Original Resear	Volume -10 Issue - 5 May - 2020 PRINT ISSN No. 2249 - 555X DOI : 10.36106/ijar Pathology COMPARISON OF CONVENTIONAL PAP SMEAR AND LIQUID BASED CYTOLOGY FOR CERVICAL CANCER SCREENING AND ITS CORRELATION WITH BIOPSY
Dr. Saranya. B*	Assistant Professor, Department of Pathology, Vinayaka Missions Kirupanandha Variyar Medical College and Hospitals, Vinayaka Missions Research Foundation – (Deemed to be University), Salem, Tamilnadu - 636308. *Corresponding Author
Dr. C. Mythily	Assistant Professor, Department of pathology, Thanjavur medical college, Thanjavur.

ABSTRACT Introduction: Cervical carcinoma is the fourth most common malignancy worldwide and fourth most common cause of deaths due to cancer worldwide which makes it an important public health problem. The cellular changes in cervix and intraepithelial lesions can be detected many years before the patients present with frank invasive carcinoma. So, cervical screening programs were introduced worldwide. For many years, Conventional PAP smears were used for screening. Though it led to drastic reduction in number of cervical carcinoma cases, it had high false negativity. So, newer methods like Liquid based cytology were introduced. This study was undertaken to compare Liquid based cytology with Conventional PAP smear and to correlate the results with biopsy obtained from the same patient.

Materials and methods: This study was done on randomly selected 100 patients attending the Pilot screening project at Department of Obstetrics and Gynaecology, Thanjavur medical college, Thanjavur and their personal details like age, puberty age, number of children and their presenting complaints were obtained. The sample for Conventional PAP smear was taken using Ayre's spatula and slides were prepared. Sample for Liquid based Cytology was taken using the Cytobrush and the sample was rinsed in the fixative provided by the manufacturer. The sample was then centrifuged and slides were prepared. Both the slides were then stained using the Rapid PAP stain. Colposcopy was done and biopsy was taken from the suspicious area which was then processed and stained by Haematoxylin and Eosin. The slides were analysed and the following results were obtained.

Results: Most of the patients who attended the screening program were in the fourth decade of life. Most of the cases with dysplasia (26%) were in the age group of 21 – 40 years. Most of the cases were in the Socio economic Class II of the Modified Prasad's classification. Dysplasia was found more in the Socio economic class III (12% of cases). 90% of cases started sexual activity before 25 years of age and out of these 90 patients, 92.3% had dysplasia. Dysplasia was more in patients with parity 3 (14% of cases). 46% of cases presented with white discharge per vaginum. Cytological abnormality was found in 28 cases (28%) by LBC, whereas conventional Pap smear detected abnormality in only 22 cases (22%). 96 cases (96 %) were satisfactory for evaluation in LBC and 92 cases (92%) in conventional Pap smear. ASC was found in 12% of cases in Conventional PAP whereas it was detected in only 6% of cases in LBC. LSIL and HSIL were found in 8% and 2% of cases in conventional PAP smear whereas it was found in 12% and 8% of cases in LBC. No carcinoma was found in Conventional PAP smear whereas 2% of cases had carcinoma features in LBC. Sensitivity and specificity of PAP smear in detecting LSIL was 40% and 93% whereas for HSIL it 50% and 100%. Sensitivity and specificity of LBC in detecting LSIL is 66% and 94% whereas for HSIL it was 100% and 96%. Overall sensitivity and specificity of romoventional PAP smear is 55.5% and 83.7% whereas for LBC it is 83% and 86.5% respectively. Statistically, LBC and histopathology was highly correlated (r=0.617) whereas only medium level of correlation was found for Conventional PAP smear (r=0.4651)

Conclusion: Liquid based cytology is strongly advocated in the best interest of public health especially in countries like India where more number of people are in the lower socioeconomic status category, it improves the sample quality and reduces the likelihood of false negative results and hence improving the efficacy of the screening programs and thereby reducing the incidence of cervical cancer.

KEYWORDS: Liquid based cytology, conventional Pap smear, cytology.

INTRODUCTION:

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Cervical carcinoma is the fourth most common malignancy worldwide and fourth most common cause of deaths due to cancer worldwide which makes it an important public health problem¹. The cellular changes in cervix and intraepithelial lesions can be detected many years before the patients present with frank invasive carcinoma². So, cervical screening programs were introduced worldwide.

The introduction of Papanicoloau stain by Papanicoloau and Traut made it possible ³. Cervical cancer screening was done using the conventional scrape smears stained by papanicoloau stain. This led to drastic reduction in the incidence of invasive cervical carcinoma⁴. But CP smears had high false negative rates. It was due to preparation (sampling) errors, presence of blood or mucus (obscuring) material, screening and interpretation errors⁵.

In the last 15 years, several cytological techniques were developed to improve PAP smear sensitivity. Liquid based cytology was the most important development and accepted method. The advantages include removal of obscuring cells, mucus and blood, reduction of unsatisfactory smears and inadequate smears, reduction in reading time ⁶, provision of cells for detection of HPV, presence of residual sample for performing ancillary techniques such as immunocytochemistry. LBC gives standardized slides containing a monolayer of well stained well preserved cells which is easier to interpret than the conventional smears⁷.

So, the aim of this study is to compare the results of conventional PAP smear and liquid based preparation and to correlate the results with the

histopathological findings obtained from the biopsy.

MATERIALS AND METHODS:

This prospective study was conducted in the Department of Pathology, Thanjavur medical college, Thanjavur. In our study, we proposed to compare Conventional PAP with the new method Liquid based cytology and to compare the results with the histopathological examination of the biopsy from the same patient.

The study was conducted on 100 patients selected randomly from patients coming for pilot screening project to the department of Obstetrics and Gynaecology, Thanjavur medical college.

Exclusion criteria:

- Non co-operative patients.
- Patients who do not give consent.
- Patients with massive bleeding per vaginum.
- Pregnant women.
- Treated cervical carcinoma cases.

After obtaining proper consent, proforma was given to each patient and detailed history was obtained. After that, physical examination was done and the patient was put in lithotomy position for specimen collection.

For obtaining the specimens, first for Conventional PAP, Ayer's spatula was inserted into the cervix and gently rotated at 360 degree. Then, sample was smeared onto a grease free slide and fixed in alcohol. After fixation, smear was stained with the PAP stain.

For Liquid based cytology, endocervical brush issued by the manufacturer was inserted into the endocervical canal and rotated 360 degrees 3-4 times. Then, the brush is detached and placed into a vial containing fixative issued by the manufacturer for transport. The vial is closed and shaken to obtain a homogenous mixing. The vial is taken to the lab where it is again shaken with the vortex to obtain a homogenous mixture. After agitation, centrifugal chambers are prepared by placing the slide onto the support; the chamber is then placed onto the slide and tightened. Into the centrifugal chamber, 2ml of the separator solution given by the manufacturer and 5ml of the sample is placed and fixed into a rotor and then centrifuged at the rate of 2100rpm/min for 10minutes. After centrifugation, liquid is thrown into a container containing disinfectant. Some drops of alcohol (100%) are poured along the inner side of cytochamber. The chamber is then turned onto a absorbant paper and drained. Then all the parts are disassembled and slides are dried before staining.

After VIA/VILI, biopsy was taken from the doubtful areas.

Method of Staining:

PAP smear after fixation in alcohol and LBC smears are taken for staining with PAP stain (rapid)

The biopsy specimen obtained was submitted in toto for routine histopathologic processing. The tissue sections were stained with Haematoxylin and Eosin

The PAP smears and the LBC slides were examined and recent 2001 Bethesda system of classification were used for reporting.

Both the reports were correlated with the histopahological report of the biopsy which is considered the gold standard.

OBSERVATION AND RESULTS:

Most of the cases who attended the screening programme were in the fourth decade of life (50 cases, 50%) followed by 32 cases (32%) in the fifth decade. Minimum age of the patient screened was 25 years of age and the maximum age was 67 years. About 61.5% of cases who was diagnosed with LSIL and HSIL were in the age group of 21 - 40 years. Age wise distributions of cases are shown in table 1.

Age	Total	Normal	Abnormal	LSIL	HSIL	Carcinoma
25-30	12	10	2	2	-	-
31-35	24	16	8	3	2	3
36-40	26	20	6	3	2	1
41-45	20	14	6	4	2	-
46-50	12	12	-	-	-	-
51-55	2	1	1	-	-	1
56-60	1	-	1	-	-	1
>60	3	1	2	-	-	2
TOTAL	100	74	26			

Out of 100 cases, 36 cases (36%) of cases belonged to class II of modified Prasad's classification⁸ followed by 24 cases (24%) of cases in class III. Out of 26 cases with dysplasia/carcinoma, 12 cases (46.1%) of cases belonged to class III (Table 2).

TABLE 2: Case distribution according to socio-economic status (Modified Prasad's classification)⁸

Class(rupees)	Total no. of cases	Normal cases	Abnormal cases
I(5571 & above)	10	10	-
II(2786 – 5570)	36	28	8
III(1671-2785)	24	12	12
IV(836-1670)	12	10	2
V(Below 836)	18	14	4
Total	100	74	26

90 cases (90%) started sexual activity before 25 years of age and out of these 90 patients,92.3% had dysplasia but out of the remaining 10 cases, only 2 cases(2% of total number of cases) showed dysplasia (Table 3).

Table 3: Case distribution according to the onset of sexual activity:				
Age	Total number of % of patients with			
	cases	dysplasia		
<25 years	90	92.3% of 90 cases		
>25 years	10	2% of 100 cases		

In this study, about 46 cases (46%) had 2 children and 34 cases (34%) had 3 children. Most of the cases with dysplasia were seen when patients had 3 children (14 cases, 53.8% of the abnormal smears)(Table 4).

Table 4: Case distribution according to parity:

Gravida	Total number of cases	Number of cases with dysplasia
Nulligravida	6	2(2%)
1	8	-
2	46	7(7%)
3	34	14(14%)
>3	6	3(3%)

Most common presenting complaint was white discharge per vaginum (46 cases, 46%), followed by lower abdominal pain (26 cases, 26%) and bleeding per vaginum (16 cases, 16%). Other minor complaints were dysfunctional uterine bleeding (4 cases, 4%), itching (4 cases, 4%), difficulty in micturition (2 cases, 2%), post coital bleeding (2 cases, 2%)(Table 5).

Table 5: Case distribution according to the presenting complaints:

Complaints	Number of cases
White discharge P/V	46 cases (46%)
Lower abdominal pain	26 cases (26%)
Bleeding P/V	16 cases (16%)
Dysfunctional uterine bleeding	4 cases (4%)
Dfficulty in micturition	2 cases (2%)
Post coital bleeding	2 cases (2%)

Out of the 50 cases studied, conventional PAP smear detected abnormality in 22 cases (22%) whereas LBC detected abnormality in 28 cases (28%) of cases.(Table 6)

Table 6: Number of abnormal cases

Study	Abnormal cases
Conventional PAP	22(22%)
LBC	28(28%)

Out of the 100 cases, 92 cases (92%) were satisfactory for evaluation in conventional PAP smear whereas 96 cases (96%) were satisfactory in LBC. About 60 cases (60%) in conventional PAP smear and 12 cases (12%) were satisfactory but limited by factors such as blood and inflammatory cells, air drying. 8 cases (8%) in conventional PAP and 4 cases (4%) in LBC were unsatisfactory. The most common cause for unsatisfactories in conventional PAP smear is thick smear and reduced cell number in LBC (Table 7).

TABLE 7: comparison of PAP and LBC results

Category	PAP (number)	PAP (%)	LBC (number)	LBC (%)
Unsatisfactory	8	8%	4	4%
Normal	70	70%	68	68%
ASC	12	12%	6	6%
LSIL	8	8%	12	12%
HSIL	2	2%	8	8%
Carcinoma	-	-	2	2%
Total	100	100%	100	100%

A comparative study between the findings of conventional PAP smear and the biopsy results were made. Out of 100 cases 92 cases were satisfactory for evaluation. Out of the 92 cases, 70 cases were found to be normal. Out of the 70 normal cases in PAP, 62 cases had normal histology in the biopsy obtained, 6 cases had LSIL changes and 2 cases had HSIL change histopathologically. Atypical squamous cells(ASC) were found in 12 cases in PAP. Out of 12 ASC cases in PAP,8 had normal histology,2 cases each had LSIL change and HSIL change in biopsy. 8 cases had LSIL features in conventional PAP smear. Out of these 8 cases,4 cases had normal histology and 2 case had LSIL features and carcinoma was found in 2 cases histopathologically. 2 cases showed HSIL features in PAP which turned out to be carcinoma histopathologcally. (Table 8)

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 TABLE 8: Comparison of conventional PAP and histopathology results:

HPE	PAP	Normal	LSIL	HSIL	Carcinoma
PAP	results				
Unsatisfactory	8	-	2	2	4
Normal	70	62	6	2	-
ASC	12	8	2	2	-
LSIL	8	4	2	-	2
HSIL	2	-	-	-	2
Carcinoma	-	-	-	-	-
Total	100	74	12	6	8

Similarly, comparative study was also found between LBC and biopsy results. 96 cases were found to be satisfactory for evaluation. Out of the 96 cases, 68 cases were found to be normal. Out of the 68 normal cases, 64 cases also had normal histology on biopsy, 4 cases had LSIL features. 6 cases had atypical squamous cells in LBC, but out of these, 4 cases had normal histology and 2 cases had LSIL features on histopathology. 12 cases had LSIL features on LBC and out of the 12 cases, 4 cases had normal histology, 6 cases also had LSIL features and 2 cases had HSIL features in histopathology. 8 cases had HSIL features on LBC. Out of the 8 cases, 2 cases had normal histology, 4 cases had HSIL features and 2 cases had carcinoma. 2 cases which had carcinoma on LBC also had similar features in biopsy. (Table 9)

TABLE 9: Comparison of LBC and HPE results

HPE	LBC	Normal	LSIL	HSIL	Carcino
LBC	Results				ma
Unsatisfactory	2	-	-	-	2
Normal	34	32	2	-	-
ASC	3	2	1	-	-
LSIL	6	2	3	1	-
HSIL	4	1	-	2	1
Carcinoma	1	-	-	-	1
Total	50	37	6	3	4

Statistics

Sensitivity and specificity of PAP smear in detecting LSIL are 40% and 93% respectively. The sensitivity of PAP smear in detecting HSIL is 50% and Specificity of PAP smear in detecting HSIL is 100%. The sensitivity and specificity of LBC in detecting LSIL is 66% and 94% respectively. The sensitivity and specificity of LBC in detecting HSIL is 100% and 96% respectively. The sensitivity and specificity of LBC in detecting HSIL is 100% and 96% respectively. The sensitivity and 100% respectively.

Overall sensitivity and sensitivity of PAP smear is 55.5 % and 83.7% respectively.

Overall sensitivity and specificity of LBC is 83% and 86.5% respectively.

Statistical correlation

Controlling for Age Factor partial correlation co-efficient shows:

- The LBC Vs HPE (r = 0.617) High level of correlation
- LBC Vs Papsmear (R=0.59) Medium level of correlation
- Papsmear Vs HPE (r=0.4651) Medium level of correlation.







Figure 2: Unsatisfactory smear - conventional papanicoloau. Cells are obscured by blood and inflammatory cells



Figure 3: Unsatisfactory smear - liquid-based cytology. Only blood components found with no diagnostic cells



Figure 4: Satisfactory smears - conventional Papanicolaou. This slide shows approximately 100 cells. Entire side covered at this level of cellularity has 1000 cells



Figure 5: Satisfactory smears - liquid-based cytology. This slide has approximately 50 cells. Entire slide covered at this level of cellularity has 5000 cells. Few endocervical clusters found (arrow)



Figure 6: Atypical squamous cells - Papanicolaou. Superficial cells are seen with enlarged nuclei, slightly increased N/C ratio, regular nuclear contour with focal irregularity(arrow), dense, and orangeophilic cytoplasm



Figure 7: Atypical squamous cells - liquid-based cytology. Focal irregularity is shown by arrow



Figure 8: Low-grade squamous intraepithelial lesion (koilocytosis) - conventional Papanicolaou. Koilocytes are large

cells with sharply defined perinuclear cytoplasmic cavities surrounded by a dense rim of cytoplasm with enlarged nuclei and irregular nuclear membrane.



Figure 9: Low-grade squamous intraepithelial lesion (koilocytes) liquid-based cytology



Figure 10: LSIL(Koilocytes) – HPE



Figure 11: LSIL-Conventional PAP



Figure 12: LSIL-LBC INDIAN JOURNAL OF APPLIED RESEARCH

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Figure 13: LSIL-HPE



Figure 14: HSIL-Conventional PAP



Figure 15: HSIL-LBC



Figure 16: HSIL–HPE 60 INDIAN JOURNAL OF APPLIED RESEARCH



Figure 17: Squamous cell carcinoma – LBC



Figure 18: Squamous cell carcinoma – HPE



Figure 19: Poorly differentiated squamous cell carcinoma – LBC



Figure 20: Poorly differentiated squamous cell carcinoma – HPE

For more than 50 years, PAP smear remained the only modality for screening which had a high false positive rate. Due to this, liquid based cytology was developed. This study was done to compare both the methods.

100 patients were randomly selected from those attending the Pilot screening project conducted at the Department of Obstetrics and Gynaecology, Thanjavur medical college for the study and the samples were taken from all the cases and the results analysed.

Out of the 100 cases, 50 cases (50%) of cases were in the fourth decade of life and most of the LSIL and HSIL cases were in the 4th decade ,a finding similar to Sherwani RK et al.⁹, Richard et al.,¹⁰, Jie Zhu et al.,¹¹, Erdin ITLER et al.,¹², Dr. Shubhangi et al.,¹³, Macharid H.C et al.⁴¹, M.Almonte et al.,¹⁵. But studies by Ahmed Ibrahim¹⁶, Chinaka et al.¹⁷, and S.E Nigerio Justus et al.¹⁸, reported cases mostly in the 5th decade of life which in contrast to a study by Pragya Sharma et al.¹⁹, who reported most number of cases in the 3rd decade of life.Invasive cancer was diagnosed in 35 years of age in our study which was similar to that of Sherwani RK et al.⁹, but contrast to Parker et al.²⁰ who reported activity in this part of the country may be responsible for the early onset of invasive cancer. (Table 10)

Table 10: Studies showing their ages with maximum dysplasia

Studies	Decade with maximum dysplasia
This study	4 th decade
Sherwani RK et al. ⁹	4 th decade
Richard et al., ¹⁰	4 th decade
Jie Zhu et al, ¹¹	4 th decade
Erdin ITLER et al., ¹²	4 th decade
Dr. Shubhangi et al., ¹³	4 th decade
Macharid H.C et al., ¹⁴	4 th decade
M.Almonte et al., ¹⁵	4 th decade
Ahmed Ibrahim ¹⁶	5 th decade
Chinaka et al., ¹⁷	5 th decade
S.E Nigerio Justus et al., ¹⁸	5 th decade
Pragya Sharma et al., ¹⁹	3 rd decade
Parker et al. ²⁰	>70 years

About 46.1% of the abnormal smears belonged to class III socioeconomic status and most of the dysplasia cases were observed in this group which was similar to Sherwani RK et al.,⁹, Pragya Sharma¹⁹. Parker noted that lower socio economic status women had marriage at a younger age and child birth. Latest WHO report shows that 70% of cases are from the lower socio economic status due to lack of access to screening programs and late detection of diagnosis and treatment.¹. A thesis done by Ahmed Ibrahim¹⁶., showed that uneducated and unemployed from the lower socioeconomic status showed more dysplasia. Also S.E. Nigerio Justus et al.¹⁸, postulated that illiteracy, poverty, nonuse of screening methods and lack of communication after referral among lower socio economic status persons were responsible for the increased number of dysplasia among these persons.

Carcinoma and dysplasia were mostly diagnosed when the parity was 3 or more in this study (53.8% of abnormal smears) similar to Pragya Sharma¹⁹ and Dr.Shubanigi et al.,¹³. M.Almonte et al.,¹⁵ reported more incidence of dysplasia when the parity was four. Sherwani RK et al⁹ and Shankaranarayana et al ²¹ reported high incidence of dysplasia when the parity was more than five. Parker et al ²² showed four fold increase in incidence of dysplasia when the parity was seven or more similar to S.E Nigerio Justus et al.,¹⁸. Louise et al²³ found a 5 fold increase in risk of dysplasia when the parity was 14 or more. (Table 11)

Studies	Parity
This study	3
Pragya Sharma et al., ¹⁹	3
Dr.Shubhanigi et al., ¹³	3
M.Almonte et al., ¹⁵	4
Sherwani RK et al ⁹	5
Shankaranarayana et al ²¹	5
S.E.Nigerio Justus et l., ¹⁸	7
Parker et al ²²	7
Louise et al ²³	14

About 90%(90 cases) of cases in this study had onset of sexual activity before 25 years of age where majority of dysplasia was noted. Only 2 patients with the start of sexual activity above the age of 25 years had dysplasia. This finding was similar to Sherwani RK et al.,⁹ and Rotkin et al.,²⁴. Rotkin postulated that during intercourse, there is higher probability of transmission of infections and hence dysplasia is more common when there is early onset of sexual activity.²⁴ S.E Nigerio Justus et al., ¹⁸ and Pragya Sharma et al., ¹⁹ also postulated that early marriage and early onset of sexual activity were responsible for increased dysplasia.

Most of our cases complained of white discharge PV (46 cases,46%) followed by lower abdominal pain and bleeding PV(26 cases (26%) and 16 cases(16%) respectively). Sherwani et al⁹, Kenneth and Yao²⁵, S.E Nigerio Justus et al., ¹⁸, Pragya Sharma et al., ¹⁹ and Dr.Shubhanigi et al., ¹³ also had patients with similar complaints. Kenneth and Yao noted that white discharge was associated with neoplastic changes in cervix similar to our study where most of the dysplastic changes were in this subset of patients. In a study done by Robert ME et al., ²⁶ Post coital bleeding was noted in many patients and all these had dysplasia (66.7%) and carcinoma (33.3%). In contrast, only 2 cases in this study had this complaint and similar to Robert ME et al.²⁷ this patient had carcinoma. Study done by M.Tarney et al.,²⁷, also had more number of patients with complaints of post coital bleeding in contrast to our study. (Table 12)

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Studies	Most common complaint	
This study	White discharge P/V	
Sherwani et al ⁹	White discharge P/V	
Kenneth and Yao ²⁵	White discharge P/V	
S.E. Nigerio Justus et al., ¹⁸	White discharge P/V	
Pragya Sharma et al., 19	White discharge P/V	
Dr.Shubanigi et al., ¹³	White discharge P/V	
M.Tarney et al., ²⁷	Post coital bleeding	
Robert ME et al., ²⁶	Post coital bleeding	

In our study, the number of satisfactory smears were 92%(92 cases) in Conventional PAP smear compared to (96 cases) 96% in Liquid based cytology. Most of the unsatisfactory smears in conventional PAP were due to thick and bloody smears whereas in LBC, it is due to reduced cell number.(Table 13)

Table 13: Studies and their	percentage of satisfactory smears

	Conventional PAP(%)	LBC(%)
This study	92	96
Erdin ITLER et al., ¹²	99.50	99.95
Beerman et al., ²⁸	99.1	99.87
Monsonego et al., ²⁹	99.52	99.47
Sykes et al., ³⁰	97.3	98.9
Longatto et al, ³¹	89.6	98.6
Weintraub and Morabia et al., ³²	72.2	92
Sherwani RK et al.,9	31.9	83.1
Chinaka et al., ¹⁷	53.3	83.3
Guidelines for use of LBC in cervical cancer screening ³³	90.9	98.4
M.Almonte et al., ¹⁵	88.6	94.5
Singh VB et al., ³⁴	95.7	98.3

In all these studies, liquid based cytology had more number of satisfactory smears than the conventional PAP smear. In our study, the reason for unsatisfactoriness in conventional PAP smear is thick smear and obscuring blood and inflammatory cells and LBC is reduced number of cells similar to Monsanego et al.,²⁹. According to Sherwani et al.,⁹ in Liquid based cytology cytolysis and drying artifact is minimal or absent due to immediate fixative in a liquid fixative and lesser limited factors such as inflammatory cells, blood and mucus and in Conventional PAP is due to thick smear.

In the present study, number of ASC cases in CP was 12%(12 cases) and 6% in LBC(6 cases). (Table 14)

Table 14 : studies with their percentage of atypical squamous cells		
Studies	CP(%)	LBC(%)
This study	12	6
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Davey et al., ³⁵	3.8	4
ERDIN itler et al., ¹²	2.1	2.6
Jie Zhu et al., ¹¹	8	4
O Abulafia et al., ⁵	7.35	8.31
Bolick et al., ³⁶	2.42	2.97
Diaz – Rosario et al., ³⁷	4.76	4.53
Weintraub et al., ³²	1.50	2.40
Hatch et al., ³⁸	7.04	8
Guidos et al., ³⁹	2.03	3.40

The number of smears diagnosed as ASC was more in Conventional PAP smear (12 cases,12%) compared to Liquid based cytology(6 cases,6%) similar to that of Jie Zhu et al¹¹ and Diaz Rosario et al., ³⁷but contrast to studies by Davey et al, ³⁵, ERDIN itler et al., ¹², O Abulafia et al., ⁵, Bolick et al., ³⁶, Weintraub et al., ³², Hatch et al., ³⁸, Guidos et al., ³⁹ who showed that LBC was a better test for diagnosis of ASC.

In the present study number of LSIL increased from 8% in Conventional PAP to 12% in LBC. Other studies with similar results are shown in table 15.

Table 15: Studies with their percentage of LSIL cases

	Conventional PAP(%)	LBC(%)
This study	8	12
Sherwani RK et al ⁹	10.6	18.1
Hutchinson et al 199440	9	10.6
Beerman et al 28	0.22	0.27
Monsonego et al 29	1.2	1.84
Hutchinson et al 199941	3.03	3.40
Jie Zhu et al 11	29	32
Sykes et al 30	21	24.4
O.Abulafia et al 5	6.24	7.15
M.Almonte et al., 15	0.9	13.8
Chinaka et al., 17	10.6	12.6

In all these studies, it can be seen that the rate of detection of LSIL is higher in LBC than Conventional PAP smears.

In our present study, rate of detection of HSIL was more with LBC(6 cases, 6%) compared to that of Conventional PAP(2 cases, 2%).Many studies have found similar results and these are shown in table 16.

Table 16: Studies with their percentage of HSIL cases

	Conventional PAP(%)	LBC(%)
My study	2	6
Sherwani RK et al ⁹	0.6	4.3
Diaz-Rosario and Kabawat et al ³⁷	0.3	0.5
Beerman et al ²⁸	0.56	0.64
Monsonego et al 29	0.52	0.60
Hutchinson et al 199941	1.54	1.60
O.Abulafia et al ⁵	4.24	4.45
M.Almonte et al., ¹⁵	0.9	3.1
Chinaka et al., ¹⁷	8.0	10.0

Similar to LSIL, LBC detected more HSIL lesions than conventional PAP smear.

In our study,1 frank carcinoma was detected in LBC, whereas no case were detected in Conventional PAP because the carcinoma cases in Conventional PAP smears were bloody and hence unsatisfactory for evaluation. In contrast to our study, Beerman et al.²⁸, Hutchinson et al.⁴¹,Sykes et al.³⁰, O.Abulafia et al.⁵ reported higher detection of carcinoma in Conventional PAP than LBC.

Concordance between CP and LBC:

This study showed 84% concordance between Conventional PAP and LBC. Quite similarly, Hussein et al ⁴² showed 73% agreement and O.Abulafia et al ⁵ study, which is a comparison of 17 paired studies showed in general 90% concordance and 10% discordance. He showed that in various studies, discordance was as low as 1% and as high as 20%.

Concordance with histopathological findings:

Sensitivity of the screening tests in detecting low grade SIL: Our study

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showed sensitivity of 40% in CP and 66% n LBC for detecting LSIL. Sensitivity of other studies are shown in table 17.

Table 17: Sensitivity of the screening tests in various studies in detecting low grade ${\rm SIL}$

Studies	CP(%)	LBC (%)
This study	40	66
Lee K C et al., 43	62.6	91.7
Kim Y R et al., 44	64	86
Jeon Y K et al., 45	73.7	78.9
Lim Y K et al., 46	87.2	94.9
Park IA et al., 47	89.6	82.8
Arbyn et al., 48	75.6	79.1
ERDIN Itler et al., 12	37.5	54.5
M.Almonte et al., 15	26.21	69.66

Except for a study done by Park IA et al., ⁴⁷, in all the other studies LBC was more sensitive than CP in detecting LSIL.

Sensitivity of the screening tests in detecting high grade SIL:

Our study showed sensitivity of 50% in CP and 100% in LBC. Sensitivity of other studies is shown in table 18.

Table 18 : Sensitivity of the screening tests in various studies in detecting high grade SIL

Studies	CP(%)	LBC(%)
This study	50	100
Lee K C et al., 43	62	85.1
JiN K Young oh et al.,49	76	92
Arbyn et al., 48	55.2	57.1
ERDIN itler et al., 12	50	61
Jie Zhu et al., 11	47	66

In all these studies, LBC was a better test for diagnosing HSIL lesions.

Overall sensitivity:

Our study showed sensitivity of 55.5% in CP and 83% in LBC. Sensitivity of other studies are shown in table 19.

Table 19 : Overall sensitivity of the screening tests in various studies

	Conventional PAP(%)	LBC(%)
My study	55.5	83
O.Abulafia et al ⁵	68	76
Sykes et al ³⁰	73.7	79.1
Mojgan Karimi Zarchi et al 50	51	55.3
Bolick et al ³⁶	85	95
Hussein et al 42	83	92
Sherwani RK et al ⁹	53.7	97.6
Chinaka et al., ¹⁷	86	100

Sheets et al.⁵¹, Sherman et al 1997 ⁵², Roberts et al 1997 ⁵³, Papillo et al98 ⁵⁴, Sherman et al 1998 ⁵⁵, yeoh et al99 ⁵⁶, also showed higher sensitivity for LBC than CP and higher dectection rate similar to our study. O.Abulafia et al ⁵ compared 10 studies and showed that most of the studies had higher sensitivity for LBC and wide range of sensitivity (50%-90%).

Specificity of the screening tests for detection of LSIL:

Our study showed specificity of 93% for CP and 94% for LBC. Specificity of other studies are shown in table 20.

Table 20: Specificity of the screening tests for detection of LSIL in various studies

Studies	CP(%)	LBC(%)
This study	93	94
Lee K C et al., 43	96.1	75.9
Kim Y R et al., 44	79.5	66
Jeon Y K et al., 45	90.9	81.6
Lim Y K et al., 46	87.2	92.3
Park IA et al., 47	69.8	83
Arbyn et al., 48	81.2	78.8

Our study showed increased specificity for LBC than CP similar to studies done by Lim YK et al., ⁴⁶ and Park IA et al., ⁴⁷ but contrast to Lee KC et al., ⁴³ , Kim YR et al., ⁴⁴ ,Jeon YK et al., ⁴⁵ and Arbyn et al., ⁴⁸ who showed that CP is more specific than LBC.

Specificity of the screening tests for detection of HSIL:

This study showed specificity of 100% for CP and 96% for LBC. Specificity of other studies are shown in table 21.

Table 21 : Specificity of the screening tests for detection of HSIL in various studies

Studies	CP(%)	LBC(%)
This study	100	96
Lee KC et al., ⁴³	96.5	98.3
Jin K Young oh et al. 49	76	79
Arbyn et al.,48	96.7	97

In contrast with other studies, our study showed that CP was more specific than LBC in detection of HSIL.

Overall specificity:

Our study showed specificity of 83.7% and 86.5% in CP and LBC respectively. Specificites of other studies are shown in table 22.

Table 22 : Overall specificity of screening tests in various studies

	Conventional PAP(%)	LBC(%)
My study	83.7	86.5
O.Abulafia et al ⁵	79	86
Sykes et al ³⁰	69	69
Mojgan Karimi Zarchi et al 50	66	77.7
Bolick et al ³⁶	36	58
Sherwan RK et al ⁹	50	50
Chinaka et al., 17	97	100
Macha rid et al., ¹⁴	11	75

Other studies which shows higher specificity of LBC are Sheets et al.⁵¹ Sherman et al 1997⁵², Roberts et al 1997⁵³, Papillo et al 98⁴⁴, Sherman et al 1998⁵⁵, yeoh et al 99⁵⁶, Guidos et al 1995³⁹, Hatch et al 00³⁸ Chinaka et al.,¹⁷, Macharid et al.,¹⁴ similar to our study. But a study done by Hussein et al., 4^{42} showed high specificity for CP (82% vs & 76%).

CONCLUSION

To conclude, in a country where more number of people belong to lower socio - economic status and with higher incidence of cervical cancer, screening plays an important role in prevention. so awareness should be created about the screening programs and government should take adequate measures to improve the quality of the screening procedures by introducing improved methods like LBC, since cervical cancer is preventable by early detection and intervention.

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