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Prevalence of Sexually Transmitted Infection (STI) History among Sexually Active Youth During Papillomavirus Infection in the Republic of Congo

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ABSTRACT

Papillomavirus infection is the most widespread sexually transmitted infection in young girls. The literature reports that in 80% of cases, this STI is eliminated naturally by the body: this is known as viral clearance. However, in the remaining 20% of cases, the infection persists and can lead to cervical cancer 10 or even 30 years after primary infection. This persistence is due to a number of risk factors, including other sexually-transmitted infections (STIs) such as chlamydia, mycoses and so on. So, in the absence of data on HPV, STIs and young people, and with a view to developing a sound policy to combat human papillomavirus infection, we conducted a prospective, analytical study of sexually active young girls living in the Republic of Congo, in general secondary schools in the cities of Pointe-Noire and Brazzaville. Of the 260 girls surveyed, only 198 aged between 15 and 25 had given their approval for the study. The average age of our study was reported to be 19 years. We observed that 64.14% of our study population had early sexual intercourse, with only 33.3% using contraceptive methods. The prevalence of previous STIs was estimated at 64.6%, with mycoses predominating (73.4%), followed by chlamydia (15.6%). There was an association between contraceptive use and STIs (p=0.003). Girls with single or cohabiting parents were 3 to 4 times more likely to contract an STI than those with married parents. Molecular analysis reported a 45.45% prevalence of HPV carriage. We noted that girls whose parents were cohabiting were 3 times more likely to carry HPV than those whose parents were married. There was no association between STI history and HPV carriage. These results underline the importance of practicing IEC with sexually active young girls in order to prevent the risk of exposure to STIs and minimize the contraction of STIs in general and HPV in particular.

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Abbreviations
IC95%: 95% Confidence Interval
aOR: Adjusted Odds Ratio
cOR: Crude Odds Ratio
HPV: Human Papillomavirus
CCU: Cervical Cancer
MEPSA-CAB: Ministry of Primary, Secondary Education and Literacy-Cabinet
PN: Pointe-Noire
BZV: Brazzaville
USA: United of States America

Introduction

HPV is a small, non-enveloped, double-stranded circular DNA virus belonging to the Papillomaviridae family. More than 200 types have been identified, classified according to their tropism and pathogenicity [1,2]. HPV infection is common, since 80% of women and men are exposed to it during their lifetime. Most of the time, infection is symptom-free and transient. Indeed, in 80% of cases, the immune system eliminates the virus in less than two years, a process known as viral clearance [3,4]. However, in around 20% of cases of high-risk HPV infection, pre-cancerous lesions may develop, which may disappear naturally or progress to cancer after several years. Of the 14 high-risk HPV genotypes (HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68), the two most common (HPV 16 and 18) are responsible for 71% of cervical cancers worldwide [5-7]. These different types of oncogenic HPV are responsible for over 582,000 new cases of cervical cancer (UCC), causing around 266,000 deaths worldwide every year [8]. In countries with limited resources, cervical cancer is a real public health problem due to a number of risk factors: (i) early sexual debut, (ii) lack of screening policy, (iii) high frequency of sexually transmitted infections, (iv) multiple sexual partners and (v) lack of vaccination policy against oncogenic HPV in young people. It is in these conditions that HPV infection occurs rapidly after first intercourse (3 to 4 years).

In Africa, the prevalence of HPV is high among young people, with carriage between the ages of 20 and 25 [9-11]. In the Republic of Congo, numerous studies show that genotypes 16 and 33 are the most frequently reported, while genotype 18 comes third. However, young people are often exposed to STIs, partly because of the blatant lack of awareness-raising policies, and partly because of the lack of sexual health education programs in educational establishments. Knowing the impact of STIs in the persistence of HPV infection, we wanted to conduct a study to correlate sexually transmitted infections (STIs), which are caused by bacteria, viruses and parasites, with exposure to HPV infection, in order to prevent exposure to STIs by studying risk factors such as early sexual intercourse, the use of contraceptive methods and many other aspects that may be linked to the sexual health of young girls and their exposure to sexually transmitted infections such as chlamydia, herpes, condyloma and mycosis in a population made up of adolescent girls in secondary school in the Republic of Congo, more specifically in the cities of Brazzaville and Pointe-Noire.

Materials and Methods

Procedure and Study Population

This was a cross-sectional, prospective, analytical study carried out on a population of Congolese girls and women aged between 15 and 24. This population consisted of young high school girls. It was conducted in the Republic of Congo, more specifically in the departments of Brazzaville and Pointe-Noire over a period from December 07, 2019 to September 20, 2021.

Data Collection

Participants were interviewed by healthcare professionals consisting of nurses and psychologists, with in-depth knowledge of STIs, cervical cancer, its screening and human papillomaviruses (HPV). Interviews were conducted in French and the country's national languages (Lingala or Kituba). At high school level, teachers were made aware of the need for these health professionals to visit. Girls interested in taking part in the study discussed the objectives with the health professionals. The objectives were well explained to the participants.

The Questionnaire was Divided into Three Sections:

1. Socio-demographic characteristics and sexual behavior of the girls;
2. Level of knowledge about HPV;
3. STI-based clinical history of young women.
   Information on age, level of education, age of first sexual intercourse, condom use, number of sexual partners and use of contraceptive methods was also collected.

Types of Samples for Molecular Analysis

We collected vaginal samples. A naked-eye inspection of the ano-genital region was performed on the participant in the gynaecological position, using a single-use speculum to appreciate the various aspects of the cervix. Samples were taken by cytobrushing the endocervical canal, turning the cytobrush 3 times to collect the endocervical cells. Samples were stored in a jar containing BD SurePath™ transport solution (Benex Limited, Dun Laoghaire, Ireland) and frozen at 20°C in the refrigerator pending analysis.

Molecular Analysis

After returning the samples to room temperature and resuspending them with a vortex, a volume of 1000µl of the suspension was dispensed into ready-to-use cartridges (lot no. 15402 from the manufacturer Céphéid) for each sample. The cartridges were then placed in the GeneXpert 4-module automaton for 60 minutes, in accordance with the manufacturer's instructions, to detect genotypes 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68.

Statistical Analysis

Statistical analysis was carried out using Excel spreadsheets and Stata13 software. Logistic regression analysis was performed to identify the effect of demographic characteristics on the level of knowledge about HPV. The concordance between tests was determined by summing the positives and negatives of the two tests divided by the total number of participants, and multiplying by 100. We assessed the risk (order ratio: OR) with the association of each explanatory variable together with virus carriage and STI history, using a logistic regression model to account for independently associated risk factors.
Associations were considered statistically significant for $p < 0.05$.

Ethical Considerations

This study was conducted in accordance with the ethical guidelines for human research in the Republic of Congo and following the 1964 Declaration of Helsinki and its subsequent amendments. Accordingly, the study received the approval of the Health Sciences Research Ethics Committee of the Republic of Congo (n°033-40MESRSIT/DGRST/CERSSA/-23) and administrative agreements at the level of the Ministry of Primary, Secondary and Literacy Education (n°216/MEPSA-CAB of August 14, 2020). For girls

under 18, an ethical clearance has been obtained from parents through the Congo Pupils' and Students' Parents' Association. Confidentiality and anonymity of the information provided were guaranteed. Only the medical staff were authorized to have access to information that could identify the participant. All participants gave their consent by means of a signed consent form.

Results

A total of 260 young women were approached during the study. Only 198 had given their consent to participate in this study. Thus, 198 participants constituted the sample for the present study.

Socio Demographic Characteristics

Table 1 below presents the socio-demographic characteristics of the study participants, divided between the cities of Brazzaville and Pointe-Noire. The majority of participants were aged between 18 and 24. The majority of participants' parents were married (53.03%). Cohabitation was also fairly common (30.81%), while parents were less likely to be single (16.16%). The majority of families had between 2 and 5 children (63.2%). The range of the number of children in the siblings most represented is that of [3 to 6[with a percentage of 59.09%. This simply means that the majority of girls surveyed lived in families with 3, 4 or 5 children. This first part was the subject of an article [6].

Table 1: Socio Demographic Characterisrics of the Study Population

Features	Population (N=198) enquêtée N=360	Proportions (%)	
	N	%	95% IC
Age, extreme (min, max) in years	15 ; 24		
Age, Mean (standard deviation)	19 (+/-1,87)		
Median age (q1 ; q3)	19(18 ; 20)		
Age groups (classes)			
Under 18s	35	17,68	12,63 - 23,72
18 years and over	163	82,32	76,28 - 87,37
Parents'marital status			
Single	32	16,16	11,32 - 22,04%
Cohabitation	61	30,81	24,46 - 37,74
Married	105	53,03	45,83 - 60,14
Number of siblings			
[1 à 3]	66	33,33	26,81 - 40,36
[3 à 6]	117	59,09	51,90 - 66,01
[6 à 10]	15	7,58	4,30 - 12,19

Attitudes, Practices and HPV Carriage in the Study Population

Table 2 shows a breakdown of the various characteristics of our study population. The prevalence of STIs was 64.65% (128 cases), with a 95% CI ranging from 57.55% to 71.29%. Among STIs, we observed a predominance of mycoses (73.44% or 94/128) and condylomas were the least represented with a prevalence of 1.56% (2/128). The prevalence of HPV carriage was reported at 45.5% (90/198). Only 33.3% of our study population used contraception.

Table 2: Attitudes, Practices and Molecular of the Study Population

Features	Workforce	Proportions in % (95% CI)
STI	**N=198**	
Positive	128	64,65(57,55 – 71,29)
Negative	70	35,35(28,71 – 42,45)
HPV	**N=198**	
Positive	90	45,45(38,38 – 52,67)
Negative	108	54,55(47,33 – 61,62)
STI category	**N=128**	
Chlamydiae	20	15,63(9,81 – 23,9)
Condylomes	2	1,56(0,19 – 5,53)
Herpès	12	9,38(4,94 – 15,80)
Mycoses	94	73,44(64,91 – 80,85)
Age of first sexual intercourse	**N=198**	
< 18 ans		

≥18 ans		
Use of contraceptives	**N=198**	
Yes	66	33,33(26,81 – 40,36)
No	132	66,67(59,64 – 73,19)

Correlation between age Group, Marital Status and STI History

We found that the marital status of the girls' parents was heterogeneously distributed in both STI modalities with high significance (p= 0.0002). This variable could have an influence on the occurrence of STIs in our study population. On the other hand, there was no significant association between girls' age and history of STIs. This means that age was not a risk factor in the occurrence of sexually transmitted infections (Table 3).

Table 3: Comparative Description of the Socio-Demographic Characyeristics of Young Girls on the Occurrence of STIs

Features	STI						P
	Positive			Negative			
	N	%	N	%	N	%	
Age group in year							
Under 18s	23	17,97	12	17,14	35	17,68	0,88
18 years and over	105	82,03	58	82,86	163	82,32	
Parents' marital status							
Single	24	18,75	8	11,43	32	16,16	
Cohabitation	50	39,06	11	15,71	61	30,81	0,0002
Married	54	42,19	51	72,86	105	53,03	

Risk Factors Associated with STI History

Comparing girls from married parents with those whose parents were either cohabiting or single in Table 4, we found that girls whose sires were single or cohabiting had 3 to 4 times the risk of contracting an STI compared with those whose parents were married. These two results had a significant association (p=0.018 and p=0.0001).

Table 4: Risk Factors Associated with a History of STI

STI							
	N=198	Positive		Negative			
Parents' marital status		**n**	**%**	**n**	**%**	**ORC (95% IC)**	**p**
Single	32	24	75,00	8	25,00	2,83(1,17 ; 6,88)	0,018
Cohabitation	61	50	81,97	11	18,03	4,29(2,01 – 9,15)	0,0001
Married	105	54	51,43	51	48,57	1	

1= reference. ORc = Gross Odd ration

Correlation between STIs, HPV, age at First Intercourse and Contraceptive Use

Table 5 shows a significant difference between girls who used contraceptive methods and those who did not, when correlating STIs and contraceptive use (p=0.003). However, there was no association between HPV carriage, age at first intercourse and STIs.

Table 5: Prevalence of STIs According to HPV Carriage, age at Firts Sexual Intercourse and Contraceptive Use

Features	STI						
	Positive			Negative			P
	n	%	n	%	N	%	
HPV							
Positive	62	48,44	28	40,00	90	45,45	0,25
Négative	66	51,56	42	60,00	108	54,55	
Age of first sexual intercourse							
<18 years	80	62,50	47	67,14	127	64,14	0,51
≥18 years	48	37,50	23	32,86	71	35,86	

Use of contraception							
Yes	52	40,63	14	20,00	66	33,33	0,003
No	76	59,38	56	80,00	132	66,67	

STI Prevalence by Contraceptive Use

Looking at Table 6, we found that the population in our study who used contraception had 3 times more risk of contracting an STI than those who did not. This difference was significant at p=0.003.

Table 6: Prevalence of STIs According to Contraceptive Use

	STIs						
	N=198	**Positive**		**Negative**			
Use of contraception		**n**	**%**	**n**	**%**	**ORC (95% IC)**	**P**
Yes	66	52	78,79	14	21,21	**2,74(1,38 ; 5,42)**	**0,003**
Nove	132	76	57,58	56	42,42	**1**	

HPV-HR Carriage as a Function of Age at First Intercourse and Contraceptive Use

Table 7 shows that there was no significant association between HPV carriage and age at first intercourse and contraceptive use.

Table 7: HPV Carriage According to Age at First Intercourse and Contraceptive Use

Features	**HPV**						**P**
	Positive			**Negative**			
	N	**%**	**N**	**%**	**N**	**%**	
Âge of first sexual intercourse							
18 and over	33	36,67	38	35,19	71	35,86	0,82
Under 18s	57	63,33	70	64,81	127	64,14	
Utilisation de la contraception							
Yes	31	34,44	35	32,41	66	33,33	0,76
No	59	65,56	73	67,59	132	66,67	

Risk Factors Independently Associated with HPV Carriage

In our study, we found a significant association between girls with cohabiting parents and HPV carriage (p=0.001). These girls were 3 times more likely to carry HPV than those whose parents were married. On the other hand, when comparing girls whose parents were single with those whose parents were married, there was no association with HPV carriage, as shown in Table 8.

Table 8: Risk Factors Independently Associated with HPV Carriage

	HPV						
	N=198	**Positive**		**Negative**			
Parents' marital status		**N**	**%**	**n**	**%**	**OR_C (95% IC)**	**P**
Single	32	14	43,75	18	56,25	1,37(0,61 ; 3,06)	0,44
Cohabitation	61	38	62,30	23	37,70	2,91(1,51 ; 5,59)	0,001
Married	105	38	36,19	67	63,81	1	

Discussion

Papillomavirus infection, the main cause of cervical cancer, remains the most common sexually transmitted infection among young women [6,12]. In the Republic of Congo, the few data available on HPV and STIs are not very varied, while the persistence of this infection is sometimes due to the presence of other STIs that disrupt the clearance of this HPV infection. The literature reports that young girls and adolescents are more exposed to STIs between the ages of 15 and 30, and that HPV is predominant in this age group [13,14]. Knowing the pathogenic power of HPV and its consequences in the occurrence of UCC, a consequence sometimes due to exposure to STIs as a cofactor of persistence, we were willing to carry out this study to establish the links of co-infection between HPV and STIs, including chlamydia, herpes, condyloma and mycosis. The present study was conducted in a population of sexually active young female high school students in the cities of Brazzaville and Pointe-Noire, Republic of Congo, over a period from December 07, 2019 to September 20, 2021. The objective was to determine the prevalence of STI history and susceptibility during HPV infection in a population of sexually active young females.

Of 260 young people surveyed, 198 aged between 15 and 24 agreed to take part in our study. The average age in our study was 19. This average age is higher than that obtained by Ambounda et al in Gabon in a population of young adolescent girls [15]. On the other hand, in studies carried out in Kenya and Mali, the average age reported was much higher than ours [16,17]. These differences may be due to the sample sizes of these studies. However, in a study of Cameroonian women, Embolo et al obtained an average age similar to ours for the population aged between 15 and 25 years [18].

64.14% of our study population had had early sexual intercourse. This confirms the fact that young girls before they reach maturity are often exposed to early sexual intercourse, as reported in the literature [19,20]. The precociousness of sexual intercourse was also revealed by Adedini et al. in a study of young girls in Nigeria. This study reported a prevalence of between 53.3% and 55.2% [21]. The average age at first intercourse was 16.76±1.65 years, as in the studies by Mukeya et al in Mali and Duval et al in Réunion. The same is true of the work by Adohinzin et al in Burkina Faso, where the mean age at first intercourse was 17.6 years. These results confirm the precocity of sexual intercourse among young girls, compared with the study by Zohoncon et al, in Burkina Faso, who reported an average age of first intercourse of 20 years [16,22-24]. We also noted that only 33.3% of girls in our study used contraceptives (66/198). However, some studies carried out in South Africa and Brazil report lower rates than ours (11% and 21.9%) [25,26]. Another study, in Nigeria to be precise, obtained a higher rate than ours (72.4) [21]. These differences can be explained by the quality and implementation of awareness-raising and outreach programs on sexuality education for young girls or adolescents, as part of a policy to combat unwanted pregnancies and among young girls of childbearing age.

In the study population, 128 participants (64.65%) had a history of STIs, with a predominance of mycoses (73.4%), followed by chlamydia (15.6%), herpes (9.38%) and condylomata (1.56%). Our results differ from those reported by Djouedjon, Chinyere and Carneiro (44.72%, 46.3% and 36.2% for the first three STIs) in a population of women of childbearing age. This difference may be due to sample size, average age, the study population of these studies and the early onset of sexual intercourse in our study [27-29]. The study by Wastiaux et al reported a prevalence of 21.7%, with chlamydia predominating (77%). This confirms what the literature reports about sex life and the predominance of STIs in young people [30-32]. These observed differences are also the result of a lack of knowledge and communication about STIs in developing countries, which leaves the way open for misinformation, especially among minors and sexually active young people, because in these countries with limited resources, sex remains a taboo subject [27,33,34].

The results of our study showed a significant association between the use of contraceptive methods and STIs (p=0.003). This significant difference is explained by the fact that young people, once they can avoid unwanted pregnancies, can now indulge in unprotected sex and multiply their sexual partners.

There was a significant difference between STI history and parental marital status in our study population. When looking for independently associated factors, we found that girls whose parents were single or cohabiting were 3 to 4 times more likely to contract a sexually transmitted infection. This can be explained by the simple fact that in households where parents are not in a marital relationship, childcare remains a serious problem.

Molecular analysis of our study samples using GèneXpert technology reported a prevalence of 45.45%. In reviewing the literature, we noted that, whether old or recent, the various studies show that the prevalence of HPV, whatever the methodology used, varies from one country to another, and within the same country, from one population to another, and within the same age group, from one category of person to another. The study by Tchounga et al in Côte d'Ivoire, for example, showed a carriage rate of 2.8% among adolescent girls. The difference with our study may lie in the country's cervical cancer control policy, which emphasizes the relevance and importance of HPV vaccination in the adolescent age group. Also in Africa, one study reported a prevalence of 48.2% among girls aged between 15 and 24 [35]. Among women aged 25 and over, several studies conducted in Central Africa show that prevalence varies between 12 and 64.4% [36,37]. In West Africa, prevalence ranged from 16.5% to 33.2% [11,38,39]. In East Africa, a study conducted in a cohort of young women in Tanzania found a higher prevalence (74%) than in our study [40]. Thus, comparing our results with those of other studies, although the prevalence of HPV in young girls varies according to the region of the world, all studies agree that this infection is more important in the juvenile age group, which is more exposed to early sexual intercourse with multiple partners. This often exposes them to high levels of STIs. These results corroborate those of previous studies, which have shown that sex life and early sexual relations are legion in the two cities of Brazzaville and Pointe-Noire [29,36]. The differences observed in terms of prevalence can also be explained in relation to the average age of the studies, the sample size of the population used by the various authors and the type of population recruited, i.e. the cohort behaviours. These studies also show that the high prevalence of HPV may in part reflect the at-risk population served by the study sites used for the studies. Other studies have shown that an increase in the number of sexual partners, early sexual intercourse, the use of intravaginal insertions and the number of previous pregnancies or the young age of girls are some of the behavioral risk factors in young women, although the risk of infection differs from person to person [41,42].

Conclusion

Sexually-active young people are particularly vulnerable to sexually-transmitted infections, especially HPV, which is often contracted at first intercourse. Lack of information, low uptake of screening, irregular condom use and contraceptive methods all contribute to the silent spread of these infections. It is therefore essential to strengthen sex education, encourage HPV vaccination and promote easy, confidential access to prevention and screening services. Prevention means protecting young people's present and future sexual health.

Ethical Considerations

This study was conducted in accordance with the ethical guidelines for human research in the Republic of Congo and following the 1964 Declaration of Helsinki and its subsequent amendments. Accordingly, the study received the approval of the Health Sciences Research Ethics Committee of the Republic of Congo (n°033-40MESRSIT/DGRST/CERSSA/-23) and administrative agreements at the level of the Ministry of Primary, Secondary and Literacy Education (n°216/MEPSA-CAB of August 14, 2020). For girls under 18, an ethical clearance has been obtained from parents through the Congo Pupils' and Students' Parents' Association. Confidentiality and anonymity of the information provided were guaranteed. Only the medical staff were authorized to have access to information that could identify the participant. All participants gave their consent by means of a signed consent form.

Clinical Trial Number
Not applicable.

Consent to publication
Consent to publication was obtained from all persons included in the study.

Conflict of Interest
The authors declare that they have no conflicts of interest. Availability of data and materials All data underlying the results described in this article were fully presented in the manuscript.

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Availability of Data
The data is provided in the manuscript or in additional information files.

Authors Contributions
RBBN: design, literature search, writing, funding, EGES: data processing, LPKF: data analyses and interpretation, AMNN: data processing, EEE: design, LMAB: design, FRN: coordination, CEEM: coordination and guidance.

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