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Original Research Article

Statistical analysis of human papillomavirus prevalence and related factors in the North Tamil Nadu population: a cross-sectional study

Poornima Shyam[1]*, S. Subramaniam[1], G. Vijaiyan Siva[2], Shyam Subramaniam[3]

[1]Department of Biochemistry, Regenix Super Speciality laboratories Pvt. Ltd. (Affliated to University of Madras), Choolaimedu (Vadapalani), Chennai, Tamil Nadu, India
[2]Department of Biotechnology, University of Madras, Guindy Campus, Chennai, Tamil Nadu, India
[3]Department of Biochemistry, Apollo LabServices, Chennai, Tamil Nadu, India

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***Correspondence:**
Dr. Poornima Shyam,
E-mail: poornimashyambt@gmail.com

ABSTRACT

Background: Cervical cancer is one of the most prevalent cancers in women worldwide. Cervical cancer is 95% caused by the consistent infection by high-risk human papillomavirus (Hr HPV). The incidence of this cancer is higher in developing countries.
Method: This study is a cohort study consisting of an analysis of data from patient detail and consent form 120 HPV-suspected samples collected from north Tamil Nadu namely Chennai, Pochampalli, Vellore, Kanchipuram, Dharmapuri, and Ambur. The incidence of HPV is seen to be slightly raised in these regions. This study deals with exploring factors like age, cervix conditions, comorbidities, and symptoms for testing in correlation with HPV positivity. All the values interpreted are in significance $p<0.05$. All statistics was calculated using SPSS version 22.
Results: This is a first-of-its-kind study in this population. This study aims to highlight the correlating factors of HPV infection and standardize a pattern to screen women. This timely screening will greatly reduce the impact of HPV-dependent cervical cancer. Factors like diabetes, inflamed cervix, erosion and age were seen to be positively correlated with HPV positive status and consequently with cervical cancer.
Conclusions: These factors may be applied to other population groups and predictive parameters for HPV dependent cervical cancers may be established.

Keywords: North Tamil Nadu, HPV, Cervical cancer, Dependent factors, Predictive symptoms

INTRODUCTION

The 2020 statistics show that 19.3 million new cases of cancers were identified, while 10 million deaths were reported.[1-4] The increasing trends indicate that breast, cervical, and prostate cancers are the top three cancers to focus on. Among the above-mentioned cancers, with a defined point of origin is cervical cancer with more than 95% of the cancers caused by Hr-HPV infection. Hence, making it the most easily detectable and preventable form of cancer. Cervical cancers are majorly caused by the infection of HPV is prevalent in low- and mid-income countries. Between 84 and 90% occurred in low- and middle-income countries (LMICs) such as South Africa, India, China, and Brazil.[5] Death rates for female breast and cervical cancers, however, were considerably higher in transitioning versus transitioned countries (15.0 vs 12.8 per 100,000 and 12.4 vs 5.2 per 100,000, respectively). The latest accurate statistics remain in 2020, the post-COVID era is unknown. Lack of timely diagnosis and treatment has aided in the increased rates of deaths.[11] Among women breast and cervix uteri are the predominant cancers.[8] The Tamil Nadu statistics show a steady increase in the number of cancer patients, and among women, cervical cancer is on the rise post-pandemic as estimated by the Tamil Nadu cancer registry programme (TNCRP).[10]

The squamous cell carcinoma or adenocarcinoma of the lower part of the uterus and the upper part of the vagina is cervical cancer. This type of cancer begins in the cervix and extends into the uterus. Cervical cancer is rated as the fourth most common cancer for women worldwide. A whopping number of 604000 women were diagnosed with cervical cancer worldwide and 342000 women lost their battle against this easily preventable cancer in 2020 (WHO statistics). The statistics show a decrease in the incidence of cervical cancer over the years owing to the screening and vaccine. Cervical cancer is majorly caused by HPV types 16 and 18. The constant prevalence of the virus leads to cancer; hence early detection of HPV makes it a preventable form of cancer. Among the HPV types HPV 16, HPV 18, and HPV 45 are the prevalent types contributing to 68%, 20%, and 4.5% of the total HPV- related cancers respectively.[7]

METHODS

Sample collection

This is a cohort study conducted between the period of January 2020-October 2022 for a period of 2 years and 9 months (unavailability of samples during COVID pandemic). Samples received for cervical biopsy, HPV molecular testing, LBC, and PAP smear, which were reported as positive for HPV and positive/inflammatory in PAPS smear and/or LBC, and positive tissue samples for cervical cancer, after analysis were used in the study. Consent forms and patient details were collected. The data collected in the consent forms were used for this study.

Groups-A total of 120 samples were evaluated, group 1: normal (Control)-pap smear and HPV negative-30 samples, group 2: Inflammatory-tested for HPV: 2. a-Positive HPV status-40 samples, 2. b-negative HPV status-30 samples, group 3: cervical cancer positive-cervical cancer positive samples-20 samples: 3. a- LSIL, 3. b-HSIL and 3. C. Squamous cell carcinoma-positive samples.

HPV testing was carried out with a CE-approved kit available in the market

Inclusion criteria

Women between the ages of 18-70 were included in the study.

Exclusion criteria

Women with other known malignancies and pregnant women were excluded from the study.

Ethical approval

Ethical approval for the project was obtained from HYCARE Wounds IEC project no:027/HYC/IEC/2018 dated:13.12.2018. Ethical approval for the project was obtained from HYCARE super specialty hospital IEC. Project no: 027/HSSH-EC/2022 dated: 04.02.2022 (Study registered under central drugs standard control organization) Hycare super speciality hospital ethics committee Hycare super speciality hospital 37, 38 Razack garden road MMDA colony main road, Arumbakkam Chennai, Tamil Nadu ECR/1291/Inst/TN/2019Tamil Nadu2019-Nov-05.

Statistics

All the values interpreted are in the significance $p<0.05$. All the statistics were calculated using SPSS version 22.

RESULTS

The consent forms and patient details were collected from the patients taken for the study. A statistical analysis of various factors was done for a better understanding of the disease conditions. The data analysis was in line with the studies so far. Global data suggests that as far as 1 in 53 women suffer from cervical cancer in their lifetime.[6] This accounts for almost a quarter of the world's cervical cancer burden.[2] This is a cross-sectional study wherein the observations of the patients were recorded. The study was conducted in the samples received for testing at Regenix super specialty laboratories Pvt. Ltd. labs from its branches in Chennai and its neighboring districts-Kanchipuram, Vellore, Ambur, Salem, Pochampalli and Dharmapuri.

The analysis of data showed that the prevalence was higher in the lower-income group. Some factors such as age at menarche, and days of flow did not seem to have a pronounced effect from our observation. The family history of cancer does not play a significant role in our study as the study is based on a viral infection. Among the hygiene techniques used older women who have used cloths are seen to have a higher incidence of HPV infection. Persistent infection is a key factor to HPV-based cervical cancer. The overcoming of HPV infection is often attributed to the immune system by activation of the CD4+ and CD8+.[9] Hygiene habits such as douching or menstrual hygiene techniques such as pads or menstrual cups did not affect HPV prevalence.

Age distribution

Among the 126 samples tested HPV 16 showed the highest incidence. The samples taken for testing were suspected cases of HPV with a few routine checks this may be attributed to the higher rate of positivity. Only 2 co-infection cases and 4 HPV 45 cases were seen in the study population.

The age distribution of the participants in this study is between 21-68 years with the mean age being 38 years. The positivity rate increased with age. the mean age of positivity was found to be 45 years. The highest positivity

rate was seen in the age group over 40. This was compliant with the statistics worldwide. The latest statistics of the Indian scenario from 2012 are amenable to the data obtained in the study. The cervical cancer fact sheet of WHO regarding cervical cancer also supports the same. The weights of patients taken from this study averaged at 64 kg with the highest weight being 90 kg and the lowest weight being 48 kg. The weight of the patients did not play any significant role in the positivity rates. Menstrual hygiene techniques did not play an influential role in HPV positivity.

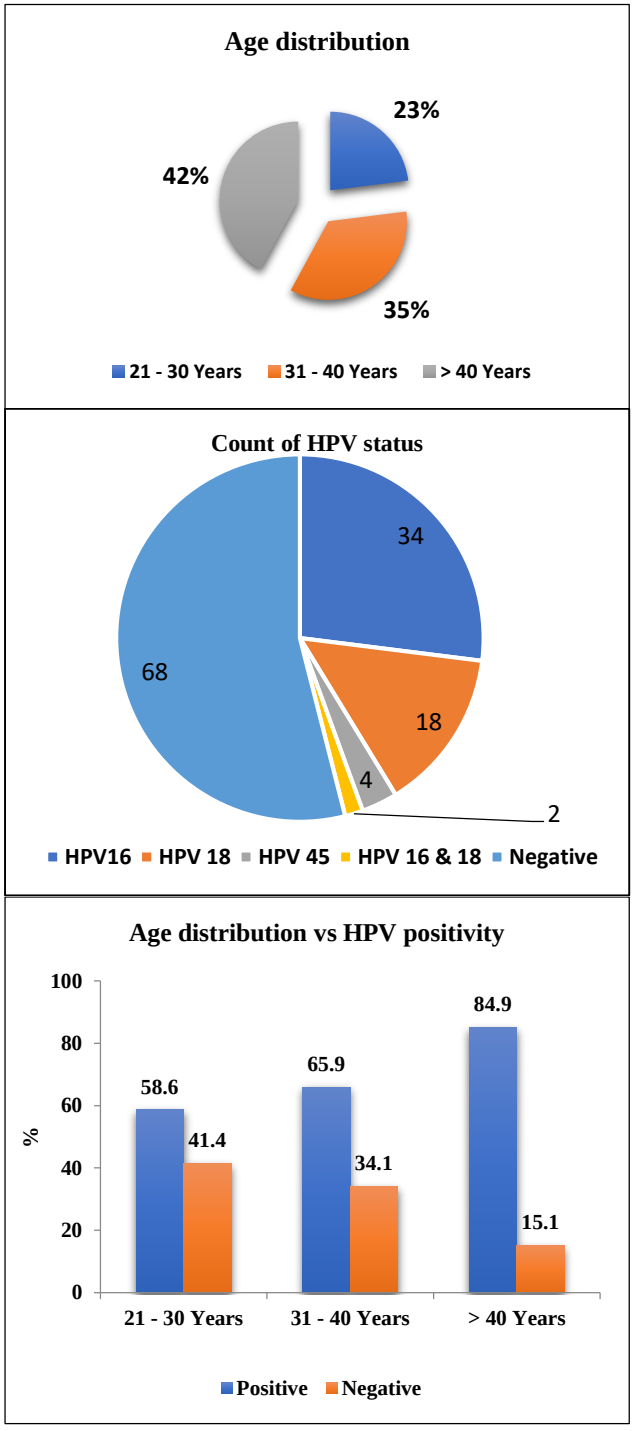

Figure 1: Overall positivity and age distribution.

Comorbidities

Comorbidities recorded include hypertension, diabetes mellitus, hyper-cholesterol, and anemia. Diabetes mellitus was found to be the comorbidity that affected a larger number of patients in this study. Though hypertension was relatively lesser in the population tested the rates of HPV positivity were higher for patients with hypertension. Patients with diabetes mellitus were found to have positivity rates as well. Patients with diabetes mellitus are prone to vaginal infections and immunity is lower and hence may be the reason for the higher positivity rates. This data is similar to that of Yue et al. Brito et al also found that the HPV positivity rates were higher in patients with hypertension.[2,3,12]

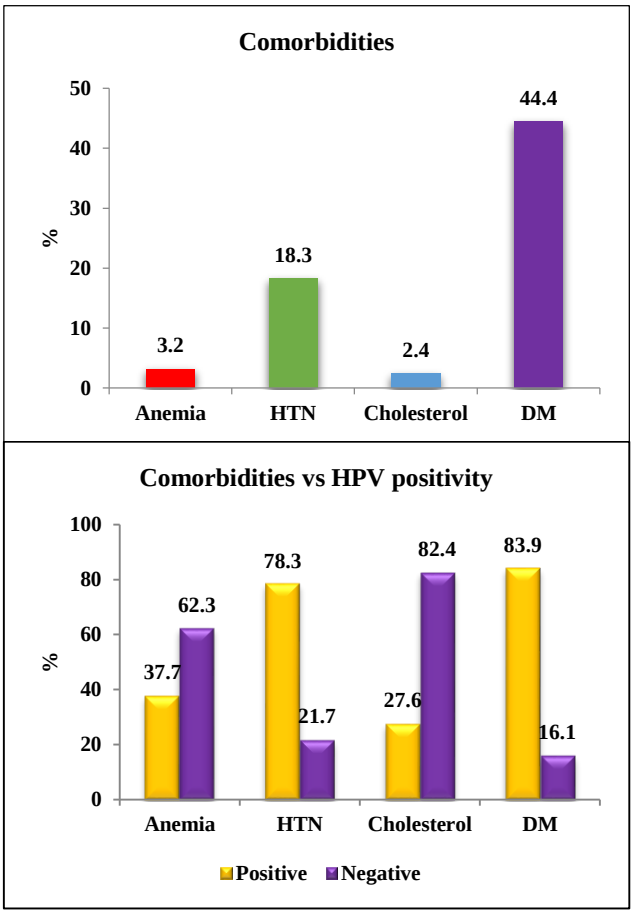

Figure 2: Comorbidities.

Pap smear results

Among the 126 samples analyzed it was seen that the distribution of pap smear results was in the order inflammatory, normal, HSIL, LSIL, and malignant. The distribution of the inflammatory smears was the highest. The global data also suggests the same.[1] The HPV positivity status was in agreement with the pap-smear testing results. The pap smears taken in this study are both traditional smears and smears processed from liquid-based cytology samples.

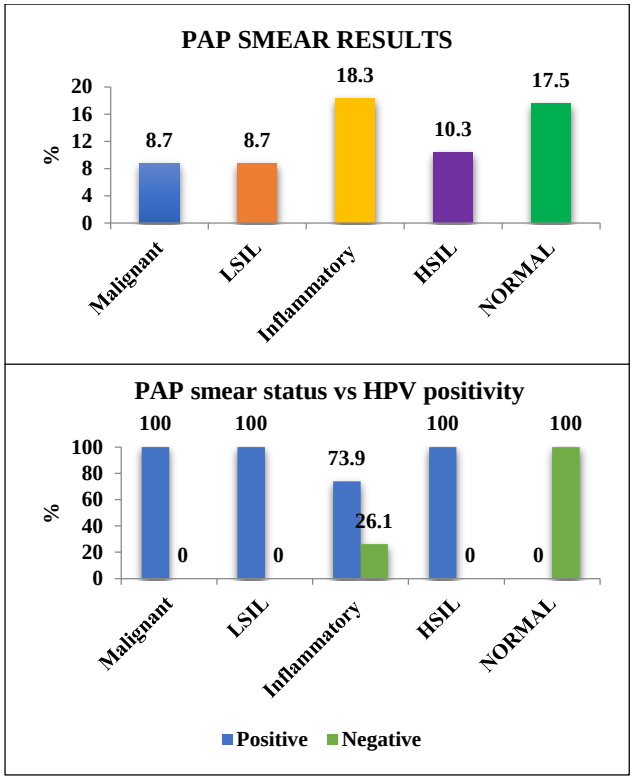

Figure 3: Pap smear results.

Colposcopy cervix findings

The cervix conditions based on colposcopy examination showed that cervix conditions such as inflammation, erosion, and hardening were the most common findings. Cases with warts and heavy erosion that were doubtful for malignancy and later confirmed malignant are marked as-malignant in the graph below. The HPV-positive status was compliant with abnormalities of cervix. Hemorrhages, hardening, erosion, and inflammation showed highest positivity rates in chronological order. This signifies any of these cervix's characteristics on visual detection mandates HPV molecular testing. These are phenotypic manifestations to be watched out for during a physical examination of the cervix.

Reasons for testing

Bad cervix characteristics such as intermittent bleeding, foul-smelling discharge, colored discharge (color), and pain during sex (Pain) were recorded as reasons for testing. Predominantly reason for testing emerged as intermittent bleeding between cycles and foul-smelling discharge. This shows positive trend of awareness. Visual inspection by acetic acid is a common investigatory procedure carried out. Principle behind this test is that abnormal cells have increased protein levels and hence coagulate when acetic acid is added showing a white precipitate. It was also noted that 35.7% of patients came for regular checkups. This awareness with regular screening and vaccination can by itself eradicate HPV-dependent cervical cancer.

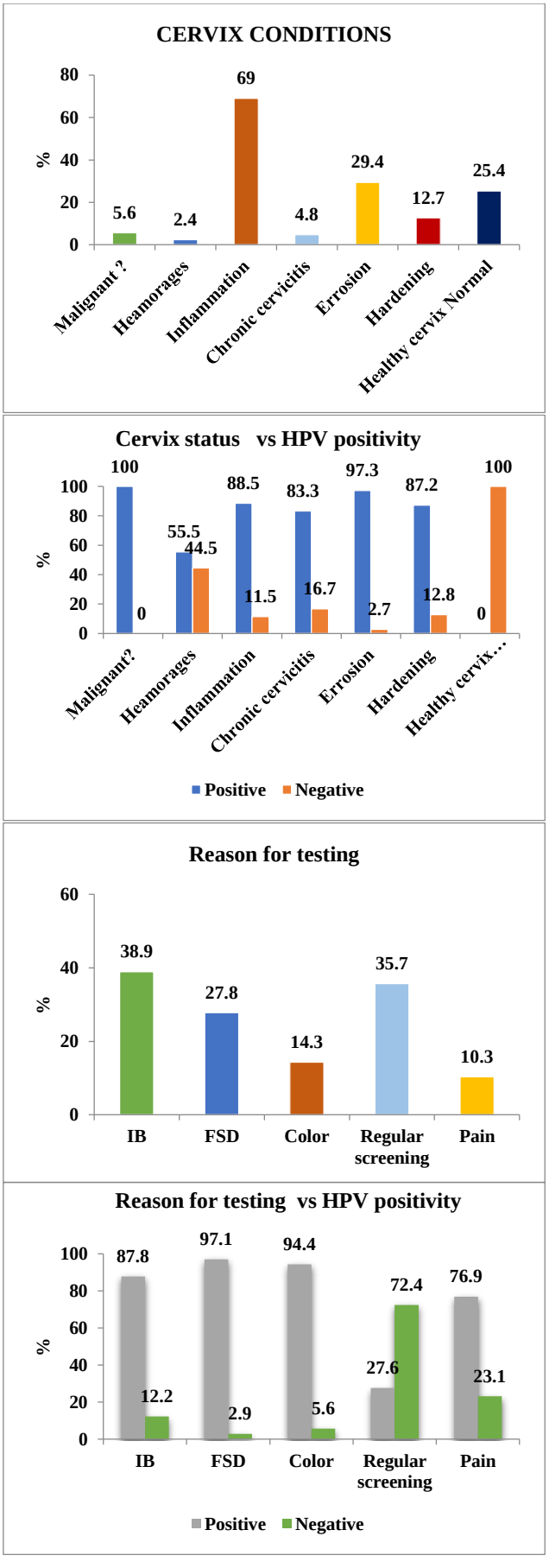

Figure 4: Cervix conditions and reasons for testing.

DISCUSSION

This study short lists few factors that can be taken as a basic guideline for HPV testing. Women in the postmenopausal ages are seen to be more prone to HPV positivity and hence the stringency of screening must be increased in that age group. HPV clearance rates were seen to be higher in the post-partum period as well as menstruating phase.[13] This study highlights factors such as cervix conditions like erosion, inflammation, chronic cervicitis to be closely related to HPV positivity and leading up to LSIL and HSIL conditions. The US department of veteran affairs in their guideline for HPV-based cervical cancers states that the increase in foul-smelling/colored vaginal discharges that may be pale, watery, pink, brown, and bloody are early red flags for the otherwise asymptomatic HPV infection/cervical cancer. The HPV positivity range for HPV varied with the highest positivity range for those who were tested for HPV for foul-smelling discharge, colored discharge, intermittent bleeding, and pain having high positivity rates. The patients with foul-smelling discharge and colored discharge had a positivity rate of over 90% ascertaining the factor that these are warning factors to be watched out for screening of HPV. Increasing rates of RoS that cause hypoxic conditions and consequent cell death are predominant in cancer. This may be attributed to the foul smell and colored discharge. Collagen deposition is a key feature of cervical cancer, this leads to the hardening of the cervix, and pain as a symptom may be due to this factor. A correlation of these factors with the HPV positive status may be used as a predictive prognostic marker for HPV based cervical cancers. The above demographic studies reveal the bad cervix characteristics is an important factor for testing of HPV and shares a positive correlation of 99 % confidence with HPV positivity. All the above listed factors are significant factors that influence the positivity of HPV. Data was insufficient and in conclusive for factors like common bathroom usage, other gynecological disorders, socio-economic status, educational qualification, douching habits etc. Since, this study deals with viral cause for cancer, family history does not play a significant role. The above listed factors are crucial check points that may be considered while screening a patient for HPV status.

CONCLUSION

The above demographic studies reveal that bad cervix characteristics are an important factor for testing HPV and share a positive correlation of 99% confidence with HPV positivity. All the above-listed factors are significant factors that influence the positivity of HPV. Data was insufficient and inconclusive for factors like common bathroom usage, other gynecological disorders, socio-economic status, educational qualification, douching habits, etc. Since this study deals with viral causes of cancer, family history does not play a significant role. The above-listed factors are crucial checkpoints that may be considered while screening a patient for HPV status. Hence, may be used as a predictive factor combined with HPV status to determine patients for screening as well as cervical cancer progression possibility.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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