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Investigating Cervical Risk Factors that Lead to Cytological and Biopsy Examination

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ABSTRACT

Introduction: Cervical cancer ranks the fourth prevalent cancer in women at the global level, and the second in poor countries. The main objectives of the present study were to investigate the risk factors associated with cervical cancer and to study their possible association with the decision to take a cervical biopsy. **Aim:** The main objectives of this study were to investigate the risk factors associated with cervical cancer and to study their possible association with the decision to take a cervical biopsy. **Methods:** It was cross-sectional study and we analyzed an online data posted on Kaggle. This Dataset is obtained from UCI Repository. A list of risk factors for cervical cancer leading to biopsy examination was included, such as age, number of sexual partners, first sexual intercourse, number of pregnancies, smoking variables, hormonal contraceptives, IUD, and sexually transmitted disease variables, Hinselmann, Schiller, Cytology, and Biopsy. The dataset was prepared for appropriateness through filtering invalid cases with missing data. **Results:** The results of the study showed that the following variables were significantly associated with cytological examination: STD-Condylomotosis ($p=0.035$), STD-Pericondylomotosis ($p=0.029$), STD_HIV ($p=0.006$), Hinselmann ($p<0.001$), Schiller ($p<0.001$), and biopsy ($p<0.001$). the results also showed that the following variables were significantly associated with cytological examination. **Conclusion:** Taken together, cytological variables or biopsy examination variables if carried out at an early stage, lead to better diagnostic and therapeutic options.

Keywords: cervical cancer, risk factors, dataset, Kaggle, HPV, sexually transmitted disease.

1. INTRODUCTION

Cancer is the main cause of death internationally and is responsible for approximately 9 million deaths in 2015 (1). Cancer is developed as normal cells are transformed into tumor cells passing through various stages that involve the transformation of precancerous cells into malignant cells. Early identification of cancer leads to better therapeutic responses with higher survival rates, less morbidity, and less treatment costs (1).

Cervical cancer ranks the fourth prevalent cancer in women at the global level, and the second in poor countries (2). It has been estimated that there are approximately 600000 new cases of cervical cancer, and about 300,000 deaths yearly, and the majority of these cases are likely to be encountered in poor countries (3, 4).

However, cervical cancer can be controlled through vaccination against papillomavirus infection (HPV) and routine screening programs including cytology (5). Moreover, surgical removal of affected tissue at an early stage can cure cervical tumor (3, 5).

Cervical cancer examination involves cytology screening, colposcopy, and biopsy. Cytology and colposcopy depend on image screening. Cytological examination requires stained smears (6). The high costs of these techniques make their use not applicable in countries with low income (6).

Colposcopic examination implies 4 stages. In the first stage, a normal saline solution is applied followed by examining both of the squamous and columnar epithelium with a magnifier lens to identify if there are signs of transformation. The general appearance of the squamous epithelium is likely to be smooth with pinkish tone. On the other hand, the columnar epithelium is almost red with villous appearance (7). In the second stage, a green filter is used to improve the contrast of the vessels, here reticular and hairpin-shaped capillaries are identified (7). In the third stage, 5% acetic acid solution is applied and followed by observation of cervix tissues for both squamous and colum-

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nar epithelium which leads to detection of precancerous lesions. This process is known as Hinselmann. The fourth stage is known as the Schiller's test, and is characterized by applying Lugol's iodine solution to the cervix. Normal cells stain as brown or black, while abnormal cells are stained or partially stained (7, 8).

2. AIM

The main objectives of this study were to investigate the risk factors associated with cervical cancer and to study their possible association with the decision to take a cervical biopsy.

3. METHODOLOGY

Data source

An online data posted on Kaggle (9). This Dataset is Obtained from UCI Repository. A list of risk factors for cervical cancer leading to biopsy examination was included.

Dataset included the following cervical risk factors: Age, Number of sexual partners, First sexual intercourse, Number of pregnancies, Smokes, Smokes (years), Smokes (packs/year), Hormonal Contraceptives, Hormonal Contraceptives (years), IUD, IUD (years), STDs, STDs (number), STDs: condylomatosis, STDs: cervical condylomatosis, STDs: vaginal condylomatosis, STDs: vulvar-perineal condylomatosis, STDs: syphilis, STDs: pelvic inflammatory disease, STDs: genital herpes, STDs: molluscum contagiosum, STDs: AIDS, STDs: HIV, STDs: Hepatitis B, STDs: HPV, STDs: Number of diagnosis, Hinselmann, Schiller, Cytology, and Biopsy.

Data preparation

The data in its raw source was composed of 858 entries of patients. Data contained missing data due to the right of privacy of participants in filling data. Inappropriate data was deleted. The remaining valid data included 676 entries of patients.

Statistical analysis

The analysis of data was made using SPSS version 21. Descriptive analysis was used to describe data including frequencies and percentages for categorical variables, and means with standard deviations for continuous variables. The impacts of cervical cancer risk factors on biopsy or cytology examination were evaluated using One Way ANOVA. The significance was assessed at $\alpha \leq 0.05$.

4. RESULTS

General characteristics of study participants

The general characteristics of the study participants are summarized in Table 1. The mean age is 27.23 ± 8.7 years. The mean of sexual partners is 2.50 ± 1.63 . The mean age for first sexual intercourse is 17.14 ± 2.85 years old. The mean of pregnancies number is 2.32 ± 1.6 . Smoking was reported by 14.2% of study participants. The mean of Smoking years 8.85 ± 7.71 , while the mean of smoking packets per year was 3.32 ± 5.48 . The use of hormonal contraceptives was reported by about 65% of study participants. For those women who used hormonal contraceptives, the mean number of hormonal contraceptives was 3.53 ± 4.12 per year. The use of IUD was

reported by about 11% of study participants with a rate of 4.72 ± 4.006 .

Variable	Description
Age (M \pm SD) years	27.23 \pm 8.70
Number of sexual partners (M \pm SD)	2.50 \pm 1.63
First sexual intercourse (M \pm SD)	17.14 \pm 2.85
Number of pregnancies (M \pm SD)	2.32 \pm 1.6
Smoking (N, %):	
Yes	95 (14.2%)
No	572 (85.8%)
Smoking years (M \pm SD)	8.85 \pm 7.71
Smoking packets/year	3.32 \pm 5.48
Hormonal contraceptives (N, %):	
Yes	431 (64.6%)
No	236 (35.4%)
Number of hormonal contraceptives per year	3.53 \pm 4.12
IUD (N, %):	
Yes	75 (11.2%)
No	592 (88.8%)
IUD per year (M \pm SD)	4.72 \pm 4.006

Table 1. General characteristics of study participants

Sexually transmitted diseases and related variables

As seen in Table 2, sexually transmitted diseases (STD) were reported in about 10% of the study participants. The mean number of STDs was 1.70 ± 0.70 . Condylomatosis was reported in about 6% of the study participants. Vaginal condylomatosis was reported in 0.6% of study participants. Pericondylomatosis was reported in 5.4% of study participants. Syphilis was reported in 2.2% of the study participants. Pelvic inflammatory diseases, genital herpes, and Molluscum contagiosum were reported in 0.1% of study participants for each. A total of 13 (1.9%) cases were positive for HIV. Hepatitis was reported in 0.1% of cases, and HPV was reported in 0.3% of cases. The frequency of diagnosis for STD was in the following patterns: no diagnosis was reported for 91.2% of cases, one time for 8.6% of cases, two diagnoses were reported for 0.1% of cases, and three diagnoses were reported for 0.1% of cases. Hinselmann was carried out for 4.5% of cases, Schiller test was carried out for 9.3% of study participants. Cytology was reported for 5.7% of cases, and biopsy was taken from 6.7% of study participants.

The impact of study variables on biopsy taking decision

We investigated the impact of study variables on biopsy taking decision using One Way ANOVA test. As seen in Table 3, the following variables were significantly associated with biopsy taking decision: smoking ($p=0.0483$), hormonal contraceptives per year ($p=0.023$), STD ($p=0.003$), condylomatosis ($p=0.002$), pericondylomatosis ($p=0.002$), genital herpes ($p<0.001$), AIDS ($p=0.018$), No of diagnosis ($p=0.017$), Hinselmann ($p<0.001$), Schiller ($p<0.001$), and cytology ($p<0.001$).

5. DISCUSSION

The following cervical risk factors were significantly associated with biopsy examination: smoking, hormonal contraceptives per year, STD, condylomatosis, pericon-

Variable	Description
STD (N, %):	
Yes	65 (9.7%)
No	602 (90.3%)
No of STD (M±SD)	1.70±0.70
SDT- Condylomatosis (N, %):	
Yes	37 (5.5%)
No	630 (94.5%)
STD-vaginal condylomatosis (N, %):	
Yes	4 (0.6%)
No	667 (99.4%)
STD-pericondylomatosis (N, %):	
Yes	36 (5.4%)
No	631 (94.6%)
STD-Syphilis (N, %):	
Yes	15 (2.2%)
No	652 (97.8%)
STD-pelvic inflammatory disease (N, %):	
Yes	1 (0.1%)
No	666 (99.9%)
STD- genital herpes (N, %):	
Yes	1 (0.1%)
No	666 (99.9%)
STD- Molluscum contagiosum (N, %):	
Yes	1 (0.1%)
No	666 (99.9%)
STD-HIV (N, %):	
Yes	13 (1.9%)
No	654 (98.1%)
STD- Hepatitis (N, %):	
Yes	1 (0.1%)
No	666 (99.9%)
STD-HPV (N, %):	
Yes	2 (0.3%)
No	665 (99.7%)
STD-No of diagnosis (N, %):	
Not diagnosed	608 (91.2%)
1	57 (8.6%)
2	1 (0.1%)
3	1 (0.1%)
Hinselmann (N, %):	
Yes	30 (4.5%)
No	637 (95.5%)
Schiller (N, %):	
Yes	62 (9.3%)
No	605 (90.7%)
Cytology (N, %):	
Yes	38 (5.7%)
No	629 (94.3%)
Biopsy (N, %):	
Yes	45 (6.7%)
No	622 (93.3%)

Table 2. Sexually transmitted diseases (STD)

dylomatosis, genital herpes, AIDS, STD-No of diagnosis, Hinselmann, Schiller, and cytology. Several studies have confirmed the significant relationship between cervical cancer and smoking (12-14). We think that smoking plays an important roles in the pathogenesis of diseases through increasing the potential to develop free radicals that harm tissues and accelerate disease progress. The results of this study showed that the use of hormonal contraceptives for a long time is a risk fac-

Variable	Significance
Smoking	0.0483
Hormonal contraceptives per year	0.023
STD	0.003
Condylomatosis	0.002
Pericondylomatosis	0.002
Genital herpes	<0.001
HIV	0.018
No of diagnosis	0.017
Hinselmann	<0.001
Schiller	<0.001
Cytology	<0.001

Table 3. The impact of study variables on biopsy taking decision

tor of cervical cancer. Our results are in agreement with other studies such as the study of Chichareon et al (12) who found that the use of hormonal contraceptives for >4 years is considered a risk factor for cervical cancer. Hormones contraceptives are believed to increase the susceptibility to HPV infection, an issue that improves the pathogenesis of cervical cancer (15). Sexually transmitted diseases in general have been shown in various studies to increase the likelihood of developing cervical cancer because viruses interfere with the genetic material of host cells and accelerate the development of cervical cancer (16, 17). HPV is a essential sexually transmitted disease that increases the likelihood of occurrence of cervical cancer (18-20).

6. CONCLUSION

The results of the present study revealed several risk factors of cervical cancer that should be taken into account to carry out the biopsy examination. These factors include smoking, hormonal contraceptives per year, sexually transmitted diseases, Hinselmann, Schiller, and cytology.

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