Prevalence and Associated Factors of Liquid-Based Cytology (LBC) Results among Women Attending a Tertiary Cancer Hospital of Central Nepal

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ABSTRACT

Background

Cervical cancer remains a leading cause of morbidity and mortality among women worldwide. Early detection is crucial for prevention and management. Liquid-Based Cytology (LBC) offers more accurate screening compared to traditional Pap smears. This study aimed to find the prevalence and associated factors of LBC positivity among women at a tertiary cancer hospital in central Nepal.

Methods

A hospital-based analytical cross-sectional study was conducted among 987 women aged 30–50 years attending the Gynaecology OPD of B.P. Koirala Memorial Cancer Hospital from July 2024 to March 2025. LBC results were the dependent variable, and demographic, reproductive, and family-related factors were independent variables. Data were entered and analyzed using SPSS and R; descriptive and inferential statistics were applied, with p-value < 0.05 considered significant.

Results

The prevalence of positive LBC results was 6.9% (95% CI: 5.31% to 8.4%). Among the 56 women with positive LBC, 89% had menarche before age 15, and 34% were aged 40–45 years. Contraceptive use (p-value < 0.001), bleeding during sexual intercourse (p-value = 0.043), and number of deliveries (p-value = 0.02) were significantly associated with LBC positivity.

Conclusions

The study revealed a moderate prevalence of positive LBC results among women aged 30–50 years at a tertiary cancer hospital in Nepal. Significant associations included bleeding during sexual intercourse, contraceptive use, and number of deliveries. These findings underscore the importance of regular screening and increased awareness to reduce cervical cancer burden in Nepal.

Keywords: LBC; tertiary cancer hospital; women; Nepal.

INTRODUCTION

Cervical cancer is the eighth most common cancer worldwide, with 6.61 million new cases annually (3.3 % of all cancers) and 3.5 million deaths (3.6 % of cancer mortality) according to GLOBOCAN 2022.[1] Majority of deaths occur in low and middle-income countries.[2] In South-East Asia, incidence is 17.4 % with 9.5 % mortality.[1] In Nepal, 2244 new cases and 1493 deaths occur annually. Early detection is essential to reduce incidence.[3] Conventional Pap smear, introduced by George Papanicolaou in the mid-20th century, relies on Ayre's spatula and has limited accuracy due to sampling and expertise constraints[4]. Liquid-Based Cytology (LBC) improves specimen quality and diagnostic accuracy, offering higher sensitivity and specificity than conventional Pap tests.[5-6] Prevalence of abnormal cytology ranges from 1.97% to 14.53% [7-10] , with Nepal reporting 12.9%.[11] This study aimed to find prevalence of abnormal LBC among women attending a tertiary cancer center in Nepal to inform screening program implementation.

METHODS

A hospital based analytical cross-sectional study was conducted among 1000 women of 30-50 years in the Gynecology Department of BP Koirala Memorial Cancer Hospital, Bharatpur, Chitwan, Nepal from July 2024 to March 2025. This study is a fragmented part of a larger collaborative research project on, "Application and Demonstration of Chinese HPV Vaccine and Cervical screening in low resource country" jointly conducted between BP Koirala Cancer Hospital, Bharatpur, Chitwan and China. Ethical approval was taken from the Nepal Health Research Council (Ref No 53/2024.). Before data collection, informed written consent was taken from all women. The dependent variable was outcome of LBC result as either positve or Negative. While other independent variables includes age at menarche, current age, age at marriage, age at first sexual intercourse, age at pregnancy, BMI, yearly family income, occupation, family history, marital status, regular menstruation, menopausal status, bleeding during sexual intercourse, contraceptive use,

number of sexual partners, number of deliveries, and participation in screening programs. To perform the association LBS was categorized as positive (ASC-US, HSIL, LSIL) and while NILM were taken as Negative whereas unsatisfactory cases (samples that cannot be properly evaluated) were excluded during the data analysis of association among variables. Data was collected usign self structured questionnaire. Collected data were carefully reviewed as well as check for completeness and than assigned serial numbers. Data was enred in to Microsoft Excel. Descriptive as well as inferential statistical tool were used for data analysis using SPSS 16 software. In the descriptive statistics for categorical variable frequency with percentage were calculate along with bar diagram while in inferential statistics to find the association between LBC test result with others independent variables, Chi-square tests and Fisher's Exact test were used. A 95% confidence interval was calculated for positive LBC test result to generalize in the population. p-value of less than 0.05 was considered as statistically significant.

RESULTS

Among the 1,000 women screened with Liquid-Based Cytology (LBC), the majority (93.1%) had Negative for Intraepithelial Lesion or Malignancy (NILM) results. Atypical Squamous Cells of

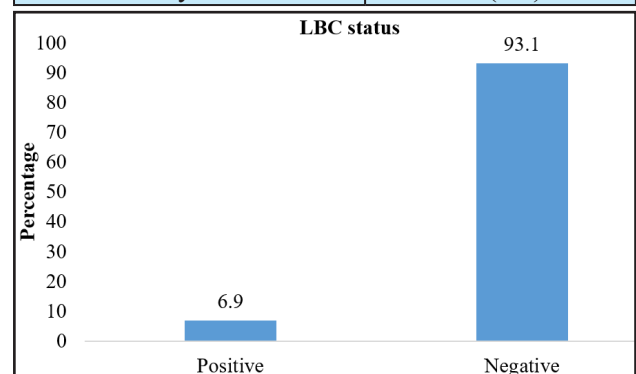| Table 1. LBC results. (n=1000)	
LBC test result	**Frequency (%)**
ASC-US	41(4.1)
HSIL	1(0.1)
LSIL	14(1.4)
NILM	931(93.1)
Unsatisfactory	13(1.3)

Figure 1. Prevalence of LBC finding. (n=987)

Undetermined Significance (ASC-US) was observed in 4.1% of participants, while Low-grade Squamous Intraepithelial Lesions (LSIL) and High-grade Squamous Intraepithelial Lesions (HSIL) were found in 1.4% and 0.1% of women, respectively. Additionally, 1.3% of the samples were found to be unsatisfactory for evaluation (Table 1).

The prevalence of LBC status was found to be positive in 6.9% (with 95% CI as 5.31% to 8.48%) while 913 (93.1%) were negative (Figure 1).

Among 56 women found to be positive for Liquid-Based Cytology (LBC) test. Majority (89%) women experienced menarche age before 15 and most were between 40–45 years old (34%), followed by 45–50 years (23%). Among positive women nearly all were married between ages 15–30 (93%), and 66% reported having their first sexual intercourse between ages 10–20. Additionally, 86% of LBC-positive women had their first pregnancy before age 25. None of the variables were found to be statistically significant (p-value >0.05) (Table 2).

Among the positive sample, 45% had a normal BMI, while 39% were overweight, and 13% were obese. The majority had a yearly family income between 200,000–500,000 NPR (50%). In terms of occupation, the highest proportion of positive cases were involved in enterprise (38%), followed by farmers (21%), while only 7.1% were unemployed. A family history of related illness was reported by 11% of LBC-positive individuals. All LBC-positive women were married, with no representation from divorced, widowed, or unmarried groups. None of the variable were found to be statistically significant with above factors (p-value>0.05) (Table 3).

Table 2. Association of LBC result with age related information of women. (n=987)

| Characteristic | Overall | LBC status | | p-value[2] |
		Negative (n = 931[1])	Positive (n = 56[1])	
Age of mensuration				
<15	818 (83%)	768 (82%)	50 (89%)	0.2
>15	169 (17%)	163 (18%)	6 (11%)	
Age (years)				
30-35	200 (20%)	188 (20%)	12 (21%)	0.8
35-40	243 (25%)	231 (25%)	12 (21%)	
40-45	288 (29%)	269 (29%)	19 (34%)	
45-50	256 (26%)	243 (26%)	13 (23%)	
Age at marriage				
<15	60 (6.1%)	56 (6.0%)	4 (7.1%)	0.8
15-30	920 (93%)	868 (93%)	52 (93%)	
>30	7 (0.7%)	7 (0.8%)	0 (0%)	
Age at first sex				
10-20	581 (59%)	544 (58%)	37 (66%)	0.6
20-30	399 (40%)	380 (41%)	19 (34%)	
30-40	7 (0.7%)	7 (0.8%)	0 (0%)	
Age at pregnancy				
<25	832 (84%)	784 (84%)	48 (86%)	0.8
>25	155 (16%)	147 (16%)	8 (14%)	
[1] n (%)				
[2] Pearson's Chi-squared test; Fisher's exact test				

Table 3. Association of LBC with sociodemographic characteristics of women. (n=987)

| Characteristic | Overall n = 987 | LBC status | | p-value[2] |
		Negative (n = 931[1])	Positive (n = 56[1])	
BMI				
<18.5	11 (1.1%)	10 (1.1%)	1 (1.8%)	0.5
18.5-24.99	348 (35%)	323 (35%)	25 (45%)	
25-29.99	451 (46%)	429 (46%)	22 (39%)	
30-34.99	151 (15%)	144 (15%)	7 (13%)	
35-39.99	26 (2.6%)	25 (2.7%)	1 (1.8%)	
Yearly family income				
<200000	77 (7.8%)	71 (7.6%)	6 (11%)	0.6
200000-500000	437 (44%)	409 (44%)	28 (50%)	
500000-1000000	300 (30%)	286 (31%)	14 (25%)	
>1000000	173 (18%)	165 (18%)	8 (14%)	
Occupation				
Unemployed	109 (11%)	105 (11%)	4 (7.1%)	0.2
Farmer	152 (15%)	140 (15%)	12 (21%)	
Job	44 (4.5%)	43 (4.6%)	1 (1.8%)	
Worker	73 (7.4%)	68 (7.3%)	5 (8.9%)	
Others	335 (34%)	322 (35%)	13 (23%)	
Enterprise	274 (28%)	253 (27%)	21 (38%)	
Family history				
No	847 (86%)	797 (86%)	50 (89%)	0.4
Yes	140 (14%)	134 (14%)	6 (11%)	
Marital status				
Unmarried	1 (0.1%)	1 (0.1%)	0 (0%)	>0.9
Married	960 (97%)	904 (97%)	56(100%)	
Divorced	9 (0.9%)	9 (1.0%)	0 (0%)	
Widowed	13 (1.3%)	13 (1.4%)	0 (0%)	
Others	4 (0.4%)	4 (0.4%)	0 (0%)	
[1] n (%)				
[2] Pearson's Chi-squared test; Fisher's exact test				

Among positive Liquid-Based Cytology (LBC) results, 64% reported having regular menstruation. A

majority (89%) were not menopausal, 3.6% were peri-menopausal, and 7.1% were menopausal. Notably, 14% of LBC-positive women experienced bleeding during sexual intercourse, which was significantly associated with LBC test result (p-value= 0.043). Contraceptive use showed a strong association (p-value< 0.001) with LBC test result. With more than half (52%) of the LBC-positive group reporting its use. Regarding sexual partners, 91% had no other sexual partners. In terms of childbirth history, 66% of LBC-positive women had 0–2 deliveries, 27% had 2–4 deliveries, and 5.4% had more than 4 indicating a statistically significant relationship (p-value = 0.02). Screening participation did not show a significant difference between LBC-positive and negative individuals, with 52% having participated once and 48% twice (Table 4).

Table 4. Association of LBC with personal characteristics of women. (n=987)				
Characteristic	Overall (n = 987)	LBC status		p-value[2]
		Negative (n = 931[1])	Positive (n = 56[1])	
Regular menstruation				
No	315 (32%)	295 (32%)	20 (36%)	0.5
Yes	672 (68%)	636 (68%)	36 (64%)	
Menopausal				
Not menopause	881 (89%)	831 (89%)	50 (89%)	
Perimenopause	47 (4.8%)	45 (4.8%)	2 (3.6%)	0.9
Menopausal	59 (6.0%)	55 (5.9%)	4 (7.1%)	
Bleeding sexual				
Yes	70 (7.1%)	62 (6.7%)	8 (14%)	0.043
No	917 (93%)	869 (93%)	48 (86%)	
Contraceptive	94 (9.5%)	65 (7.0%)	29 (52%)	<0.001
Sexual partners other than husband				
Yes	18 (1.8%)	16 (1.7%)	2 (3.6%)	
No	920 (93%)	869 (93%)	51 (91%)	
Don't know	40 (4.1%)	37 (4.0%)	3 (5.4%)	0.4
It's not convenient to answer	9 (0.9%)	9 (1.0%)	0 (0%)	
Number of deliveries (n=972)				
0-2	783 (79%)	746 (80%)	37 (66%)	
2 4	174 (18%)	159 (17%)	15 (27%)	0.02
>4	15 (1.5%)	12 (1.3%)	3 (5.4%)	
Participate screening				
No	485 (49%)	456 (49%)	29 (52%)	0.7
Yes	502 (51%)	475 (51%)	27 (48%)	
[1] n (%)				
[2] Pearson's Chi-squared test; Fisher's exact test				

DISCUSSION

In our study total patient attended in the screening program, 93.1% had normal report meaning Negative for intraepithelial lesson or malignancy (NILM). Atypical squamous cells of undetermined significance (ASC-US) in 4.1% of participants, while low grade squamous intra epithelial Lesions (LSIL) and High grade Squamous Intraepithelial Lesions (HSIL) were found in 0.4% and 0.1%. In contrast to our study overall prevalence of the abnormal LBC is 6.9%. In contrast to our study from India showed overall prevalence of 47% and among them LSIL 15.30% , HSIL 9.9%, ASCUS 1.8% and SCC 4.5%[12] such higher rate they have suggested as their study was done in urban area which lead to better diagnostic capabilities and health care access. This dissimilarities may be due to as they have studied in only small group of people and may be on high prevalent area and lack of population's diversity. Result is similar to study done by Khaengkhor et al., where they have found overall prevalence is 7% with HSIL 0.7%.[13] Similarly study from bihar also showing overall prevalence to abnormal cytology in lbc was 5.33.[14] Our result was little higher than the study done in Kuwait overall prevalence was 4.3% in which ASCUS 2.2% , AGUS in 0.8%, LSIL in 1% , HSIL in 0.2% and carcinoma in 0.05%.[15] As we go through the age related information of the women Most of the positive for abnormal LBC was found in women who had menarche before 15 years of age and it was statistical significance with p-value of 0.02. Similarly some studies have shown the similar age of menarche in with abnormal LBC findings.[16] Most women with positive report were from 40-45 years age group. Whereas study from India found that majority of abnormal LBC were found in the 31-40 years of age this may be due to their study population were 21 years onwards.[16] Most of the women with positive results were 15-30 years of age they got married with percentage of 93% but it is not statistically significant. Some studies have shown the dissimilar and similar results with age at marriage is ranges in some study from 15 to 30 years, early married life lead to the longer sexual duration and more prone to abnormal cytology.[17, 18]

As early marriage lead to abnormal cytology the fact early marriage is directly proportional to early sexual exposure regarding this question our study population with abnormal cytology have sexual exposure was in their teens with 66% among the positive result. Similar result was found in the study from Ethiopia.[19] Study from India showed that most women have started their sexual life in 14-20 years of age.[16] Most of the women had their first child less than 25 years of age similarly other studies also shown the first issue at the age of less than 25 years.[12]

Regarding sociodemographic characteristics our study have shown that most of the women with positive results are of normal BMI and occupation included are those who are involved in enterprise are the most to be infected. Similarly most of the studies showing most of the abnormal cytology was found in normal BMI population.[20] In contrast to our study one study showing more you have BMI more abnormal cytology.[21] Definitely in most positive result among married women 100% other status women are all negative this results are similar with the studies done in other parts of the worlds.[17] In contrast to our study one study showing positive results were more in divorced women because of the multiple partners issue.[19] Regarding personal characteristics our study showed that most of the abnormal cytology people have normal menstrual cycle in contrast to our study study from Ethiopia and Saudi Arabia where most the women with irregular cycle have abnormal cytology.[7,19] Whereas some other study showing similar results as ours. Most of the women with abnormal cytology are in reproductive age group whereas least abnormal cytology was found in postmenopausal women this result showed opposite result with the study from Romania[22] and similar with the study done in Thailand.[20] Our study have shown statistical significance with post coital bleeding and

abnormalities with p-value of 0.043 similarly study from Saudi Arebia[7] Whereas study from Ethiopia[19] have shown the just opposite result, which was supported by other studies from different part of the world. Association of the contraceptives with positive result are highly statistical significance with p-value of 0.001 which was supported by the study from middle east[23], some other studies are not agree with our result also[7, 19, 21] whereas our study have shown the significance association with the no of deliveries and higher positive result was found in the women with 2 deliveries. Similarly study from Saudi and South Korea also saw the low parity associated with the abnormal cytology.[7, 24] However others studies have shown the high parity have more positive result.[19, 21] Whereas our study failed to show the association with multiple sexual partner and abnormal cytology are not related to each other, result was high with two sexual partners with 91%, Whereas studies are always supported the multiple sexual partners are always associated with abnormal cytology reports and that because of multiple sexual partners lead to exposure to high risk HPV virus.[25, 26]

CONCLUSIONS

The prevalence of positive Liquid-Based Cytology (LBC) findings was 6.9% among women screened, with significant associations observed between LBC positivity and both bleeding during sexual intercourse and contraceptive use, number of deliveries, where higher parity was more common among LBC-positive women. These results highlight the value of targeted cervical screening, particularly among women presenting with risk-related symptoms or reproductive histories.

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