

**PREVALENCE AND GENOTYPE GROUPS OF HUMAN
PAPILLOMAVIRUS AND DIAGNOSTIC PERFORMANCE OF PAP
SMEAR IN CERVICAL SAMPLES AT THE UNIVERSITY OF ABUJA
TEACHING HOSPITAL, NIGERIA**

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**РАСПРОСТРАНЕННОСТЬ И ГЕНОТИПНЫЕ ГРУППЫ ВИРУСА
ПАПИЛЛОМЫ ЧЕЛОВЕКА И ДИАГНОСТИЧЕСКАЯ ЗНАЧЕНИЕ
ПАП-МАЗКА В ОБРАЗЦАХ ШЕЙКИ МАТКИ В УЧЕБНОЙ БОЛЬНИЦЕ
УНИВЕРСИТЕТА АБУДЖИ, НИГЕРИЯ**

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Abstract***Aim:***

Infections with high-risk genotypes of Human Papillomavirus (HPV) are the primary etiological factor for cervical cancer (CC). However, the Papanicolaou (Pap) test without adjunctive virological confirmation has been the mainstay of CC diagnosis in resource-limited settings. This study determined the frequency of HPV infection, genotype groups, and performance characteristics of the Pap test in cervical samples at the University of Abuja Teaching Hospital (UATH), Nigeria.

Methods:

Ninety-seven (97) cervical smears were retrieved using the cytology register, and previously liquid-based pap smear-stained slides were recalled and re-examined, and the retrieved samples were processed and analysed using the Polymerase chain Reaction (PCR) and microscopy following Pap staining. The agreement level of PCR and Pap staining was evaluated.

Results:

Of the samples tested, 25.8% (n=25) were HPV DNA positive. The prevalence of HPV was significantly higher among participants aged 20-30 years (OR=10, 95% CI: 1.3-79.3, $p=0.0293$). About 6.2%, 8.2%, and 17.5% of the participants carried the low carcinogenic risk (group 3), definite carcinogenic risk (group 1), and probable/possible carcinogenic risk (group 2A/B) genotype groups, respectively. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of the Pap test in detecting HPV-induced cervical changes were 50%, 93.3%, 66.7%, 87.5% and 84.2%, respectively. Remarkably, 24.4% (10/41), 30.7% (12/39) and 33.3% (2/6) of participants with Pap smear-negative, LSIL and HSIL, respectively, were HPV DNA-positive.

Conclusion:

The possible/probable carcinogenic risk HPV genotype group was the most prevalent among participants, exceeding the prevalence of the definite carcinogenic risk genotype group, reflecting regional epidemiological characteristics and

underscoring the need to consider these genotypes when selecting optimal test systems. The low sensitivity of the Pap test (50%) in detecting HPV-induced cervical changes underscores the need for HPV-based screening methods.

Keywords: Human Papillomavirus, Cervical cancer, Nigeria, High-risk HPV, Papanicolaou test, Performance characteristics.

Резюме

Цель:

Инфицирование вирусами папилломы человека (ВПЧ) высокого онкогенного риска является ведущим этиологическим фактором рака шейки матки (РШМ). Однако в условиях ограниченных ресурсов основным методом диагностики РШМ остается цитологическое исследование по Папаниколау (Пап-тест) без дополнительного вирусологического подтверждения. В настоящем исследовании была определена частота ВПЧ-инфекции, генотипические группы и характеристики эффективности Пап-теста в образцах шейки матки, полученных в Университетской клинической больнице Абуджи (UATH), Нигерия.

Методы:

Девяносто семь (97) мазков из шейки матки было получено из цитологического регистра, а ранее окрашенные по Папаниколау препараты были исследованы повторно. Полученные образцы были обработаны и проанализированы с использованием полимеразной цепной реакции (ПЦР) и микроскопии после окрашивания по Папаниколау. Оценена степень соответствия результатов ПЦР и окрашивания по Папаниколау.

Результаты:

Из протестированных образцов 25,8% (n=25) оказались положительными на ДНК ВПЧ. Распространенность ВПЧ была значительно выше среди лиц в возрасте 20-30 лет (OR=10, 95% ДИ: 1,3-79,3, p=0,0293). Около 6,2%, 8,2% и 17,5% участников имели генотипы с низким канцерогенным риском (группа 3), выраженным канцерогенным риском (группа 1) и вероятным/возможным канцерогенным риском (группа 2A/B) соответственно. Чувствительность, специфичность, положительная прогностическая ценность, отрицательная прогностическая ценность и

точность цитологического исследования по Папаниколау при выявлении изменений шейки матки, вызванных ВПЧ, составили 50%, 93,3%, 66,7%, 87,5% и 84,2% соответственно. Примечательно, что ДНК ВПЧ была обнаружена у 24,4% (10/41), 30,7% (12/39) и 33,3% (2/6) участников с отрицательным результатом мазка Папаниколау, LSIL и HSIL соответственно.

Заключение:

У обследованных лиц преобладала группа генотипов ВПЧ с возможным/вероятным, а не высоким канцерогенным риском, что отражает географические эпидемиологические особенности и подчеркивает необходимость учета этих генотипов при выборе оптимальных тест-систем. Низкая чувствительность цитологического исследования (50%) при выявлении изменений шейки матки, вызванных ВПЧ, подчеркивает необходимость скрининговых методов на обнаружение ВПЧ.

Ключевые слова: Вирус папилломы человека, рак шейки матки, Нигерия, ВПЧ высокого риска, цитологическое исследование, характеристики эффективности.

1 **1 Introduction**

2 Human Papillomavirus (HPV) is a clinically significant pathogen that is
3 involved in the development of cervical cancer and other premalignant lesions of
4 global health concern [12]. There are over 450 known genotypes of HPV. Many of
5 these are sexually transmitted, and they are categorized into high-risk and low-risk
6 groups based on their potential to cause cancer [16]. While most HPV infections are
7 resolved on their own, about 99.7% of cervical cancer cases are linked to persistent
8 genital HPV infection with high-risk strains [28]. Specifically, two high-risk types,
9 HPV 16 and HPV 18, cause 70% of cervical cancers worldwide [8].

10 HPV infections cause a variety of low- or high-grade cellular abnormalities,
11 most commonly detected during routine Papanicolaou (Pap) testing [14]. Molecular
12 tests detecting HPV DNA or proteins are now available either commercially or in-
13 house [13]. The World Health Organization recommended that DNA detection
14 should be the first-choice screening method for the diagnosis and monitoring of
15 HPV-related diseases [26, 30].

16 The International Agency for Research on Cancer (IARC) classifies HPV
17 types into groups based on their carcinogenic potential [33]. Group 1 encompasses
18 HPV types with definite carcinogenic risk: types 16, 18, 31, 33, 35, 39, 45, 51, 52,
19 56, 58, and 59. Group 2A includes HPV types with probable carcinogenic risk: type
20 68. Group 2B comprises HPV types with possible carcinogenic risk: types 26, 30,
21 53, 66, 67, 69, 70, 73, 82, 85, and 97. Group 3 includes HPV types with low
22 carcinogenic risk: types 6, 7, 9, 11, 40, 42, 43, 61, 74, 81, 86, 87, 89, 90, 91, and 114
23 [33].

24 Pap smear testing has served a significant role in screening and prevention
25 drives; however, it has limitations in only revealing Morphological information and
26 changes from activities and impacts of HPV [33]. In 2025, Global Leaders Unite to
27 Accelerate Cervical Cancer Elimination Efforts through strengthening early
28 detection programs for cervical cancer through the DNA HPV test, especially in low
29 and middle-income countries [29]. Therefore, the need for molecular testing to

30 validate the Pap method has become crucial. Since different HPV genotypes exhibit
31 varying oncogenic potential and responses to treatment, molecular characterization
32 can facilitate the personalized management of HPV-related diseases by identifying
33 high-risk genotypes and guiding the selection of targeted therapies tailored to an
34 individual patient [17]. Identifying the specific genotype group allows for tailored
35 therapies and improved patient outcomes.

36 This study determined the frequency of HPV infection and genotype groups
37 in cervical smears submitted to the histopathology laboratory of the University of
38 Abuja Teaching Hospital (UATH). Also, to assess the performance characteristics
39 of the conventional Pap smear microscopy in detecting HPV-associated cervical
40 changes.

41 **2 Materials and methods**

42 **Ethical considerations**

43 All study protocols were submitted for ethical review and were approved by
44 the human research ethical committee of the University of Abuja Teaching Hospital
45 (approval no.: UATH/HREC/PR/576). All data generated was treated with the
46 utmost confidence and analysed anonymously. All participants gave written
47 informed consent before enrolment into the study. Samples and data collection from
48 participants were performed according to Helsinki's declaration as revised in 2024.

49 **Study design and area**

50 The study was a retrospective cross-sectional study that involved all cervical
51 liquid-based Pap smears brought to the department of Histopathology of the
52 University of Abuja Teaching Hospital (UATH) within six (6) months (December
53 2023- May 2024). The hospital is located at (N 8° 57'1.4976", E 7° 3'45.4212 and is
54 a major public tertiary hospital in the capital city of Nigeria. This 520-bed hospital
55 boasts excellent services and enjoys patronage and referrals from health facilities in
56 six (6) neighbouring states because of the few histopathology departments
57 nationwide.

58 **Sample size determination**

59 As this is a cross-sectional study, the sample size was calculated from a
60 previous study [10]. Using the 6.8% prevalence of HPV in cervical samples in
61 Nigeria, a minimum sample size of 97 was calculated using the formula:

$$62 \text{ number of participants} = \frac{3.84 (1-P) p}{e \times e}$$

$$63 n = \frac{3.84 (1 - 0.068) 0.068}{0.05 \times 0.05} = 97$$

64 **Sample collection and analyses**

65 Cervical smear samples were collected at the UATH gynaecology clinics and
66 sent to the histopathology department. Specifically, samples were retrieved using the
67 cytology register, and previously liquid-based pap smear-stained slides were
68 recalled and re-examined. Furthermore, the samples were analysed for HPV DNA
69 amplification.

70 **Liquid Base Pap Smear Analysis**

71 The archived stained pap smear slides were retrieved. The slides were
72 examined under the microscope using $\times 10$ and $\times 40$ objective lenses. Findings were
73 reported using the Bethesda System (TBS). TBS for Reporting Cervical Cytology is
74 the standardised, globally recognised framework for classifying Pap smear results
75 that focuses on categorising epithelial cell abnormalities—specifically, identifying
76 changes induced by HPV to guide patient management.

77 **HPV DNA Extraction**

78 The DNA was extracted using the Jiangsu Mole Bioscience kit (Lot number
79 301100063500, Jiangsu Province, China). The extraction involved breaking down
80 the structure of sample cells, such as the nucleus, cell membrane, nuclear membrane,
81 or cell wall, using heat, to release the nucleic acid molecules.

82 **HPV DNA Amplification**

83 This was done using the Mospire Human Papillomavirus Nucleic Acid
84 Amplification Kit, 301100041200 (Jiangsu Province, China), which employs a
85 fluorescent probe-based real-time PCR technique.

86 The primers and fluorescent probes of this kit were specifically designed in
87 the E6/E7 loci of the HPV genome, and the fluorescent probes are labelled with
88 FAM, HEX/VIC, and ROX fluorescent dyes, respectively. By using PCR with
89 TaqMan fluorescent probes, qualitative detection of the 24 HPV genotypes (6, 11,
90 16, 18, 26, 31, 33, 35, 39, 42, 43, 44, 45, 51, 52, 53, 56, 58, 59, 66, 68, 73, 81, and
91 82) was achieved from the cervical samples. These genotypes were grouped into
92 three: Group 1 (6, 11, 42, 43, 44 or 81), Group 2B (16, 18, 31, 33, 35, 39, 45, 51, 52,
93 56, 59), Group 2A (68) and Group 3 (26,53, 66, 73, or 82). The reaction and
94 interpretation of results were based on instructions provided by the kit manufacturer.

95 The Molarray 688 RT-PCR system was validated for the detection of Human
96 Papillomavirus. The instrument was calibrated using a standard curve generated
97 from serial dilutions of the positive control. Moreover, external verification was
98 performed using reference materials. The validation study results demonstrated that
99 the instrument has a specificity of 100%, a sensitivity of 95%, and an accuracy of
100 99%. The limit of detection was determined to be 10 copies/ μ L

101 **Statistical analysis**

102 Statistical Package for Social Science (IBM, USA) was used to digitise the
103 data collected and presented in tables and charts. Sociodemographic variables were
104 expressed as frequencies and compared with the detection rates of HPV using
105 bivariate regression tests. Furthermore, sensitivity, specificity, and predictive value
106 tests were used to determine the performance characteristics of the Pap test in
107 detecting cervical changes due to HPV infection. All analysis outputs with $p < 0.05$
108 at 95% confidence interval were considered statistically significant.

109 **3 Results**

110 The mean age of the participants was 41.8 years (range: 22-59 years). Of the
111 samples tested, 25.8% (n=25) were HPV DNA positive. The prevalence of HPV was
112 significantly higher among participants aged 20-30 years (OR=10, 95% CI: 1.3-79.3,
113 $p=0.0293$) (Table 1). No statistical association was found between the high-risk HPV
114 genotype group and the age of the participants (Table 1). About 6.2%, 8.2% and

115 17.5% of the participants carried the low carcinogenic risk (group 3), definite
116 carcinogenic risk (group 1), and probable/possible carcinogenic risk (group 2 A&B)
117 genotype groups, respectively. Moreover, participants aged 20-30 years had a
118 significantly higher odds of developing LSIL than other groups (OR=7.5, 95% CI:
119 1.04-54.11, $p=0.045$) (Table 2). Specifically, only 4.1% of the participants had only
120 a definite carcinogenic risk genotype group, 13.4% had only possible/probable
121 carcinogenic risk genotype group, and 1% had low carcinogenic risk genotype
122 group. Other HPV-infected participants had mixtures of two or three genotype
123 groups (Figure 2).

124 The sensitivity, specificity, positive predictive and negative predictive values
125 and accuracy of Pap test in detecting HPV-induced cervical changes were 50% (95%
126 CI: 27.2 - 72.8), 93.3% (95% CI: 85.1- 97.8), 66.7% (95% CI: 43.5- 83.8), 87.5%
127 (95% CI: 81.8- 91.6) and 84.2% (95% CI: 75.3- 90.9), respectively (Table 3).
128 Remarkably, 24.4% (10/41) of Pap smear negative reports were HPV DNA positive,
129 30.7% (12/39) of participants with LSIL were HPV DNA positive and 33.3% (2/6)
130 of those with HSIL were HPV DNA positive (Figure 3).

131 **4 Discussion**

132 Studies have shown that HPV infection is a significant public health concern
133 in Nigeria, with cervical cancer being the second most common cancer among
134 women [25, 27]. The prevalence of HPV in cervical samples in Nigeria varies
135 depending on the study location, immune status of participants, study design, sexual
136 habits, socioeconomic status of participants, cultural beliefs, and laboratory
137 detection method [6, 10]. To our knowledge, this is the first study in Nigeria to
138 determine the performance characteristics of the Pap test in detecting HPV-
139 associated cervical changes.

140 In the present study, the overall prevalence of HPV was 25.8%. This is similar
141 to the 24.9% HPV prevalence reported by Onwuamah et al. [23] in southern Nigeria
142 and corroborated by the 21.2% reported in a systematic review of PCR-based studies
143 in Nigeria [10]. However, the prevalence of HPV in our study was relatively higher

144 than the 13.2% and 19.5% previously reported in Nigeria [9, 24]. Higher prevalence
145 values (29-95.5%) were reported in other studies from all the geopolitical zones in
146 Nigeria [1, 7, 15, 18, 30, 32]. HPV prevalence in cervical samples is generally
147 considered low in developed countries, particularly among younger women, due to
148 the impact of the HPV vaccination programmes.

149 This study found that HPV prevalence is significantly higher in the 20-30 age
150 group, which is consistent with the understanding that sexual activity is a primary
151 mode of transmission for HPV. This age range often coincides with increased sexual
152 activity and the start of sexual relationships, potentially leading to a higher
153 likelihood of HPV exposure and infection [3].

154 While the body's immune system clears most HPV infections, individuals in
155 the 20-30 age range may not yet have developed the same level of immunity as older
156 individuals who have had more time to build it [8]. The reasons for this variation in
157 immune response and disease progression are not fully understood [8].
158 Notwithstanding, intentional efforts must be made targeting this age group with
159 cervical testing options that possibly target the presence of the causative agent of
160 cervical lesions. Based on cervical smear cytology results, participants aged 20-30
161 years had significantly higher odds of developing LSIL than participants in other
162 age groups. It has been reported that LSILs are very common in younger women
163 (particularly those under 30 or in their teens and twenties), often appearing shortly
164 after the onset of sexual activity [34]. These findings are usually a transient, self-
165 limiting response to an HPV infection that frequently regresses spontaneously
166 without treatment [35].

167 Based on the HPV genotype group, the 6.2% prevalence of the definite
168 carcinogenic risk HPV genotype group obtained in this study was lower than
169 previously reported data in Nigeria [2, 21, 22]. This could reflect differences in
170 circulating genotypes among participants in the studies, as most HPV genotype
171 groups in our study were possible/probable carcinogenic risk genotype group. The
172 most interesting finding is the high prevalence of HPV genotypes 26, 53, 66, 73, and

173 82 (possible carcinogenic risk Group 2B), which likely reflects regional
174 epidemiological characteristics and represents an important finding for this region.
175 This has practical significance, as it should be taken into account when selecting
176 optimal test systems capable of detecting HPV genotypes 26, 53, 66, 68, 73, and 82
177 in future studies. While HPV 16 and 18 cause the majority of cervical cancers
178 (Group 1), 2B types are phylogenetically related to high-risk types but have limited,
179 though consistent, evidence of causing cancer [33]. Though "less risky" than 16/18,
180 they can still lead to High-Grade Squamous Intraepithelial Lesions (HSIL/CIN2+)
181 if the infection persists [33].

182 The HPV DNA in cervical samples with intraepithelial lesions shows that the
183 cells undergo a change from persistent infections with HPV. This agrees with
184 Alrajjal et al. [5] who suggested that cervical smears with LSIL should be described
185 as transient HPV infection-related changes, and HSIL should be categorised as true
186 precancerous lesions.

187 Remarkably, some Pap smear negative reports from the present study were
188 HPV DNA positive. First, cervical smears can appear morphologically normal
189 (meaning they look healthy under a microscope) even when they contain HPV that
190 has the potential to cause cervical lesions [31]. This is because HPV infection can
191 be present in cervical cells without immediately causing visible changes, and it can
192 take time for these changes to develop. Secondly, a Pap smear reporting HPV-related
193 changes but with a negative HPV DNA test result is an interesting scenario. It
194 suggests that while the Pap smear detected some abnormalities, these changes are
195 not associated with the definite carcinogenic risk HPV strains that are typically
196 linked to cervical cancer [4]. This indicates a low risk of developing cervical cancer,
197 and further testing might not be immediately necessary.

198 In the present study, the sensitivity and specificity of the Pap test were low.
199 These corroborate findings from previous studies indicating that the specificity of
200 the Pap smear is 86–100% [20], whereas sensitivity ranges from 30–87% [19, 20],
201 which explains why the chances of missing precancerous lesions in screening

202 programmes are high. Primary HPV-based screening, coupled with high-quality
203 immunocytochemical and molecular triage, appears to be the best option.
204 Colposcopy with histological examination remains the gold standard for diagnosis,
205 but it necessitates quality guidelines and assurance measures.

206 A limitation of this study is that other sociodemographic characteristics of
207 patients (marital status, number of sexual partners, reproductive history,
208 contraceptive use, and HIV status) were not available to infer their relationship with
209 cervical cytology data and HPV DNA results.

210 **5 Conclusions**

211 The possible/probable carcinogenic risk HPV genotype group was the most
212 prevalent among participants, exceeding the prevalence of the definite carcinogenic
213 risk genotype group, reflecting regional epidemiological characteristics and
214 underscoring the need to consider these genotypes when selecting optimal test
215 systems. The low sensitivity of the Pap test (50%) in detecting HPV-induced cervical
216 changes underscores the need for HPV-based screening methods. For instance, Pap
217 test should be used alongside HPV DNA PCR test.

ТАБЛИЦЫ

Table 1. Association of HPV and definite carcinogenic risk HPV genotype group with the age of the participants.

Age group	No. of participants tested	No. (%) positive for HPV	OR (95% CI)	<i>p</i> value	No. Positive for Group 1 HPV genotypes	OR (95% CI)	<i>p</i> value
20 - 30	8	5 (62.5)	10 (1.3- 79.3)	*0.0293	1 (12.5)	1.9 (0.1- 34.4)	0.6778
31 - 40	35	7 (20)	1.5 (0.3 - 8.3)	0.6423	1 (2.9)	4.9 (0.3- 87.3)	0.2836
41 - 50	40	11 (27.5)	2.3 (0.4- 11.9)	0.3286	3 (7.5)	2.8 (0.3- 27.8)	0.3897
51 - 60	14	2 (14.2)	1	1	1 (7.1)		

Notes: *Significant association determined by bivariate regression.

Table 2. Association of cervical disorders with the age of the patients

Age group	No. of participants tested	No. (%) with ASCUS	OR (95% CI)	<i>p</i> value	No. (%) with LSIL	OR (95% CI)	<i>p</i> value	No. (%) with HSIL	OR (95% CI)	<i>p</i> value
20 - 30	8	1 (12.5)	0.86 (0.07-11.23)	0.9066	6 (75)	7.5 (1.04-54.11)	0.0457*	0	NA	Na
31 - 40	35	0	NA	NA	10 (28.6)	1 (0.25-3.94)	1	1 (2.9)	0.18 (0.01-2.13)	0.1720
41 - 50	40	0	NA	NA	11 (27.5)	0.95 (0.25-3.66)	0.9386	4 (10)	0.67 (0.11-4.11)	0.6622
51 - 60	14	2 (14.3)	1	1	4 (28.7)	1	1	2 (14.3)	1	1

Notes: *Significant association determined by bivariate regression.

NA: not applicable because of zero observed output.

Table 3. Performance characteristics of the Pap smear in the identification of HPV-associated cervical changes

Performance indicator	Sensitivity (95% CI)	Specificity (95% CI)	Positive predictive value (95% CI)	Negative Predictive Value (95% CI)	Accuracy (95% CI)
Pap test	50 (27.2 - 72.8)	93.3 (85.12- 97.8)	66.7 (43.53- 83.84)	87.5 (81.81- 91.59)	84.21 (75.3- 90.88)
PCR (reference protocol)	100	100	100	100	100

Notes: The following equations were used for the computation of performance characteristics of Pap test in detecting HPV-associated cervical changes:

$$\text{Sensitivity} = \text{True Positive} / \text{True Positive} + \text{False Negative}$$

$$\text{Specificity} = \text{True Negative} / \text{False Positive} + \text{True Negative}$$

$$\text{Positive Predictive Value} = \text{True Positive} / \text{True Positive} + \text{False Positive}$$

$$\text{Negative Predictive Value} = \text{True Negative} / \text{True Negative} + \text{False Negative}$$

$$\text{Accuracy} = \text{True Positive} + \text{True Negative} / \text{True Positive} + \text{True Negative} + \text{False Positive} + \text{False Negative}$$

РИСУНКИ

Figure 1. Prevalence of HPV and distribution pattern of HPV Genotype groups among women with cervical disorders

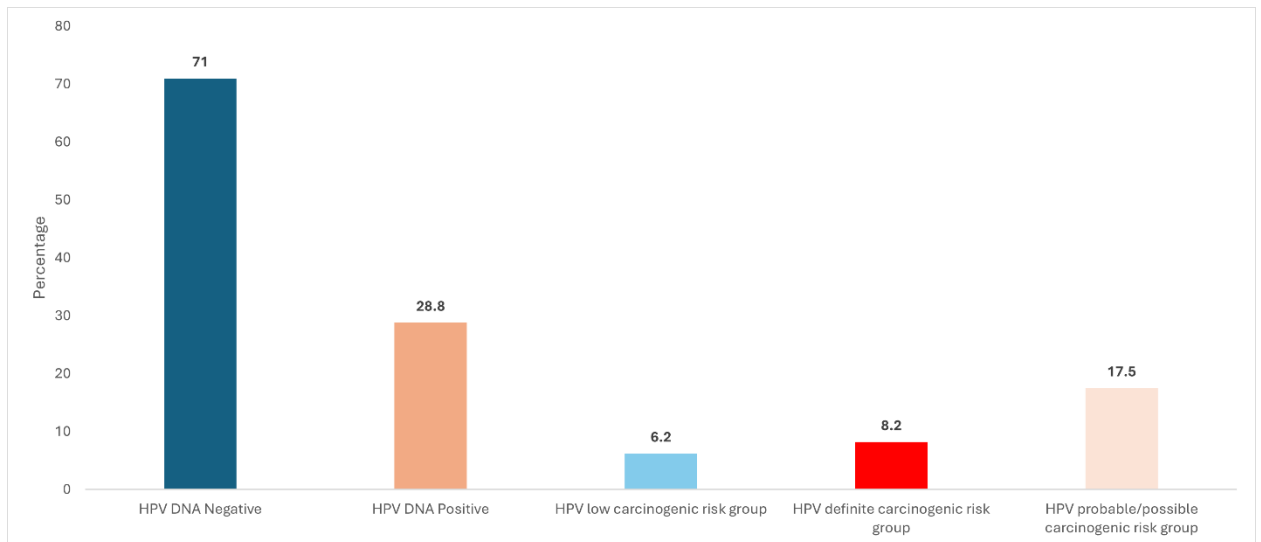


Figure 2. HPV genotype group diversity of HPV among women with cervical disorders

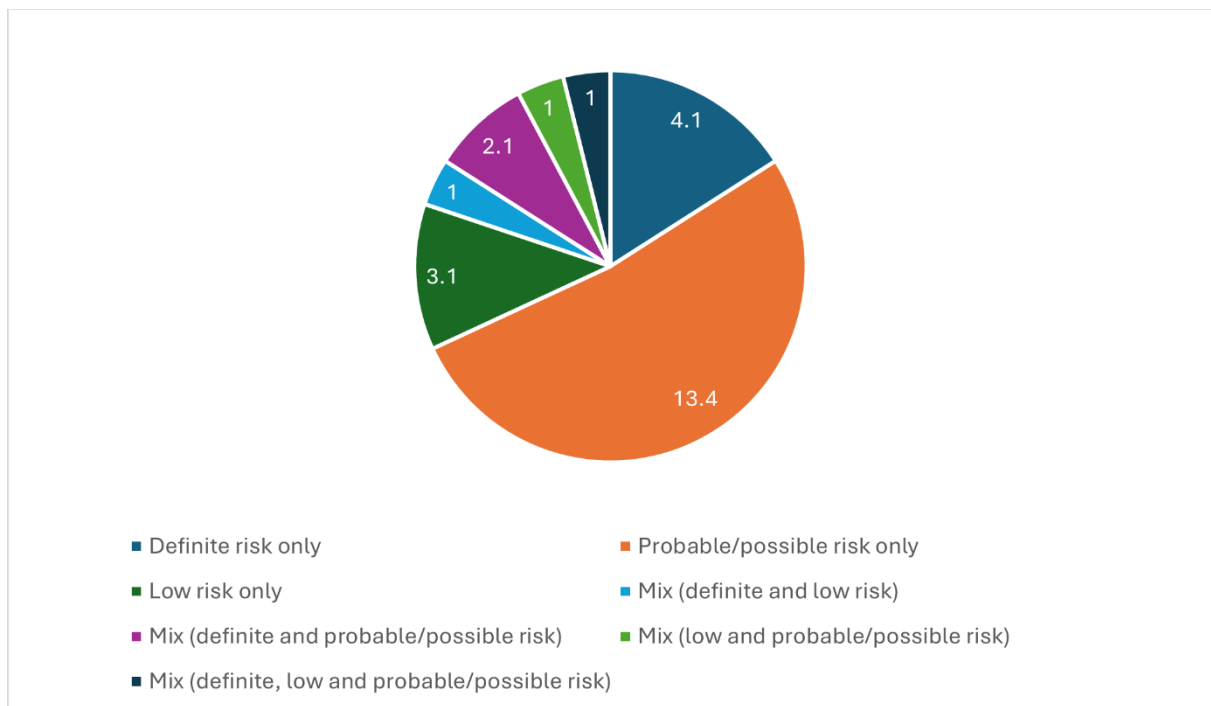
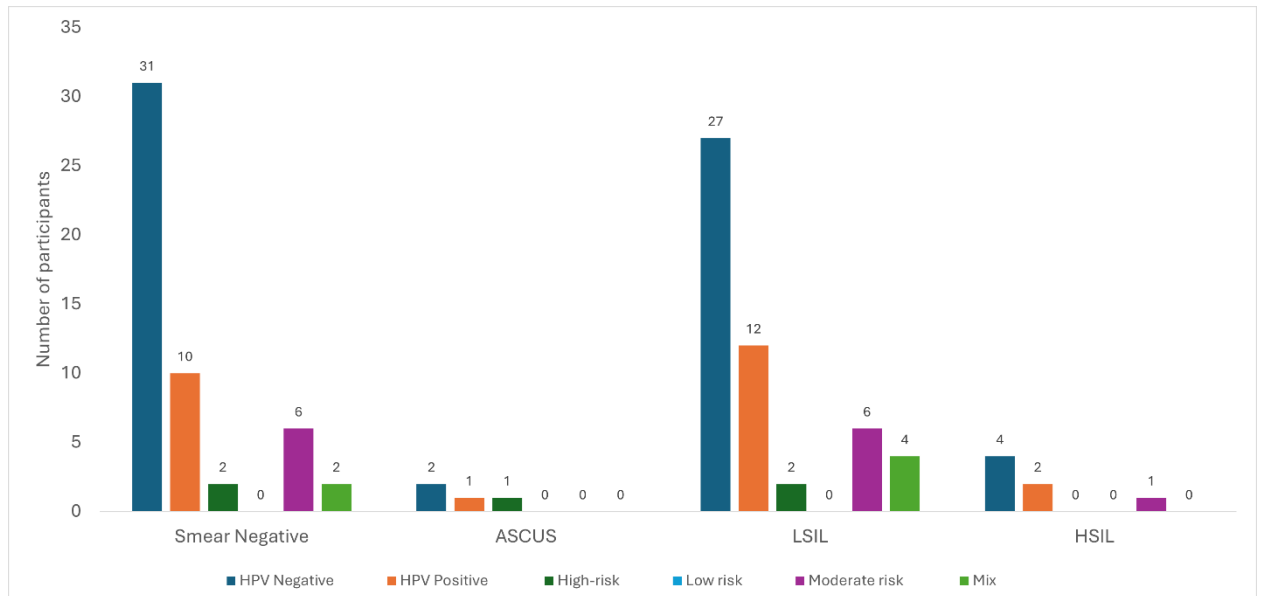


Figure 3. Frequency of HPV detection rate and genotypes by smear microscopy results



Key: ASCUS: Atypical Squamous Cells of Undetermined Significance; LSIL: Low-grade squamous intraepithelial lesion; HGIL: High-grade squamous intraepithelial lesion; NILM: Negative for Intraepithelial Lesion or Malignancy

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Блок 3. Метаданные статьи

PREVALENCE AND GENOTYPE GROUPS OF HUMAN PAPILLOMAVIRUS AND DIAGNOSTIC PERFORMANCE OF PAP SMEAR IN CERVICAL SAMPLES AT THE UNIVERSITY OF ABUJA TEACHING HOSPITAL, NIGERIA

РАСПРОСТРАНЕННОСТЬ И ГЕНОТИПНЫЕ ГРУППЫ ВИРУСА ПАПИЛЛОМЫ ЧЕЛОВЕКА И ДИАГНОСТИЧЕСКАЯ ЗНАЧЕНИЕ ПАП-МАЗКА В ОБРАЗЦАХ ШЕЙКИ МАТКИ В УЧЕБНОЙ БОЛЬНИЦЕ УНИВЕРСИТЕТА АБУДЖИ, НИГЕРИЯ

Сокращенное название статьи для верхнего колонтитула:

GENOTYPE GROUPS OF HPV IN CERVICAL SAMPLES

ГЕНОТИПНЫЕ ГРУППЫ ВИРУСА ПАПИЛЛОМЫ ЧЕЛОВЕКА В ОБРАЗЦАХ ШЕЙКИ МАТКИ

Keywords: Human Papillomavirus, Cervical cancer, Nigeria, High-risk HPV, Papanicolaou test, Performance characteristics.

Ключевые слова: Вирус папилломы человека, рак шейки матки, Нигерия, ВПЧ высокого риска, цитологическое исследование, характеристики эффективности.

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