HPV Prevalence in a College-aged Sample Group and its Link to Sexual Behaviors and Attitudes

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HPV, or Human Papilloma Virus, is the most common Sexually Transmitted Infection (STI)[1]. It is the number one STI in men and women[2]. There are over 460 subtypes; a majority of the subtypes are able to be cleared by the human immune system within 3 years after initial infection[1,3]. However fifteen of these subtypes have been classified as 'high-risk' for carcinoma development, accounting for almost 100% of cervical cancers[1]. This STI has an age prevalence starting at 19 for oral and genital infections[4]. The overall goal of this research is to provide students with an equally represented and unbiased database regarding the prevalence of HPV infections on campus and the sexual attitudes/behaviors of college students that could be associated with possible infection rates. This research uses a previously developed polymerase chain reaction screening to detect HPV genome within an oral swab sample[3,5]. This portion of the research followed a 14-person sample group, in which once a month they completed an oral swab along with a sexual behavior survey during a three-month period. Their screening results were compared with their survey results to examine any possible connections between the attitudes/behaviors that students reported on and the possible student HPV infection rate.

Introduction

Human Papilloma Virus, or HPV, is a Sexually Transmitted Infection (STI) that is transmitted through scratching or sexual activity (vaginal-penile sex, oral-genital sex, penile-anal sex)[1]. It is a non-enveloped virus that can range from 62-66nm in diameter[1]. HPV can infect both the genital and oral regions by taking hold in the squamous epithelial cells within these areas[1]. This infection is cell-specific in that it targets karyocytes on the basal lamina[1]. Once it has infected cells through binding to heparan sulfate proteoglycans in the segments of the basement membrane using the L1 major capsid protein, it then replicates in a differentiation-dependent manner[1,6]. Early genes specifically in HPV the E6/E7 oncogenes, are expressed in undifferentiated or intermediately differentiated keratinocytes while the later genes, the L1 oncogenes, occur in keratinocytes that undergo terminal or high differentiation[1]. It is the most common STI with around 80% of sexually active individuals developing at least one infection in their lifetime[1]. The odds of developing an infection after just one sexual encounter is low, however HPV is the number one STI in both men and women[2]. It has a genital prevalence between the ages of 19-69 and an oral prevalence from age 19-79[4]. HPV has over 460 subtypes which many can be cleared through the human immune system within 7 months to 3 years of the initial infection[5]. However, around 40 of its subtypes have been traced to carcinoma development[1].

HPV has been connected to six types of cancer: anal cancer, cervical cancer, penile cancer, vaginal cancer, oropharyngeal cancer, and vulvar cancer[7,8]. Fifteen of HPV's subtypes have been classified as 'high-risk' infections; the mechanism of these infections is that they degrade the tumor suppressors, p63 and pRb which can lead to carcinoma development[1] (Table 1). There are two main subtypes that are most associated with carcinoma development: HPV 16 and HPV 18[7]. Currently, HPV accounts for 26-100% of genital cancers and almost 100% of cervical cancer[1,9]. HPV is the most common agent that's responsible for cervical cancer carcinomas forming, which is the fourth deadliest cancer for women[8]. Each year it is estimated that HPV causes 730,000 cancers around the world[7].

There are numerous ways to help prevent the development of HPV and most STI's/sexually transmitted diseases (STD's). The CDC recommends the correct condom use and/or dental damn use, getting properly vaccinated, and regular STI/STD testing to help decrease the chances of developing/spreading an STI[10]. They also encourage regularly communicating with your partners about your test results[10]. These may be straight forward precautions, but college students are not as consistent with protected, safe, sexual activity; a study from 2019 observed only 64% of male students used a condom for vaginal sex, 55% used for anal sex; for the female students 66% used a condom for vaginal sex and 28% used for anal sex[11]. These rates of unprotected sex are in part due to how unreliable accessibility to contraception is (condoms, birth control pills,

Table 1: This table is a literature comprised of the fifteen highest risk HPV subtypes. There are three 'Probable High-Risk' subtypes. The two subtypes most responsible for associated carcinomas are HPV 16 and HPV 18[8].

Risk Category	Type of HPV
High-Risk	HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, 73, 82
Probable High-Risk	HPV 25, 53, 56

etc.) for young adults in America; in a sexual behavior study conducted by Jacobs Institute of Women's Health, they found that 18% of study participants had unprotected sex because of the difficulty it takes to get consistent contraception[12]. The lack of safe sex could also be connected to the general lack of sex education in America; the CDC states that only half of the high schools in America teach all the proper sex education topics (how to have safe sex to avoid STI's/STD's, proper safe sex behavior, side effects/future consequences of developing STI's/STD's)[13]. This lack of education could be harmful with highly infectious viruses, like HPV.

The first available vaccine for HPV was administered in 2007[14]. It was theorized that if the vaccine was administered at full scale, with equal distribution for males and females, and the addition of twice a year STI screening, 97% of cervical cancers could be reduced by the year 2100[14]. However, when the vaccine was first released there was a focus towards female patients, even though HPV infection rates in straight men are about the same as women (3.5-44% women, 2-44% men)[14,15,16]. Even though the vaccine was released to the public in 2007, boys weren't considered for the shot until 2011[17,18].This uneven vaccine administration has severely deterred the vaccine from being as effective as it could have been. As of 2019, the Center for Disease Control (CDC) reports that of those who have had the recommended doses of HPV vaccine around 36.3% are women and only 9% are men[14]. Despite these possible consequences of infection, the age prevalence starting during the age of beginning college, and the unequal vaccination rates information regarding HPV for college students is not regularly available or highly publicized.

The overall goal of this research is to create an equal, unbiased, database regarding prevalence of HPV at Coastal Carolina University and any possible sexual behaviors/attitudes that are attributed to possible infection rates. This database will be based off a previously developed polymerase chain reaction (PCR)[3] screening to test for HPV genome within the saliva sample and a sexual behavior/attitude survey created by the Public Health Department at Coastal Carolina University. The survey has a focus on overall sexual history, pre-sexual behaviors, behaviors and attitudes during sexual activity, post-sexual activity behaviors,

attitudes towards protective sex, personal STI/STD health, and HPV vaccination status. This portion of the project focused on a 14-person anonymous volunteer-based sample group who completed these two portions of the study once a month for three months (February, March, April). In 2023 the information regarding how we inactive any possible virus within the collected oral samples was published[6]. One of the main focuses in this research is the safety of the samplers and students working with the oral samples. In 2024, the information regarding the actual development of the test for samplers was published[6]. The test was designed to not only provide the most accurate results, but also to ensure the volunteers who sampled could sample themselves in the most comfortable manner. Along with the physical and mental safety of lab members and participants, there was also a focus on personal information safety. The research students working on both the sample processing and the survey processing were double blind to the opposite side, as to keep all volunteer information confidential. The survey retained no personal information on it and was only connected to samples through a randomly assigned number. The final gathered data was wiped of all personal information, so that students evaluating the data wouldn't have any access to volunteer information. Both the screening and survey were also evaluated for improvements for continuing research. This combination of these two study elements is to provide an insight not only into the prevalence of HPV on a college campus, but also to examine the way students are conducting their sexual experiences and if this is contributing to possible infection rates.

Methods

Study Design

Over 3 months, 14 willing and consenting volunteers were instructed to come in to the lab once a month to perform an oral self-collection, the human sample group of the research. This was followed by completing a sexual behavior/attitudes survey to collect data that could be used to compare the sexual behaviors of college students with the gathered screening data that represents possible HPV prevalence.

In order to ensure that the identities of the volunteers remained anonymous, each sampler was given a randomly assigned number that was used to identify their sample. After the number was assigned and sample was collected, the sample was taken into a separate area for processing. To maintain confidentiality, every sample was processed by a member of the lab that was completely blind to what number was used to assign samples. After all the data was collected, oral sample and survey results were compiled into a spreadsheet and each sample number was replaced by a random letter assigned by the project leader (Dr. Paul E. Richardson). This was done to eliminate any possible sources of bias and ensure the study was double-blind.

Self-Collection Methods

This methodology of self-collection was previously established through the testing of various sampling methods and has proven to be the most accurate and consistent method for orally collecting human DNA[4]. Samplers were given a sterile cotton swab, the Puritan Sterile Cotton Tipped Applicator, and instructed to vigorously scrape the back of the throat, near the tonsil region, in circular motions for 30 seconds. The swab was then placed in a 1.5mL centrifuge tube containing 1mL of nuclease free water. The tip of the swab was then broken off inside the centrifuge tube and sat at room temperature for 5 minutes.

Filtration and Deactivation

Samples were filtered using a 0.45 micrometer filter attached to a sterile syringe and into a new 1.5mL centrifuge tube. 5 microliters (5µl) of Proteinase K were added to the samples, and then placed on a shaking table for 1 hour. Samples were then placed in a heat block set to 85°C for 20 minutes for proper denaturation. The methods used to ensure inactivation of any viral material were developed in a previous study[3].

PCR Primers

The PCR primers that were used in this HPV screening included the Papillomavirus (Pap) Pap E6/E7 primer set[20], the Papillomavirus primer set Pap L1[19], and the human β-globin (HB1) primer set[20]. Human β-globin (260bp)[20] primer set was used to confirm that the samples collected contained human DNA[20]. E6/E7 (230-270bp) and L1(150bp) papillomavirus primer sets were gathered from a Pedro Surriabea dissertation and used for the detection of HPV by providing a detection threshold for Papillomavirus p53 DNA[20]. After the PCR protocol was run, each sample was screened with both of the Papillomavirus primers and HB1[20] and ran on separate gels based on their primers. The L1 primer[19] had started being used about halfway through the experiment, so its results are not listed in this paper.

Polymerase Chain Reaction (PCR)

The PCR mix for these samples contained 25 microliters (25µl) of Gotaq Green Master Mix 2x, 21 microliters (21µl) of the given sample, and 4 microliters (4µl) of the corresponding primer set. PCR analysis was conducted in the BioRad T100 Thermocycler. PCR program PAPNORM was used and conducted as follows: an initial 4-minute unwinding of DNA step at 96°C, 39 cycles of DNA denaturation (30 seconds at 94°C), annealing of primer(s) (1 minute at 66°C), and extension of DNA (2 minutes at 82°C). After completion, PCR products were held at 4°C in a freezer for short-term storage.

Gel Electrophoresis

The PCR products were imaged by gel electrophoresis using a 2% agarose (Agarose 1, VWR) gel and 1x tris-acetate (TAE) buffer. The staining agent used for the 2% agarose gel was ethidium bromide, 4 microliters (4µl) for large gel boxes and 2 microliters (2µl) for small gel boxes. 7 microliters (7µl) of DNA ladder of 100 bp DNA ladder (Promega Corporation) were added to the corresponding wells, along with 10 microliters (10µl) of PCR product associated with the appropriate primer. Gel electrophoresis was run at 100 volts for 1 hour, followed by being imaged under UV light with the Molecular Imager ChemiDoc XRS+ Imaging System from BioRad Laboratories, Inc.

Results and Discussion

PCR Screening Monthly Results

During February, fourteen Coastal Carolina students volunteered to participate in the three-month experiment, which involved the PCR oral swab screening and the sexual behavior/attitudes survey. In March and April only twelve volunteers participated in the experiment. Volunteers came in once a month for each month to complete both tests. Overall, out of the 38 E6/E7[20] samples throughout the three-month sampling period, there were 4 positive samples from 3 separate volunteers.

Specifically, regarding the test, two key points were noticed throughout the three-month period. One key point was the improvement needed to the oral sampling instructions. This was deduced due to the repeated missing bands on the HB1[20] agarose gels. HB1[20] is the is the control for confirmation of DNA in the collected samples. It is a common target that is used in HPV tests for confirmation of human samples[20]. It is collected through the scraping of the epithelial cells with the oral swab. Both the appropriate band lengths and an example of the missing bands are pictured in Figures 1 and 2. The missing bands are most likely due to a lack of thorough scrubbing or scraping of the swab in the oral region. With an improved instruction sheet that focuses on the importance of scrubbing or scraping the selected area, this problem may be resolved. Another development was the appearance of repeated unique band patterns. Pictured in both Figures 3 and 4, on multiple samples a band pattern that did not match up with the positive control of E6/E7[20] appeared on the agarose gels. Currently this band is unknown, and sequencing might be used in the future to determine what it corresponds to.

Statistical Survey Analysis

The sexual behavior/attitudes survey questions and responses are listed below in numerical order. Some of the questions are broken down into sub-questions, listed in alphabetical order. The results from each month are analyzed and our positive E6/E7[20] positive volunteers' answers will be provided for comparison. Note that in the months of March and April two of the volunteers did not show up for screening or
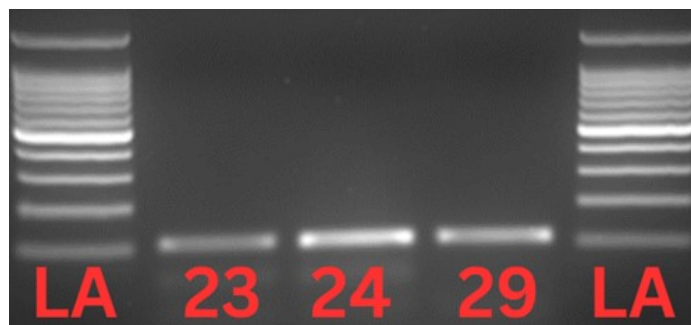
Figure 1: HB1[20] gel electrophoresis image for sample numbers 23, 24, 29(left to right). The well order is 100bp DNA Ladder from Promega (LA), #23, #24, #29, and 100bp DNA Ladder from Promega (LA). All three samples have a correct HB1 primer[18] band length around 110bp.
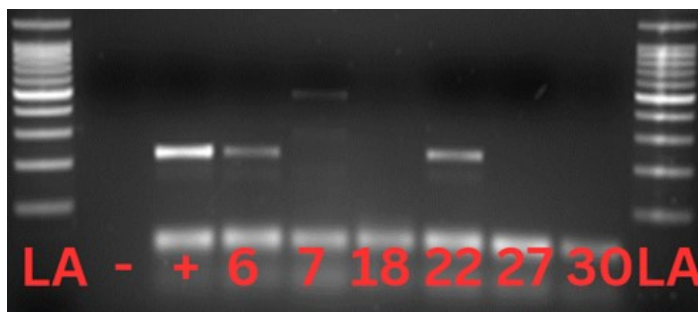

Figure 2: HB1[20] 2% agarose gel for sample numbers 6,7,18,22,27,30 (left to right) 100bp DNA Ladder from Promega (LA), #6, #7, #18, #22, #27, #30, and 100bp DNA Ladder from Promega (LA). The band for sample #18 HB1 primer does not appear on this gel.

Figure 3: E6/E7[20] gel electrophoresis image for sample numbers 6,7,18,22,27,30 (left to right). The order of the wells in this image are as following; 100bp DNA Ladder from Promega (LA), Negative Control (-), Positive Control (+), #6, #7, #18, #22, #27, #30, and 100bp DNA Ladder from Promega (LA). Samples #6 and #22 are positive bands around 200-210 bp, while sample #7 has a unique band pattern with 3 bands around 500bp, 300bp, and 100bp.
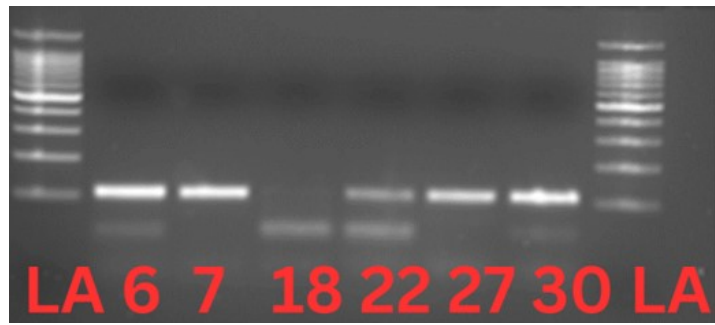

Figure 4: E6/E7[20] gel electrophoresis image for sample numbers 25,43,44,49,52 (left to right). The well order is as follows; 100bp DNA Ladder from Promega (LA), Negative Control (-), Positive Control (+), #25, #43, #44, #49, #52, and 100bp DNA Ladder from Promega (LA). Sample #25 has 3 distinct bands around the lengths of 400bp, 300bp, and 100bp.

survey, so the sample group dropped from 14 volunteers to 12. A table comparison of the E6/E7[20] self-reported answers to the following survey questions (3a-3g) are shown in Table 2. There were some questions from the original survey that are not listed below as they were deemed to not be relevant. The removed questions did not seem to have any connection or relevance to the results from the HPV oral screening.

1. Have you ever engaged any type of sexual behavior (sexual behavior, hooked-up, oral sex, penile vaginal sex, anal sex, any or all) Yes, or no?

a. In February, eleven volunteers answered, 'yes' and three answered 'no'. In March eight answered, 'yes' and two answered 'no'. In April, two answered 'no' and eight answered 'yes'. A majority of the volunteers have had a sexual experience in their life *(sexual behavior, hooked-up, oral sex, penile vaginal sex, anal sex, any or all)* ensuring the experimental element and at least three with no sexual experience for the control element of the research. All three of the volunteers who presented as positives on the HPV E6/E7[20] genes answered yes to this question. Those who have had sexual experiences or have engaged in sexual behavior are more likely to develop an HPV infection[1].

2. Sexual Behaviors

a. *How many partners have you engaged in sexual behavior with but not had sex with?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum number of partners reported was 0 with the first quartile of answers also being 0. The median number of partners reported was 1 and the third quartile range being 3. The maximum self-reported answer was 21. There were some outliers in this question (10,10,14,21). A

confidence level was calculated for this three-month data set with the following results: there was a standard deviation of 4.493. The confidence integral is (1.54,4.40) The high standard deviation can suggest that there was a high distribution of reported answers. It also infers that the volunteers all have different levels of sexual experience, regarding this question. The three volunteers who were presenting positive for the E6/E7[20] gene answered, 2-3, 0, and 7-21. The wide range of self-reported answers from volunteers reflects the idea that it is not how many sexual partners or activity an individual has that affects infection rates, it is the precautions the individuals are taking during sexual activity (wearing condoms/dental dams, getting regularly tested, etc.)[10].

3. Sexual Behaviors cont.
The following questions had multiple ambiguous answers (50+, 20+, 10+, etc.) so the statistically interpreted data cannot be taken in complete confidence.

a. *How many times have you had vaginal intercourse without a latex or polyurethane condom?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum response for times was 0 and the first quartile was 0.25. The median times reported was 5.5 and the third quartile was 15. The maximum number of times was 50. The mean of the data set was 10.02 and the standard deviation was 12.84. The confidence interval was between 5.94 and 14.1 times. This data can be interpreted as a wide array of regular usage of condom usage during vaginal sex. Some students are high up on the scale, but a majority are below the third quartile. This skew in the data set can be seen as a lack of condom usage within the student volunteer sample. The three volunteers who were presenting positive for the E6/E7 gene answered, 20, 8, 10-15. The

Table 2: This is the collected responses from the presenting E6/E72[20] positive volunteers and the month(s) they presented positive for. The average responses of all volunteers from the three-month period are listed at the bottom of the table. For the third positive, both responses from March and April are listed. This table is specific to questions 3a-3g in the sexual behavior/attitudes survey

E6/E7[18] Results	Sexual Behavior Survey Questions:	3a	3b	3c	3d	3e	3f	3g
Positive (Feb)	Feb Response	20	15	15	0	3	0	0
Positive (Mar)	Mar Response	8	10	2	0	5	3	2
Positive (Mar, Apr)	Mar, Apr Response	10, 15	6,4	8,4	0,0	6,5	10,9	7,8
	Average Response:	10.02	5.43	8.16	0.21	4.56	2.35	4

higher responses from the positive volunteers could indicate that a lack of proper condom use during vaginal intercourse leads to a higher likelihood of infection, which would reflect what the CDC has presented and why they recommend proper condom use for each sexual encounter[10].

b. *How many times have you given or received fellatio (oral sex on a man) without a condom?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum value was 0 and the first quartile value was 0. The median reported number of times was 1 and the third quartile was 9.5. There was a maximum reported value of 50 and a mean value of 5.433. There was a standard deviation of 9.722. The confidence interval was between 5.49 and 14.11. This data set shows a wide array of usage of condoms while performing/receiving oral sex on a man. The three volunteers who were presenting positive for the E6/E7 genes answered 15, 10, and 4-6. Two of these answers are higher than the average, which could be connected to their positive E6/E7 results, as this question is about protection in the oral area during oral sexual activity.

c. *How many times have you given or received cunnilingus (oral sex on a woman) without a dental dam or "adequate protection"?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum number of reported times was 0 and the first quartile was 0. The median amount was 2 and the third quartile as 10. The maximum response was 60. There was a standard deviation in this data set of 14.2. The mean response was 8.16. The confidence interval was between (3.64, 12.69). There were two outlier responses (50,60). This data shows a diverse set of answers when it comes to this question. It also shows a higher mean value which could be connected to the low positive rates from the oral sample screen. The three volunteers who were presenting positive for the E6/E7 gene answered 15, 2, 4-8. The wide range of answers from the positives could show that students are not regularly using proper protection while engaging in this sexual behavior, which could be connected to their positive results.

d. *How many times have you given or* received analingus *(oral stimulation of the anal region, "rimming") without a dental dam or "adequate protection" (please see definition of dental dam for what is considered adequate protection)?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum value reported by volunteers was 0, the first quartile was 0, the third quartile was 0, and the median value was found to be 0. The maximum reported value for this question was 2. The standard deviation was 0.577 and the mean was 0.21. This data shows that students are not engaging in this specific sexual behavior without protection. The three volunteers who were presenting positive for the E6/E7 gene answered 0. The use of protection during this sexual activity could be contributed to the small number of positives in E6/E7 results.

e. *How many times have you or your partner used alcohol or drugs before or during sex?*

All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum number was 0 and the first quartile range was 0. The median value was 2.5 and the third quartile value was 5. The maximum value reported was 50 and the standard deviation was 9.04. The mean response was 4.56 and the confidence interval was found to be (1.687, 7.44). There is a large spread of diversity in these answers, shown through the maximum value and the standard deviation. The three volunteers who were presenting positive for the E6/E7[18] primer answered, 3, 5, 6-5. These answers are around the average response, which could show the intoxication of partners before sex could be connected to unsafe sexual behaviors/attitudes that could lead to infection rates increasing[21].

f. *How many times have you had sex with a new partner before discussing sexual history, IV drug use, disease status and other current sexual partners?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum number was 0, the first quartile was 0, and the median value 0. The third quartile was found to be 3 and the maximum value was 21. The standard deviation was calculated to be 4.21 and the confidence interval was (1.012, 3.69). This data was heavily skewed to the 0 side, as shown in the five number summary and the confidence interval. This data could reflect that students in the volunteer group are not discussing sexual history, IV drug use, and other current sexual partners with their partners before sex. The three volunteers who were presenting positive for the E6/E7 gene answered, 0, 3, and 9-10. Two of these responses are higher than the average. Even with students discussing histories there still seems to be a present infection rate, which goes against what the CDC says could help prevent the spread of STI's[10].

g. *How many times (that you know of) have you had sex with someone who was also engaging in sex with others during the same time period?*
All responses from the sampling period for this question were gathered and calculated into a five number summary. The minimum number reported was 0, the first quartile was 0, and the median value was found to be 0. The third quartile range was calculated to 1 and the maximum value reported was 16. The standard deviation was determined to be 4 and the mean value was 4. The confidence interval was (0.623, 3.17). This data has a smaller range and a higher standard deviation. The three volunteers who were presenting positive for the E6/E7 gene answered, 0, 2, and 7-8. The range of these positive answers once again could be interpreted as the notion that your partners having a high number of partners isn't correlated with HPV infection rates, but the way the individuals are having sex can (not wearing a condom, not using proper protection, etc.)[10].

4. *Sexually Transmitted infections*

a. *Are you currently worried about contracting a Sexually Transmitted Infection (STI)?*
In the month of February there were two responses of 'N/A', three 'yes', and nine 'no'. In the month of March, one responded 'N/A', two answers for 'yes', and nine 'no'. In April there was one response of one 'N/A', two 'yes', and nine 'no'. Throughout the course of the

sample period, many volunteers reported that they are not worried about contracting an STI, despite high national infection rates of STI's, HPV specifically[1].

b. *Have you ever been previously tested for any STI?*
In February five responses 'yes', 2 responded (N/A), and seven answered 'no'. In March one responded 'N/A', three responded 'yes', and eight responded 'no'. In April one responded 'N/A', five responded 'yes', and six responded 'no'. In our sample group a majority of total respondents said they have not been tested for an STI. The CDC recommends regular testing to maintain knowledge on your sexual health and keep the infection rate lowered[16]. It does seem, however, that through the sampling period, the number of volunteers who got a clinical STI test increased. This could be due to the increased awareness of STI dangers to the sample group through participation in the study.

c. *To your knowledge have you ever tested positive for a STI?*
In February two volunteers answered 'N/A' and twelve answered no. In the month of March, one answered 'N/A' and eleven answered 'no'. In the month of April one answered 'N/A', one answered 'yes', and ten answered 'no'. Although the majority of volunteers answered that they haven't tested positive for an STI, most of them have never been tested for an STI (Question 4b). The lack of knowledge on current STI status could be associated with increased infection rates, as regular testing can help to inform students so they can stop the spread of STI/STD[10].

5. *Human Papilloma Virus*

a. *Have you received the Human Papilloma vaccine (Gardasil complete 3 shot series) in the past?*
In February eight answered 'yes', one answered 'unsure', and five answered 'no'. In March two answered 'N/A', four answered 'yes', and six answered 'no'. In April two answered, 'not sure', five answered 'no' and five answered 'no'. Overall, an average of 51% of our volunteers have had the Gardasil complete 3 shot series. The lack of vaccinations could be attributed to positive E6/E7 results, as the vaccinations help to prevent infection of HPV[15].

Conclusion

This research is focused on determining the relationship of the PCR oral swab screening for HPV detection and a survey based on sexual attitudes/behaviors college students are exerting. For this semester of work, a sample group of 14 anonymous volunteer college students completed both the oral sample and the sexual behavior/attitudes survey once a month for three months (February, March, April). Previous work from this lab has been published on both the safety of the screening and the development of the self-collection methods[3,4]. The sexual behavior/attitudes survey was created by the Department of Public Health at Coastal Carolina University. The combination of both the self-collection and survey results allows a glimpse into possible trends in behaviors/attitudes students are exerting that could be connected to HPV infection rates on the college campus.

During this sample group period, the self-collection methodology highlighted some areas of improvement. Mainly improvement on the self-collection instructions as to limit the amount of missing HB1 bands on the result gels (Figure 1, Figure 2). By focusing and editing the self-collection instructions, volunteers should be able to understand the importance of scraping the oral area to pick up enough human DNA. There were also some unique band patterns on two of the gels (Figure 3, Figure 4).

Overall, the focus of this portion of research was regarding the answers from the sexual behavior/attitudes survey. This survey showed, as other national studies have shown previously, that college students are not consistently taking all safe-sex precautions that they could be (having conversations with partners regarding sexual activity, getting regularly tested, having proper vaccinations, using proper contraceptive protection)[6,7]. Although these cannot be confirmed as direct links to HPV infection rates, due to our small sample group and small timeline of collecting samples, they are a beginning point for further investigation with this research. These results also show that every college student has varied sexual experiences, and correlations cannot be confirmed without a larger sample to compare answers.

In the future, this research will continue with the use of both the self-collected oral samples and the use of the sexual behavior/attitude survey to further understand if there are any possible connections between students' actions and any prevalence of HPV on the campus. To get a better understanding of these connections, the sample group will be enlarged, and the overall period of sample time will be extended. As previously stated, the self-collection methodology and instructions will be improved. Continuation of this research will provide more concrete evidence to support the possibility of HPV prevalence and the connection of students' attitudes/behaviors to any infection rates.

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