



The Association Between Pubic and External Genitalia Hair Removal by Laser Devices and Human Papillomavirus (HPV) Infection

Manizheh Sayyah-Melli¹, Shabnam Yaghoubi Kondelaji^{1*}, Parvin Mostafa-Gharabaghi¹, Mehri Jafari Shobeiri¹, Behrooz Shokouhi¹, Vahideh Rahmani¹, and Maryam Vaezi¹

Abstract

Objectives: This study aimed to investigate the association between pubic and external genitalia hair removal by laser devices and human papillomavirus (HPV) infection.

Materials and Methods: In this study, a total of 809 women were examined. To this end, 250 women with HPV-positive and 500 ones with HPV-negative/normal cytology were assigned to two groups. Then these women were demographically matched, and the two groups were compared regarding the prevalence of laser device usage for external genital hair removal. Finally, the statistical analysis was performed using unpaired student t-test and Kolmogorov-Smirnov test.

Results: The prevalence of laser hair removal were 59% and 25% in HPV-positive and HPV-negative/regular cytology groups, respectively. It was found that the history of laser hair removal was positively associated with positive HPV results (OR: 4.353, CI: 95%, 3.157 to 5.989).

Conclusions: Laser hair removal was positively associated with positive HPV transmission. However, it was recommended that further studies with greater sample sizes should be carried out to determine if the pubic hair removal by laser devices increased the HPV transmission risk.

Keywords: Human, Papilloma, Virus, HPV, Laser

Introduction

A substantial body of evidence supports the linkage between HPV and cervical cancer (1-3). The worldwide human papillomavirus (HPV) prevalence in cervical carcinomas is 99.7%, highlighting the importance of recognizing HPV transmission routes (4). However, there are contradictory results about the root of HPV transmission. While skin-to-skin and mucosa-to-mucosa contacts during the intercourse are considered the main pathways for HPV transmission, non-sexual contacts (e.g., vertical transmission from mother to fetus via placenta or amniotic fluid, or through vaginal mucosa or perineal area at the time of delivery) have been also suggested by some studies as the causes of the given transmission (5-7). Horizontal transmission via instruments, fingers, mouth and non-sexual skin contact (6), self-inoculation in virgins (8-10), and genital warts in children without a history of sexual assault (11) have been determined as other transmission methods for the disease. HPV-DNA has been detected in 21% of the cases on the condom-covered transvaginal ultrasound probes after examination and even after proper disinfection (12). In one study, 3% of the samples obtained from ultrasound probes before examination and 1.9% of them after examination were

positive for high-risk HPV-DNAs (13) and, in some studies, free virions were found in addition to DNA (14).

HPVs are stable and resistant to heat and desiccation, and can preserve 30% of their infectivity even after seven days of desiccation of the surfaces, cloths, and gynecologic instruments (15). Galloway et al demonstrated that HPV existed on gynecologic office instruments (e.g., speculum handles and examination lamps) in 18% of the cases, even after their regular disinfection (16). However, there is no evidence proving these particles' ability to cause the infection. HPV can persist in various environmental conditions and, due to the characteristics of its capsid, may resist disinfection through desiccation and ethanol. As a result, HPV-16 is resistant to several medical instruments sterilizers (e.g., glutaraldehyde); however, hypochlorite and high concentrations of per-acetic acid-silver-based disinfectants can disinfect it (17).

Perineal laser hair removal method, irrespective of its potential risks, has recently gained a considerable popularity due to the provision of women with widely accessible laser and intense pulsed light (IPL) devices accompanied by their relatively low cost and partly permanent hair removal outcome as well as the representation of hairlessness equal to sexual attractiveness by media and society. According



Key Messages

- ▶ Laser hair removal was associated with HPV transmission.
- ▶ HPV may have been transmitted via non-sexual routes.

to American society of plastic surgeons, the side effects of laser hair removal procedures could be mild swelling around the hair follicles, temporary pigment changes, redness of the skin, temporary irritation resulting in blistering, crusting, scarring or other changes in skin texture (18).

A large number of studies investigated the side effects of laser hair removal methods; however, they failed to thoroughly examine the association between laser hair removal and HPV infection. This study, therefore, aimed to investigate the effect of skin contact with laser devices on HPV transmission.

Methods

Study Population

In this descriptive study, a total of 809 sexually active women admitted to a gynecology clinic in Al-Zahra and Talegani teaching hospitals, Tabriz, Iran from February to December, 2022, either for specific gynecologic problems or for routine cervical cancer screening program were examined. To this end, women volunteering to participate in the survey were asked to answer the questions in a questionnaire.

Data Collection

The required questions were designed by the researchers to obtain information about the demographic characteristics, age at first intercourse, number of lifetime sexual partners, frequency of intercourse, number of sexually active years, as well as pubic and perineal hair grooming methods. A single-shared numerical code was assigned to each questionnaire and its related medical record containing the results of each participant's HPV and cytology assessments.

Inclusion and Exclusion Criteria

The only inclusion criterion in this study was the application of laser hair removal tools by participants for at least five times prior to the study. Those with multi-partners (e.g., sex workers) as well as those laser users

utilizing personal heads on laser applier probes were excluded from this study.

HPV Detection

The questionnaires were divided into HPV-positive and HPV-negative/regular cytology groups after the completion of sampling in December 2022 and the assessment of the related medical records. The two groups were adjusted for the present age, age at the time of first intercourse, number of lifetime sexual partners, number of sexually active years, and frequency of intercourse. The prevalence of the laser and IPL devices applications for hair grooming was determined for each group.

Statistical Methods

GraphPad Prism 8.0 (GraphPad Software, San Diego, CA, USA) was used to analyze the obtained data. The unpaired student t-test was performed to compare the data from two groups. Kolmogorov-Smirnov test was used to investigate the normality of residuals. A *P*-value <0.05 was considered a statistically significant difference between the groups.

Results

The Characteristics of Included Individuals

In this study, 549 HPV-negative/normal cytology females and 260 females with positive HPV were recruited. After matching the participants, 49 females without HPV infection and 10 females with HPV infection were excluded; therefore, 250 females with HPV infection and 500 females without HPV infection, who aged between 21-64 years, were included. The number of sexual partners for the cases and controls ranged from 1 to 10. According to the results, no statistically significant differences were found between females with HPV infection and females without HPV infection regarding the relationship between the number of sexual partners and the frequency of sexual intercourse per week (*P*=0.7999 and *P*=0.0750, respectively) (Table 1).

The mean age for the case group was 40.86 years old, and the mean age for the control group was 41.89 years old. The mean age of the first sexual intercourse for the case and control groups were 22.88 and 22.68, respectively. The mean number of sexual partners for the case and control groups were 1.438 and 1.441, respectively. Furthermore, the frequencies of sexual intercourse per week for the case

Table 1. The Characteristics of Included Individuals

	HPV Positive (n=250)	HPV Negative (n=500)	<i>P</i> Value
Age	40.86 ± 6.926	41.89 ± 7.487	0.0801
First sexual intercourse	22.88 ± 5.436	22.68 ± 4.909	0.6834
Number of sexual partners	1.438 ± 0.8775	1.441 ± 0.8081	0.7999
Frequency of sexual intercourse per week	1.079 ± 0.5809	1.149 ± 0.9858	0.0750
Monthly income (IRT)	15723000 ± 5979467	16026000 ± 6397345	0.5991
Education (Academic/non-academic)	136/114	233/267	0.0527

Data were presented as mean ± standard deviation.

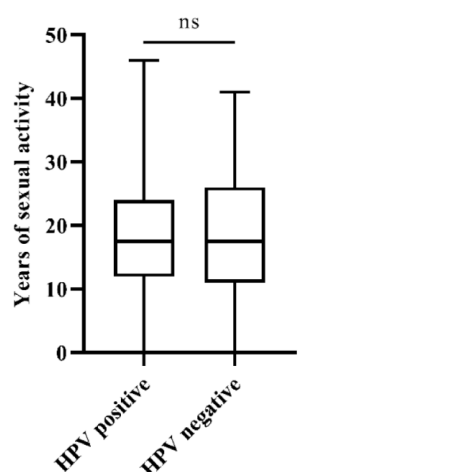


Figure 1. Year of Sexual Activity in HPV-infected Individuals and Controls. ns: non-significant.

and control groups were 1.079 and 1.149, respectively (Table 1). No differences were observed between two groups in terms of monthly income and education ($P=0.5991$, and $P=0.0527$) (Table 1).

Years of Sexual Activity in HPV-Infected Individuals and Controls

HPV-infected individuals and controls were compared in terms of the number of sexual activity years. However, no statistically significant difference was detected between HPV-infected individuals and controls regarding the given years (Figure 1) ($P=0.3284$).

The Prevalence of Shaving, Waxing, Electric Epilator, Hair Removal Cream, and Laser Hair Removal for Perineal Hair Removal

Our study results showed that 52.2%, 17.2%, 14.22%, 23.6%, 59.2%, and 70% of the HPV-infected individuals utilized shaving, waxing, electric epilator, hair removal cream, laser, and shaving along with other methods for removing perineal hair, respectively (Figure 1). However, 40.20%, 19.4%, 12.02%, 22%, 25%, 75.6% of the controls used to utilize shaving, waxing, electric epilator, hair removal cream, laser, and shaving along with other methods for removing perineal hair (Figure 2). The prevalence of perineal laser hair removal in HPV positive group was 59.2%, while it was 25% in HPV negative/regular cytology group.

Association of HPV status with the methods of perineal hair removal

According to our study results, a positive association was found between shaving and HPV infection (OR=1.625, 95% CI=1.199 to 2.209, and $P=0.0023$) (Table 2). A significant positive association was also detected between laser hair removal and HPV infection (OR=4.353, 95% CI=3.157 to 5.989, and $P<0.0001$) (Table 2). However, no statistically significant associations were observed between electric epilator, waxing, and hair removal cream with HPV infection (all $P>0.05$) (Table 2). The results revealed that 75% of the individuals with at least a bachelor degree had a history of laser therapy (Figure 3).

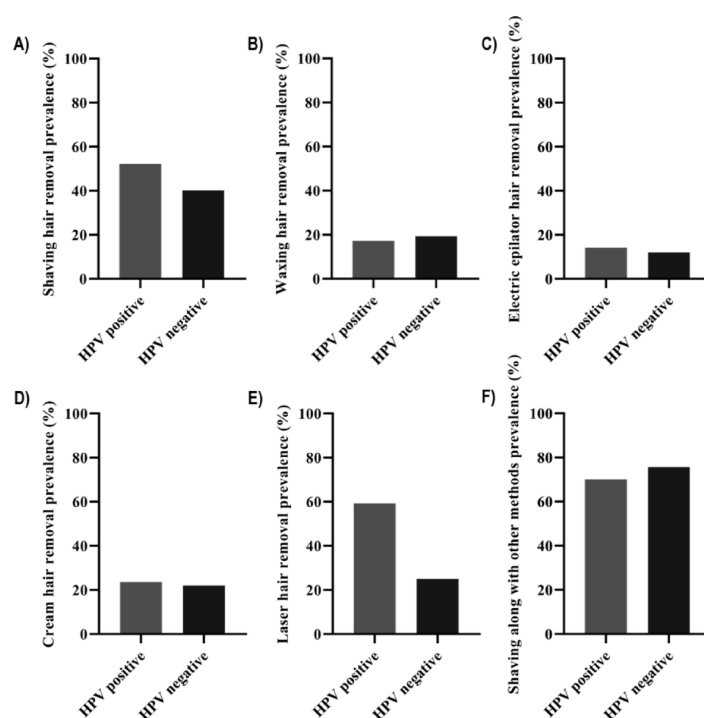


Figure 2. The Prevalence of Various Methods for Perineal Hair Removal Methods. A) shaving, B) waxing, C) electric epilator, D) cream hair removal, E) laser, and F) shaving along with other perineal hair removal methods.

Table 2. Associations Among Various Methods of Perineal Hair Removal and HPV Infection

	Odds ratio	95% CI	P Value
Shaving	1.625	1.199 to 2.209	0.0023
Waxing	0.8630	0.5843 to 1.276	0.4881
Electric epilator	1.214	0.7798 to 1.911	0.4146
Hair removal cream	1.095	0.7571 to 1.574	0.6434
Laser hair removal	4.353	3.157 to 5.989	< 0.0001

Discussion

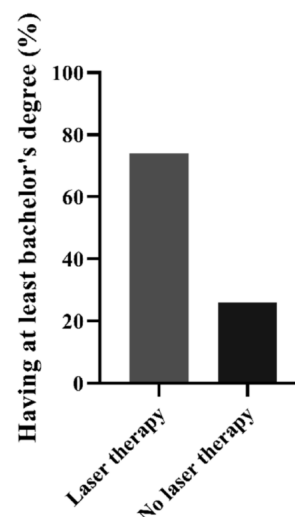
There are serious concerns about the possibility of infection transmission – HPV transmission, in particular – through the devices due to the growing popularity of the light-based devices like laser and IPL for long-term depilation of unwanted body hair (e.g., pubis, perineum, and external genitalia) as well as the necessity for the direct contact of applicator head to the skin in order to energy delivery. The high stability of HPV and its resistance to the heat and desiccation increase the probability of the risk. Previous studies had failed to evaluate the risk of infection transmission through, particularly, laser devices. Therefore, a serious need was felt to carefully assess the risks of HPV transmission by routes other than the sexual activities since these risks had been weakly suggested in the literature but had not been given sufficient research attention.

Laser, seemingly, is an attractive means for women with more frequent sexual activity (e.g., sex workers and women with multi partners) which put them at a conspicuously higher risk of HPV transmission. At first, some may mistakenly think that the primary linkage is actually between “laser usage and frequency of sexual contacts” instead of “laser usage and HPV”. To eliminate this confusion, our two study groups were matched regarding the frequency of sexual contacts, the number of life-long sexual partners, and the number of sexually active years. To this end, first, women with multi partners (e.g., sex workers) were excluded from the study. The economic status of the case and control groups was also matched in order to remove the positive impact of a high income on the application of laser hair removal method as a costly method.

An interesting finding revealed by our study was the high prevalence of laser hair removal among highly educated women since 68% of the laser users had a bachelor's degree or higher degrees, while only 23% of the non-laser users had similar educational degrees.

Limitations of the Study

Since a self-expression method was adopted in this study to collect the required data, some inaccurate data may have entered into the study due to the cultural factors. Since the HPV vaccination coverage in Iran was very poor, the vaccination history of the participants was not considered in this study, which was another limitation of this study.

**Figure 3.** The Percentage of Individuals With/Without a History of Laser Therapy and With at Least a Bachelor's Degree.

Conclusions

In sum, the prevalence of laser usage in HPV positive group was higher than that in HPV negative group, which may have suggested the possibility of HPV virus transmission via laser devices used in perineal/pubic hair removal method. Our finding was consistent with the results from previous studies on non-sexual routes of HPV transmission, and may have contributed to the related future studies. In our study, the case and control groups of previously manifested HPV results were also examined and the prevalence of laser usage in them was extracted. This approach was mainly based on restricted financial resources and could potentially be applied to HPV detection in future studies involving laser users. It was recommended that experimental and laboratory-based studies on gynecologic office equipment should be conducted in order to detect the virus on light-applying devices and demonstrate its potential for pathogenesis.

Authors' Contribution

Conceptualization: Manizheh Sayyah-Melli.

Data curation: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji, Parvin Mostafa-Gharabaghi, Mehri Jafari Shobeiri, Behrooz Shokouhi, Vahideh Rahmani, and Maryam Vaezi.

Formal analysis: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji.

Funding acquisition: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji.

Investigation: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji, Parvin Mostafa-Gharabaghi, Mehri Jafari Shobeiri, Behrooz Shokouhi, Vahideh Rahmani, and Maryam Vaezi.

Methodology: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji.

Project administration: Manizheh Sayyah-Melli.

Resources: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji, Parvin Mostafa-Gharabaghi, Mehri Jafari Shobeiri, Behrooz Shokouhi, Vahideh Rahmani, and Maryam Vaezi.

Software: Manizheh Sayyah-Melli, Shabnam Yaghoubi Kondelaji.

Supervision: Manizheh Sayyah-Melli.

Validation: Manizheh Sayyah-Melli, Parvin Mostafa-Gharabaghi, Mehri Jafari Shobeiri, Behrooz Shokouhi, Vahideh Rahmani, and Maryam Vaezi.

Visualization: Manizheh Sayyah-Melli, Shabnam Yagoubi Kondelaji.

Writing-original draft: Manizheh Sayyah-Melli, Shabnam Yagoubi Kondelaji.

Writing-review & editing: Manizheh Sayyah-Melli, Shabnam Yagoubi Kondelaji, Parvin Mostafa-Gharabaghi, Mehri Jafari Shobeiri, Behrooz Shokouhi, Vahideh Rahmani, and Maryam Vaezi.

Conflict of Interests

Authors declare that they have no conflict of interests.

Data Availability Statement

Data are available upon reasonable request from the corresponding author.

Ethical Issues

An informed consent was obtained from all subjects prior to inclusion in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Research Ethics Committees of Tabriz University of Medical Sciences (ID: IR.TBZMED.REC.1400.1172, <https://ethics.research.ac.ir/IR.TBZMED.REC.1400.1172>).

Acknowledgments

We thank the **Clinical Research Development Unit of Al-Zahra Hospital**, at Tabriz University of Medical Sciences for statistical supports.

References

1. Franco EL, Duarte-Franco E, Ferenczy A. Cervical cancer: epidemiology, prevention and the role of human papillomavirus infection. *CMAJ*. 2001;164(7):1017-1025.
2. Sedlacek TV. Advances in the diagnosis and treatment of human papillomavirus infections. *Clin Obstet Gynecol*. 1999;42(2):206-220. doi:10.1097/00003081-199906000-00006
3. Sonnex C. Human papillomavirus infection with particular reference to genital disease. *J Clin Pathol*. 1998;51(9):643-648. doi:10.1136/jcp.51.9.643
4. Walboomers JM, Jacobs MV, Manos MM, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *J Pathol*. 1999;189(1):12-19. doi:10.1002/(sici)1096-9896(199909)189:1<12::aid-path431>3.0.co;2-f
5. Smith EM, Parker MA, Rubenstein LM, Haugen TH, Hamsikova E, Turek LP. Evidence for vertical transmission of HPV from mothers to infants. *Infect Dis Obstet Gynecol*. 2010;2010:326369. doi:10.1155/2010/326369
6. Petca A, Borislavski A, Zvanca ME, Petca RC, Sandru F, Dumitrascu better future (review). *Exp Ther Med*. 2020;20(6):186. doi:10.3892/etm.2020.9316
7. Sabeena S, Bhat P, Kamath V, Arunkumar G. Possible non-sexual modes of transmission of human papilloma virus. *J Obstet Gynaecol Res*. 2017;43(3):429-435. doi:10.1111/jog.13248
8. Tay SK, Ho TH, Lim-Tan SK. Is genital human papillomavirus infection always sexually transmitted? *Aust N Z J Obstet Gynaecol*. 1990;30(3):240-242. doi:10.1111/j.1479-828x.1990.tb03223.x
9. Houlihan CF, Baisley K, Bravo IG, et al. Human papillomavirus DNA detected in fingertip, oral and bathroom samples from unvaccinated adolescent girls in Tanzania. *Sex Transm Infect*. 2019;95(5):374-379. doi:10.1136/sextrans-2018-053756
10. Liu Z, Rashid T, Nyitray AG. Penises not required: a systematic review of the potential for human papillomavirus horizontal transmission that is non-sexual or does not include penile penetration. *Sex Health*. 2016;13(1):10-21. doi:10.1071/sh15089
11. Mamas IN, Dalianis T, Doukas SG, et al. Paediatric virology and human papillomaviruses: an update. *Exp Ther Med*. 2019;17(6):4337-4343. doi:10.3892/etm.2019.7516
12. Ma ST, Yeung AC, Chan PK, Graham CA. Transvaginal ultrasound probe contamination by the human papillomavirus in the emergency department. *Emerg Med J*. 2013;30(6):472-475. doi:10.1136/emered-2012-201407
13. Fakhry C, Gillison ML, D'Souza G. Tobacco use and oral HPV-16 infection. *JAMA*. 2014;312(14):1465-1467. doi:10.1001/jama.2014.13183
14. Ryndock EJ, Meyers C. A risk for non-sexual transmission of human papillomavirus? *Expert Rev Anti Infect Ther*. 2014;12(10):1165-1170. doi:10.1586/14787210.2014.959497
15. Casalegno JS, Le Bail Carval K, Eibach D, et al. High risk HPV contamination of endocavity vaginal ultrasound probes: an underestimated route of nosocomial infection? *PLoS One*. 2012;7(10):e48137. doi:10.1371/journal.pone.0048137
16. Gallay C, Miranda E, Schaefer S, et al. Human papillomavirus (HPV) contamination of gynaecological equipment. *Sex Transm Infect*. 2016;92(1):19-23. doi:10.1136/sextrans-2014-051977
17. Meyers J, Ryndock E, Conway MJ, Meyers C, Robison R. Susceptibility of high-risk human papillomavirus type 16 to clinical disinfectants. *J Antimicrob Chemother*. 2014;69(6):1546-1550. doi:10.1093/jac/dku006
18. ASPS. What Are the Risks of Laser Hair Removal? 2023. Available from: <https://www.plasticsurgery.org/cosmetic-procedures/laser-hair-removal/safety#:~:text=Mild%20swelling%20around%20the%20hair,other%20changes%20in%20skin%20texture>. Accessed 12,1, 2023.

© 2025 The Author(s); This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.