of the study were to assess the prevalence of abnormal Pap smears and their quality metrics in a tertiary health-care facility in the western region of Saudi Arabia and to share our data with other researchers in Saudi Arabia to potentially establish benchmark data based on a Saudi population.

Material and Methods: A retrospective study was carried out by the Department of Pathology at King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia, on Pap smear statistics for 14,376 Pap smears of both conventional and liquid-based cytology (LBC) between 2010 and 2022.

Results: The prevalence of abnormal Pap smears of both conventional and LBC was 3.05% (438 Pap smears). The percentages of adenocarcinoma and squamous cell carcinoma were 0.08% and 0.02%, respectively, and the ratio of atypical squamous cells (ASCs) to squamous intraepithelial lesions (SILs) (ASC/SIL) was 2.61.

Conclusion: The prevalence of abnormal Pap smears and the ASC/SIL ratio were consistent with the international benchmark data provided by the College of American Pathologists for each preparation type and within the range of the data provided by published studies, highlighting the need for greater focus on glandular abnormalities.

Keywords: Prevalence, Pap smears, Saudi Arabia, Gynecology, Cytopathology

INTRODUCTION

Cervical cancer (CC) is one of the three most common cancers that affect women globally. The two most common subtypes are squamous cell carcinoma (SQCCA), constituting most of the cases, and adenocarcinoma (ADCA). Fortunately, in Saudi Arabia, which follows strict conservative religious restrictions regarding sexual behaviors, CC has a very low incidence, with 358 diagnosed cases and 179 deaths annually.[1,2] When diagnosed at an early stage, CC is curable by various methods,[3] and Pap smear screening is considered a valuable tool, along with human papillomavirus (HPV) cotesting, in detecting precancerous and cancerous lesions and reducing the CC incidence rate and mortality.[4]

In cytology, the method of communicating Pap smear interpretations to clinicians is very important for patient follow-up and management plans, and the best method is using The Bethesda System for Reporting Cervical Cytology (TBSRCC).[5] The TBSRCC was last updated in 2014, and it categorizes the results into the following categories: (i) Negative for intraepithelial lesion or malignancy;

(ii) other, for endometrial cells of >45-year-old women (with specification of whether it is negative for squamous intraepithelial lesion [SIL]); (iii) epithelial cell abnormality (ECA); and (iv) other malignant neoplasm. ECA is further classified into the following categories: Atypical squamous cells of undetermined significance (ASC-US), atypical squamous cells that cannot exclude HSIL (ASC-H), low-grade SIL (LSIL), high-grade SIL (HSIL), SQCCA, atypical glandular cells (AGCs), and adenocarcinoma *in situ* (AIS) and ADCA.[6,7]

There are numerous metrics for quality assurance in cytology laboratories that are required by certification and/or accreditation bodies. One method is to compare the percentages of each Pap smear category with benchmark data and provide an explanation of any outlier and calculate the ASC to SIL (ASC/SIL) ratio.[8,9] In this paper, we will share our data from a tertiary health-care facility in the western region of Saudi Arabia with other researchers in this field to potentially establish benchmark data based on a Saudi population.

MATERIAL AND METHODS

Pap smear data at King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia, were collected from the laboratory information system for the period between 2010 and 2022. All Pap smears were reported by pathologists. Even after a cytotechnologist joined the facility in May 2019, 100% of Pap smears were rescreened and reported by pathologists. Using an Excel sheet, we distributed the data according to the designated year and then to its designated category. The total number and prevalence of abnormal Pap smears were ASCUS or higher were calculated. The ASC/SIL ratio was calculated as follows: ASC/SIL ratio = (ASC-US + ASC-H)/(LSIL + HSIL + ADCA + SQCCA). The prevalence of abnormal Pap smears and the ASC/SIL ratio were compared to the College of American Pathologists (CAP) benchmark data and published studies in Saudi Arabia.

RESULTS

Out of 14376 of pap smears, 11241 were conventional while 3135 were as LBC between 2019 – 2022 only [Table 1]. The ASC/SIL ratio and the prevalence of abnormal pap smears in our study were compared to published studies in Saudi Arabia covering the same period [Table 2].

DISCUSSION

Our institute shifted to liquid-based cytology (LBC) in late 2019, as it was proven to reduce the rate of unsatisfactory results.[10-12] However, our unsatisfactory rate remained high due to the intermittent supply of re-preparation reagents. The scope of the high unsatisfactory rate and cytologic-histologic correlations will be the focus of our next published studies. LBC also allows for the molecular testing of HPV from the same vial, as long as approximately 2 mL of sample is sent for molecular biology first (to avoid contamination), and then routine LBC preparation is carried out.[13,14] For laboratories accredited by CAP, the cytopathology checklist provides benchmarking data for

Table 1: Numbers and percentages of abnormal Pap smears from 2010–2022.

Category		Conv. + LBC 2010–2022		Conv. only 2010–2022		LBC only 2019–2022	
		n	%	*n*	%	*n*	%
Total Pap smears		14376	-	11241	-	3135	-
	Unsatisfactory	1040	7.23	793	7.05	247	7.88
Abnormal Pap smears	ASCUS	207	1.44	64	0.57	143	4.56
	AGC	124	0.86	93	0.83	31	0.99
	LSIL	38	0.26	21	0.19	17	0.54
	ASC-H	20	0.14	12	0.11	8	0.26
	HSIL	35	0.24	13	0.12	22	0.70
	ADCA	11	0.08	8	0.07	3	0.10
	SQCCA	3	0.02	3	0.03	0	0.00
	TOTAL APS	438	3.05	214	1.90	224	7.15
	ASC/SIL RATIO (AGC EXCLUDED)	2.61		1.69		3.60	

Conv.: Conventional method, LBC: Liquid-based cytology, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cell, LSIL: Low-grade squamous intraepithelial lesion, ASC-H: Atypical squamous cells that cannot exclude HSIL, HSIL: High-grade squamous intraepithelial lesion, ADCA: Adenocarcinoma, SQCCA: Squamous cell carcinoma, APS: Abnormal Pap smear

Table 2: Comparison of the number of Pap smears, prevalence of abnormal Pap smears, and ASC/SIL ratio between our study and published articles.

Published study	Years covered	Number of Pap smears	Prevalence of abnormal Pap smears	ASC/SIL ratio
Mufti and Altaf, 2014	2000–2012	15805	14.52%	2.57
Al-Kadri *et al*., 2015	2008–2011	19650	4.28%	2.26
Nasser *et al*., 2017	2006–2016	19759	1.97%	2.19
Our study (this paper)	2010–2022 including LBC	14376	3.05%	2.61

ASC/SIL: Atypical squamous cell/squamous intraepithelial lesion, LBC: Liquid-based cytology

the acceptable reporting-percentile rate (RPR) for each category and ASC/SIL ratio for each preparation type.[9] Our data, percentages and ASC/SIL ratios, as shown in [Table 1], were within the 5–95th RPR; due to copyright, we cannot share the CAP's RPR in our study. Remarkably, in our study, LBC detected more abnormalities than the conventional method, except for SQCCA, which was not detected by LBC. The rate of adenocarcinomas was higher than that of SQCCAs (0.08% and 0.02%, respectively). This finding concurs with the findings of Al-Kadri *et al*., 2015 and Nasser *et al*., 2017, where n = 19,650 and 19,759, respectively, highlighting the need for greater focus on glandular abnormalities.[15,16] As shown in [Table 2], the prevalence of abnormal Pap smears in our study was 3.05% (conventional and LBC methods); in Saudi Arabia, the prevalence rate was 14.52% in a single study due to a high rate of ASCUS, which was within the range according to their ASC/SIL ratio.[17] For detailed statistical data, see Appendix 1 and 2.

SUMMARY

The prevalence of abnormal pap smears and the ASC/SIL ratio was within the ranges of the CAP benchmark data and published studies, highlighting the need for greater focus on glandular abnormalities.

COMPETING INTEREST STATEMENT BY ALL AUTHORS

The authors declare that they have no competing interest.

AUTHORSHIP STATEMENT BY ALL AUTHORS

All authors follow the 4 criteria in ICMJE guidelines. All authors (AA, DA, RF, AA, RA, EBA and WF) contributed equally in the design of the research study, performed the research, provided help in the acquisition, analysis and interpretation of the statistical data, drafting, revising and approval of the manuscript. All authors contributed to editorial changes in the manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work. All authors read and approved the final manuscript.

AVAILABILITY OF DATA AND MATERIALS

All data points generated or analyzed during this study are included in this article and there are no further underlying data necessary to reproduce the results.

ETHICS STATEMENT BY ALL AUTHORS

The Research Ethics Committee of King Fahd Armed Forces Hospital-Jeddah reviewed and approved this study (REC560).

LIST OF ABBREVIATIONS (In alphabetic order)

ADCA - Adenocarcinoma
AGC - Atypical glandular cell
AIS - Adenocarcinoma in situ
APS - Abnormal Pap smear.
ASC/SIL - Atypical squamous cell/squamous intraepithelial lesion
ASC-H - Atypical squamous cells that cannot exclude HSIL
ASCUS - Atypical squamous cells of undetermined significance
CAP - College of American Pathologists
CC - Cervical cancer
Conv - Conventional method
ECA - Epithelial cell abnormality
HPV - Human papillomavirus
HSIL - High-grade squamous intraepithelial lesion
LBC - Liquid-based cytology
LIS - Laboratory information system
LSIL - Low-grade squamous intraepithelial lesion
NILM - Negative for intraepithelial lesion or malignancy
SQCCA - Squamous cell carcinoma
TBSRCC - The Bethesda system for reporting cervical cytology

EDITORIAL/PEER REVIEW STATEMENT

To ensure the integrity and highest quality of CytoJournal publications, the review process of this manuscript was

conducted under a **double-blind model** (authors are blinded for reviewers and *vice versa*) through the automatic online system.

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APPENDIX

Appendix 1: Statistical data for Pap smears from 2010 to 2018.

Categories	2010 CONV	%	2011 CONV	%	2012 CONV	%	2013 CONV	%	2014 CONV	%	2015 CONV	%	2016 CONV	%	2017 CONV	%	2018 CONV	%
NILM	1095	95.47	1224	93.65	968	92.19	1022	94.45	909	91.27	858	87.91	990	88.24	1061	92.02	1119	90.02
UNSAT	44	3.84	73	5.59	70	6.67	54	4.99	68	6.83	101	10.35	102	9.09	65	5.64	101	8.13
ASCUS	1	0.09	4	0.31	4	0.38	0	0.00	4	0.40	4	0.41	10	0.89	11	0.95	5	0.40
AGC	1	0.09	1	0.08	6	0.57	4	0.37	6	0.60	6	0.61	15	1.34	10	0.87	18	1.45
LSIL	3	0.26	3	0.23	1	0.10	2	0.18	1	0.10	2	0.20	1	0.09	2	0.17	0	0.00
ASC-H	0	0.00	0	0.00	0	0.00	0	0.00	3	0.30	2	0.20	3	0.27	0	0.00	0	0.00
HSIL	1	0.09	0	0.00	0	0.00	0	0.00	3	0.30	1	0.10	1	0.09	3	0.26	0	0.00
ADCA	1	0.09	2	0.15	0	0.00	0	0.00	1	0.10	2	0.20	0	0.00	1	0.09	0	0.00
SQCCA	1	0.09	0	0.00	1	0.10	0	0.00	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	1147	100	1307	100	1050	100	1082	100	996	100	976	100	1122	100	1153	100	1243	100

CONV: Conventional method, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cell, LSIL: Low-grade squamous intraepithelial lesion, ASC-H: Atypical squamous cells that cannot exclude HSIL, HSIL: High-grade squamous intraepithelial lesion, ADCA: Adenocarcinoma, SQCCA: Squamous cell carcinoma

Appendix 2: Statistical data for Pap smears from 2019 to 2022.

Categories	2019 CONV	%	2019 LBC	%	2020 CONV	%	2020 LBC	%	2021 CONV	%	2021 LBC	%	2022 CONV	%	2022 LBC	%
NILM	940	86.56	154	88.51	27	79.41	410	82.00	9	60.00	730	86.39	12	40.00	1370	84.78
UNSAT	87	8.01	13	7.47	4	11.76	36	7.20	6	40.00	61	7.22	18	60.00	137	8.48
ASCUS	19	1.75	5	2.87	2	5.88	27	5.40	0	0.00	37	4.38	0	0.00	74	4.58
AGC	25	2.30	2	1.15	1	2.94	14	2.80	0	0.00	2	0.24	0	0.00	13	0.80
LSIL	6	0.55	0	0.00	0	0.00	3	0.60	0	0.00	0	0.00	0	0.00	14	0.87
ASC-H	4	0.37	0	0.00	0	0.00	4	0.80	0	0.00	0	0.00	0	0.00	4	0.25
HSIL	4	0.37	0	0.00	0	0.00	5	1.00	0	0.00	15	1.78	0	0.00	2	0.12
ADCA	1	0.09	0	0.00	0	0.00	1	0.20	0	0.00	0	0.00	0	0.00	2	0.12
SQCCA	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.0+0
TOTAL	1086	100	174	100	34	100	500	100	15	100	845	100	30	100	1616	100

CONV: Conventional method, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cell, LSIL: Low-grade squamous intraepithelial lesion, ASC-H: Atypical squamous cells that cannot exclude HSIL, HSIL: High-grade squamous intraepithelial lesion, ADCA: Adenocarcinoma, SQCCA: Squamous cell carcinoma

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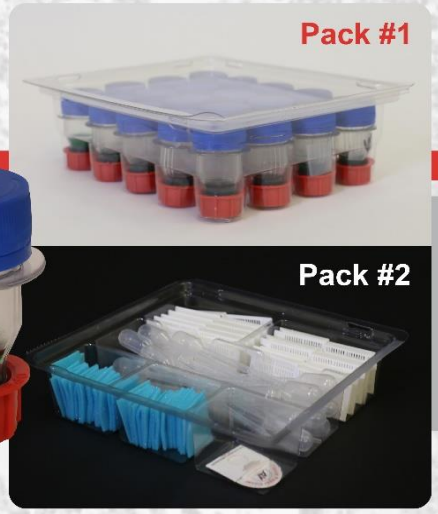

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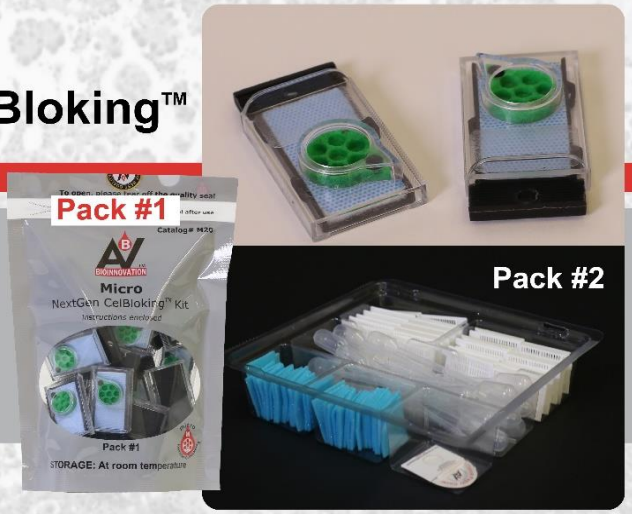

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